

# CapStone B Final WB - Thad

May 29, 2021

## 0.1 ## Table of Contents

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### 0.1.1 TASKS

1. predicting stage (SVM, Decision Trees, novel model)
2. determining if there is a correlation with the disease and any other characteristic (SVM, Decision Trees, novel model)
3. determining whether or not there is any genetic ties (neural networks, novel model) (add this in)
4. determine what type of disease is?
5. Target the same dataset as the related works.

#### Walter

- Neural Networks (parameter tuning + model + stats + feature reduction) EOW5
- statistics/metrics (p-value, t-value, AUC) EOW7

#### Kris

- Decision Trees (parameter tuning + model + stats + feature reduction) EOW5
- discussion EOW7
- conclusion EOW7
- updates to PPT EOW8 (Jamie will help)

#### Thad

- SVM (parameter tuning + model + stats + feature reduction) EOW5
- rewrite of other papers EOW7
- how this affects the community EOW7
- tie back to other papers EOW7

#### Jamie

- intro EOW4
- explaining data points EOW4
- data manipulation (all data related tasks) (reduction method) (reach if needed) EOW3
- enhance pre-processing (feature correlations)
- visualizations of ML Models (TBD if we have time) very novel EOW

- application build EOW8
- create new ML model EOW5
- just see if we can find another dataset: found a separate one, too late for change
- create a repo EOW3
- one (minimum) paper for baseline (Walter/Thad will find 2-3 each) EOD Thursday
- feature comparison for Logit & Chi2
- change SMOTE (X\_train) & Scaling (X\_train & X\_Test) after split

## 0.2 ## Primary Dataset

Cross, Simon S. "Dataset of Observed Features on Endoscopic Colorectal Biopsies from Normal Subjects and Patients with Chronic Inflammatory Bowel Disease (Crohn's disease and Ulcerative Colitis)." Department of Pathology, University of Sheffield Medical School (1999): 1-15

Genetics Summary Statistics Dataset: <https://www.ibdgenetics.org/downloads.html>

East Asian DataSet: <https://academic.oup.com/ecco-jcc/article/12/6/730/4951970#116848212>

## 0.3 ##### Libraries

```
[1]: # general libraries
import pandas as pd
import numpy as np
import itertools
import scipy.stats as stats
import random
import statistics

[2]: # data cleaning libraries
from collections import Counter
from imblearn.over_sampling import SMOTE
from sklearn.feature_selection import SelectKBest, mutual_info_classif, chi2
from sklearn.preprocessing import LabelEncoder, OrdinalEncoder, MinMaxScaler

[3]: # ML libraries
from sklearn.ensemble import RandomForestClassifier, AdaBoostClassifier
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, f1_score, precision_score, recall_score, roc_auc_score
from sklearn.model_selection import KFold, train_test_split
from sklearn.naive_bayes import GaussianNB
from sklearn.neighbors import KNeighborsClassifier
from sklearn.neural_network import MLPClassifier
from sklearn.svm import SVC
from sklearn.tree import DecisionTreeClassifier

[4]: # Visualization libraries
from matplotlib import pyplot
import matplotlib.pyplot as plt
```

```
import seaborn as sns
import plotly.express as px
```

## 0.4 ## Data

```
[5]: # toggle to hide code
from IPython.display import HTML

HTML('''<script>
code_show=true;
function code_toggle() {
    if (code_show){
        $('div.input').hide();
    } else {
        $('div.input').show();
    }
    code_show = !code_show
}
$( document ).ready(code_toggle);
</script>
<form action="javascript:code_toggle()"><input type="submit" value="Click here to toggle on/off the raw code."></form>'''')
```

```
[5]: <IPython.core.display.HTML object>
```

```
[6]: # center all images
from plotly.offline import download_plotlyjs, init_notebook_mode, plot, iplot
init_notebook_mode(connected=True)
HTML("""
<style>
.output_png {
    display: table-cell;
    text-align: center;
    vertical-align: middle;
}
</style>
""")
```

```
[6]: <IPython.core.display.HTML object>
```

### 0.4.1 Pull in Data

#### *ENDSC Data*

```
[7]: # all cases
all_cases = pd.read_excel("../Data/dataset/END0SC_1.xls", sheet_name="All cases")
# cleaned cases
```

```

cleaned_cases = pd.read_excel("../Data/dataset/ENDOSC_1_2_2.xls",\n
                           sheet_name="All IBD&normal")\n
cleaned_cases_og = cleaned_cases\n
cleaned_cases.head()

```

[7]:

	Year	Lab No	Age	Sex	Active inflammation?	Mucosal surface	\
0	92	5213	20.536986	0		0	0
1	90	805	55.575342	1		1	1
2	90	5957	58.698630	0		1	1
3	92	9207	65.934247	0		0	1
4	95	14469	23.391781	0		0	0

	Crypt architecture	Crypt profiles	Increased lamina propria cellularity?	\
0	0	7		0
1	3	4		1
2	1	7		1
3	1	7		0
4	0	7		0

	Mild & superficial increase in lamina propria cellularity?	...	\
0	0	...	
1	0	...	
2	0	...	
3	0	...	
4	0	...	

	Mucin depletion	Intraepithelial lymphocytes	Subepithelial collagen	\
0	0	0	0	0
1	1	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0

	Lamina propria granulomas	Submucosal granulomas	Basal histiocytic cells	\
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0

	Confirmed diagnosis	Method of confirmation	\
0	UC	Endoscopy	
1	UC	Endoscopy	
2	UC	Endoscopy	
3	UC	Endoscopy	
4	Crohns	Endoscopy	

```

Initial pathologists diagnosis \
0           Normal
1           IBD ?UC
2   IBD indeterminate, active
3 Non-specific inflammation, chronic
4 Non-specific inflammation, chronic

Observing pathologists diagnosis
0           Normal
1 Chronic idiopathic IBD - highly suggestive of ...
2           Inflammation - unclassified
3 Chronic idiopathic IBD - indeterminate
4           Normal

[5 rows x 29 columns]

```

#### 0.4.2 Data Definitions

```
[8]: IBD_def = pd.read_excel("../Data/Column_Definitions.xlsx", sheet_name="IBD")
```

```
[9]: IBD_def[["Data Column", "Definition", "In depth understanding"]]
```

```

[9]:
Data Column \
0           Year
1           Lab No
2           Age
3           Sex
4   Active inflammation?
5           Mucosal surface
6           Crypt architecture
7           Crypt profiles
8   Increased lamina propria cellularity?
9 Mild & superficial increase in lamina propria ...
10  Increased lymphoid aggregates in lamina propria?
11  Patchy lamina propria cellularity?
12  Marked & transmucosal increase in lamina prop...
13           Cryptitis extent
14           Cryptitis polymorphs
15           Crypt abscesses extent
16           Crypt abscesses polymorphs
17           Lamina propria polymorphs
18           Epithelial changes
19           Mucin depletion
20           Intraepithelial lymphocytes
21           Subepithelial collagen
22           Lamina propria granulomas
23           Submucosal granulomas

```

24 Basal histiocytic cells  
25 Confirmed diagnosis  
26 Method of confirmation  
27 Initial pathologists diagnosis  
28 Observing pathologists diagnosis

0 Year the biopsy was taken  
1 unique laboratory accession number for specifi...  
2 Age of patient  
3 Sex of patient  
4 Boolean  
5 is there mucous on the stomach wall?  
6 is low stomach present? is there  
7 NaN  
8 Its layers increased inflammation by inflamat...  
9 NaN  
10 NaN  
11 Blocks Worked  
12 NaN  
13 Cell inside it in the wall of the stomach  
14 The difference in shape  
15 how severe is the ascess?  
16 The form of an abscess  
17 Outputs has  
18 The last layer is a layer in the wall of the s...  
19 The layer of mucus secreted by the stomach  
20 Lymphocytes occur with inflammation  
21 is needed if it increased, it is not normal  
22 Types of cells that are not present in Al-Tabi...  
23 NaN  
24 NaN  
25 the confirmed and final diagnosis  
26 how the diagnosis was come about  
27 intially, what the diagnosis was thought to be  
28 NaN

	In depth understanding
0	NaN
1	NaN
2	NaN
3	NaN
4	NaN
5	flat, irregular, or villous projections Thi...
6	prolific by crypt distortion ( branching, Basa...
7	no definition provided
8	a thin layer of connective tissue that forms p...

```

9                      Top layer only of mucus only?
10 A collection of B cells, T cells, and supporti...
11                         missingin some areas?
12 Increase in mucus? - usually a sign of early UC
13 inflammation of the intestinal crypts. The cry...
14                     changes in gland shapes
15 Typically only present in chrons disease
16             what does the abscess look like?
17             mutation in the lamina propria
18 changes in the first layer of the wlal?
19             was the mucin layer depleted?
20 lymphocytes (white blood cells) found in the e...
21 below the outer layer of the outside wall of ...
22 small lumps of immune cells that form in your ...
23 "
24 part of the immune system: vertebrate cell tha...
25                     NaN
26                     NaN
27                     NaN
28                     NaN

```

#### 0.4.3 Data Manipulation

**IBD Stages:** Since the stages of UC is determined by the severity of symptoms, the classes are manually added based on symptoms.

Use decision trees to determine

Perhaps find a doctor who can provide some expertise into the stages? - check if this is possible (we would need multiple people to have statistically significance)

**Data Transformation** Since the data is already dummy coded, the transformation of it will be required for understanding the outcome after modeling.

```
[10]: transform_dict = [{"data": ["Mucin depletion", "Crypt architecture"],  
                      "definitions": [{  
                          0: "Normal",  
                          1: "Mild",  
                          2: "Moderate",  
                          3: "Severe"}]},  
                      {"data": ["Cryptitis extent", "Crypt abscesses extent"],  
                      "definitions": [{  
                          0: "None",  
                          1: "Little",  
                          2: "Moderate",  
                          3: "Marked"}]},  
                      {"data": ["Lamina propria polymorphs"],  
                      "definitions": [{  
                          0: "Absent",  
                          1: "Present"}]}]
```

```

        1: "Focal",
        2: "Diffuse"}]}},
{"data": ["Cryptitis polymorphs", "Crypt abscesses",
→polymorphs"],

"definitions": [
    0: "None",
    1: "Few",
    2: "Several",
    3: "Many"}]},

{"data": ["Epithelial changes"],
"definitions": [
    0: "Normal",
    1: "Flattening",
    2: "Degeneration",
    3: "Erosion"}]},

{"data": ["Mucosal surface"],
"definitions": [
    0: "Flat",
    1: "Irregular",
    2: "Villous projections"]}]

```

Set Seed for consistency

[11]: random.seed(123)

*Crypt architecture* measures the severity of the deformation of the colon, which will also signify at what severity stage the cases are at. This is the column that will be used for determining cases severities.

[12]: cleaned\_cases['Crypt architecture'].unique()

```

crypt_dict = {0:"normal",
              1:"mild",
              2:"moderate",
              3:"severe"}

cleaned_cases['Severity of Crypt Arch'] = [crypt_dict[x] for x in
→cleaned_cases['Crypt architecture']]

'Severity of Crypt Arch' + 'diagnoses'

```

[12]: 'Severity of Crypt Archdiagnoses'

*convert data to object* rather than int since these are categorical data.

[13]: `def change_to_object(df, data_col):`  
`df[data_col] = df[data_col].astype(object)`

```
run = [change_to_object(cleaned_cases, c) for c in cleaned_cases.columns[3:]]
```

```
cleaned_cases['Crypt profiles'] = cleaned_cases['Crypt profiles'].astype('int')
cleaned_cases.dtypes
```

```
[13]: Year                                int64
      Lab No                             int64
      Age                                 float64
      Sex                                object
      Active inflammation?               object
      Mucosal surface                  object
      Crypt architecture                object
      Crypt profiles                   int32
      Increased lamina propria cellularity?   object
      Mild & superficial increase in lamina propria cellularity?   object
      Increased lymphoid aggregates in lamina propria?            object
      Patchy lamina propria cellularity?        object
      Marked & transmucosal increase in lamina propria cellularity    object
      Cryptitis extent                  object
      Cryptitis polymorphs              object
      Crypt abscesses extent           object
      Crypt abscesses polymorphs       object
      Lamina propria polymorphs        object
      Epithelial changes              object
      Mucin depletion                 object
      Intraepithelial lymphocytes      object
      Subepithelial collagen          object
      Lamina propria granulomas       object
      Submucosal granulomas          object
      Basal histiocytic cells         object
      Confirmed diagnosis             object
      Method of confirmation          object
      Initial pathologists diagnosis  object
      Observing pathologists diagnosis object
      Severity of Crypt Arch         object
      dtype: object
```

#### 0.4.4 Data Cleaning

**Clean Diagnosis:** Strip data and Upper Case and ensure spelling of all are correct to prevent any separation of classes which are unnecessary.

```
[14]: print(cleaned_cases['Confirmed diagnosis'].unique())
      cleaned_cases['Confirmed diagnosis'] = [c.strip().upper() for c in_
      ~cleaned_cases['Confirmed diagnosis']]
      print( cleaned_cases['Confirmed diagnosis'].unique())
```

```
['UC' 'Crohns' 'Normal' 'Uc' 'Normal' 'Crohns ']
['UC' 'CROHNS' 'NORMAL']
```

```
[15]: cleaned_cases.columns
cleaned_cases["Method of confirmation"] = [x if x != "Endosocpy" else "Endoscopy" for x in cleaned_cases["Method of confirmation"]]
cleaned_cases["Method of confirmation"].unique()

[15]: array(['Endoscopy', 'Resection', ' '], dtype=object)

[16]: cleaned_cases['Observing pathologists diagnosis'].unique()

[16]: array(['Normal',
       'Chronic idiopathic IBD - highly suggestive of ulcerative colitis',
       'Inflammation - unclassified',
       'Chronic idiopathic IBD - indeterminate',
       "Chronic idiopathic IBD - highly suggestive of Crohn's disease",
       "Chronic idiopathic IBD - suggestive of Crohn's disease",
       'Chronic idiopathic IBD - suggestive of ulcerative colitis',
       'Infective type colitis', 'Other colitis Lymphocytic colitis',
       'Other colitis Melanosis coli'], dtype=object)

[17]: cleaned_cases['Initial pathologists diagnosis'].unique()
cleaned_cases['Initial pathologists diagnosis'] = [d if d != "IBD ?Crohn's" else "IBD ?Crohns" for d in cleaned_cases['Initial pathologists diagnosis']]
cleaned_cases['Initial pathologists diagnosis'] = [d if d not in ["Non-specific inflammation, chronic", "Non-specific inflammaton, chronic"] else "Non-specific inflammation, chronic" for d in cleaned_cases['Initial pathologists diagnosis']]
cleaned_cases['Initial pathologists diagnosis'].sort_values().unique()

[17]: array(['?IBD ?Infective', 'Acute self-limiting colitis', 'Crohns',
       'Diversion colitis', 'IBD ?Crohns', 'IBD ?UC',
       'IBD indeterminate, active', 'IBD indeterminate, quiescent',
       'IBD indeterminate, quiscent', 'Inadequate', 'Melanosis coli',
       'Non-specific inflammation, acute',
       'Non-specific inflammation, chronic', 'Normal',
       'Normal - biopsy artefact', 'Normal - oedema',
       'Normal - spirochaetosis', 'Pouchitis', 'UC'], dtype=object)

[18]: cleaned_cases['Year'].sort_values().unique()

[18]: array([87, 88, 89, 90, 91, 92, 93, 94, 95, 96], dtype=int64)
```

### *Missing/Duplicate Data Checks*

There is no duplicates data

```
[19]: print(f'IBD duplicates: {cleaned_cases.duplicated().any()}')
```

IBD duplicates: False

There are no missing data values

```
[20]: print(f'IBD missing: {cleaned_cases.isnull().values.any()}')
```

```
IBD missing: False
```

#### 0.4.5 Train Test Split

Cross and coworkers randomly shuffled the dataset and split the first 540 cases as the train set and the last 269 cases as the test set.

```
[21]: X = cleaned_cases.drop('Confirmed diagnosis',axis=1)
y = cleaned_cases['Confirmed diagnosis']
X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=269,
                                                random_state=123)
print(f'Train set has {X_train.shape[0]} rows and test set has {X_test.
                                                shape[0]} rows')
```

```
Train set has 540 rows and test set has 269 rows
```

Class Imbalance

The minority class of healthy was oversampled so that there were equal diseased as unhealthy classes. This is also reflected in graphs below.

```
[22]: Counter(y_train)
```

```
[22]: Counter({'UC': 305, 'CROHNS': 117, 'NORMAL': 118})
```

```
[23]: Counter(cleaned_cases['Initial pathologists diagnosis'])
```

```
[23]: Counter({'Normal': 195,
              'IBD ?UC': 56,
              'IBD indeterminate, active': 122,
              'Non-specific inflammation, chronic': 39,
              'Crohns': 62,
              'UC': 219,
              'IBD indeterminate, quiescent': 67,
              'IBD ?Crohns': 19,
              'Normal - oedema': 6,
              'Non-specific inflammation, acute': 12,
              'IBD indeterminate, quiescent': 1,
              '?IBD ?Infective': 1,
              'Acute self-limiting colitis': 2,
              'Normal - spirochaetosis': 1,
              'Inadequate': 1,
              'Normal - biopsy artefact': 1,
              'Pouchitis': 1,
              'Melanosis coli': 3,
              'Diversion colitis': 1})
```

EDA

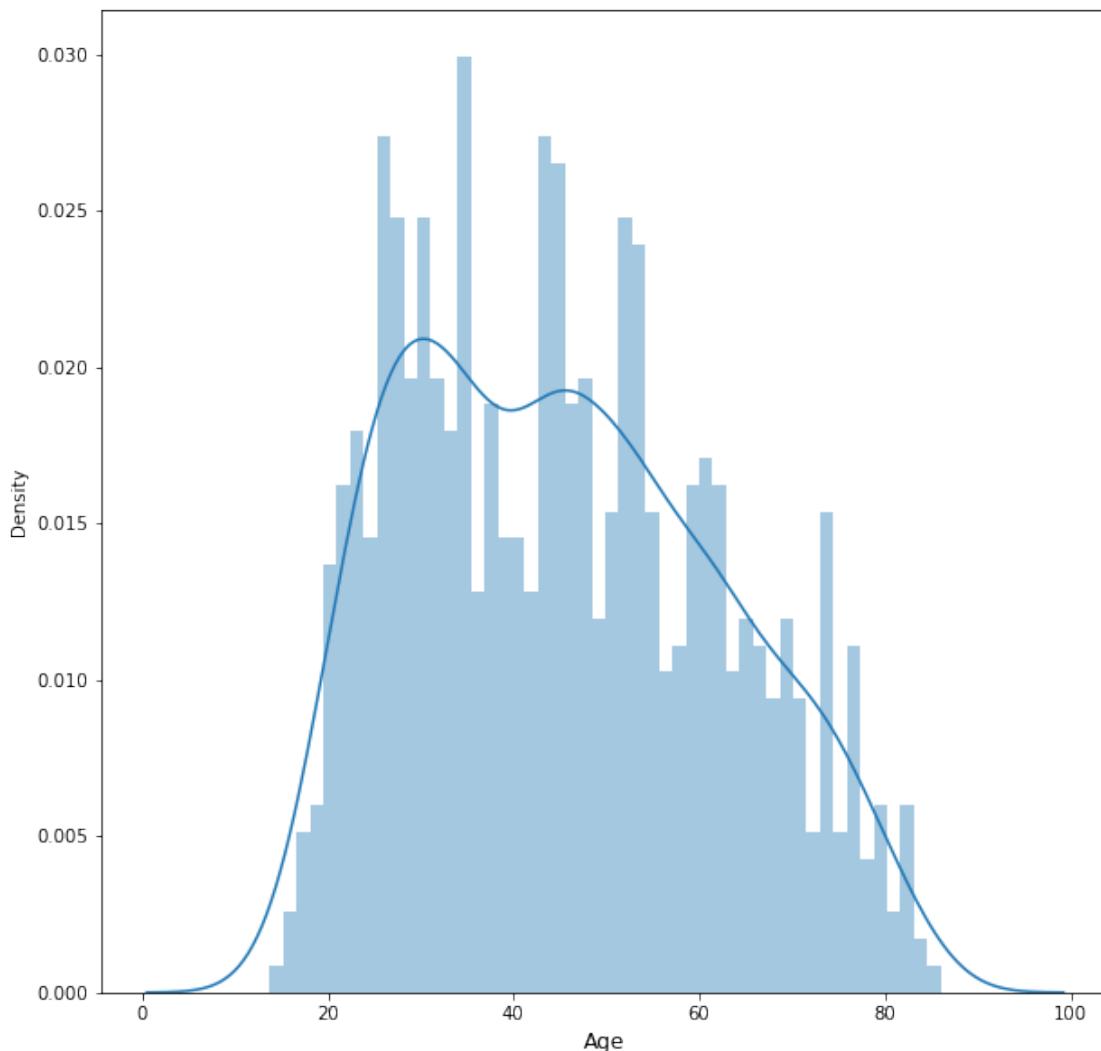
## 0.5 ##### Jamie

The age is skewed towards the younger generations, and there are outliers of age under 15 and above 85. Since there is no proof that these age groups are errors opposed to only having a low count, they will be left in the data.

```
[24]: plt.figure(figsize=(10,10))
sns.distplot(cleaned_cases.Age.values, bins=50, kde=True)
plt.xlabel('Age', fontsize=12)
plt.show()
```

C:\Users\thads\Anaconda3\lib\site-packages\seaborn\distributions.py:2551:  
FutureWarning:

`distplot` is a deprecated function and will be removed in a future version.  
Please adapt your code to use either `displot` (a figure-level function with  
similar flexibility) or `histplot` (an axes-level function for histograms).

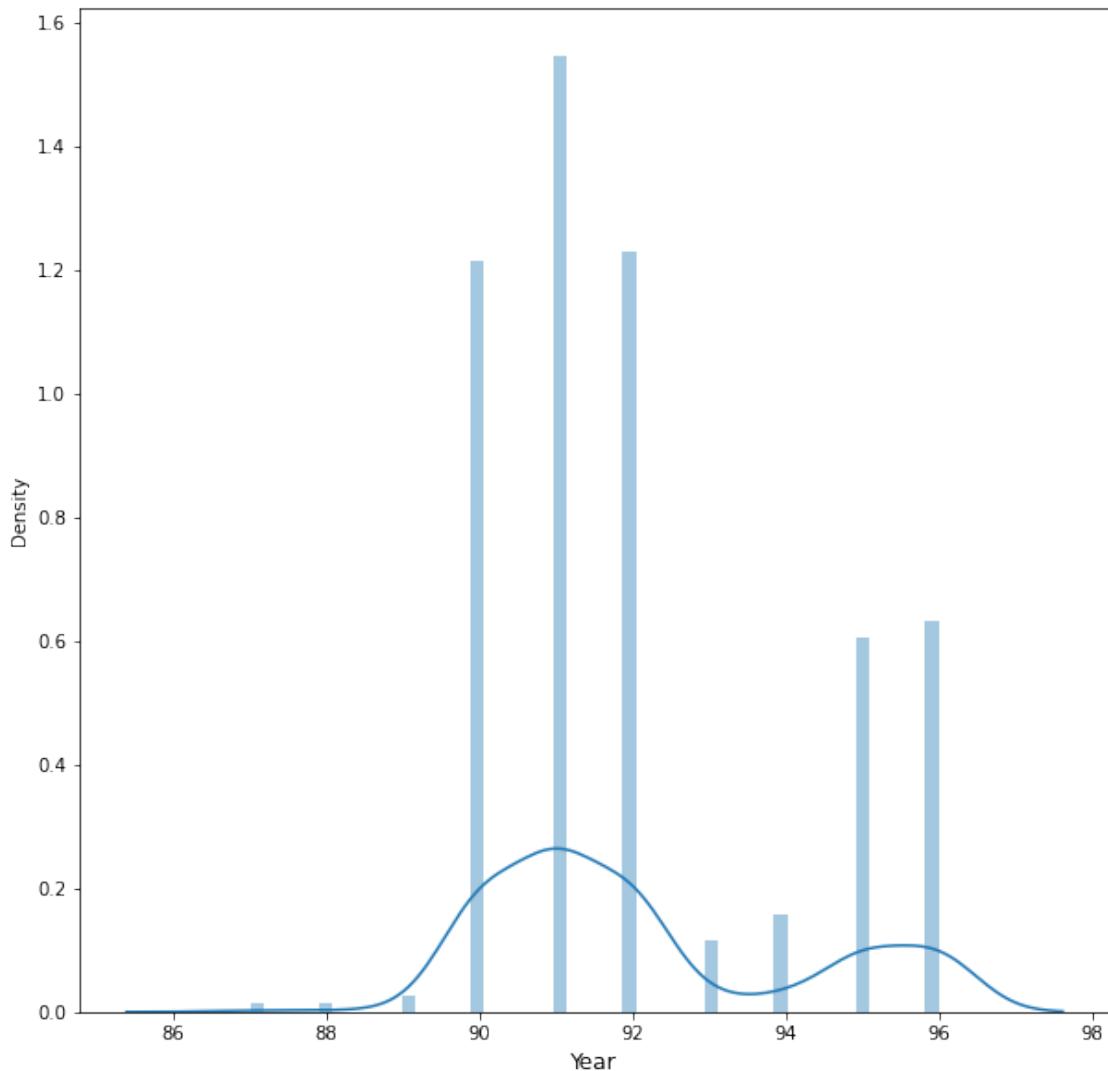


The data below shows that majority of the cases are from years 90-92 and 95-96. The other years have minimal contribution for years prior to year 90.

```
[25]: plt.figure(figsize=(10,10))
sns.distplot(cleaned_cases.Year.values, bins=50, kde=True)
plt.xlabel('Year', fontsize=12)
plt.show()
```

```
C:\Users\thads\Anaconda3\lib\site-packages\seaborn\distributions.py:2551:
FutureWarning:
```

```
`distplot` is a deprecated function and will be removed in a future version.
Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).
```



While the data is a mixture of both histology and endoscopy, but majority of the confirmation methods are endoscopy.

```
[26]: fig = px.histogram(cleaned_cases, x="Age", color='Method of confirmation')
fig.show()
```

Distribution of the dataset, where majority of the classes are UC and the remaining are split to normal and UC roughly evenly.

```
[27]: cd_gb = cleaned_cases.groupby("Confirmed diagnosis").count().reset_index()
fig = px.bar(cd_gb, x='Confirmed diagnosis', y='Year')
fig.show()
# cd_gb
```

```
[28]: fig = px.histogram(cleaned_cases, x="Age", color='Confirmed diagnosis')
fig.show()
plt.figure(figsize=(10,10))
```

[28]: <Figure size 720x720 with 0 Axes>

<Figure size 720x720 with 0 Axes>

### 0.5.1 correlations

The correlation matrix is show below, which is no the same method which is used for continuous variable, but rather categorical variables.

```
[29]: corr_matrix = cleaned_cases.apply(lambda x : pd.factorize(x)[0]).corr(method='pearson', min_periods=1)
corr_matrix.head()
```

	Year	Lab No	Age	Sex	\
Year	1.000000	-0.003860	-0.136752	0.013127	
Lab No	-0.003860	1.000000	0.664152	-0.054323	
Age	-0.136752	0.664152	1.000000	-0.001607	
Sex	0.013127	-0.054323	-0.001607	1.000000	
Active inflammation?	0.030828	0.022624	-0.025780	-0.064066	
					Active inflammation? Mucosal surface \
Year		0.030828		0.006227	
Lab No		0.022624		0.027877	
Age		-0.025780		-0.009704	
Sex		-0.064066		-0.122315	
Active inflammation?		1.000000		0.369577	
					Crypt architecture Crypt profiles \
Year		0.031643		-0.022099	
Lab No		-0.023491		0.030618	
Age		-0.097190		-0.015083	
Sex		-0.097119		-0.056975	
Active inflammation?		0.494637		0.210146	
					Increased lamina propria cellularity? \
Year				0.042273	
Lab No				0.005793	
Age				-0.086089	
Sex				-0.084777	
Active inflammation?				0.742688	
					Mild & superficial increase in lamina propria cellularity? \
Year					-0.041336

Lab No		-0.037130
Age		-0.005274
Sex		-0.014896
Active inflammation?		0.085048
	... Intraepithelial lymphocytes \	
Year	...	0.028937
Lab No	...	-0.029240
Age	...	-0.019805
Sex	...	0.023621
Active inflammation?	...	-0.013979
	Subepithelial collagen Lamina propria granulomas \	
Year		NaN 0.028572
Lab No		NaN 0.002857
Age		NaN -0.036528
Sex		NaN -0.005535
Active inflammation?		NaN 0.124816
	Submucosal granulomas Basal histiocytic cells \	
Year		-0.003668 0.042199
Lab No		-0.019444 -0.069136
Age		-0.045555 -0.063514
Sex		0.000962 -0.052319
Active inflammation?		0.035432 0.144034
	Confirmed diagnosis Method of confirmation \	
Year		-0.009555 0.051771
Lab No		0.007435 0.054606
Age		0.040530 0.070234
Sex		0.142636 -0.032284
Active inflammation?		-0.422155 0.155847
	Initial pathologists diagnosis \	
Year		-0.013499
Lab No		0.020831
Age		0.039240
Sex		-0.071933
Active inflammation?		0.223316
	Observing pathologists diagnosis Severity of Crypt Arch	
Year		0.082114 0.031643
Lab No		-0.016912 -0.023491
Age		-0.110549 -0.097190
Sex		-0.057528 -0.097119
Active inflammation?		0.434342 0.494637

[5 rows x 30 columns]

We see strong correlations between the symptoms. Specifically, there is a strong correlation between active inflammation and lamina propria polymorphs, which is investigated further below.

Many of the correlations are intuitively connected. For example, cryptis polymorphs and extent, since they are both related to the fact of where there is inflammation in the linings of the stomach to the morphed cells of the glands.

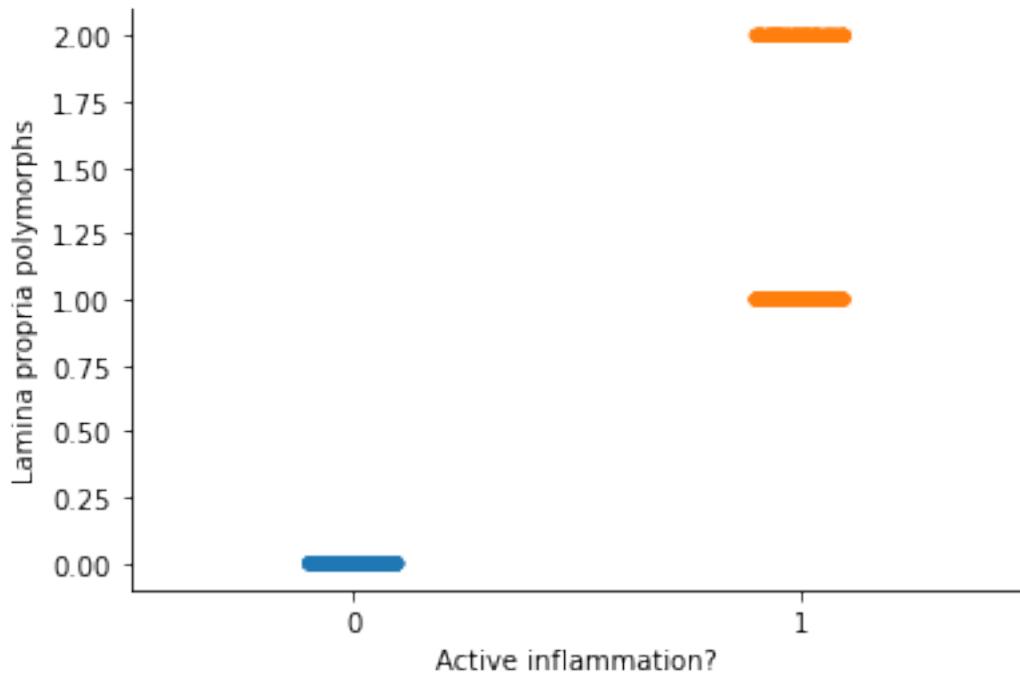
One interesting observation is the correlation of epithelial changes and the mucin depletions since the epithelial layer concerns the outer layer of the intestine and the mucin depletion primarily concerns with the inner side of the organ.

```
[30]: fig = px.imshow(corr_matrix)
fig.update_yaxes(visible=False, showticklabels=False)
fig.update_xaxes(visible=False, showticklabels=False)
fig.show()
```

### *Active inflammation and lamina propria polymorphs*

Overall, the active inflammation makes sense considering if there is no inflammation, that there in turn would have no polymorphs. Since the inner linings are typically only shows to morph when there is inflammation, this is intuitive in the results.

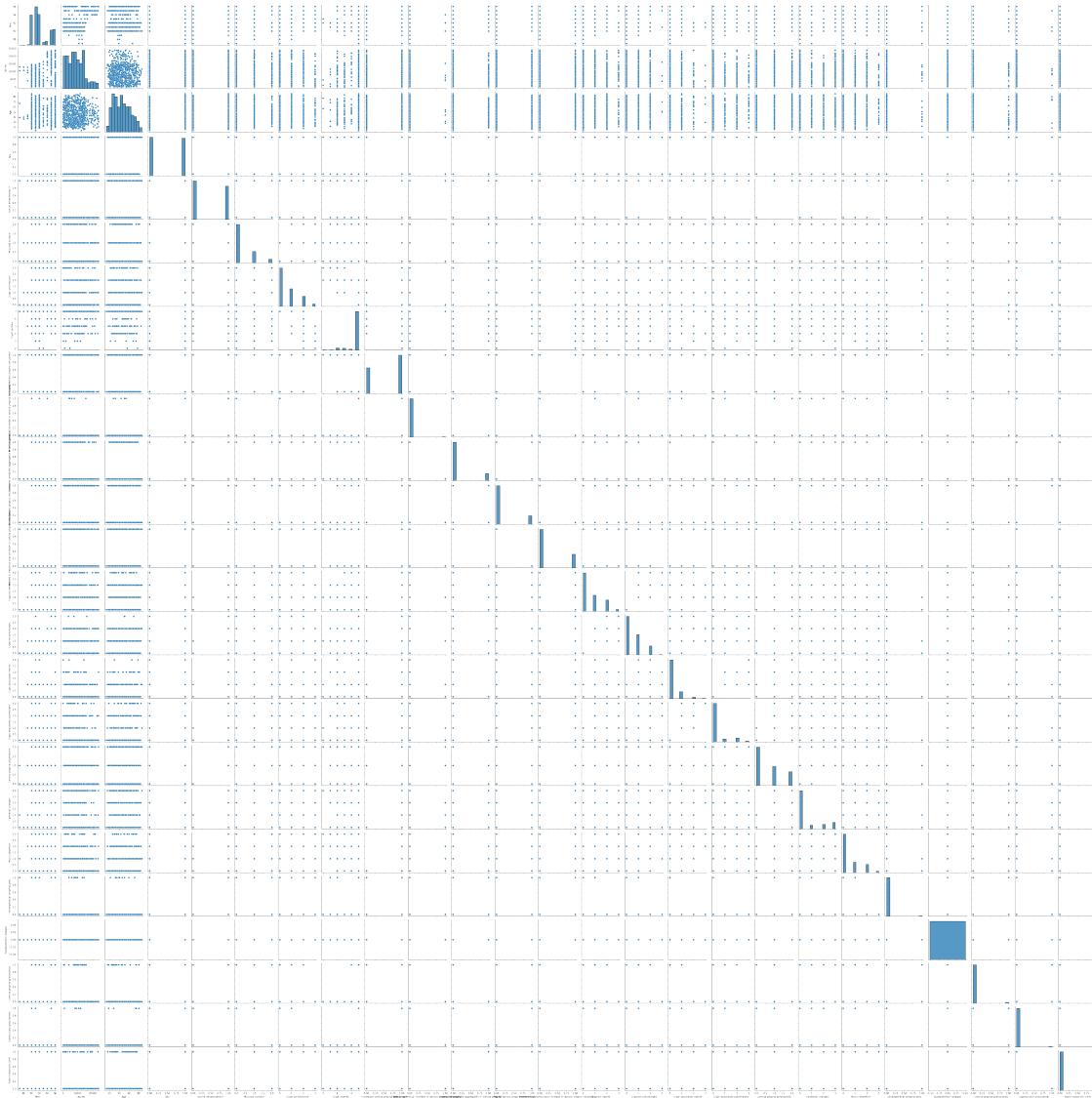
```
[31]: sns.stripplot(x='Active inflammation?', y='Lamina propria polymorphs', data=cleaned_cases, jitter=True)
sns.despine()
```



```
[32]: %%time  
sns.pairplot(cleaned_cases)
```

Wall time: 3min 55s

```
[32]: <seaborn.axisgrid.PairGrid at 0x150a213a3a0>
```



**Odds Ratio** Odds ratio is a measure of association between an exposure and an outcome. The OR represents the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure. [source](#)

There is no strong correlations between the two, that if a patient is of a specified year and age, there is a 1:1 ratio of the patient being diagnosed with UC or chrohns.

```
[33]: # odds ratio calc
uc_ch = cleaned_cases.loc[cleaned_cases["Confirmed diagnosis"].isin(['UC', 'CROHNS'])]
table_uc = uc_ch[["Confirmed diagnosis", "Year", "Age"]].groupby("Confirmed diagnosis").sum()#.values
print(table_uc)
oddsratio_uc, pvalue_uc = stats.fisher_exact(table_uc)
print("OddsR: ", round(oddsratio_uc,4), "p-Value:", pvalue_uc)
```

	Year	Age
Confirmed diagnosis		
CROHNS	15735	7288.413699
UC	43525	22326.134247
OddsR:	1.1075	p-Value: 4.212365775994321e-10

\*\*\* Reducing categorical classes\*\*\* Since there isn't a high number of classes in each categorical columns, there is no need to reduce the number of classes in a categorical set.

## 0.6 ##### Walter

Each column in the dataset is a symptom. SOme of the symptoms are rankings. When the column for Subepithelial collagen is 1 it means that the patient had that symptom and when it is 0 it means the patient did not have that symptom.

```
[34]: train = pd.concat([X_train,y_train],axis=1)
```

Supervised Learning

Get only the binary variables

```
[35]: binary_vars = X_train.columns[X_train.apply(lambda series: False if set(series)-{0,1} else True)]
binary_vars = list(set(binary_vars) - set(['Active inflammation?']))
# binary_vars
```

Calculate the relative risk ratio of having IBD if patient has or doesnt have Patchy lamina propria cellularity

```
[36]: patchyVsIbd = train.groupby(['Patchy lamina propria cellularity?', 'Confirmed diagnosis']).size()
patchySummary = X_train.groupby('Patchy lamina propria cellularity?').size()
print(patchyVsIbd)
print(patchySummary)
```

Patchy lamina propria cellularity?	Confirmed diagnosis	Count
0	CROHNS	82
0	NORMAL	114
0	UC	257
1	CROHNS	35
1	NORMAL	4

```
dtype: int64
Patchy lamina propria cellularity?
0    453
1     87
dtype: int64
```

What proportion of those with patchy lamina propria had Crohn's Disease?

```
[37]: proportions = patchyVsIbd/patchySummary
proportions
```

```
[37]: Patchy lamina propria cellularity?  Confirmed diagnosis
0                           CROHNS          0.181015
                               NORMAL          0.251656
                               UC            0.567329
1                           CROHNS          0.402299
                               NORMAL          0.045977
                               UC            0.551724
dtype: float64
```

How much more chance of getting Crohn's disease if you have patchy lamina propria cellularity VS if you dont have patch lamina propria cellularity?

```
[38]: proportions.loc[1]/proportions.loc[0]
```

```
[38]: Confirmed diagnosis
CROHNS      2.222456
NORMAL      0.182698
UC          0.972494
dtype: float64
```

Observe above that the probability of getting Crohn's is twice as much if you have patchy lamina propria cellularity VS if you dont have patchy lamina.

Determine relative risk of Crohn's or UC for all the symptoms Calculation will require creating 3 tables:

Symptom, Is Symptom Present, Confirmed Diagnosis, Count

Symptom, Is Symptom Present, Count

Symptom, Is Symptom Present, Confirmed Diagnosis, Proportion

Symptom, Confirmed Diagnosis, Relative Risk (Final Table)

```
[39]: #1. Symptom, Is Symptom Present, Confirmed Diagnosis, Count
#Column, Value, Value for Diagnosis Column
binaryTrain = train[binary_vars+['Confirmed diagnosis']]
symptomDiagnosis = binaryTrain.reset_index().melt(id_vars=['index','Confirmed_diagnosis'])
#Column, Value, Value for Diagnosis Column, Count
```

```
diseaseCountPerSymptom = symptomDiagnosis.  
    ↪groupby(['variable','value','Confirmed diagnosis']).size()  
diseaseCountPerSymptom.head()
```

[39]:

variable	value	Confirmed diagnosis
Basal histiocytic cells	0	CROHNS 113
		NORMAL 117
		UC 291
	1	CROHNS 4
	NORMAL 1	

dtype: int64

[40]: #2. Symptom, Is Symptom Present, Count  
countPerSymptom = symptomDiagnosis.groupby(['variable','value']).size()  
countPerSymptom.head()

[40]:

variable	value	
Basal histiocytic cells	0	521
	1	19
Increased lamina propria cellularity?	0	216
	1	324
Increased lymphoid aggregates in lamina propria?	0	453

dtype: int64

[41]: #3. Symptom, Is Symptom Present, Confirmed Diagnosis, Proportion  
proportionIbdPerSymptom = diseaseCountPerSymptom/countPerSymptom  
proportionIbdPerSymptom.head()

[41]:

variable	value	Confirmed diagnosis
Basal histiocytic cells	0	0.216891
		NORMAL 0.224568
		UC 0.558541
	1	CROHNS 0.210526
	NORMAL 0.052632	

dtype: float64

[42]: #4. Symptom, Confirmed Diagnosis, Relative Risk (Final Table)  
propDf = proportionIbdPerSymptom.reset\_index()  
noSymptom = propDf.loc[propDf['value']==0].drop('value',axis=1).  
 ↪set\_index(['variable','Confirmed diagnosis'])  
yesSymptom = propDf.loc[propDf['value']==1].drop('value',axis=1).  
 ↪set\_index(['variable','Confirmed diagnosis'])

'''

*Some symptoms such as Submucosal granulomas are only present in Crohn's patients. this means there is no*

```

patient who has both submucosal granuloma and UC. So the risk of having UC
→given u have submcuoal granulomas
is 0. But currently in the yesSymptom df, the row Submucosal granulom and UC
→does not even exist. So if that row
is missing just add a row with 0
'''

noSymptom = noSymptom.reset_index()
varDxCombos= list(itertools.
    →product(set(noSymptom['variable']),set(noSymptom['Confirmed diagnosis'])))
allCombos = pd.DataFrame(index=pd.MultiIndex.from_tuples(varDxCombos))
allCombos.index.names = ['variable','Confirmed diagnosis']
noSymptom = noSymptom.set_index(['variable','Confirmed diagnosis'])
yesSymptom = pd.merge(yesSymptom, allCombos, left_index=True, right_index=True,
    →how='outer').fillna({0:0})
yesSymptom.head()

```

[42] :

		0
variable	Confirmed diagnosis	
Basal histiocytic cells	CROHNS	0.210526
	NORMAL	0.052632
	UC	0.736842
Increased lamina propria cellularity?	CROHNS	0.225309
	NORMAL	0.046296

Out of all the people that had Increased lamina propria cellularity, what percent of them had Crohn's disease? In below table see that 22.5% of patients with Increased lamina propria cellularity had Crohn's disease.

Out of all the people that did NOT have Increase lamina propria cellularity, how many had Crohn's disease?

[43] :

```

noSymptom = pd.merge(noSymptom, allCombos, left_index=True, right_index=True,
    →how='outer').fillna({0:0})
noSymptom.head()

```

[43] :

		0
variable	Confirmed diagnosis	
Basal histiocytic cells	CROHNS	0.216891
	NORMAL	0.224568
	UC	0.558541
Increased lamina propria cellularity?	CROHNS	0.203704
	NORMAL	0.476852

You have two people, one with increased lamina propria cellularity and the other one without increased lamina propria cellularity. How much more likely is the first person to have Crohn's disease compared to the second?

You have two people, one with increased lamina propria cellularity and the other one without increased lamina propria cellularity. How much more likely is the first person to have Crohn's

disease compared to the second?

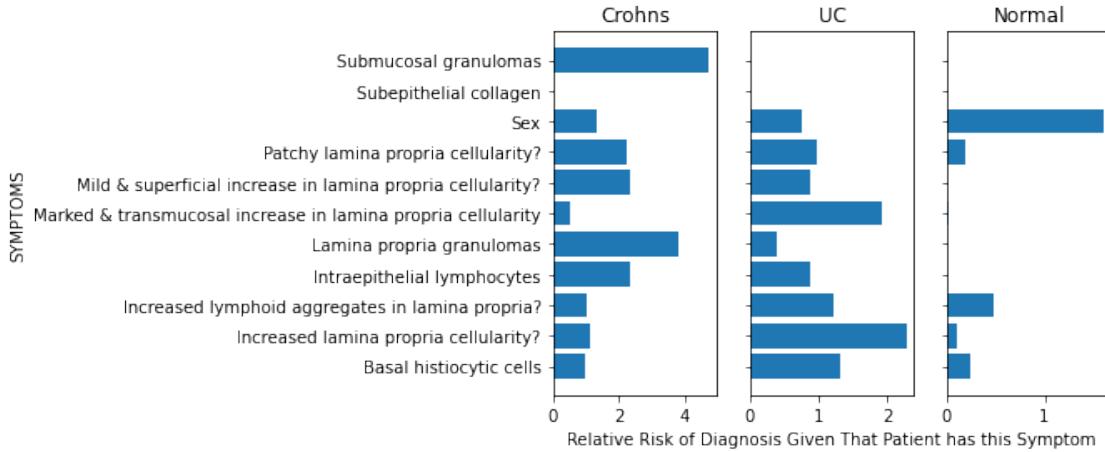
```
[44]: relativeRiskIbd = (yesSymptom/noSymptom).reset_index()
relativeRiskIbd.head()
```

```
[44]:
```

	variable	Confirmed diagnosis	0
0	Basal histiocytic cells	CROHNS	0.970657
1	Basal histiocytic cells	NORMAL	0.234368
2	Basal histiocytic cells	UC	1.319226
3	Increased lamina propria cellularity?	CROHNS	1.106061
4	Increased lamina propria cellularity?	NORMAL	0.097087

```
[45]: fig,ax = plt.subplots(nrows=1,ncols=3, sharey=True)
crohns = relativeRiskIbd[relativeRiskIbd['Confirmed diagnosis']=='CROHNS']
uc      = relativeRiskIbd[relativeRiskIbd['Confirmed diagnosis']=='UC']
normal  = relativeRiskIbd[relativeRiskIbd['Confirmed diagnosis']=='NORMAL']
ax[0].barh(crohns['variable'],crohns[0])
ax[0].set(title='Crohns',
           ylabel='SYMPTOMS')
ax[1].barh(uc['variable'],uc[0])
ax[1].set(title='UC', xlabel='Relative Risk of Diagnosis Given That Patient has this Symptom')
ax[2].barh(normal['variable'],normal[0])
ax[2].set(title='Normal')
```

```
[45]: [Text(0.5, 1.0, 'Normal')]
```



For unsupervised EDA, The objective is to find multiple symptoms that are all 1 for the same patients and are all 0 for other patients.

First, manually calculate the risk ratio between Symptom A and Symptom B

Next, create a cross tab where the row is Symptom A, the column is Symptom B and the cell value

is the risk ratio of Symptom B / Symptom A

Finally, find the groups of symptoms that have highest risk ratios for one another. If 3 columns have high relative risk ratios, consider keeping only one of those columns and dropping the other 2

### Risk Ratio

What is the risk of getting “Increased lamina propria cellularity” if you do have “Lamina propria granulomas” versus the risk of getting “Increased lamina propria cellularity” if you do not have “Lamina propria granulomas”?

If two symptoms are both positive in 1000 patients. And in another 1000 patients the two symptoms are negative. This would indicate correlation between those 2 symptoms.

```
[46]: exposure = 'Lamina propria granulomas'
disease = 'Increased lamina propria cellularity?'
risks = X_train.groupby([exposure,disease])
        .size()/X_train.groupby([exposure]).size()
risks = risks.reset_index()
riskGivenNoExposure = risks.loc[(risks[exposure] == 0)&
                                (risks[disease] == 1),0].values[0]
riskGivenExposure = risks.loc[(risks[exposure] == 1)&
                                (risks[disease] == 1),0].values[0]
riskGivenExposure/riskGivenNoExposure
```

[46]: 1.5591715976331362

Get the cross tab of every symptom with every other symptom

```
[47]: def multicolumn_crosstab(df,cols):
    cols=sorted(cols)
    dummies = pd.get_dummies(df[cols])
    dfWithDummies = pd.concat([df,dummies],axis=1)
    dfWithDummies = dfWithDummies.reset_index()
    dfMelt = dfWithDummies.melt(id_vars=np.concatenate([np.
→array(['index']),dummies.columns.values]),
                               value_vars=cols)
    dfMelt = dfMelt.drop('index',axis=1)
    levelGroup = dfMelt.groupby(['variable','value'])
    crosstab = levelGroup.sum()
    countPerLevel = levelGroup.size()
    crossTabProp = crosstab.divide(countPerLevel, axis=0)
    return crossTabProp
```

```
[48]: ct = multicolumn_crosstab(X_train.astype(str),binary_vars)
```

In the below cross tab, the value in the second row, and in the fourth column (Increased Lamina propria cellularity\_1) is the number 0.894737. This means that 89% of the patients (in the train set) had both Basal histocytic cells and Increased lamina propria cellularity. Notice how this number 89% adds up to the 10.5263 % on the left of it. That 10% number is the proportion of patients that had basal histocytic cells but did NOT have increased lamina propria cellularity.

```
[49]: ct.head()
```

```
[49]:
```

	Basal histiocytic
cells_0 \ variable	value
Basal histiocytic cells	0
1.000000	1
0.000000	
Increased lamina propria cellularity?	0
0.990741	1
0.947531	
Increased lymphoid aggregates in lamina propria?	0
0.964680	
	Basal histiocytic
cells_1 \ variable	value
Basal histiocytic cells	0
0.000000	1
1.000000	
Increased lamina propria cellularity?	0
0.009259	1
0.052469	
Increased lymphoid aggregates in lamina propria?	0
0.035320	
	Increased lamina propria
cellularity?_0 \ variable	value
Basal histiocytic cells	0
0.410749	1
0.105263	
Increased lamina propria cellularity?	0
1.000000	1
0.000000	
Increased lymphoid aggregates in lamina propria?	0
0.476821	
	Increased lamina propria
cellularity?_1 \ variable	value

Basal histiocytic cells	0	
0.589251	1	
0.894737		
Increased lamina propria cellularity?	0	
0.000000	1	
1.000000		
Increased lymphoid aggregates in lamina propria? 0		
0.523179		
		Increased lymphoid
aggregates in lamina propria?_0 \		
variable	value	
Basal histiocytic cells	0	
0.838772	1	
0.842105		
Increased lamina propria cellularity?	0	
1.000000	1	
0.731481		
Increased lymphoid aggregates in lamina propria? 0		
1.000000		
		Increased lymphoid
aggregates in lamina propria?_1 \		
variable	value	
Basal histiocytic cells	0	
0.161228	1	
0.157895		
Increased lamina propria cellularity?	0	
0.000000	1	
0.268519		
Increased lymphoid aggregates in lamina propria? 0		
0.000000		
		Intraepithelial
lymphocytes_0 \		
variable	value	
Basal histiocytic cells	0	
0.988484	1	
1.000000		
Increased lamina propria cellularity?	0	

0.995370		1
0.984568		
Increased lymphoid aggregates in lamina propria?	0	
0.988962		
Intraepithelial lymphocytes_1 \		
variable	value	
Basal histiocytic cells	0	
0.011516	1	
0.000000		
Increased lamina propria cellularity?	0	
0.004630	1	
0.015432		
Increased lymphoid aggregates in lamina propria?	0	
0.011038		
Lamina propria		
granulomas_0 \		
variable	value	
Basal histiocytic cells	0	
0.976967	1	
0.947368		
Increased lamina propria cellularity?	0	
0.995370	1	
0.962963		
Increased lymphoid aggregates in lamina propria?	0	
0.971302		
Lamina propria		
granulomas_1 \		
variable	value	
Basal histiocytic cells	0	
0.023033	1	
0.052632		
Increased lamina propria cellularity?	0	
0.004630	1	
0.037037		
Increased lymphoid aggregates in lamina propria?	0	
0.028698		

		\
variable	value	...
Basal histiocytic cells	0	...
	1	...
Increased lamina propria cellularity?	0	...
	1	...
Increased lymphoid aggregates in lamina propria?	0	...
		Marked & transmucosal
increase in lamina propria cellularity_1 \		
variable	value	
Basal histiocytic cells	0	
0.272553	1	
0.421053		
Increased lamina propria cellularity?	0	
0.000000	1	
0.462963		
Increased lymphoid aggregates in lamina propria?	0	
0.331126		
		Mild & superficial
increase in lamina propria cellularity?_0 \		
variable	value	
Basal histiocytic cells	0	
0.996161	1	
1.000000		
Increased lamina propria cellularity?	0	
1.000000	1	
0.993827		
Increased lymphoid aggregates in lamina propria?	0	
0.995585		
		Mild & superficial
increase in lamina propria cellularity?_1 \		
variable	value	
Basal histiocytic cells	0	
0.003839	1	
0.000000		
Increased lamina propria cellularity?	0	
0.000000	1	

```

0.006173
Increased lymphoid aggregates in lamina propria? 0
0.004415

                                              Patchy lamina propria
cellularity?_0 \
variable                               value
Basal histiocytic cells               0
0.844530                             1
0.684211
Increased lamina propria cellularity? 0
1.000000                             1
0.731481
Increased lymphoid aggregates in lamina propria? 0
0.812362

                                              Patchy lamina propria
cellularity?_1 \
variable                               value
Basal histiocytic cells               0
0.155470                             1
0.315789
Increased lamina propria cellularity? 0
0.000000                             1
0.268519
Increased lymphoid aggregates in lamina propria? 0
0.187638

                                              Sex_0      Sex_1 \
variable                               value
Basal histiocytic cells               0      0.508637  0.491363
                                         1      0.684211  0.315789
Increased lamina propria cellularity? 0      0.462963  0.537037
                                         1      0.549383  0.450617
Increased lymphoid aggregates in lamina propria? 0  0.509934  0.490066

                                              Subepithelial collagen_0
\
variable                               value
Basal histiocytic cells               0          1.0
                                         1          1.0
Increased lamina propria cellularity? 0          1.0
                                         1          1.0

```

```

Increased lymphoid aggregates in lamina propria? 0           1.0
                                                              
                                                               Submucosal granulomas_0
\

variable          value
Basal histiocytic cells      0       0.992322
                           1       1.000000
Increased lamina propria cellularity? 0       1.000000
                                         1       0.987654
Increased lymphoid aggregates in lamina propria? 0       0.991170

                                                               Submucosal granulomas_1
variable          value
Basal histiocytic cells      0       0.007678
                           1       0.000000
Increased lamina propria cellularity? 0       0.000000
                                         1       0.012346
Increased lymphoid aggregates in lamina propria? 0       0.008830

[5 rows x 21 columns]

```

Which feature is most correlated with the other features? Observe that “Increased lamina propria cellularity” and “Active Inflammation” are the columns that is most correlated with the other symptoms.

noExposureDf: Get all the risks of getting Symptom B given that you dont have symptom A.  
exposureDf: Get all the risks of getting Symptom B given that you do have symptom A.

```
[50]: crossTab      = ct.reset_index()
noExposureDf = crossTab.loc[crossTab['value']=='0']
exposureDf   = crossTab.loc[crossTab['value']=='1']
```

Divide all the risk-given-exposure/ risk-given-no-exposure to get the relative risk for every symptom pair

```
[51]: noExposureDf = noExposureDf.set_index('variable').drop('value',axis=1)
exposureDf   = exposureDf.set_index('variable').drop('value',axis=1)
relativeRisks= exposureDf/noExposureDf
relativeRisks.head()
```

```
[51]:                                Basal histiocytic cells_0 \
variable
Basal histiocytic cells          0.000000
Increased lamina propria cellularity? 0.956386
Increased lymphoid aggregates in lamina propria? 1.000868
Intraepithelial lymphocytes        1.036893
Lamina propria granulomas        0.955720
```

```
                                Basal histiocytic cells_1 \
```

variable		
Basal histiocytic cells		inf
Increased lamina propria cellularity?		5.666667
Increased lymphoid aggregates in lamina propria?		0.976293
Intraepithelial lymphocytes		0.000000
Lamina propria granulomas		2.252137

Increased lamina propria

cellularity?_0 \		
variable		
Basal histiocytic cells		
0.256272		
Increased lamina propria cellularity?		
0.000000		
Increased lymphoid aggregates in lamina propria?		
0.000000		
Intraepithelial lymphocytes		
0.413953		
Lamina propria granulomas		
0.188551		

Increased lamina propria

cellularity?_1 \		
variable		
Basal histiocytic cells		
1.518430		
Increased lamina propria cellularity?		
inf		
Increased lymphoid aggregates in lamina propria?		
1.911392		
Intraepithelial lymphocytes		
1.394984		
Lamina propria granulomas		
1.559172		

Increased lymphoid aggregates

in lamina propria?_0 \		
variable		
Basal histiocytic cells		
1.003974		
Increased lamina propria cellularity?		
0.731481		
Increased lymphoid aggregates in lamina propria?		
0.000000		
Intraepithelial lymphocytes		
0.993304		
Lamina propria granulomas		

1.197727

Increased lymphoid aggregates  
in lamina propria?\_1 \  
variable  
Basal histiocytic cells  
0.979323  
Increased lamina propria cellularity?  
inf  
Increased lymphoid aggregates in lamina propria?  
inf  
Intraepithelial lymphocytes  
1.034884  
Lamina propria granulomas  
0.000000

Intraepithelial lymphocytes\_0  
\  
variable  
Basal histiocytic cells 1.011650  
Increased lamina propria cellularity? 0.989147  
Increased lymphoid aggregates in lamina propria? 0.999538  
Intraepithelial lymphocytes 0.000000  
Lamina propria granulomas 0.931919

Intraepithelial lymphocytes\_1  
\  
variable  
Basal histiocytic cells 0.000000  
Increased lamina propria cellularity? 3.333333  
Increased lymphoid aggregates in lamina propria? 1.041379  
Intraepithelial lymphocytes inf  
Lamina propria granulomas 8.107692

Lamina propria granulomas\_0 \  
variable  
Basal histiocytic cells 0.969703  
Increased lamina propria cellularity? 0.967442  
Increased lymphoid aggregates in lamina propria? 1.029545  
Intraepithelial lymphocytes 0.852490  
Lamina propria granulomas 0.000000

Lamina propria granulomas\_1 \  
variable  
Basal histiocytic cells 2.285088  
Increased lamina propria cellularity? 8.000000  
Increased lymphoid aggregates in lamina propria? 0.000000

Intraepithelial lymphocytes    7.416667  
Lamina propria granulomas    inf

    ... \  
variable    ...  
Basal histiocytic cells    ...  
Increased lamina propria cellularity?                                    ...  
Increased lymphoid aggregates in lamina propria?                    ...  
Intraepithelial lymphocytes    ...  
Lamina propria granulomas    ...

    Marked & transmucosal increase  
in lamina propria cellularity\_1 \  
variable  
Basal histiocytic cells  
1.544848  
Increased lamina propria cellularity?  
inf  
Increased lymphoid aggregates in lamina propria?  
0.000000  
Intraepithelial lymphocytes  
1.202703  
Lamina propria granulomas  
0.000000

    Mild & superficial increase in  
lamina propria cellularity?\_0 \  
variable  
Basal histiocytic cells  
1.003854  
Increased lamina propria cellularity?  
0.993827  
Increased lymphoid aggregates in lamina propria?  
1.004435  
Intraepithelial lymphocytes  
1.003759  
Lamina propria granulomas  
1.003810

    Mild & superficial increase in  
lamina propria cellularity?\_1 \  
variable  
Basal histiocytic cells  
0.0  
Increased lamina propria cellularity?  
inf  
Increased lymphoid aggregates in lamina propria?

```

0.0
Intraepithelial lymphocytes
0.0
Lamina propria granulomas
0.0

Patchy lamina propria
cellularity?_0 \
variable
Basal histiocytic cells
0.810167
Increased lamina propria cellularity?
0.731481
Increased lymphoid aggregates in lamina propria?
1.202680
Intraepithelial lymphocytes
0.792873
Lamina propria granulomas
0.089687

Patchy lamina propria
cellularity?_1 \
variable
Basal histiocytic cells
2.031189
Increased lamina propria cellularity?
inf
Increased lymphoid aggregates in lamina propria?
0.122515
Intraepithelial lymphocytes
2.094118
Lamina propria granulomas
6.486154

Sex_0      Sex_1 \
variable
Basal histiocytic cells          1.345184  0.642681
Increased lamina propria cellularity?  1.186667  0.839080
Increased lymphoid aggregates in lamina propria?  1.059412  0.938180
Intraepithelial lymphocytes        0.644928  1.379845
Lamina propria granulomas       1.356305  0.628503

Subepithelial collagen_0 \
variable
Basal histiocytic cells          1.0
Increased lamina propria cellularity?  1.0
Increased lymphoid aggregates in lamina propria?  1.0

```

Intraepithelial lymphocytes	1.0
Lamina propria granulomas	1.0
	Submucosal granulomas_0 \
variable	
Basal histiocytic cells	1.007737
Increased lamina propria cellularity?	0.987654
Increased lymphoid aggregates in lamina propria?	1.008909
Intraepithelial lymphocytes	1.007547
Lamina propria granulomas	0.770693
	Submucosal granulomas_1
variable	
Basal histiocytic cells	0.000000
Increased lamina propria cellularity?	inf
Increased lymphoid aggregates in lamina propria?	0.000000
Intraepithelial lymphocytes	0.000000
Lamina propria granulomas	121.615385

[5 rows x 21 columns]

The relative risk from our risk matrix is the same as the one when we manually calculated it.  
1.559171

```
[52]: relativeRisks.loc['Lamina propria granulomas', 'Increased lamina propria_\n    →cellularity?_1' ]
```

```
[52]: 1.5591715976331362
```

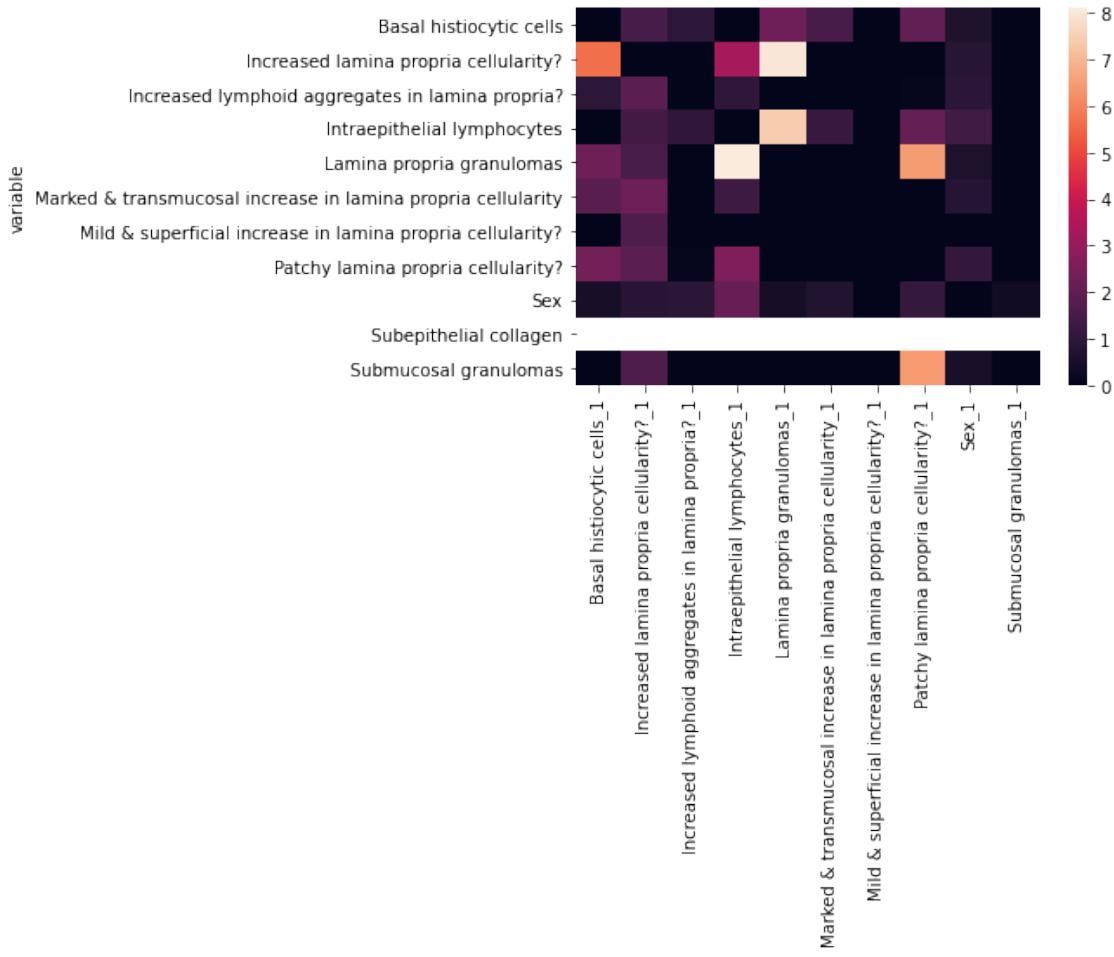
Replace infinity values or abnormally high Relative risks with 0

```
[53]: relativeRisks = relativeRisks.applymap(lambda cell:0 if cell>20 else cell)
```

Observe in heatmap below that Submucosal granulomas are highly correlated with lamina propria granulomas

```
[54]: symptomPresent = [column for column in ct.columns if '1' in column]\nsns.heatmap(relativeRisks[symptomPresent])
```

```
[54]: <AxesSubplot:ylabel='variable'>
```



Out of the 453 patients that did not have patchy lamina propria cellularity none of those patients also had lamina propria granulomas. However, out of the 87 patients that had patchy lamina propria cellularity, 4 of those patients also had lamina propria granulomas. It looks like these 2 columns are correlated.

```
[55]: X_train.groupby(['Patchy lamina propria cellularity?', 'Submucosal granulomas']).size()
```

```
[55]: Patchy lamina propria cellularity? Submucosal granulomas
```

0	0	453
1	0	83
	1	4

```
dtype: int64
```

Out of the 453 patients that did not have patchy lamina propria cellularity only 1 of those patients also had lamina propria granulomas. However, out of the 87 patients that had patchy lamina propria cellularity, 12 of those patients also had lamina propria granulomas. It looks like these 2 columns are correlated.

```
[56]: X_train.groupby(['Patchy lamina propria cellularity?','Lamina propria granulomas']).size()
```

```
[56]: Patchy lamina propria cellularity? Lamina propria granulomas
      0          0           452
                  1            1
      1          0           75
                  1            12
dtype: int64
```

You have two people, one with increased lamina propria cellularity and the other one without increased lamina propria cellularity. How much more likely is the first person to have Crohn's disease compared to the second?

```
[57]: train.groupby(['Submucosal granulomas','Confirmed diagnosis']).size()
```

```
[57]: Submucosal granulomas Confirmed diagnosis
      0          CROHNS        113
                  NORMAL        118
                  UC            305
      1          CROHNS         4
dtype: int64
```

### 0.6.1 Model Assumptions

The model assumptions for all models are not concerning to the data for visualization. The main requirement is that the data doesn't have a linear correlation between features and that the data is independent, assumed by the unique data points.

Due to the data primarily being categorical, the modifications/assumptions are difficult to decipher.

### 0.6.2 Data Prep for Modeling

#### *Dummy coding the Data*

There are two different set methods, dummy coding and ordinal. Before converting to dummy code, the data is first returned to its original form, then dummy coded to understand the effects of feature reduction and whether it's required.

```
[58]: # convert it back to the original setup
df_reset = cleaned_cases.copy()
df_reset_od = cleaned_cases.copy()
df_reset.head()
```

```
[58]:   Year  Lab No       Age  Sex Active inflammation? Mucosal surface \
0     92    5213  20.536986    0                      0             0
1     90     805  55.575342    1                      1             1
2     90    5957  58.698630    0                      1             1
3     92    9207  65.934247    0                      0             1
4     95   14469  23.391781    0                      0             0
```

	Crypt architecture	Crypt profiles	Increased lamina propria cellularity?	\
0	0	7	0	
1	3	4	1	
2	1	7	1	
3	1	7	0	
4	0	7	0	
	Mild & superficial increase in lamina propria cellularity?	...	\	
0		0	...	
1		0	...	
2		0	...	
3		0	...	
4		0	...	
	Intraepithelial lymphocytes	Subepithelial collagen	\	
0	0	0		
1	0	0		
2	0	0		
3	0	0		
4	0	0		
	Lamina propria granulomas	Submucosal granulomas	Basal histiocytic cells	\
0	0	0	0	
1	0	0	0	
2	0	0	0	
3	0	0	0	
4	0	0	0	
	Confirmed diagnosis	Method of confirmation	\	
0	UC	Endoscopy		
1	UC	Endoscopy		
2	UC	Endoscopy		
3	UC	Endoscopy		
4	CROHNS	Endoscopy		
	Initial pathologists diagnosis	\		
0	Normal			
1	IBD ?UC			
2	IBD indeterminate, active			
3	Non-specific inflammation, chronic			
4	Non-specific inflammation, chronic			
	Observing pathologists diagnosis	Severity of Crypt Arch		
0	Normal	normal		
1	Chronic idiopathic IBD - highly suggestive of ...	severe		
2	Inflammation - unclassified	mild		

```
3          Chronic idiopathic IBD - indeterminate      mild
4          Normal                               normal
```

[5 rows x 30 columns]

```
[59]: transform_dict
```

```
[59]: [ {'data': ['Mucin depletion', 'Crypt architecture'],
  'definitions': [{0: 'Normal', 1: 'Mild', 2: 'Moderate', 3: 'Severe'}]}, {
  'data': ['Cryptitis extent', 'Crypt abscesses extent'],
  'definitions': [{0: 'None', 1: 'Little', 2: 'Moderate', 3: 'Marked'}]}, {
  'data': ['Lamina propria polymorphs'],
  'definitions': [{0: 'Absent', 1: 'Focal', 2: 'Diffuse'}]}, {
  'data': ['Cryptitis polymorphs', 'Crypt abscesses polymorphs'],
  'definitions': [{0: 'None', 1: 'Few', 2: 'Several', 3: 'Many'}]}, {
  'data': ['Epithelial changes'],
  'definitions': [{0: 'Normal',
    1: 'Flattening',
    2: 'Degeneration',
    3: 'Erosion'}]}, {
  'data': ['Mucosal surface'],
  'definitions': [{0: 'Flat', 1: 'Irregular', 2: 'Villous projections'}]}]
```

```
[60]: for val in transform_dict:
    print("=====new dictionary====")
    cols = val['data']
    print(val['definitions'])
    for col in cols:
        try:
            df_reset[col] = [val['definitions'][0][v] for v in df_reset[col]]
        except:
            pass
```

```
=====new dictionary=====
[{:0: 'Normal', 1: 'Mild', 2: 'Moderate', 3: 'Severe'}]
=====new dictionary=====
[{:0: 'None', 1: 'Little', 2: 'Moderate', 3: 'Marked'}]
=====new dictionary=====
[{:0: 'Absent', 1: 'Focal', 2: 'Diffuse'}]
=====new dictionary=====
[{:0: 'None', 1: 'Few', 2: 'Several', 3: 'Many'}]
=====new dictionary=====
[{:0: 'Normal', 1: 'Flattening', 2: 'Degeneration', 3: 'Erosion'}]
=====new dictionary=====
[{:0: 'Flat', 1: 'Irregular', 2: 'Villous projections'}]
```

```
[61]: # review the data transformation
```

```

df_reset[['Cryptitis extent", "Cryptitis polymorphs", "Crypt abscesses",
          "extent", "Crypt abscesses polymorphs", "Lamina propria polymorphs", "Epithelial",
          "changes", "Mucin depletion"]]

# get dummies
dummied = pd.get_dummies(df_reset[['Cryptitis extent", "Cryptitis",
                                     "polymorphs", "Crypt abscesses extent", "Crypt abscesses polymorphs", "Lamina",
                                     "propria polymorphs", "Epithelial changes", "Mucin depletion", "Method of",
                                     "confirmation", "Initial pathologists diagnosis", "Observing pathologists",
                                     "diagnosis", "Severity of Crypt Arch"]])

df_dummy = pd.merge(dummied, cleaned_cases.drop(["Cryptitis extent", "Cryptitis",
                                                 "polymorphs", "Crypt abscesses extent", "Crypt abscesses polymorphs", "Lamina",
                                                 "propria polymorphs", "Epithelial changes", "Mucin depletion", "Method of",
                                                 "confirmation", "Initial pathologists diagnosis", "Observing pathologists",
                                                 "diagnosis", "Severity of Crypt Arch"], axis=1), how = "inner",
                     left_index=True, right_index=True)

```

for column “Initial pathologists diagnosis\_?IBD ?Infective”, there is only one instance of this observation. Due to this we will drop the column as it will error during analysis.

```
[62]: df_dummy = df_dummy.drop(["Initial pathologists diagnosis_?IBD ?
                                 ?Infective", "Initial pathologists diagnosis_Pouchitis", "Initial pathologists",
                                 "diagnosis_Diversion colitis", "Initial pathologists diagnosis_IBD",
                                 "indeterminate, quiscent"] ,axis=1)
```

```
[63]: df_type = pd.DataFrame(df_dummy.dtypes)

for x in df_type.loc[df_type[0] == "uint8"].reset_index()['index']:
    df_dummy[x] = df_dummy[x].astype('object')

df_dummy.dtypes
```

```
Cryptitis extent_Little      object
Cryptitis extent_Marked     object
Cryptitis extent_Moderate   object
Cryptitis extent_None       object
Cryptitis polymorphs_Few    object
                           ...
Subepithelial collagen     object
Lamina propria granulomas object
Submucosal granulomas      object
Basal histiocytic cells    object
Confirmed diagnosis        object
Length: 78, dtype: object
```

### *Ordinal Data*

Ordinal data is the method of which the data is already set up in. This allows the researchers to put the remaining data types into an ordinal set up for analysis.

```
[64]: ord_cols = ["Method of confirmation","Initial pathologists diagnosis","Observing pathologists diagnosis","Severity of Crypt Arch"]
```

```
[65]: for val in ord_cols:  
    print(val)  
    array_un = df_reset_od[val].unique().tolist()  
    df_reset_od[val] = df_reset_od[val].apply(lambda x: array_un.index(x))
```

Method of confirmation  
Initial pathologists diagnosis  
Observing pathologists diagnosis  
Severity of Crypt Arch

```
[66]: df_ordinal = df_reset_od  
df_ordinal.head()
```

```
[66]:   Year  Lab No      Age Sex Active inflammation? Mucosal surface  \  
0     92    5213  20.536986  0                      0          0  
1     90     805   55.575342  1                      1          1  
2     90    5957   58.698630  0                      1          1  
3     92    9207   65.934247  0                      0          1  
4     95   14469  23.391781  0                      0          0  
  
      Crypt architecture  Crypt profiles Increased lamina propria cellularity?  \  
0                 0            7                      0  
1                 3            4                      1  
2                 1            7                      1  
3                 1            7                      0  
4                 0            7                      0  
  
      Mild & superficial increase in lamina propria cellularity? ...  \  
0                     0          ...  
1                     0          ...  
2                     0          ...  
3                     0          ...  
4                     0          ...  
  
      Intraepithelial lymphocytes Subepithelial collagen  \  
0                   0            0  
1                   0            0  
2                   0            0  
3                   0            0  
4                   0            0  
  
      Lamina propria granulomas Submucosal granulomas Basal histiocytic cells  \  
0                   0            0          0  
1                   0            0          0  
2                   0            0          0
```

3		0	0	0
4		0	0	0
	Confirmed diagnosis	Method of confirmation	Initial pathologists diagnosis	\
0	UC	0		0
1	UC	0		1
2	UC	0		2
3	UC	0		3
4	CROHNS	0		3
	Observing pathologists diagnosis	Severity of Crypt Arch		
0		0	0	
1		1	1	
2		2	2	
3		3	2	
4		0	0	

[5 rows x 30 columns]

Of the two differing methods, one of the two will be selected for analysis.

### 0.6.3 Train/Test Split

```
[67]: X_ord = df_ordinal.drop("Confirmed diagnosis", axis=1)
y_ord = df_ordinal['Confirmed diagnosis']

X_train_ord , X_test_ord, y_train_ord, y_test_ord = train_test_split(X_ord, y_ord, test_size=0.25, random_state=42)
```

```
[68]: X_train_ord[X_train_ord.isna().any(axis=1)]
```

[68]: Empty DataFrame  
Columns: [Year, Lab No, Age, Sex, Active inflammation?, Mucosal surface, Crypt architecture, Crypt profiles, Increased lamina propria cellularity?, Mild & superficial increase in lamina propria cellularity?, Increased lymphoid aggregates in lamina propria?, Patchy lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Cryptitis extent, Cryptitis polymorphs, Crypt abscesses extent, Crypt abscesses polymorphs, Lamina propria polymorphs, Epithelial changes, Mucin depletion, Intraepithelial lymphocytes, Subepithelial collagen, Lamina propria granulomas, Submucosal granulomas, Basal histiocytic cells, Method of confirmation, Initial pathologists diagnosis, Observing pathologists diagnosis, Severity of Crypt Arch]  
Index: []

[0 rows x 29 columns]

*Max-Min Transformation*

```
[69]: df_ord_scale = df_reset_od.drop("Confirmed diagnosis", 1)
X_train_ord = X_train_ord.copy().reset_index().drop('index', axis=1)
X_test_ord = X_test_ord.copy().reset_index().drop('index', axis=1)
for val in X_train_ord.columns:
    X_train_ord[val] = X_train_ord[val].astype(int)
    X_test_ord[val] = X_test_ord[val].astype(int)
```

```
[70]: # Scale only columns that have values greater than 1
to_scale = [col for col in X_train_ord.columns if X_train_ord[col].max() > 1]
mms = MinMaxScaler()
scaled = mms.fit_transform(X_train_ord[to_scale])
scaled = pd.DataFrame(scaled, columns=to_scale)
scaled_test = mms.fit_transform(X_test_ord[to_scale])
scaled_test = pd.DataFrame(scaled_test, columns=to_scale)

# Replace original columns with scaled ones
for col in scaled:
    X_train_ord[col] = scaled[col]
    X_test_ord[col] = scaled_test[col]

# df_ord_scale = X_train_ord.merge(df_reset_od["Confirmed diagnosis"], how="inner", left_index=True, right_index=True)
```

```
[71]: # X_train_ord = X_train_ord.merge(df_reset_od["Confirmed diagnosis"], how="inner", left_index=True, right_index=True)
X_train_ord[X_train_ord.isna().any(axis=1)]
```

[71]: Empty DataFrame  
Columns: [Year, Lab No, Age, Sex, Active inflammation?, Mucosal surface, Crypt architecture, Crypt profiles, Increased lamina propria cellularity?, Mild & superficial increase in lamina propria cellularity?, Increased lymphoid aggregates in lamina propria?, Patchy lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Cryptitis extent, Cryptitis polymorphs, Crypt abscesses extent, Crypt abscesses polymorphs, Lamina propria polymorphs, Epithelial changes, Mucin depletion, Intraepithelial lymphocytes, Subepithelial collagen, Lamina propria granulomas, Submucosal granulomas, Basal histiocytic cells, Method of confirmation, Initial pathologists diagnosis, Observing pathologists diagnosis, Severity of Crypt Arch]  
Index: []

[0 rows x 29 columns]

```
[72]: X_test_ord[X_test_ord.isna().any(axis=1)]
```

[72]: Empty DataFrame  
Columns: [Year, Lab No, Age, Sex, Active inflammation?, Mucosal surface, Crypt architecture, Crypt profiles, Increased lamina propria cellularity?, Mild &

```
superficial increase in lamina propria cellularity?, Increased lymphoid aggregates in lamina propria?, Patchy lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Cryptitis extent, Cryptitis polymorphs, Crypt abscesses extent, Crypt abscesses polymorphs, Lamina propria polymorphs, Epithelial changes, Mucin depletion, Intraepithelial lymphocytes, Subepithelial collagen, Lamina propria granulomas, Submucosal granulomas, Basal histiocytic cells, Method of confirmation, Initial pathologists diagnosis, Observing pathologists diagnosis, Severity of Crypt Arch]
```

```
Index: []
```

```
[0 rows x 29 columns]
```

### SMOTE

```
[73]: sm = SMOTE(random_state=123)
```

```
[74]: X_sm, y_sm = sm.fit_resample(X_train_ord, y_train_ord)

print(f'''Shape of X before SMOTE: {X_ord.shape}
Shape of X after SMOTE: {X_sm.shape}'''')
```

```
Shape of X before SMOTE: (809, 29)
```

```
Shape of X after SMOTE: (1044, 29)
```

```
[75]: print('\nBalance of positive and negative classes (%):')
y_sm.value_counts(normalize=True) * 100
```

```
Balance of positive and negative classes (%):
```

```
[75]: UC          33.333333
CROHNS      33.333333
NORMAL       33.333333
Name: Confirmed diagnosis, dtype: float64
```

```
[76]: # Final Sets
data = [X_sm, X_test_ord, y_sm, y_test_ord]
```

#### 0.6.4 Feature Importance

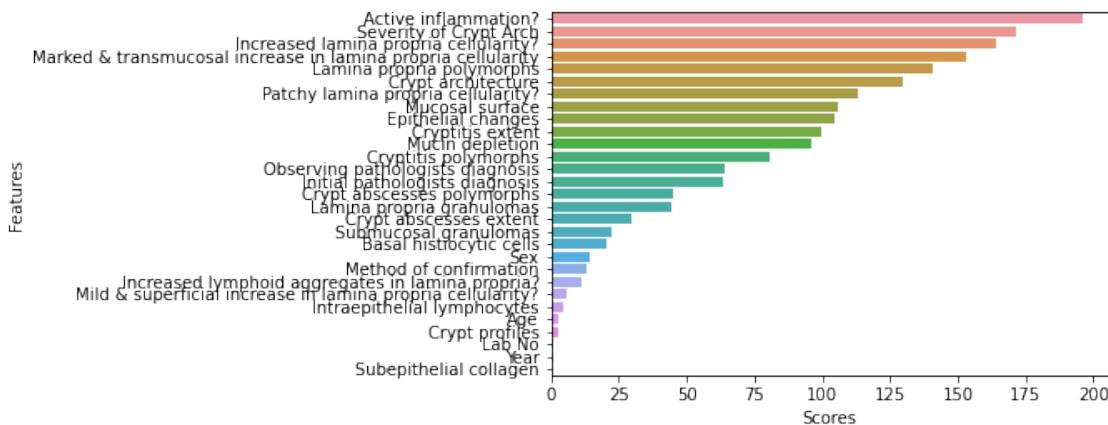
Chi-squared is used for determining feature importance. [source](#)

```
[77]: fs = SelectKBest(score_func=chi2, k='all')
fs.fit(X_sm.to_numpy(), y_sm.to_numpy())
X_train_fs = fs.transform(X_sm.to_numpy())
X_test_fs = fs.transform(X_test_ord.to_numpy())
```

```
[78]: df_features = pd.DataFrame()
df_features['Features'] = X_test_ord.columns
```

```
df_features['Scores'] = np.round(fs.scores_,2)
df_features = df_features.sort_values('Scores', ascending=False)
```

[79]: # plot the scores  
ax = sns.barplot(x="Scores", y="Features", data=df\_features)



[80]: # fit the model  
# data = [X\_sm, X\_test\_ord, y\_sm, y\_test\_ord]  
model = LogisticRegression(solver='lbfgs')  
t = model.fit(X\_sm, y\_sm)  
# evaluate the model  
yhat = model.predict(X\_test\_ord)  
# evaluate predictions  
accuracy = accuracy\_score(y\_test\_ord, yhat)  
print('Accuracy: %.2f' % (accuracy\*100))

Accuracy: 67.98  
C:\Users\thads\Anaconda3\lib\site-packages\sklearn\linear\_model\\_logistic.py:763: ConvergenceWarning:

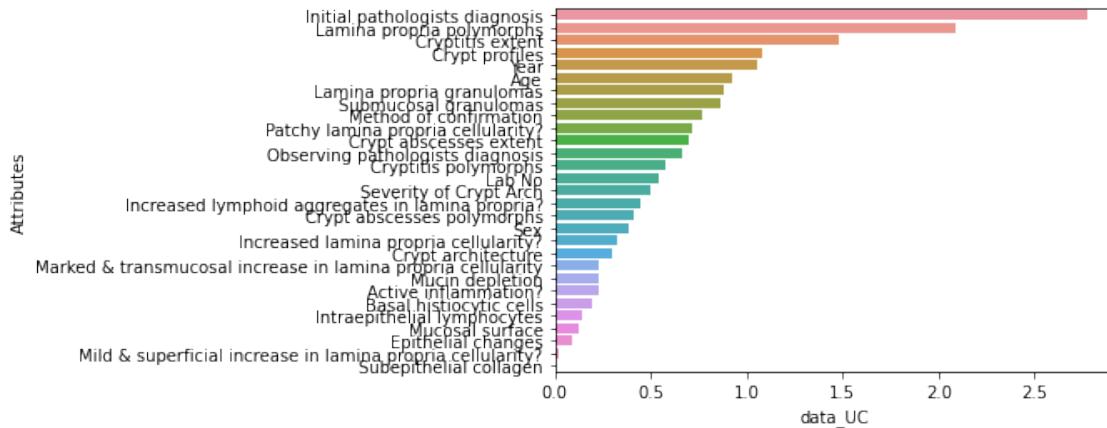
lbfgs failed to converge (status=1):  
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max\_iter) or scale the data as shown in:  
<https://scikit-learn.org/stable/modules/preprocessing.html>  
Please also refer to the documentation for alternative solver options:  
[https://scikit-learn.org/stable/modules/linear\\_model.html#logistic-regression](https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression)

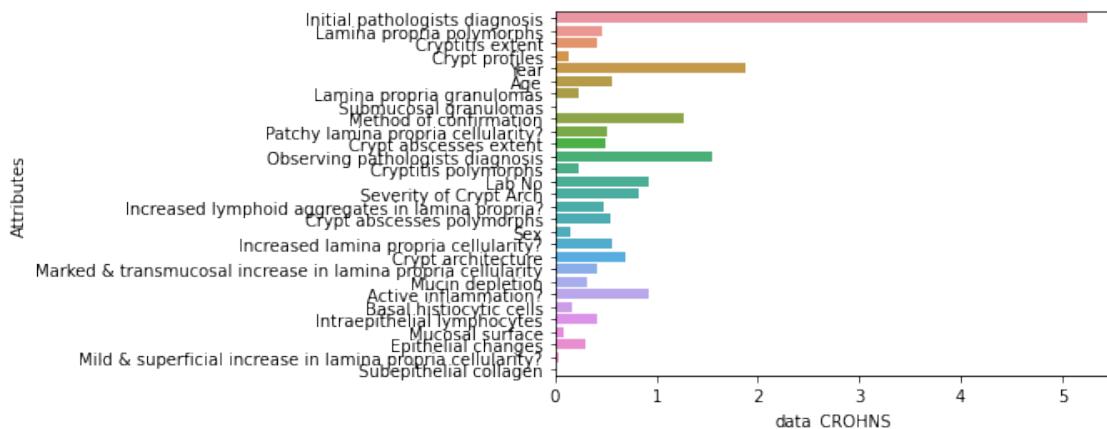
[81]: assigned = y\_sm.unique()  
assigned

```
[81]: array(['UC', 'CROHNS', 'NORMAL'], dtype=object)
```

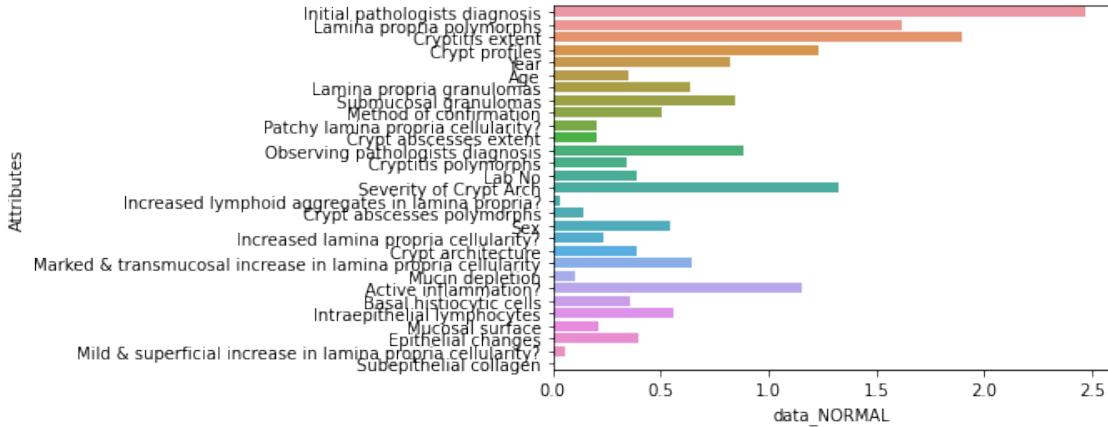
```
[82]: df_logit = pd.DataFrame()
df_logit['Attributes'] = X_sm.columns
for l in range(0, len(model.coef_)):
    df_logit['data_'+str(assign[l])] = abs(model.coef_[l])
df_logit = df_logit.sort_values(by='data_UC', ascending = False)
# plot the scores
ax = sns.barplot(x="data_UC", y="Attributes", data=df_logit)
```



```
[83]: ax = sns.barplot(x="data_CROHNS", y="Attributes", data=df_logit)
```



```
[84]: ax = sns.barplot(x="data_NORMAL", y="Attributes", data=df_logit)
```



## 0.6.5 ETL PipeLine

confirmed to not be needed considering time constraint.

## 0.7 ## Machine Learning Models

### 0.7.1 Parameter Tuning

```
[85]: modelCompare = {'model': [], 'features': [], 'accuracy': [], 'f1': [],
                     'precision': [], 'recall': [], 'params': []}

[86]: def hyper_search(modelDictionary, modelParamDictionary, data, features):
        # define empty dictionaries to start
        modelAccuracy = 0
        bestModel = {}
        df_tmp = pd.DataFrame()
        modelCompare = pd.DataFrame()
        features1 = ', '.join(map(str, features))

        # iterate through the model dictionary to execute each model
        for key, value in modelDictionary.items():
            accuracyDics = {}
            finalResults = []
            print(f'\r\nProcessing Model: {key}')

            # get the hyper parameter dictionary listings for the specific model
            paramDictionary = modelParamDictionary[key]

            # build out all permutations
            keys, values = zip(*paramDictionary.items())
            paramList = [dict(zip(keys, v)) for v in itertools.product(*values)]
```

```

for dic in paramList:
    finalResults = main(value, data, dic)
    accuracyDics.update(groupClassifiers(finalResults))

bestScore = 0
avgAccuracy = 0
plotScore = {}
for k in accuracyDics:
    for a in accuracyDics[k][0]:
        k1 = {}
        k1 = k[:k.index('(')]
        avgAccuracy = statistics.mean(accuracyDics[k][0]['accuracy'])
        avgF1 = statistics.mean(accuracyDics[k][0]['f1'])
        avgPrecision = statistics.mean(accuracyDics[k][0]['precision'])
        avgRecall = statistics.mean(accuracyDics[k][0]['recall'])
        param = accuracyDics[k][0]['params']
        if avgAccuracy > bestScore:
            bestScore = avgAccuracy
            plotScore.clear()
            plotScore = {'classifier': k1,
                         'features': features1,
                         'accuracy': accuracyDics[k][0]['accuracy'],
                         'avgAccuracy': avgAccuracy,
                         'f1': accuracyDics[k][0]['f1'],
                         'avgF1': avgF1,
                         'precision': accuracyDics[k][0]['precision'],
                         'avgPrecision': avgPrecision,
                         'recall': accuracyDics[k][0]['recall'],
                         'avgRecall': avgRecall,
                         'params': param}

plot_models(plotScore)

df_tmp = pd.DataFrame({'model': k1,
                       'features': features1,
                       'accuracy': avgAccuracy,
                       'f1': avgF1,
                       'precision': avgPrecision,
                       'recall': avgRecall,
                       'params': param})
modelCompare = modelCompare.append(df_tmp, ignore_index=True)
df_tmp = df_tmp[0:0]

print(f'*****')
print(f'* {key}')
print(f'* Best Params Result: ')
print(f'* {plotScore}')

```

```

print(f'*****')
if bestScore > modelAccuracy:
    modelAccuracy = avgAccuracy
    bestModel.clear()
    bestModel = plotScore
print(f'*****')
print(f'* Best Performing Model and Params is:')
print(f'* {bestModel}')
print(f'*****')

print(f'\r\n{modelCompare}')

```

```

[87]: def main(clfr, data, clfrHyperParams={}):
    X_, y_ , n_folds = data
    kf = KFold(n_splits=n_folds)
    ret = {}

    for id, (trainIndex, testIndex) in enumerate(kf.split(X_, y_)):
        clf = clfr(**clfrHyperParams)
        clf.fit(X_[trainIndex], y_[trainIndex])
        pred = clf.predict(X_[testIndex])
        ret[id] = {'classifier': clf,
                   'accuracy': accuracy_score(y_[testIndex], pred),
                   'f1': f1_score(y_[testIndex], pred, average='weighted'),
                   'precision': precision_score(y_[testIndex], pred, average='micro'),
                   'recall': recall_score(y_[testIndex], pred, average='micro'),
                   'params': clf.get_params(deep=True)}

    return ret

```

```

[88]: def groupClassifiers(resultsDict):
    accuraccyDict = {}

    for key in resultsDict:
        c = resultsDict[key]['classifier']
        a = resultsDict[key]['accuracy']
        f = resultsDict[key]['f1']
        p = resultsDict[key]['precision']
        r = resultsDict[key]['recall']
        params = resultsDict[key]['params']
        c_ = str(c).strip()

        # Then check if the string value 'c_' exists as a key in the dictionary
        if c_ in accuraccyDict:
            accuraccyDict[c_][0]['accuracy'].append(a)
            accuraccyDict[c_][0]['f1'].append(f)

```

```

        accuraccyDict[c_][0]['precision'].append(p)
        accuraccyDict[c_][0]['recall'].append(r)
    else:
        accuraccyDict[c_] = [{ 'accuracy': [a], 'f1': [f],
                               'precision': [p], 'recall': [r],
                               'params': [params]}]

    return(accuraccyDict)

```

```
[89]: def plot_models(accuraccyDict):
    plt.rcParams.update ({'text.usetex': False,
                         'font.family': 'stixgeneral',
                         'mathtext.fontset': 'stix'})
    # create a new histogram with a given dictionary key's values
    fig = plt.figure(figsize=(8, 8))
    ax = fig.add_subplot(1, 1, 1)
    plt.hist(accuraccyDict['accuracy'], facecolor='green', alpha=0.75, bins=8)
    plt.text(.20, .5, 'Accuracy Score: ' + str(accuraccyDict['avgAccuracy']) + '\nF1 Score: ' + str(accuraccyDict['avgF1']))
    ax.set_title(accuraccyDict['classifier'], fontsize=15)
    ax.set_xlabel('Classifier Accuracy (By K-Fold)', fontsize=15)
    ax.set_ylabel('Frequency', fontsize=15)
    ax.xaxis.set_ticks(np.arange(0, 1.1, 0.1))
    ax.yaxis.set_ticks(np.arange(0, .5, 1))
    ax.xaxis.set_tick_params(labelsize=15)
    ax.yaxis.set_tick_params(labelsize=15)
    plt.subplots_adjust(left=0.125, right=0.9, bottom=0.1,
                        top=0.6, wspace=0.2, hspace=0.2)
    plt.show()
```

```
[90]: modelDictionary = {
    'RandomForestClassifier': RandomForestClassifier,
    'KNeighborsClassifier': KNeighborsClassifier,
    'LogisticRegression': LogisticRegression,
    'GaussianNB': GaussianNB,
    'AdaBoostClassifier': AdaBoostClassifier,
    'DecisionTreeClassifier': DecisionTreeClassifier,
    'SVC': SVC,
    'MLPClassifier': MLPClassifier
}
```

```
[91]: modelParamsDictionary = {
    'RandomForestClassifier': {   # https://scikit-learn.org/modules/generated/
        'n_estimators': [200, 500, 700],
        'criterion': ['gini', 'entropy'],
        'max_features': ["auto", "sqrt", "log2"],
```

```

    'bootstrap': [True],
    'oob_score': [True, False],
    'n_jobs': [-1]
},
'KNeighborsClassifier': { # https://sklearn.org/modules/generated/sklearn.
    ↳neighbors.KNeighborsClassifier.html
        'n_neighbors': np.arange(12, 18),
        'weights': ['uniform', 'distance'],
        'algorithm': ['auto', 'ball_tree', 'kd_tree', 'brute'],
        'n_jobs': [-1]
},
'LogisticRegression': { # https://sklearn.org/modules/generated/sklearn.
    ↳linear_model.LogisticRegression.html
        'C': [0.0001, 0.001, 1],
        'solver': ['newton-cg', 'lbfgs'],
        'multi_class': ['ovr', 'multinomial'],
        'max_iter': [100, 1000],
        'n_jobs': [-1]
},
'GaussianNB': { # https://sklearn.org/modules/naive_bayes.
    ↳html#gaussian-naive-bayes
        'var_smoothing': [1e-9]
},
'AdaBoostClassifier': { # https://sklearn.org/modules/generated/sklearn.
    ↳ensemble.AdaBoostClassifier.html
        'n_estimators': [20, 50, 100, 300],
        'learning_rate': [1]
},
'DecisionTreeClassifier': { # https://sklearn.org/modules/generated/
    ↳sklearn.tree.DecisionTreeClassifier.html
        'criterion': ['gini', 'entropy'],
        'splitter': ['best', 'random'],
        'max_features': ["auto", "sqrt", "log2"]
},
'SVC': { # https://sklearn.org/modules/generated/sklearn.svm.SVC.html
    'C': [0.0001, 0.001, 1.0],
    'kernel': ['linear'],
    'gamma': ['scale', 'auto'],
    'cache_size': [4000]
},
'MLPClassifier': { # https://sklearn.org/modules/generated/sklearn.
    ↳neural_network.MLPClassifier.html
        'activation': ['identity', 'logistic'],
        'solver': ['adam'],
        'learning_rate': ['constant', 'invscaling', 'adaptive'],
        'max_iter': [5000, 7000, 9000]
}

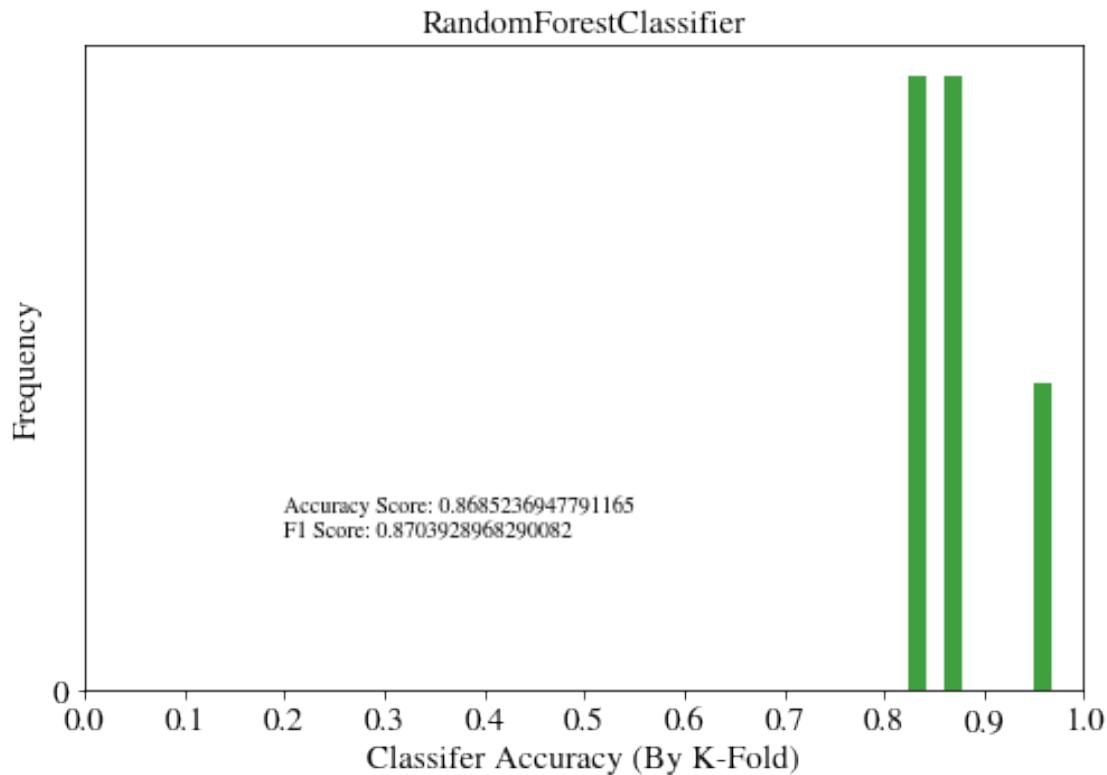
```

```
    }  
}
```

```
[92]: n_folds = 5  
l = len(df_features['Features']) - 1  
df = df_features['Features']  
  
# SMOTE Dataset  
X = pd.concat([X_sm, X_test_ord])#.to_numpy()  
y = pd.concat([y_sm, y_test_ord]).to_numpy()  
#data = (X, y, n_folds)  
  
print('*****')  
print('Starting SMOTE data set....')  
print('*****')  
  
for i in range(l, 0, -1):  
    col = []  
    col = df[:i]  
    nX = X.loc[:, col]  
    nX = nX.to_numpy()  
    data = (nX, y, n_folds)  
    hyper_search(modelDictionary, modelParamsDictionary, data, col)
```

```
*****  
Starting SMOTE data set...  
*****
```

Processing Model: RandomForestClassifier

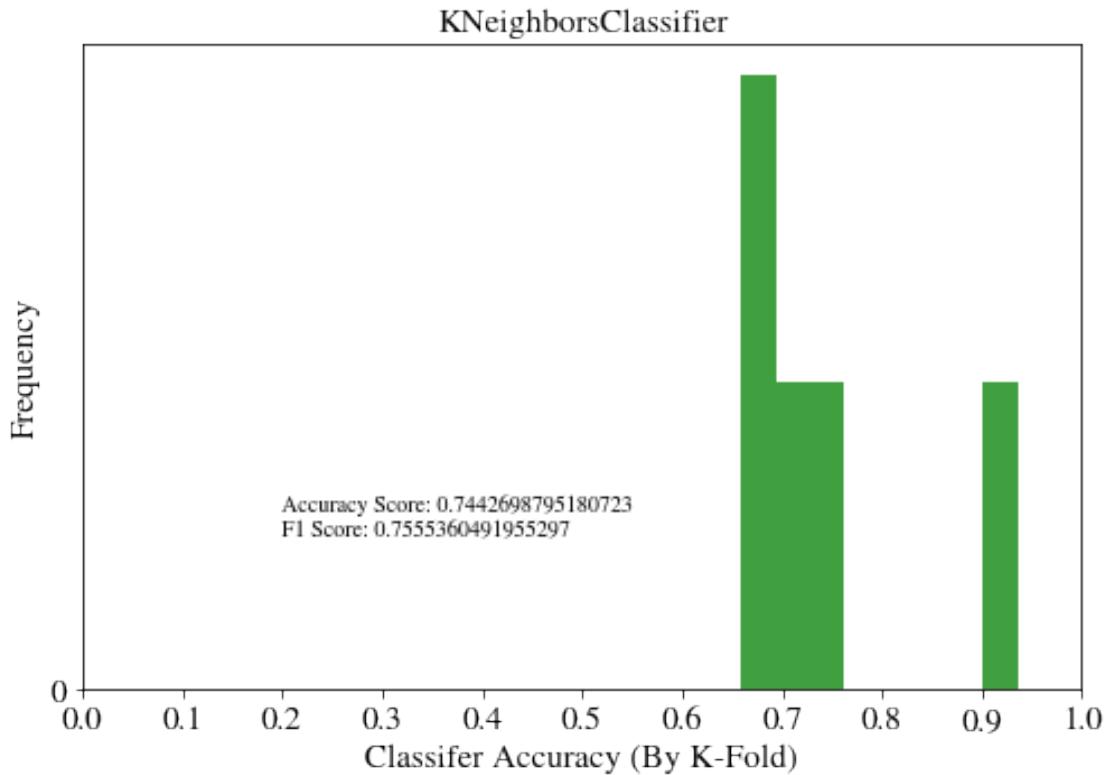


```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year, Subepithelial collagen', 'accuracy': [0.828, 0.86, 0.8634538152610441, 0.9678714859437751, 0.8232931726907631], 'avgAccuracy': 0.8685236947791165, 'f1': [0.8271091813919943, 0.8600174438108017, 0.8673740768060905, 0.977738120774916, 0.8197256613612385], 'avgF1': 0.8703928968290082, 'precision': [0.828, 0.86, 0.8634538152610441, 0.9678714859437751, 0.8232931726907631], 'avgPrecision': 0.8685236947791165, 'recall': [0.828, 0.86, 0.8634538152610441, 0.9678714859437751, 0.8232931726907631], 'avgRecall': 0.8685236947791165, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy',
```

```
'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None,
'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None,
'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0,
'n_estimators': 500, 'n_jobs': -1, 'oob_score': True, 'random_state': None,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,  
Lab No, Year, Subepithelial collagen', 'accuracy': [0.676, 0.708,
```

```

0.7429718875502008, 0.9357429718875502, 0.6586345381526104], 'avgAccuracy':  

0.7442698795180723, 'f1': [0.6786593087166771, 0.718437668090492,  

0.7535727847477373, 0.9550159287194385, 0.6719945557033038], 'avgF1':  

0.7555360491955297, 'precision': [0.676, 0.708, 0.7429718875502008,  

0.9357429718875502, 0.6586345381526104], 'avgPrecision': 0.7442698795180723,  

'recall': [0.676, 0.708, 0.7429718875502008, 0.9357429718875502,  

0.6586345381526104], 'avgRecall': 0.7442698795180723, 'params': [{  

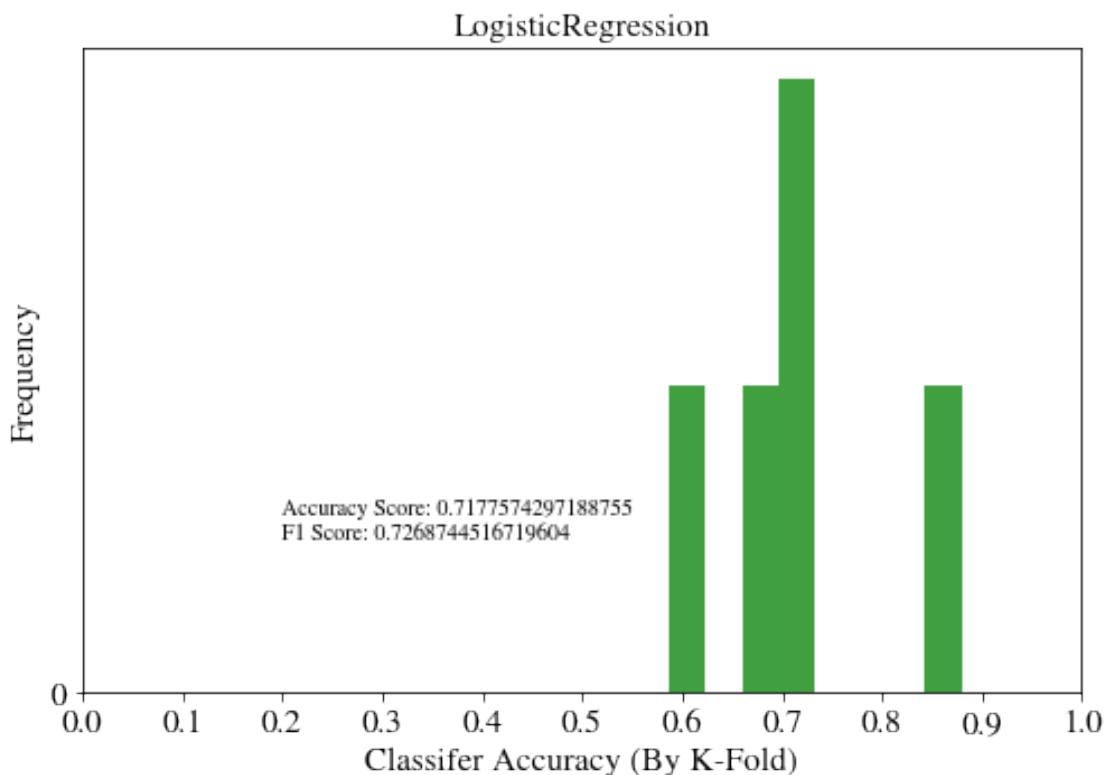
    'algorithm':  

    'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs':  

    -1, 'n_neighbors': 12, 'p': 2, 'weights': 'distance'}]}
*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,

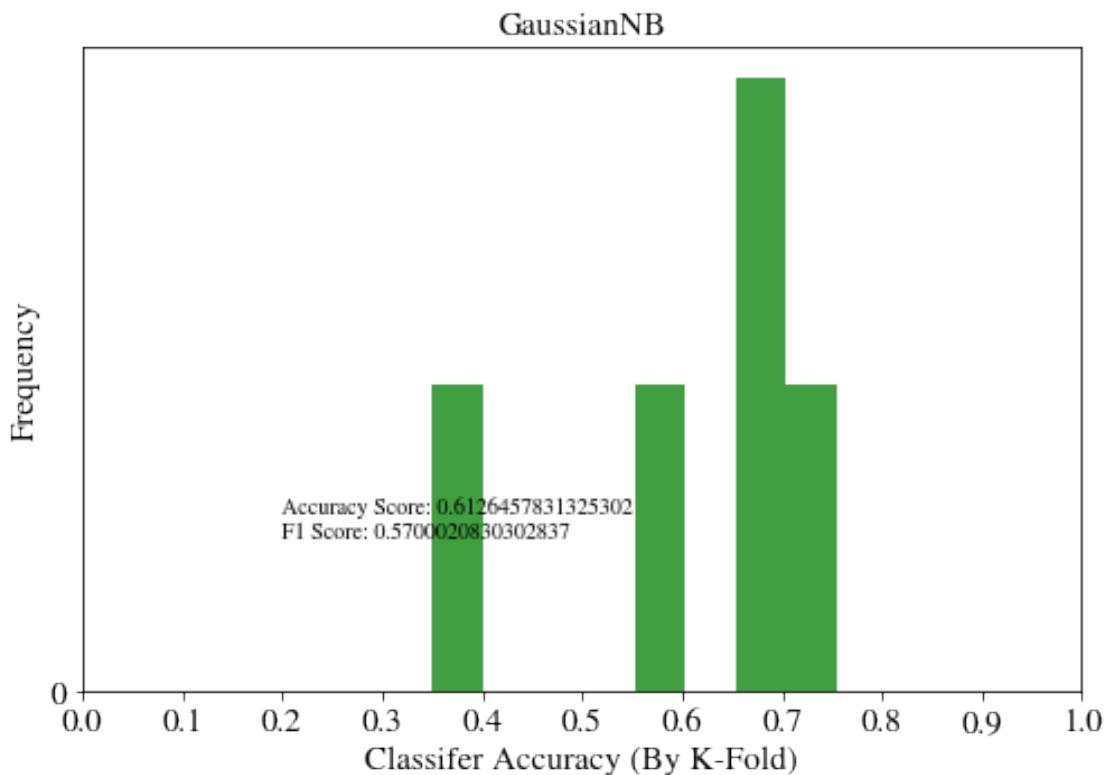
```

```

Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,
Lab No, Year, Subepithelial collagen', 'accuracy': [0.668, 0.724,
0.5863453815261044, 0.8795180722891566, 0.7309236947791165], 'avgAccuracy':
0.7177574297188755, 'f1': [0.6728897029260665, 0.7348372167764743,
0.5878572099425532, 0.903907983207618, 0.7348801455070901], 'avgF1':
0.7268744516719604, 'precision': [0.668, 0.724, 0.5863453815261044,
0.8795180722891566, 0.7309236947791165], 'avgPrecision': 0.7177574297188755,
'recall': [0.668, 0.724, 0.5863453815261044, 0.8795180722891566,
0.7309236947791165], 'avgRecall': 0.7177574297188755, 'params': [{ 'C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs':
-1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?', Severity of

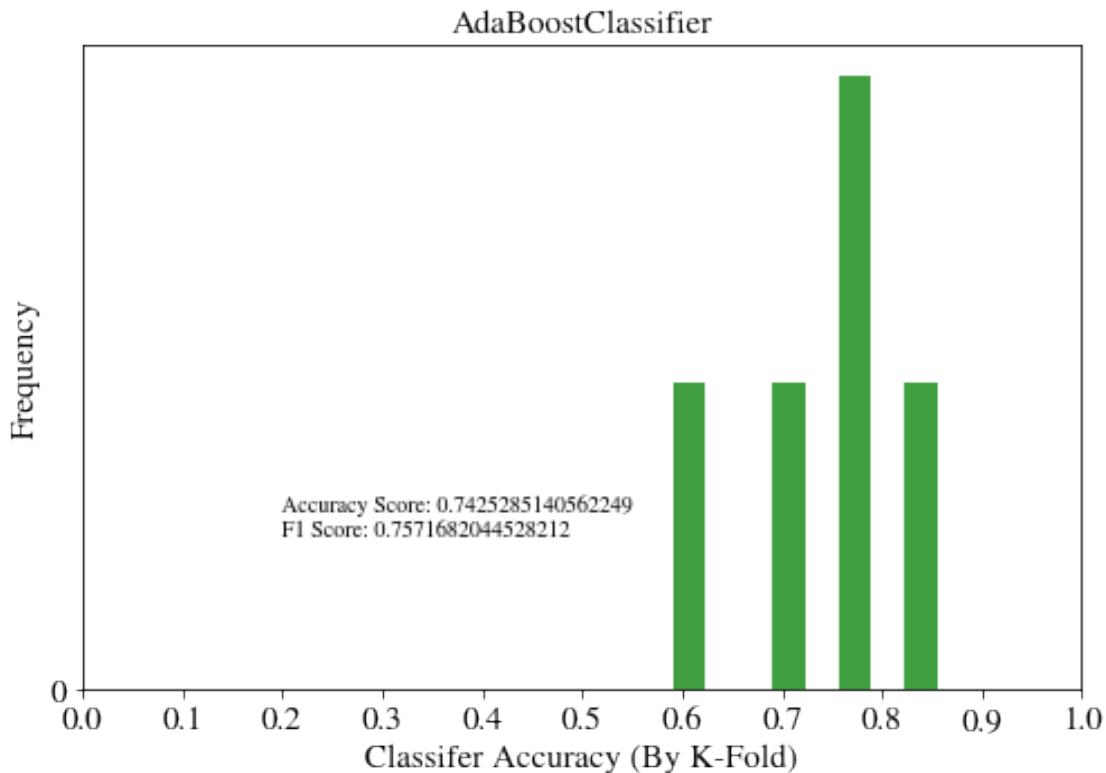
```

```

Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina
propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No,
Year, Subepithelial collagen', 'accuracy': [0.584, 0.672, 0.3493975903614458,
0.7550200803212851, 0.7028112449799196], 'avgAccuracy': 0.6126457831325302,
'f1': [0.552681447124797, 0.6288689014773975, 0.2770385974126309,
0.7336636489018139, 0.657757820234779], 'avgF1': 0.5700020830302837,
'precision': [0.584, 0.672, 0.3493975903614458, 0.7550200803212851,
0.7028112449799196], 'avgPrecision': 0.6126457831325302, 'recall': [0.584,
0.672, 0.3493975903614458, 0.7550200803212851, 0.7028112449799196], 'avgRecall':
0.6126457831325302, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```
*****

```

\* AdaBoostClassifier

```

* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  

Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  

Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  

lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,  

Lab No, Year, Subepithelial collagen', 'accuracy': [0.788, 0.764,  

0.714859437751004, 0.8554216867469879, 0.5903614457831325], 'avgAccuracy':  

0.7425285140562249, 'f1': [0.7850474403645135, 0.7776211704613379,  

0.7220169663172444, 0.8938793296352566, 0.6072761154857532], 'avgF1':  

0.7571682044528212, 'precision': [0.788, 0.764, 0.714859437751004,  

0.8554216867469879, 0.5903614457831325], 'avgPrecision': 0.7425285140562249,  

'recall': [0.788, 0.764, 0.714859437751004, 0.8554216867469879,  

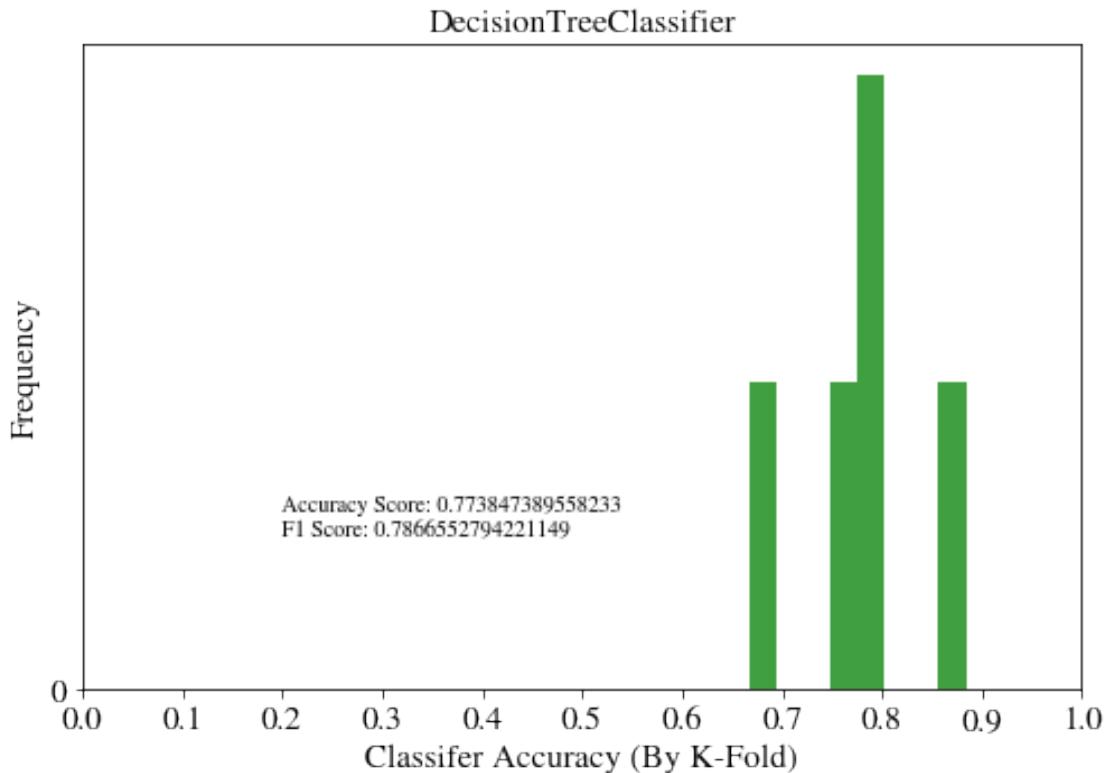
0.5903614457831325], 'avgRecall': 0.7425285140562249, 'params': [{algorithm':  

'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 50,  

'random_state': None}]}
*****

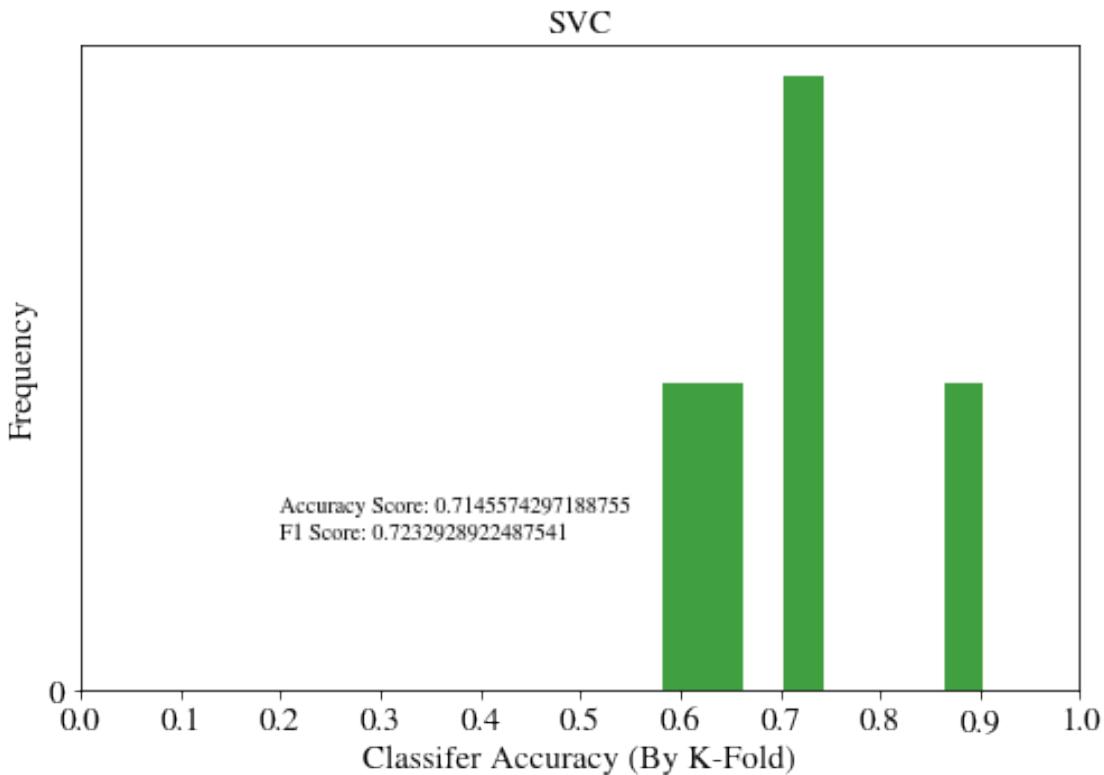
```

Processing Model: DecisionTreeClassifier



```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year, Subepithelial collagen', 'accuracy': [0.776, 0.784, 0.7590361445783133, 0.8835341365461847, 0.6666666666666666], 'avgAccuracy': 0.773847389558233, 'f1': [0.7778702548599419, 0.7844142402371753, 0.7668444549465655, 0.9172947063601807, 0.6868527407067109], 'avgF1': 0.7866552794221149, 'precision': [0.776, 0.784, 0.7590361445783133, 0.8835341365461847, 0.6666666666666666], 'avgPrecision': 0.773847389558233, 'recall': [0.776, 0.784, 0.7590361445783133, 0.8835341365461847, 0.6666666666666666], 'avgRecall': 0.773847389558233, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****
```

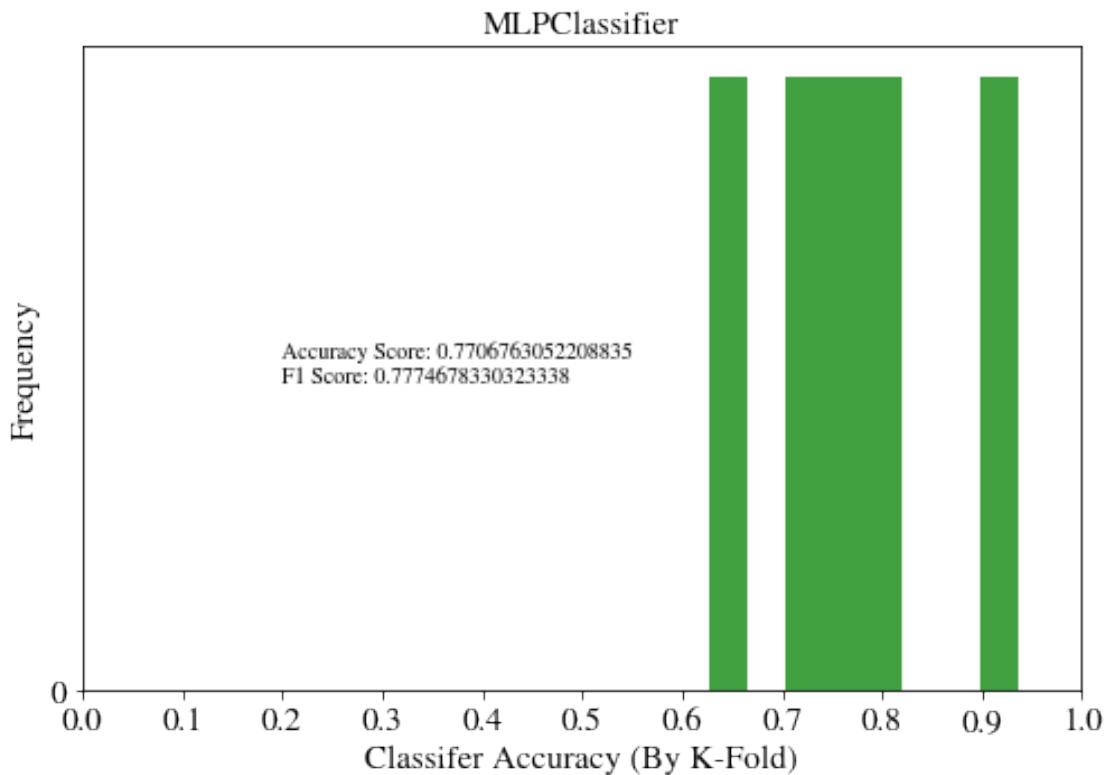
Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year, Subepithelial collagen', 'accuracy': [0.648, 0.728, 0.5823293172690763, 0.9036144578313253, 0.7108433734939759], 'avgAccuracy': 0.7145574297188755, 'f1': [0.6544530595187615, 0.7405095106913289, 0.5808435151715237, 0.9194715532200303, 0.7211868226421264], 'avgF1': 0.7232928922487541, 'precision': [0.648, 0.728, 0.5823293172690763, 0.9036144578313253, 0.7108433734939759], 'avgPrecision': 0.7145574297188755, 'recall': [0.648, 0.728, 0.5823293172690763, 0.9036144578313253, 0.7108433734939759], 'avgRecall': 0.7145574297188755, 'params': [{C: 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma':
```

```
'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False,
'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]]}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year, Subepithelial collagen', 'accuracy': [0.768, 0.74, 0.6265060240963856, 0.9357429718875502, 0.7831325301204819], 'avgAccuracy': 0.7706763052208835, 'f1': [0.7713236031254607, 0.7521796426550246, 0.6304026173343259, 0.9512785775786806, 0.7821547244681772], 'avgF1': 0.7774678330323338,
```

```

'precision': [0.768, 0.74, 0.6265060240963856, 0.9357429718875502,
0.7831325301204819], 'avgPrecision': 0.7706763052208835, 'recall': [0.768, 0.74,
0.6265060240963856, 0.9357429718875502, 0.7831325301204819], 'avgRecall':
0.7706763052208835, 'params': [{'activation': 'logistic', 'alpha': 0.0001,
'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False,
'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'adaptive',
'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5,
'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'verlbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year, Subepithelial collagen', 'accuracy': [0.828, 0.86, 0.8634538152610441, 0.9678714859437751, 0.8232931726907631], 'avgAccuracy': 0.8685236947791165, 'f1': [0.8271091813919943, 0.8600174438108017, 0.8673740768060905, 0.977738120774916, 0.8197256613612385], 'avgF1': 0.8703928968290082, 'precision': [0.828, 0.86, 0.8634538152610441, 0.9678714859437751, 0.8232931726907631], 'avgPrecision': 0.8685236947791165, 'recall': [0.828, 0.86, 0.8634538152610441, 0.9678714859437751, 0.8232931726907631], 'avgRecall': 0.8685236947791165, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 500, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
*****
```

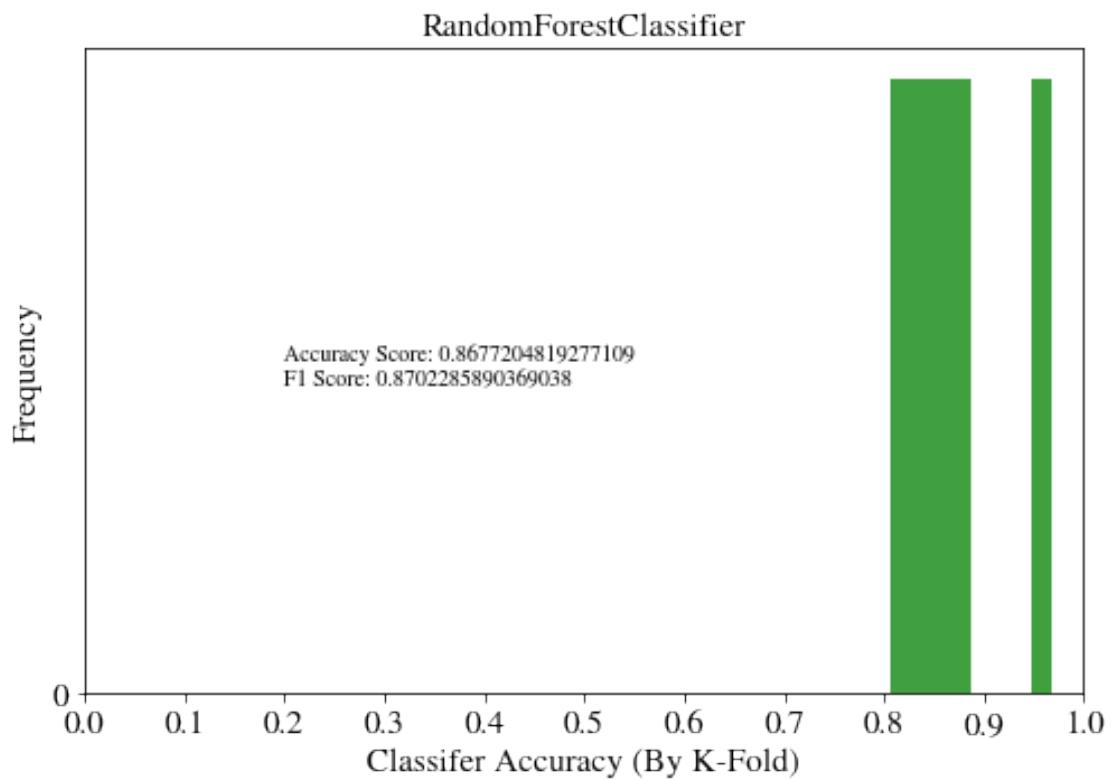
	model	features \
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...
6	SVC	Active inflammation?, Severity of Crypt Arch, ...
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...

	accuracy	f1	precision	recall	\
0	0.862908	0.865481	0.862908	0.862908	
1	0.735457	0.746901	0.735457	0.735457	
2	0.717757	0.726874	0.717757	0.717757	
3	0.612646	0.570002	0.612646	0.612646	
4	0.711290	0.729957	0.711290	0.711290	
5	0.752202	0.765450	0.752202	0.752202	
6	0.714557	0.723293	0.714557	0.714557	
7	0.770676	0.777468	0.770676	0.770676	

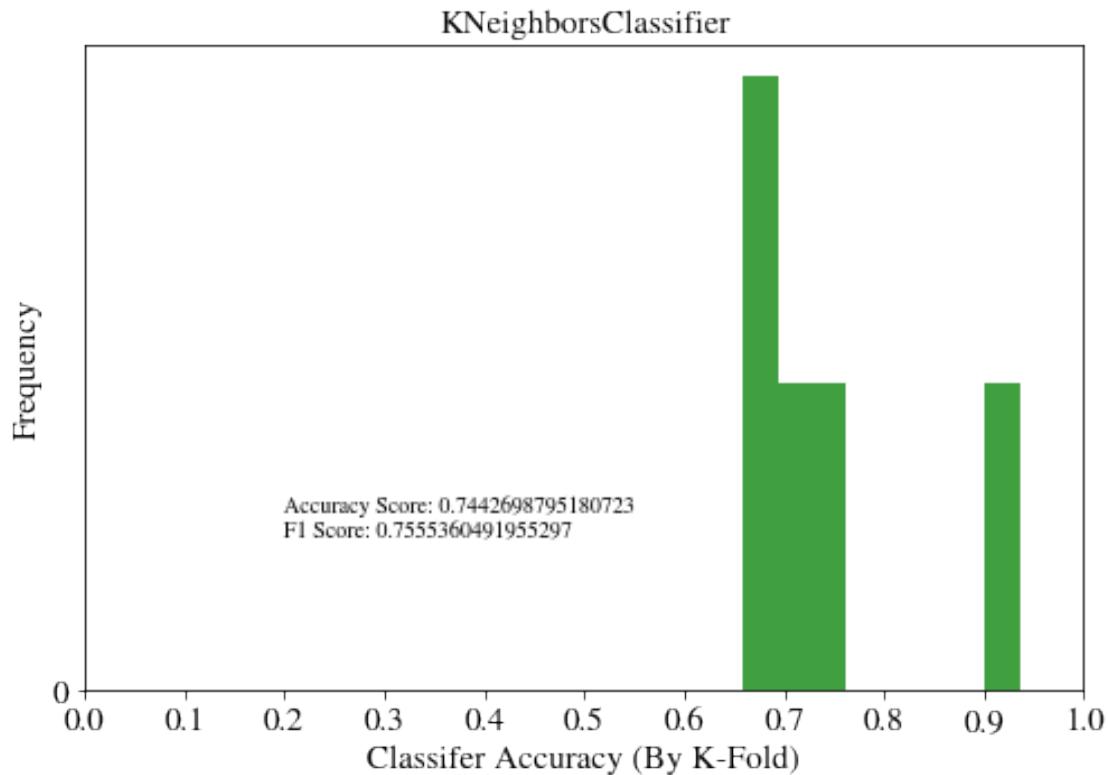
	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	{'C': 1, 'class_weight': None, 'dual': False, ...
3	{'priors': None, 'var_smoothing': 1e-09}
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...

Processing Model: RandomForestClassifier



```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year', 'accuracy': [0.836, 0.852, 0.8755020080321285, 0.9678714859437751, 0.8072289156626506], 'avgAccuracy': 0.8677204819277109, 'f1': [0.836234625472066, 0.852, 0.8789221171959674, 0.977738120774916, 0.8062480817415697], 'avgF1': 0.8702285890369038, 'precision': [0.836, 0.852, 0.8755020080321285, 0.9678714859437751, 0.8072289156626506], 'avgPrecision': 0.8677204819277109, 'recall': [0.836, 0.852, 0.8755020080321285, 0.9678714859437751, 0.8072289156626506], 'avgRecall': 0.8677204819277109, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 500, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}}
*****
```

Processing Model: KNeighborsClassifier

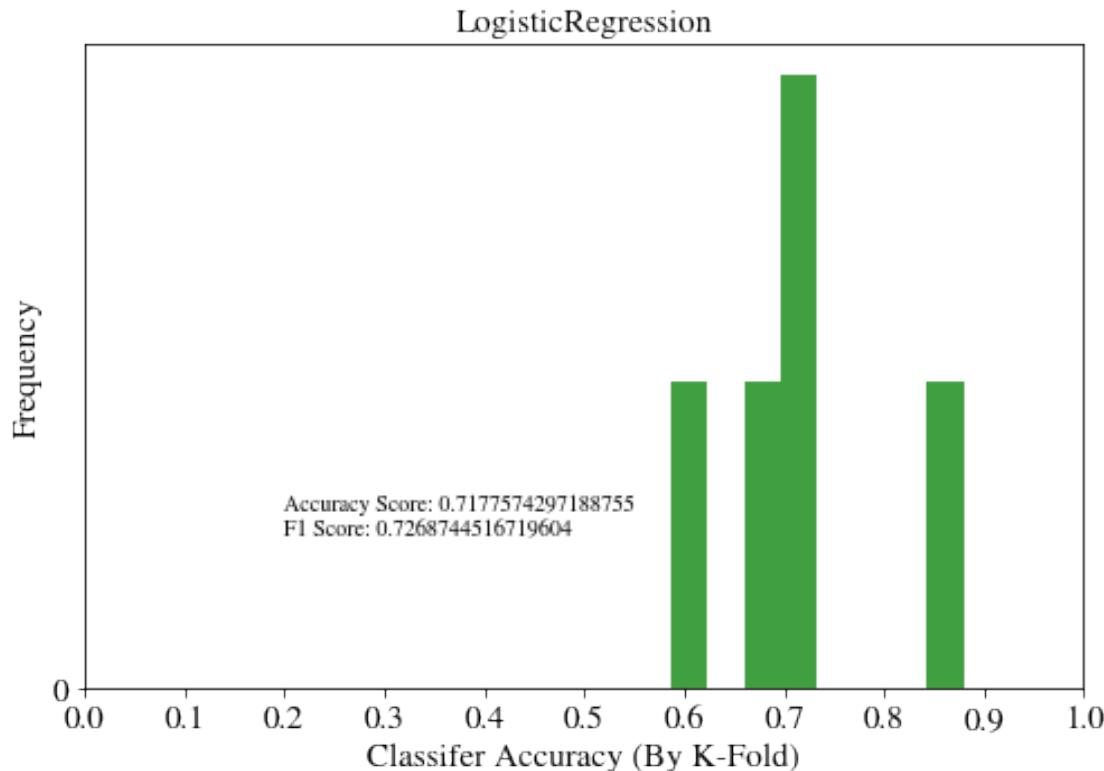


```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,  
Lab No, Year', 'accuracy': [0.676, 0.708, 0.7429718875502008,  
0.9357429718875502, 0.6586345381526104], 'avgAccuracy': 0.7442698795180723,  
'f1': [0.6786593087166771, 0.718437668090492, 0.7535727847477373,  
0.9550159287194385, 0.6719945557033038], 'avgF1': 0.7555360491955297,  
'precision': [0.676, 0.708, 0.7429718875502008, 0.9357429718875502,  
0.6586345381526104], 'avgPrecision': 0.7442698795180723, 'recall': [0.676,  
0.708, 0.7429718875502008, 0.9357429718875502, 0.6586345381526104], 'avgRecall':  
0.7442698795180723, 'params': [{'algorithm': 'auto', 'leaf_size': 30, 'metric':  
'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 12, 'p': 2,
```

```
'weights': 'distance'}]}}
*****

```

Processing Model: LogisticRegression



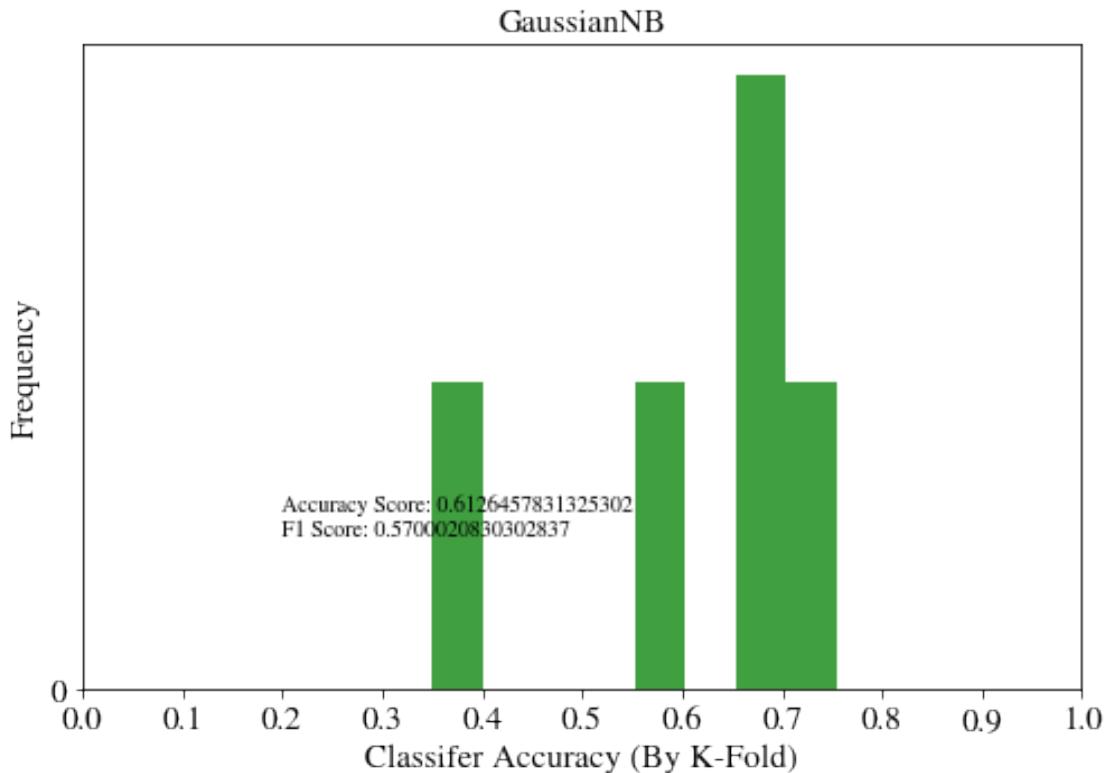
```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,  
Lab No, Year', 'accuracy': [0.668, 0.724, 0.5863453815261044,  
0.8795180722891566, 0.7309236947791165], 'avgAccuracy': 0.7177574297188755,  
'f1': [0.6728897029260665, 0.7348372167764743, 0.5878572099425532,  
0.903907983207618, 0.7348801455070901], 'avgF1': 0.7268744516719604,  
'precision': [0.668, 0.724, 0.5863453815261044, 0.8795180722891566,
```

```

0.7309236947791165], 'avgPrecision': 0.7177574297188755, 'recall': [0.668,
0.724, 0.5863453815261044, 0.8795180722891566, 0.7309236947791165], 'avgRecall':
0.7177574297188755, 'params': [{'C': 1, 'class_weight': None, 'dual': False,
'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None, 'max_iter':
100, 'multi_class': 'multinomial', 'n_jobs': -1, 'penalty': 'l2',
'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0,
'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina

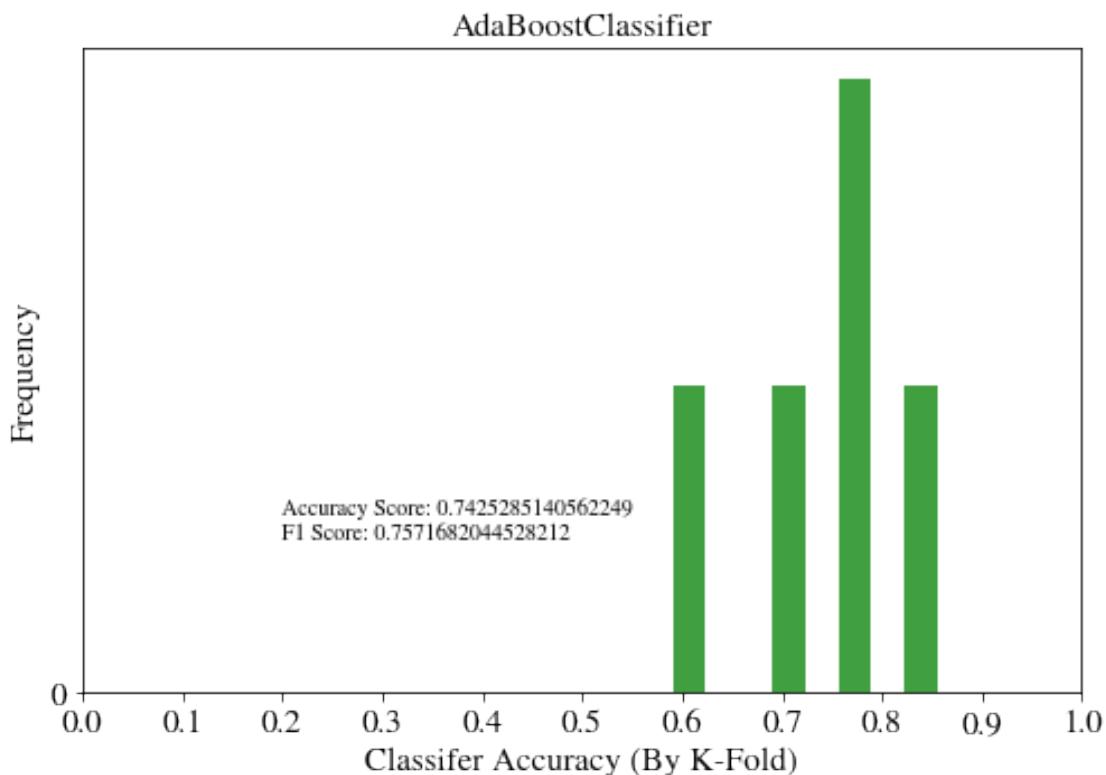
```

```

propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No,
Year', 'accuracy': [0.584, 0.672, 0.3493975903614458, 0.7550200803212851,
0.7028112449799196], 'avgAccuracy': 0.6126457831325302, 'f1':
[0.552681447124797, 0.6288689014773975, 0.2770385974126309, 0.7336636489018139,
0.657757820234779], 'avgF1': 0.5700020830302837, 'precision': [0.584, 0.672,
0.3493975903614458, 0.7550200803212851, 0.7028112449799196], 'avgPrecision':
0.6126457831325302, 'recall': [0.584, 0.672, 0.3493975903614458,
0.7550200803212851, 0.7028112449799196], 'avgRecall': 0.6126457831325302,
'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,

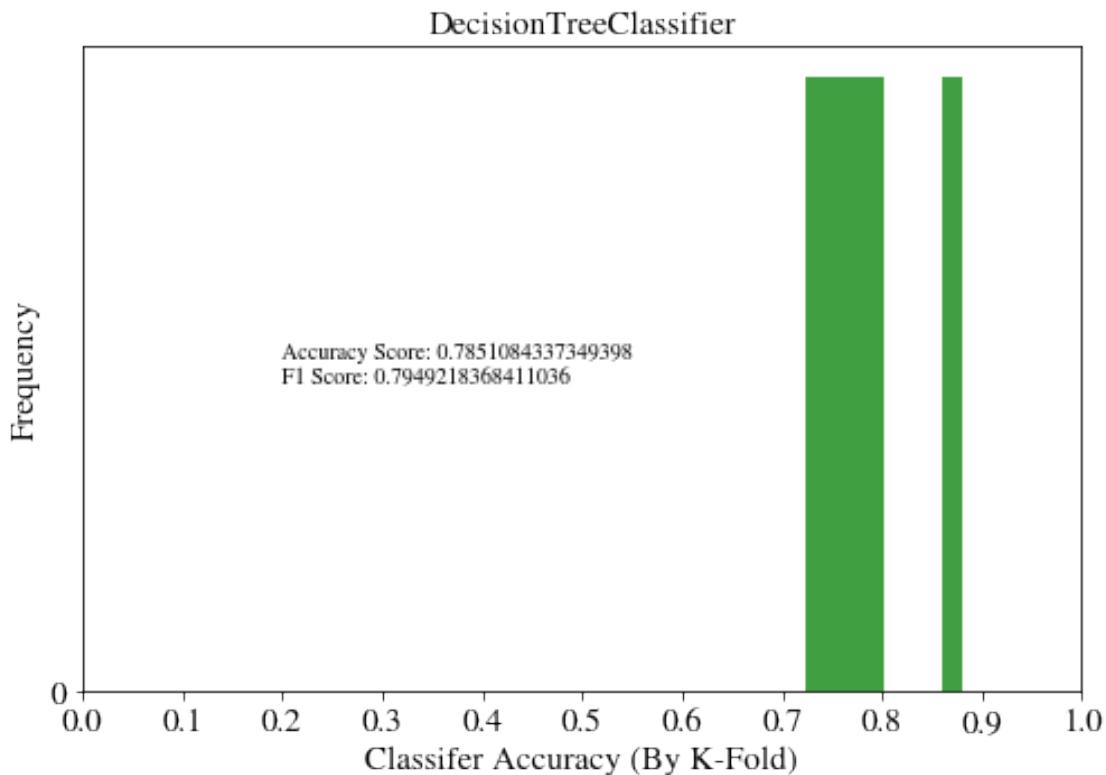
```

```

Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,
Lab No, Year', 'accuracy': [0.788, 0.764, 0.714859437751004, 0.8554216867469879,
0.5903614457831325], 'avgAccuracy': 0.7425285140562249, 'f1':
[0.7850474403645135, 0.7776211704613379, 0.7220169663172444, 0.8938793296352566,
0.6072761154857532], 'avgF1': 0.7571682044528212, 'precision': [0.788, 0.764,
0.714859437751004, 0.8554216867469879, 0.5903614457831325], 'avgPrecision':
0.7425285140562249, 'recall': [0.788, 0.764, 0.714859437751004,
0.8554216867469879, 0.5903614457831325], 'avgRecall': 0.7425285140562249,
'params': [{'algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1,
'n_estimators': 50, 'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



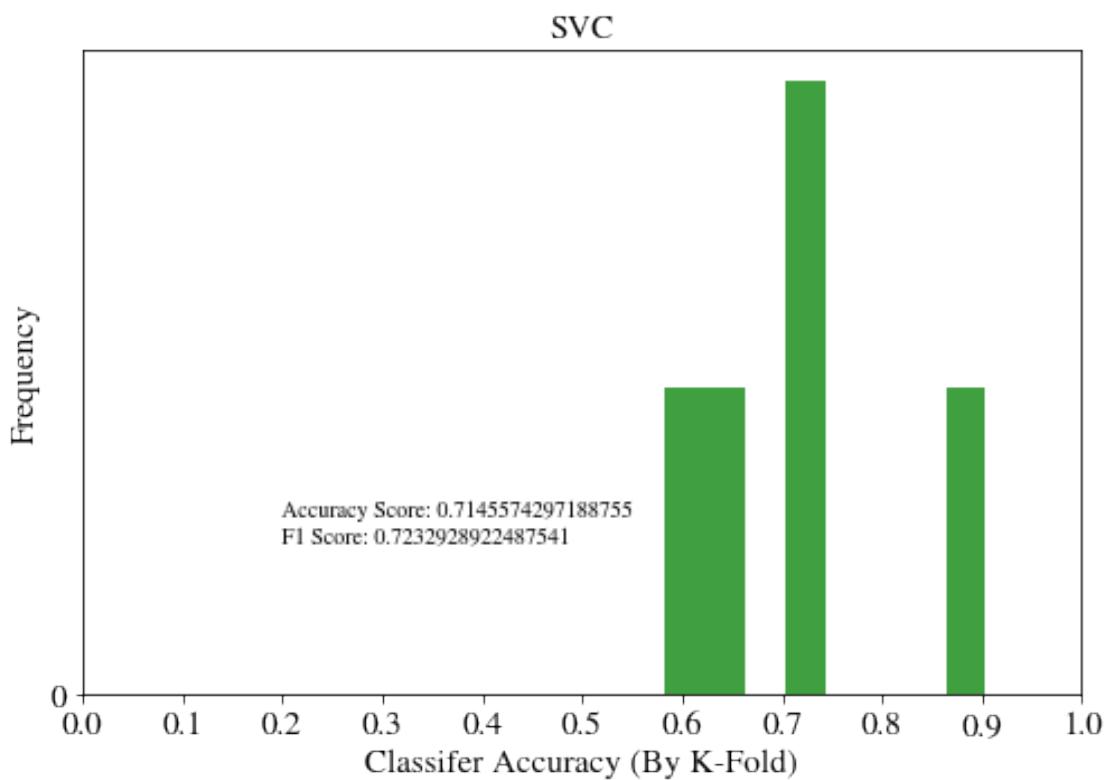
```

*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?',
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,

```

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
 Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
 abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
 Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
 Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
 lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,  
 Lab No, Year', 'accuracy': [0.76, 0.78, 0.7831325301204819, 0.8795180722891566,  
 0.7228915662650602], 'avgAccuracy': 0.7851084337349398, 'f1':  
 [0.7629434310995289, 0.7805793799665769, 0.7890713736307877, 0.9083998965622324,  
 0.7336151029463922], 'avgF1': 0.7949218368411036, 'precision': [0.76, 0.78,  
 0.7831325301204819, 0.8795180722891566, 0.7228915662650602], 'avgPrecision':  
 0.7851084337349398, 'recall': [0.76, 0.78, 0.7831325301204819,  
 0.8795180722891566, 0.7228915662650602], 'avgRecall': 0.7851084337349398,  
 'params': [{ 'ccp\_alpha': 0.0, 'class\_weight': None, 'criterion': 'entropy',  
 'max\_depth': None, 'max\_features': 'auto', 'max\_leaf\_nodes': None,  
 'min\_impurity\_decrease': 0.0, 'min\_impurity\_split': None, 'min\_samples\_leaf': 1,  
 'min\_samples\_split': 2, 'min\_weight\_fraction\_leaf': 0.0, 'random\_state': None,  
 'splitter': 'best' }]}  
\*\*\*\*\*

Processing Model: SVC



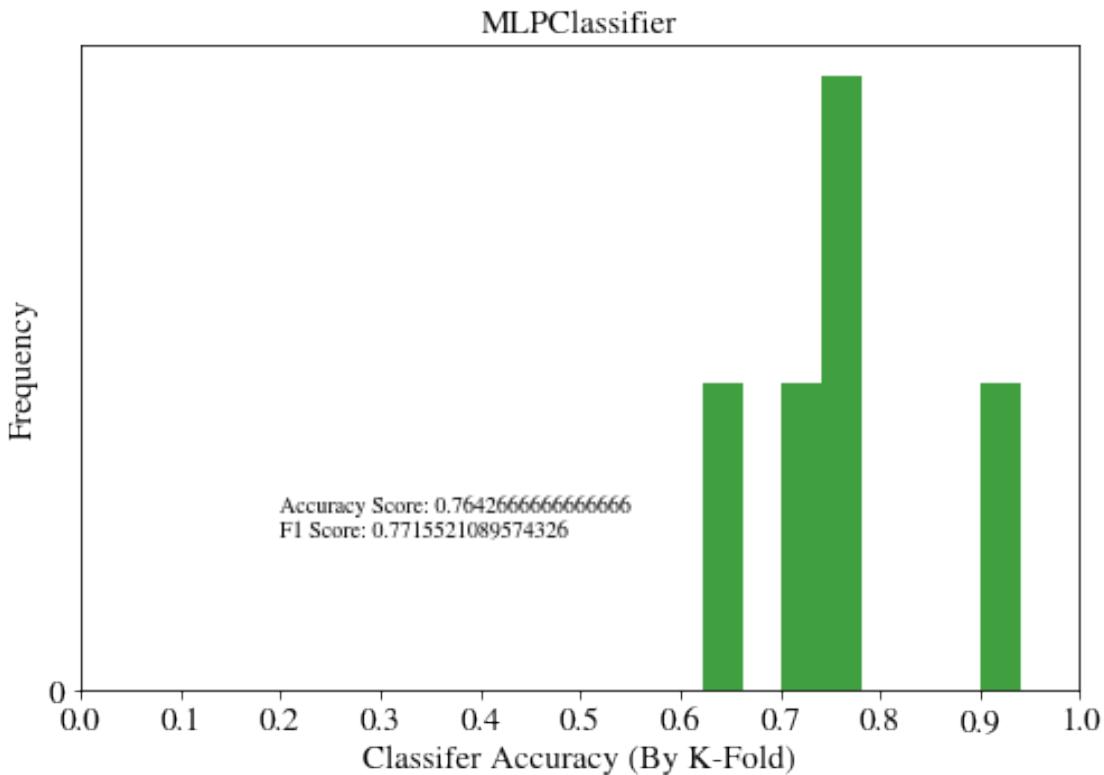
\*\*\*\*\*

```

* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year', 'accuracy': [0.648, 0.728, 0.5823293172690763, 0.9036144578313253, 0.7108433734939759], 'avgAccuracy': 0.7145574297188755, 'f1': [0.6544530595187615, 0.7405095106913289, 0.5808435151715237, 0.9194715532200303, 0.7211868226421264], 'avgF1': 0.7232928922487541, 'precision': [0.648, 0.728, 0.5823293172690763, 0.9036144578313253, 0.7108433734939759], 'avgPrecision': 0.7145574297188755, 'recall': [0.648, 0.728, 0.5823293172690763, 0.9036144578313253, 0.7108433734939759], 'avgRecall': 0.7145574297188755, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina
propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No,
Year', 'accuracy': [0.764, 0.724, 0.6224899598393574, 0.9397590361445783,
0.7710843373493976], 'avgAccuracy': 0.7642666666666666, 'f1':
[0.7676557730961064, 0.736180582846288, 0.6251461742638138, 0.957102917494551,
0.771675097086404], 'avgF1': 0.7715521089574326, 'precision': [0.764, 0.724,
0.6224899598393574, 0.9397590361445783, 0.7710843373493976], 'avgPrecision':
0.7642666666666666, 'recall': [0.764, 0.724, 0.6224899598393574,
0.9397590361445783, 0.7710843373493976], 'avgRecall': 0.7642666666666666,
'params': [{"activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto',
'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08,
```

```

'hidden_layer_sizes': (100,), 'learning_rate': 'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year', 'accuracy': [0.836, 0.852, 0.8755020080321285, 0.9678714859437751, 0.8072289156626506], 'avgAccuracy': 0.8677204819277109, 'f1': [0.836234625472066, 0.852, 0.8789221171959674, 0.977738120774916, 0.8062480817415697], 'avgF1': 0.8702285890369038, 'precision': [0.836, 0.852, 0.8755020080321285, 0.9678714859437751, 0.8072289156626506], 'avgPrecision': 0.8677204819277109, 'recall': [0.836, 0.852, 0.8755020080321285, 0.9678714859437751, 0.8072289156626506], 'avgRecall': 0.8677204819277109, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 500, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

	model	features	\		
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...			
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...			
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...			
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...			
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...			
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...			
6	SVC	Active inflammation?, Severity of Crypt Arch, ...			
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...			
	accuracy	f1	precision	recall	\
0	0.863708	0.866081	0.863708	0.863708	
1	0.735457	0.746901	0.735457	0.735457	
2	0.717757	0.726874	0.717757	0.717757	
3	0.612646	0.570002	0.612646	0.612646	

```

4 0.711290 0.729957 0.711290 0.711290
5 0.737780 0.755380 0.737780 0.737780
6 0.714557 0.723293 0.714557 0.714557
7 0.752209 0.758658 0.752209 0.752209

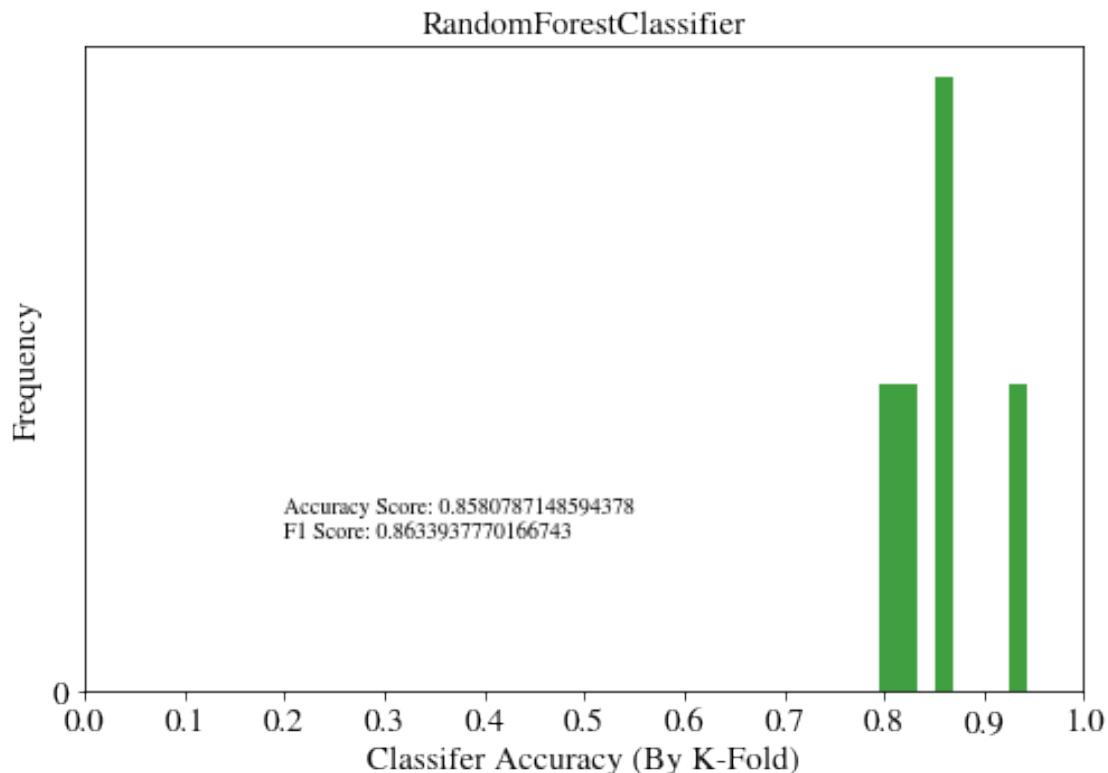
```

```

params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3         {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier



```

*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,

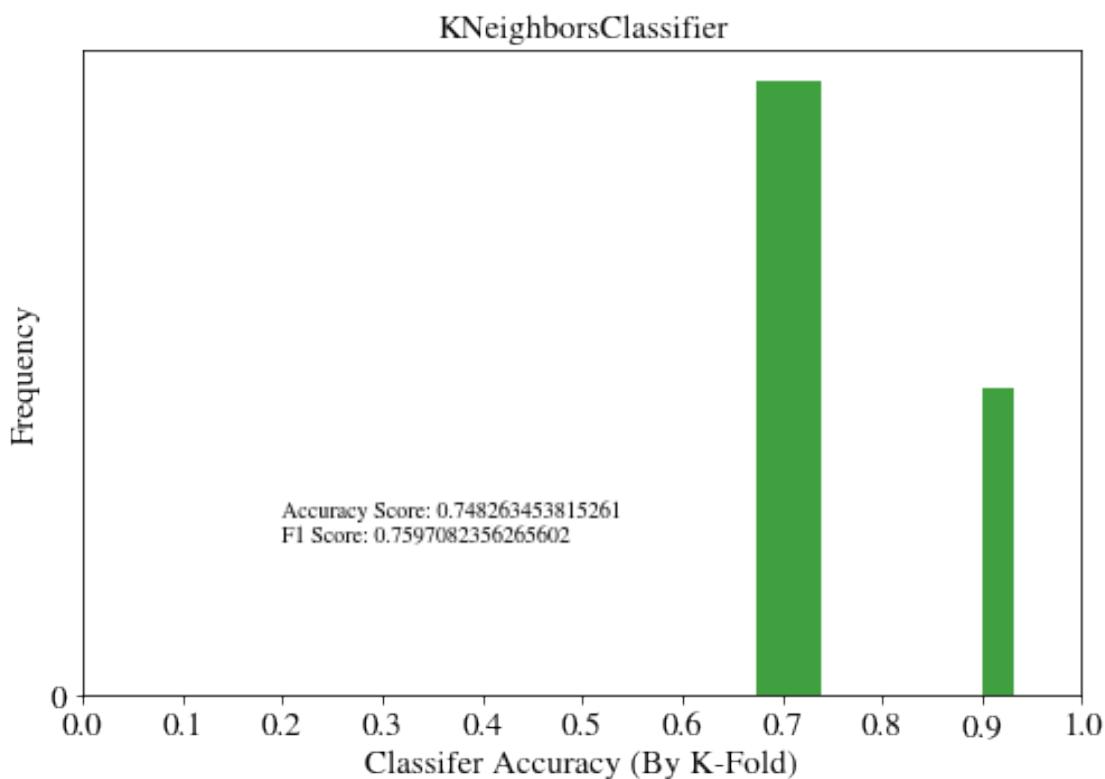
```

```

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,
Lab No', 'accuracy': [0.828, 0.864, 0.8594377510040161, 0.9437751004016064,
0.7951807228915663], 'avgAccuracy': 0.8580787148594378, 'f1':
[0.8285527797833936, 0.8655037593984962, 0.8637273320226587, 0.9612567250285755,
0.797928288502476], 'avgF1': 0.8633937770166743, 'precision': [0.828, 0.864,
0.8594377510040161, 0.9437751004016064, 0.7951807228915663], 'avgPrecision':
0.8580787148594378, 'recall': [0.828, 0.864, 0.8594377510040161,
0.9437751004016064, 0.7951807228915663], 'avgRecall': 0.8580787148594378,
'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None,
'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto',
'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 700, 'n_jobs': -1, 'oob_score':
True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

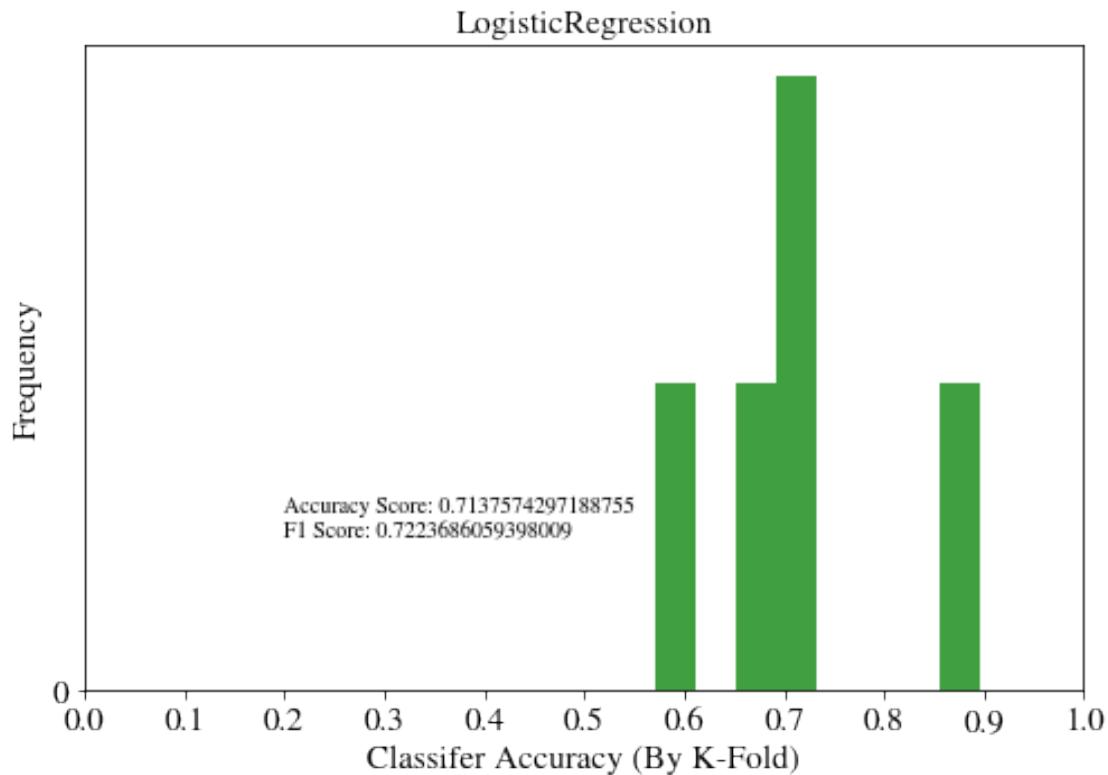
```

Processing Model: KNeighborsClassifier



```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No', 'accuracy': [0.676, 0.736, 0.7228915662650602, 0.9317269076305221, 0.6746987951807228], 'avgAccuracy': 0.748263453815261, 'f1': [0.6815873833279692, 0.7458660493006971, 0.7325713108845638, 0.9469670815364419, 0.6915493530831287], 'avgF1': 0.7597082356265602, 'precision': [0.676, 0.736, 0.7228915662650602, 0.9317269076305221, 0.6746987951807228], 'avgPrecision': 0.748263453815261, 'recall': [0.676, 0.736, 0.7228915662650602, 0.9317269076305221, 0.6746987951807228], 'avgRecall': 0.748263453815261, 'params': [{'algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 12, 'p': 2, 'weights': 'distance'}]}}
*****
```

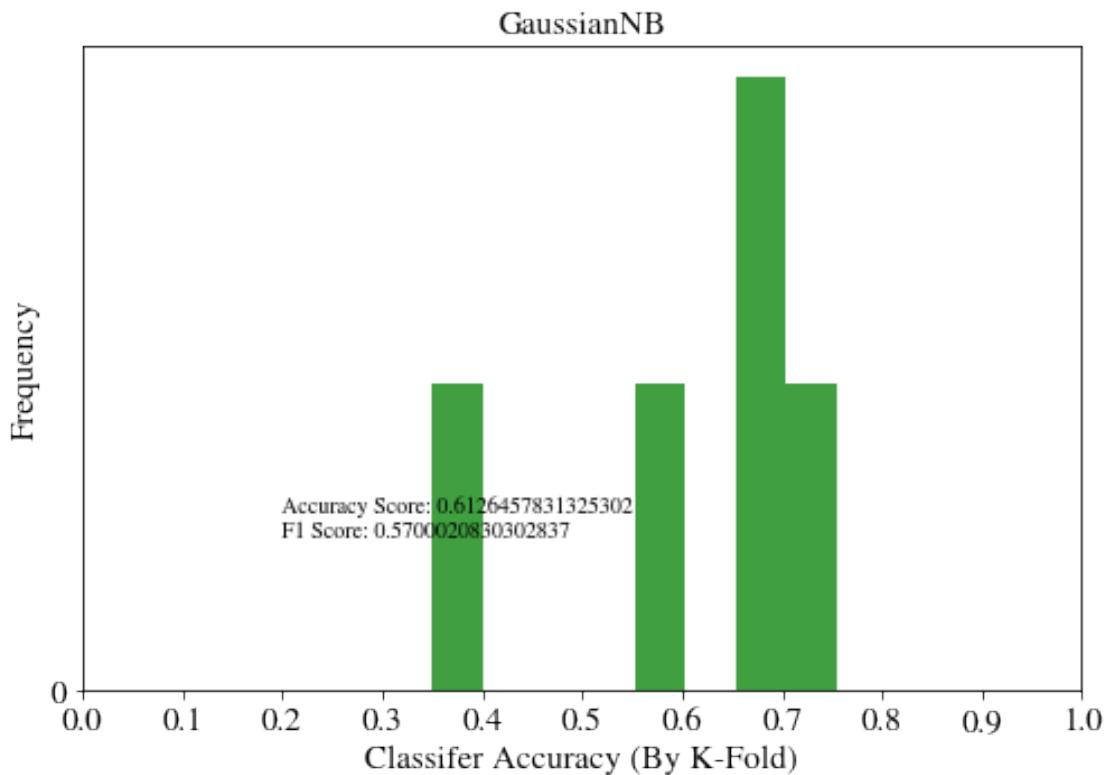
Processing Model: LogisticRegression



```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,  
Lab No', 'accuracy': [0.66, 0.712, 0.570281124497992, 0.8955823293172691,  
0.7309236947791165], 'avgAccuracy': 0.7137574297188755, 'f1':  
[0.665707475358269, 0.72396834625323, 0.5700808975480696, 0.9184093070611958,  
0.7336770034782398], 'avgF1': 0.7223686059398009, 'precision': [0.66, 0.712,  
0.570281124497992, 0.8955823293172691, 0.7309236947791165], 'avgPrecision':  
0.7137574297188755, 'recall': [0.66, 0.712, 0.570281124497992,  
0.8955823293172691, 0.7309236947791165], 'avgRecall': 0.7137574297188755,  
'params': [{'C': 1, 'class_weight': None, 'dual': False, 'fit_intercept': True,  
'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class':
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```
'multinomial', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver':  
'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}  
*****
```

Processing Model: GaussianNB



```
*****  
* GaussianNB  
* Best Params Result:  
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of  
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal  
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt  
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial  
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing  
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses  
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal  
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased  
lymphoid aggregates in lamina propria?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No',  
'accuracy': [0.584, 0.672, 0.3493975903614458, 0.7550200803212851,  
0.7028112449799196], 'avgAccuracy': 0.6126457831325302, 'f1':  
[0.552681447124797, 0.6288689014773975, 0.2770385974126309, 0.7336636489018139,  
0.657757820234779], 'avgF1': 0.5700020830302837, 'precision': [0.584, 0.672,
```

```

0.3493975903614458, 0.7550200803212851, 0.7028112449799196], 'avgPrecision':  

0.6126457831325302, 'recall': [0.584, 0.672, 0.3493975903614458,  

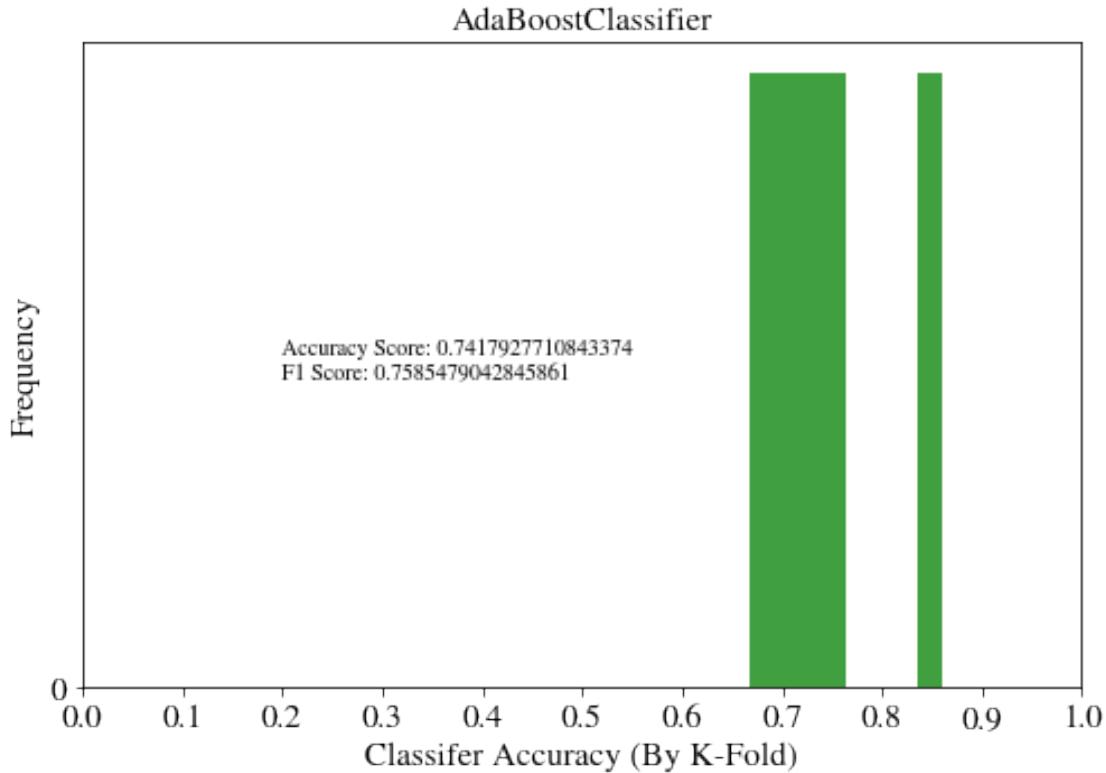
0.7550200803212851, 0.7028112449799196], 'avgRecall': 0.6126457831325302,  

'params': [{'priors': None, 'var_smoothing': 1e-09}]}  

*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  

Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  

Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  

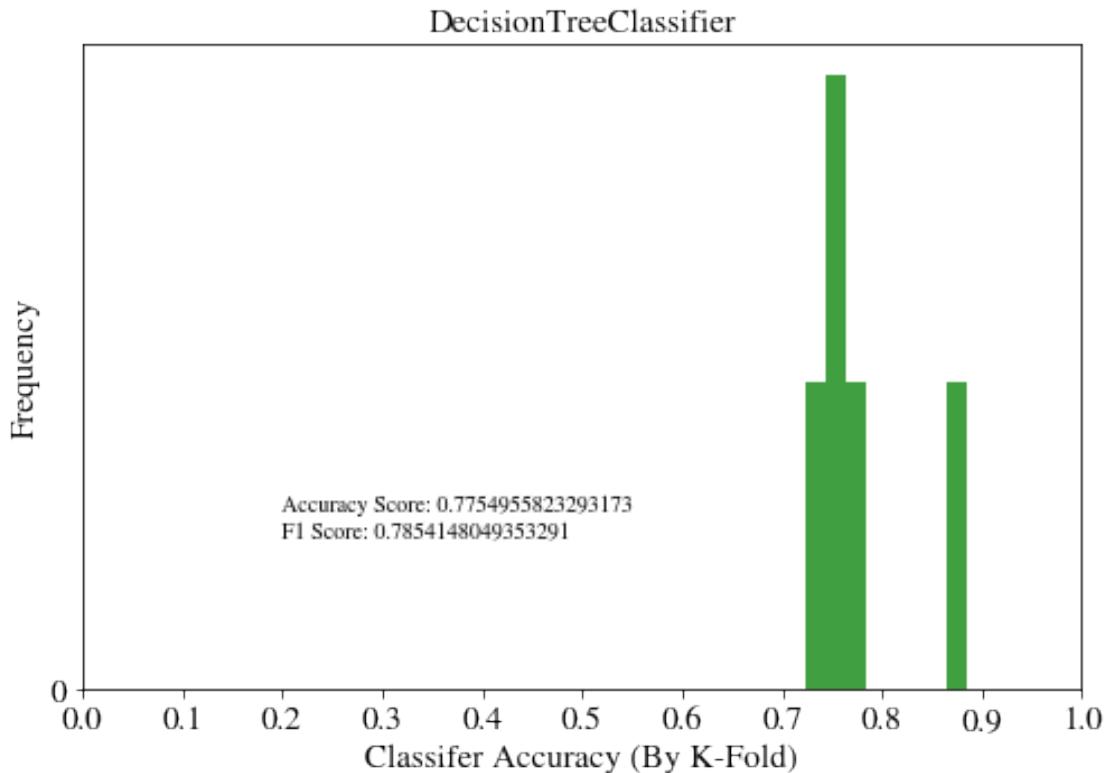
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,  

Lab No', 'accuracy': [0.708, 0.76, 0.714859437751004, 0.8594377510040161,  

0.6666666666666666], 'avgAccuracy': 0.7417927710843374, 'f1':
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```
[0.7160322689186333, 0.768625538020086, 0.7194030676010408, 0.9056605430468228,
0.6830181038363478], 'avgF1': 0.7585479042845861, 'precision': [0.708, 0.76,
0.714859437751004, 0.8594377510040161, 0.6666666666666666], 'avgPrecision':
0.7417927710843374, 'recall': [0.708, 0.76, 0.714859437751004,
0.8594377510040161, 0.6666666666666666], 'avgRecall': 0.7417927710843374,
'params': [{algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1,
'n_estimators': 20, 'random_state': None}]}
*****
```

Processing Model: DecisionTreeClassifier



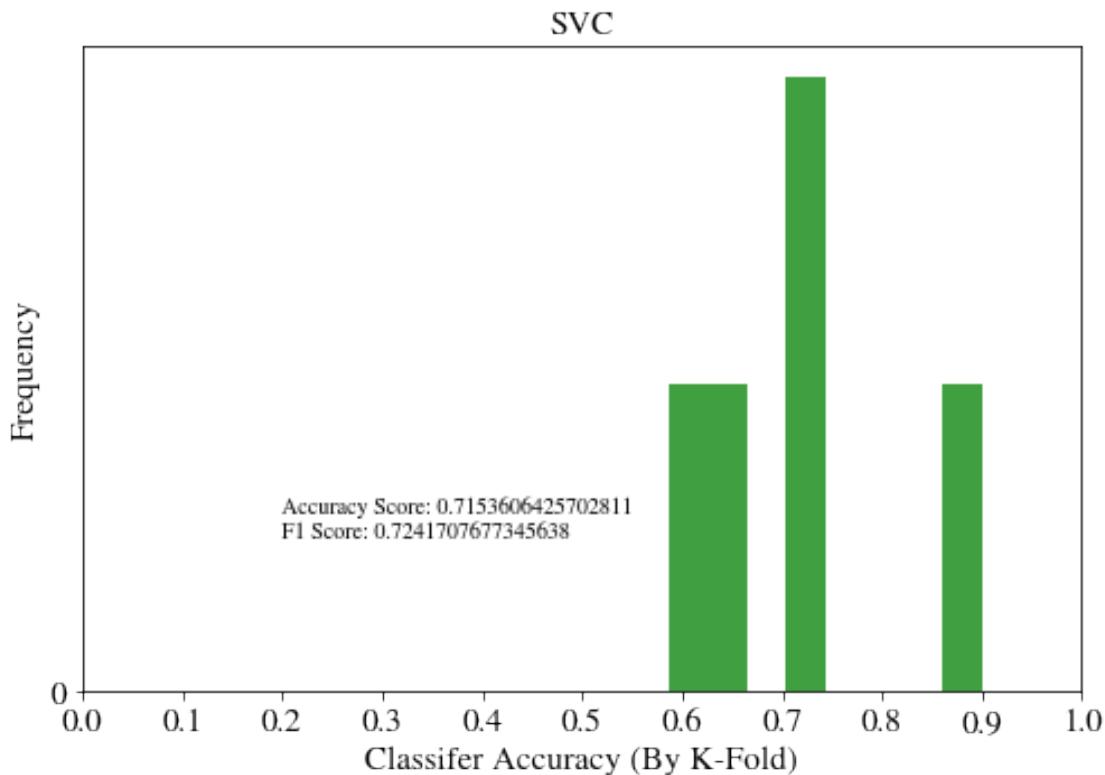
```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in
```

```

lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,
Lab No', 'accuracy': [0.76, 0.748, 0.7630522088353414, 0.8835341365461847,
0.7228915662650602], 'avgAccuracy': 0.7754955823293173, 'f1':
[0.7624401600437734, 0.7529442970822281, 0.7676948106967192, 0.9138461870967235,
0.7301485697572015], 'avgF1': 0.7854148049353291, 'precision': [0.76, 0.748,
0.7630522088353414, 0.8835341365461847, 0.7228915662650602], 'avgPrecision':
0.7754955823293173, 'recall': [0.76, 0.748, 0.7630522088353414,
0.8835341365461847, 0.7228915662650602], 'avgRecall': 0.7754955823293173,
'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini',
'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None,
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None,
'splitter': 'best'}]}
*****

```

Processing Model: SVC



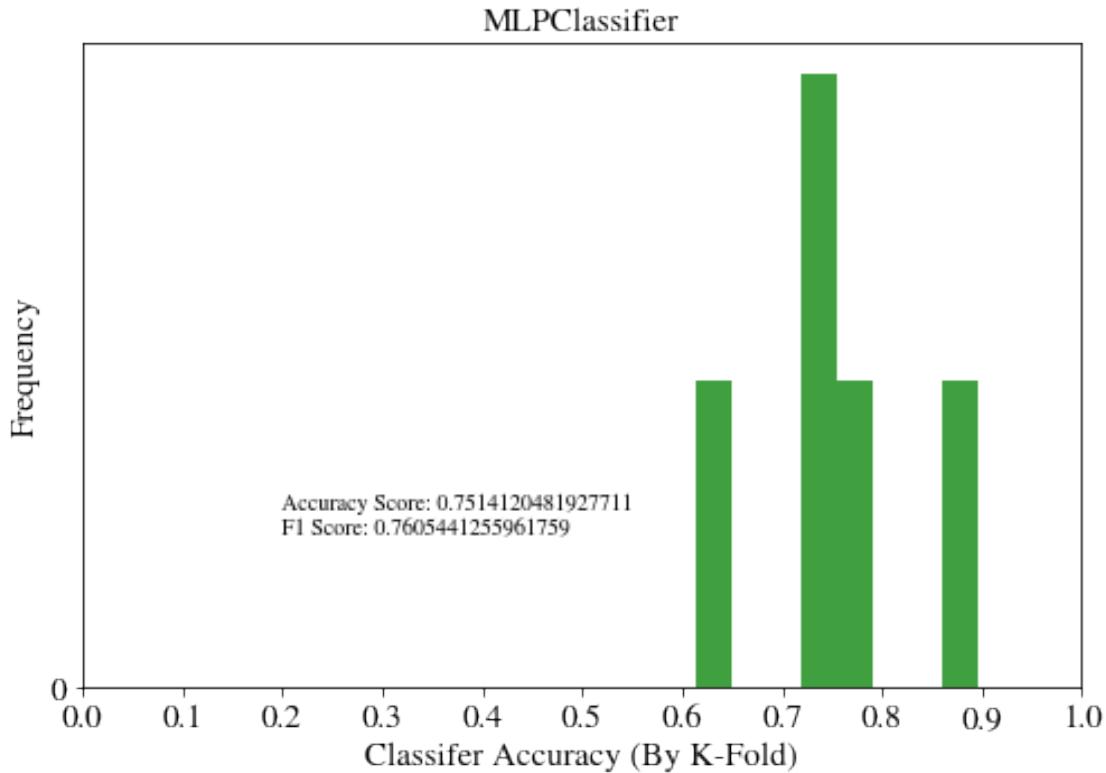
```

*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt
Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in
lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,

```

Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,  
 Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists  
 diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina  
 propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal  
 histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in  
 lamina propria?, Mild & superficial increase in lamina propria cellularity?,  
 Intraepithelial lymphocytes, Age, Crypt profiles, Lab No', 'accuracy': [0.64,  
 0.736, 0.5863453815261044, 0.8995983935742972, 0.714859437751004],  
 'avgAccuracy': 0.7153606425702811, 'f1': [0.6458142818832656,  
 0.7486072888025881, 0.5858400307064529, 0.9168629230017248, 0.7237293142787878],  
 'avgF1': 0.7241707677345638, 'precision': [0.64, 0.736, 0.5863453815261044,  
 0.8995983935742972, 0.714859437751004], 'avgPrecision': 0.7153606425702811,  
 'recall': [0.64, 0.736, 0.5863453815261044, 0.8995983935742972,  
 0.714859437751004], 'avgRecall': 0.7153606425702811, 'params': [{ 'C': 1.0,  
 'break\_ties': False, 'cache\_size': 4000, 'class\_weight': None, 'coef0': 0.0,  
 'decision\_function\_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':  
 'linear', 'max\_iter': -1, 'probability': False, 'random\_state': None,  
 'shrinking': True, 'tol': 0.001, 'verbose': False}]}  
\*\*\*\*\*

Processing Model: MLPClassifier



\*\*\*\*\*

```

* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No', 'accuracy': [0.764, 0.728, 0.6144578313253012, 0.8955823293172691, 0.7550200803212851], 'avgAccuracy': 0.7514120481927711, 'f1': [0.7680762888085839, 0.7403451757127061, 0.6137999433975126, 0.9216021677928304, 0.7588970522692465], 'avgF1': 0.7605441255961759, 'precision': [0.764, 0.728, 0.6144578313253012, 0.8955823293172691, 0.7550200803212851], 'avgPrecision': 0.7514120481927711, 'recall': [0.764, 0.728, 0.6144578313253012, 0.8955823293172691, 0.7550200803212851], 'avgRecall': 0.7514120481927711, 'params': [{activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'invscaling', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No', 'accuracy': [0.828, 0.864, 0.8594377510040161, 0.9437751004016064, 0.7951807228915663], 'avgAccuracy': 0.8580787148594378, 'f1': [0.8285527797833936, 0.8655037593984962, 0.8637273320226587, 0.9612567250285755, 0.7979282888502476], 'avgF1': 0.8633937770166743, 'precision': [0.828, 0.864, 0.8594377510040161, 0.9437751004016064, 0.7951807228915663], 'avgPrecision': 0.8580787148594378, 'recall': [0.828, 0.864, 0.8594377510040161, 0.9437751004016064, 0.7951807228915663], 'avgRecall': 0.8580787148594378, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto'}]}

```

```

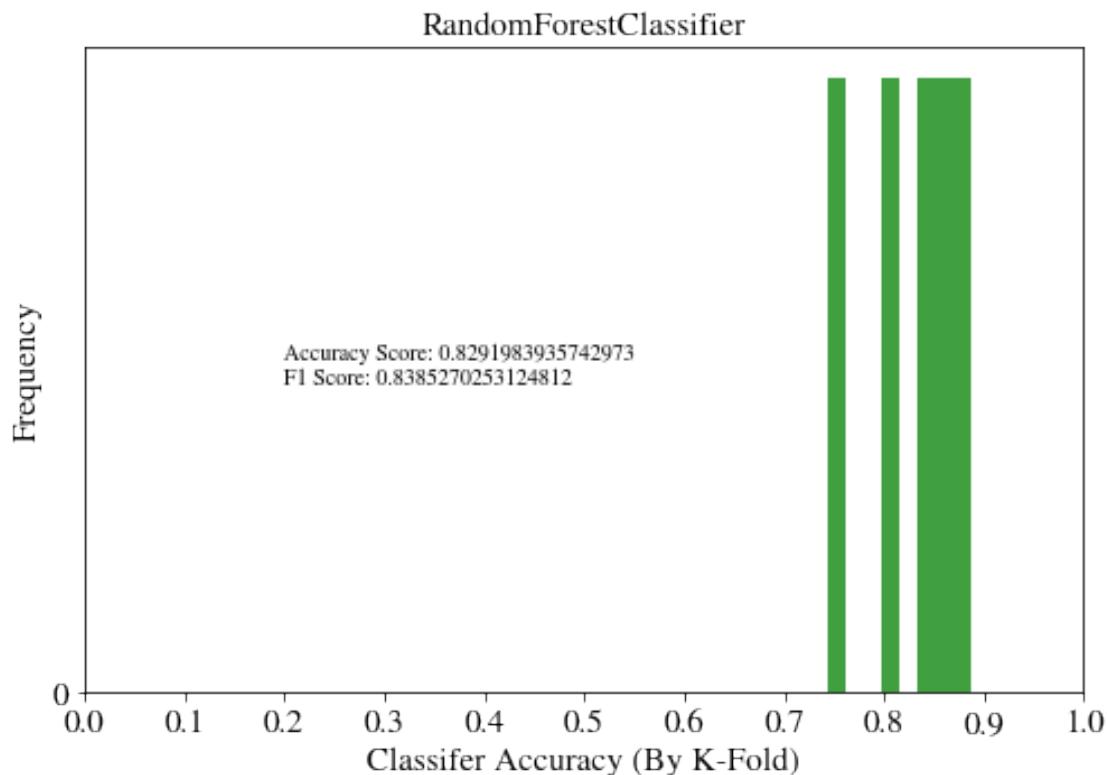
'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 700, 'n_jobs': -1, 'oob_score':
True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
model features \
0 RandomForestClassifier Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB Active inflammation?, Severity of Crypt Arch, ...
4 AdaBoostClassifier Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier Active inflammation?, Severity of Crypt Arch, ...
6 SVC Active inflammation?, Severity of Crypt Arch, ...
7 MLPClassifier Active inflammation?, Severity of Crypt Arch, ...

accuracy f1 precision recall \
0 0.854895 0.859369 0.854895 0.854895
1 0.744263 0.755206 0.744263 0.744263
2 0.713757 0.722369 0.713757 0.713757
3 0.612646 0.570002 0.612646 0.612646
4 0.708129 0.726576 0.708129 0.708129
5 0.720138 0.736696 0.720138 0.720138
6 0.715361 0.724171 0.715361 0.715361
7 0.729006 0.737930 0.729006 0.729006

params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3 {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier

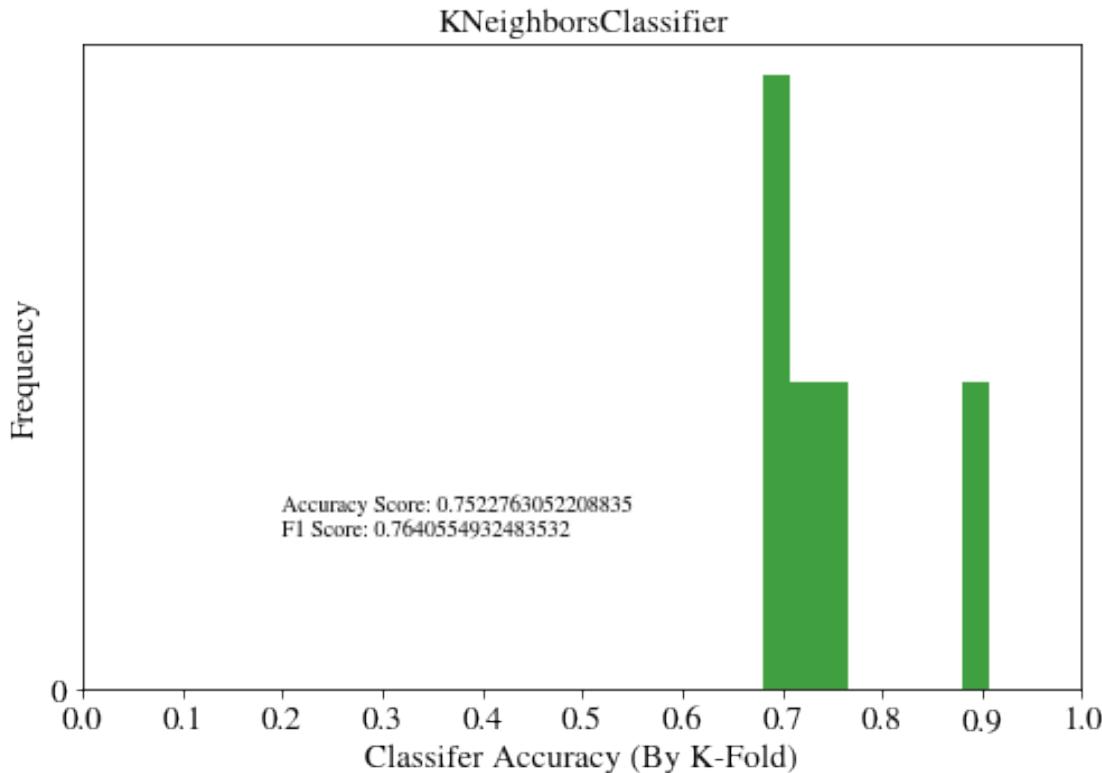


```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles', 'accuracy': [0.812, 0.836, 0.8674698795180723, 0.8875502008032129, 0.7429718875502008], 'avgAccuracy': 0.8291983935742973, 'f1': [0.813200906871294, 0.8360664842854237, 0.8718665613811093, 0.9155551595926769, 0.7559460144319022], 'avgF1': 0.8385270253124812, 'precision': [0.812, 0.836, 0.8674698795180723, 0.8875502008032129, 0.7429718875502008], 'avgPrecision': 0.8291983935742973, 'recall': [0.812, 0.836, 0.8674698795180723, 0.8875502008032129, 0.7429718875502008], 'avgRecall': 0.8291983935742973, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt', 'min_samples_leaf': 1, 'min_samples_split': 2, 'n_estimators': 100}], 'tuned_params': {'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt', 'min_samples_leaf': 1, 'min_samples_split': 2, 'n_estimators': 100}}}
```

```
'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score':
False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}}
*****

```

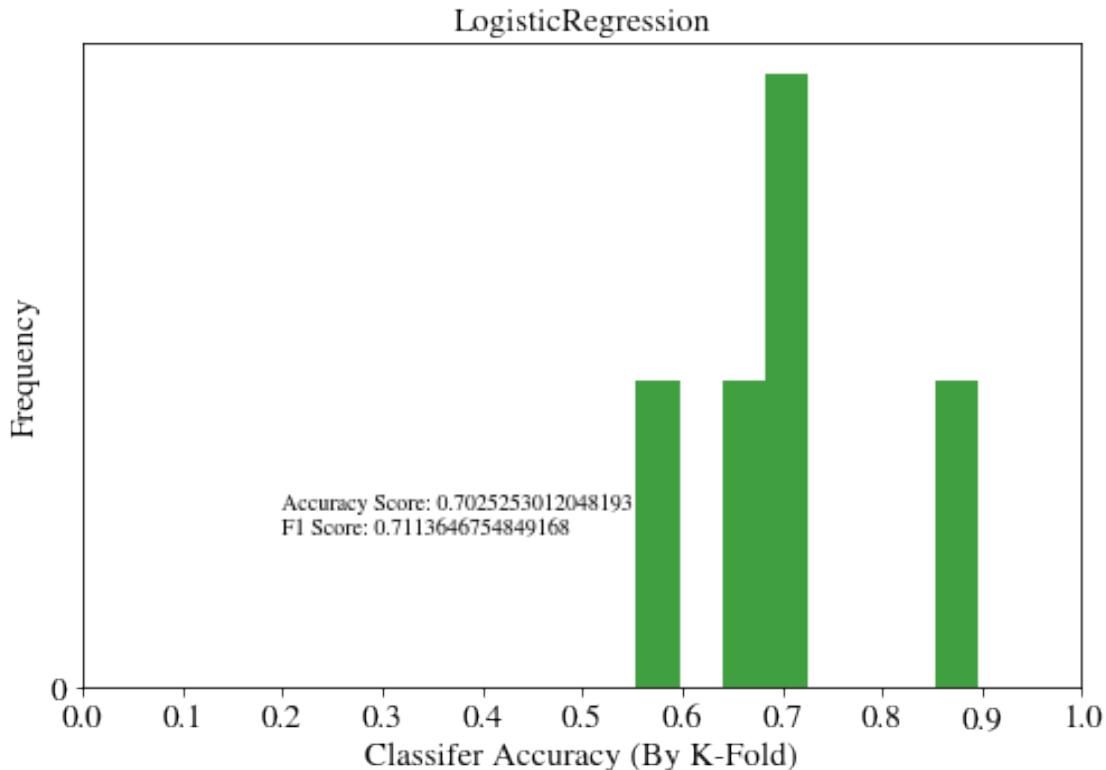
Processing Model: KNeighborsClassifier



```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles', 'accuracy': [0.68, 0.736, 0.7429718875502008, 0.9076305220883534, 0.6947791164658634], 'avgAccuracy': 0.7522763052208835, 'f1':
```

```
[0.6877526715625929, 0.7480337081311398, 0.7522077879922301, 0.9228590663230958,
0.7094242322327077], 'avgF1': 0.7640554932483532, 'precision': [0.68, 0.736,
0.7429718875502008, 0.9076305220883534, 0.6947791164658634], 'avgPrecision':
0.7522763052208835, 'recall': [0.68, 0.736, 0.7429718875502008,
0.9076305220883534, 0.6947791164658634], 'avgRecall': 0.7522763052208835,
'params': [{algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski',
'metric_params': None, 'n_jobs': -1, 'n_neighbors': 12, 'p': 2, 'weights':
'distance'}]}}
*****
```

Processing Model: LogisticRegression

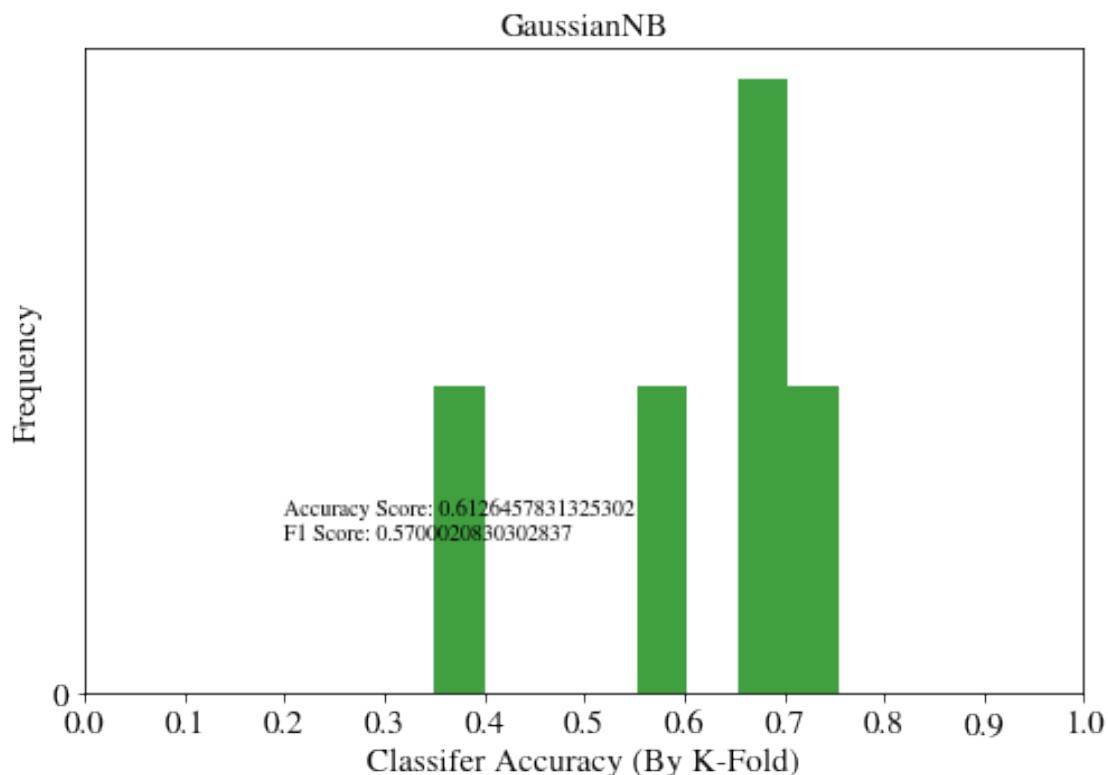


```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,
```

Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles', 'accuracy': [0.644, 0.712, 0.5542168674698795, 0.8955823293172691, 0.7068273092369478], 'avgAccuracy': 0.7025253012048193, 'f1': [0.6518589696018269, 0.7225705574912893, 0.5513998094764601, 0.9184093070611958, 0.7125847337938117], 'avgF1': 0.7113646754849168, 'precision': [0.644, 0.712, 0.5542168674698795, 0.8955823293172691, 0.7068273092369478], 'avgPrecision': 0.7025253012048193, 'recall': [0.644, 0.712, 0.5542168674698795, 0.8955823293172691, 0.7068273092369478], 'avgRecall': 0.7025253012048193, 'params': [{C: 1, 'class\_weight': None, 'dual': False, 'fit\_intercept': True, 'intercept\_scaling': 1, 'l1\_ratio': None, 'max\_iter': 100, 'multi\_class': 'multinomial', 'n\_jobs': -1, 'penalty': 'l2', 'random\_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm\_start': False}]}

\*\*\*\*\*

Processing Model: GaussianNB



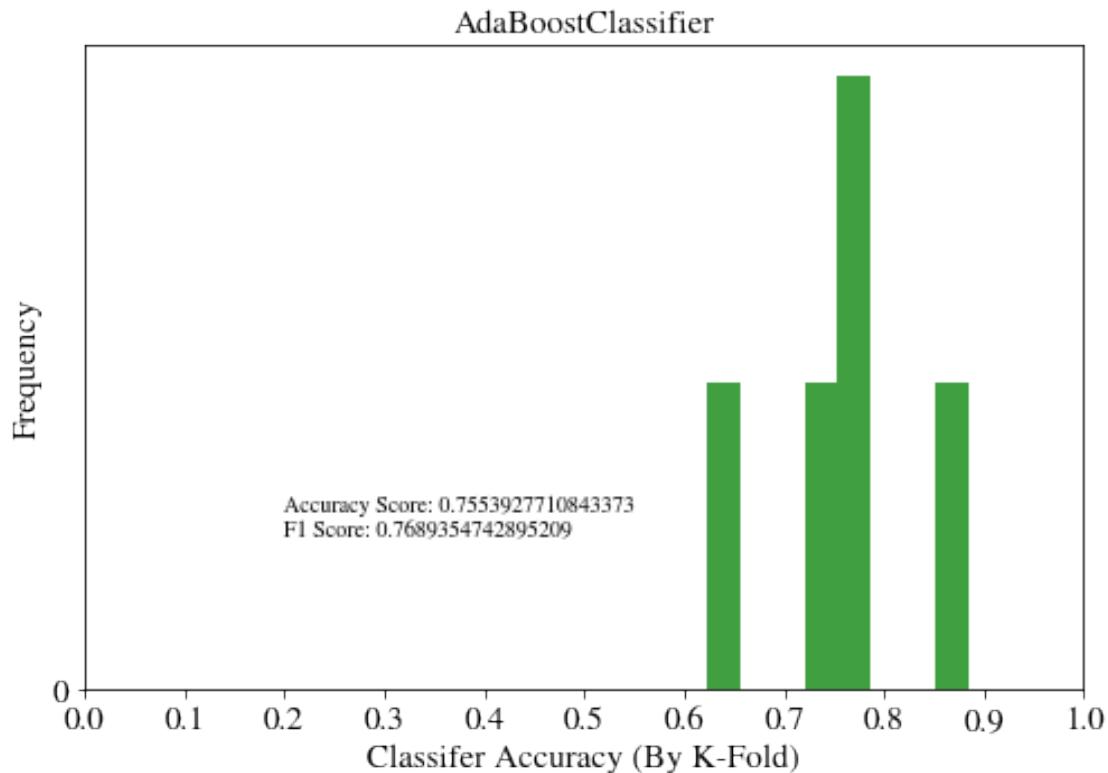
\*\*\*\*\*

- \* GaussianNB
- \* Best Params Result:
- \* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt'}

architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles', 'accuracy': [0.584, 0.672, 0.3493975903614458, 0.7550200803212851, 0.7028112449799196], 'avgAccuracy': 0.6126457831325302, 'f1': [0.552681447124797, 0.6288689014773975, 0.2770385974126309, 0.7336636489018139, 0.657757820234779], 'avgF1': 0.5700020830302837, 'precision': [0.584, 0.672, 0.3493975903614458, 0.7550200803212851, 0.7028112449799196], 'avgPrecision': 0.6126457831325302, 'recall': [0.584, 0.672, 0.3493975903614458, 0.7550200803212851, 0.7028112449799196], 'avgRecall': 0.6126457831325302, 'params': [{'priors': None, 'var\_smoothing': 1e-09}]}

\*\*\*\*\*

Processing Model: AdaBoostClassifier

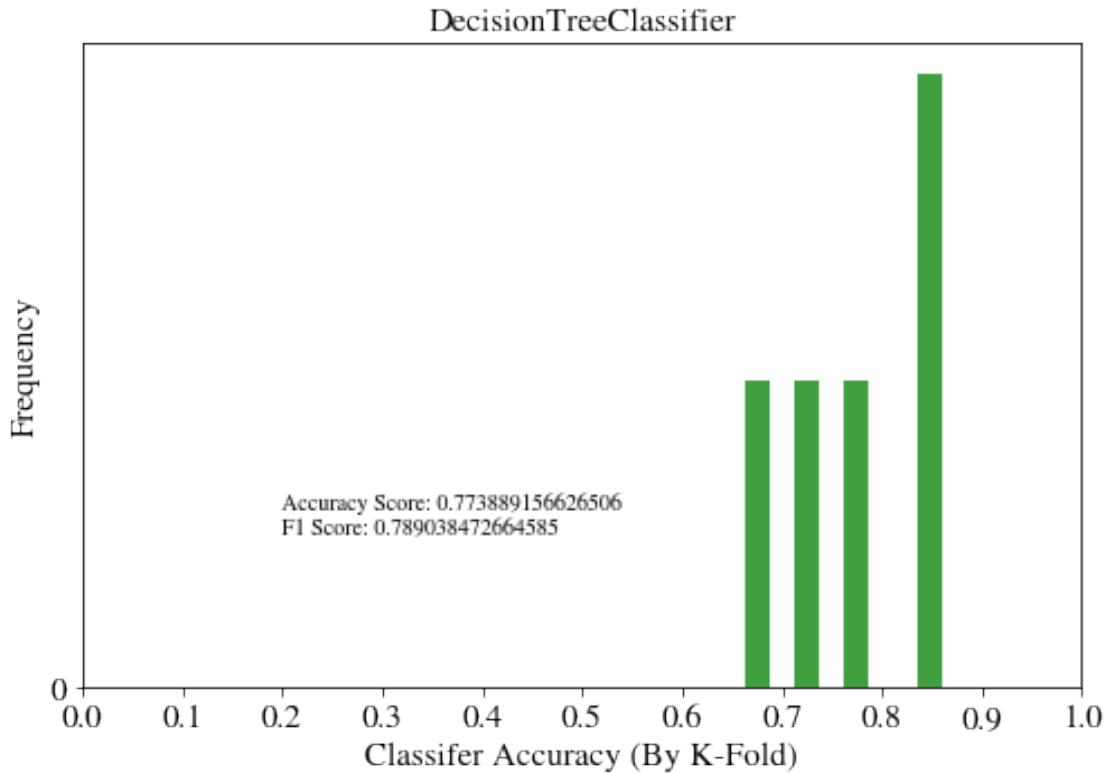


\*\*\*\*\*

- \* AdaBoostClassifier
- \* Best Params Result:
- \* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?',

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles', 'accuracy': [0.776, 0.76, 0.7349397590361446, 0.8835341365461847, 0.6224899598393574], 'avgAccuracy': 0.7553927710843373, 'f1': [0.7744280701754386, 0.7697275576036867, 0.7414945152311886, 0.9214400791014892, 0.6375871493358014], 'avgF1': 0.7689354742895209, 'precision': [0.776, 0.76, 0.7349397590361446, 0.8835341365461847, 0.6224899598393574], 'avgPrecision': 0.7553927710843373, 'recall': [0.776, 0.76, 0.7349397590361446, 0.8835341365461847, 0.6224899598393574], 'avgRecall': 0.7553927710843373, 'params': [{ 'algorithm': 'SAMME.R', 'base\_estimator': None, 'learning\_rate': 1, 'n\_estimators': 100, 'random\_state': None}]}  
\*\*\*\*\*

Processing Model: DecisionTreeClassifier



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```

* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  

Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  

Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  

lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles',  

'accuracy': [0.732, 0.776, 0.8393574297188755, 0.8594377510040161,  

0.6626506024096386], 'avgAccuracy': 0.773889156626506, 'f1':  

[0.7372749777064384, 0.7826571018651364, 0.8440899595092938, 0.8951397345521789,  

0.6860305896898781], 'avgF1': 0.789038472664585, 'precision': [0.732, 0.776,  

0.8393574297188755, 0.8594377510040161, 0.6626506024096386], 'avgPrecision':  

0.773889156626506, 'recall': [0.732, 0.776, 0.8393574297188755,  

0.8594377510040161, 0.6626506024096386], 'avgRecall': 0.773889156626506,  

'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini',  

'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None,  

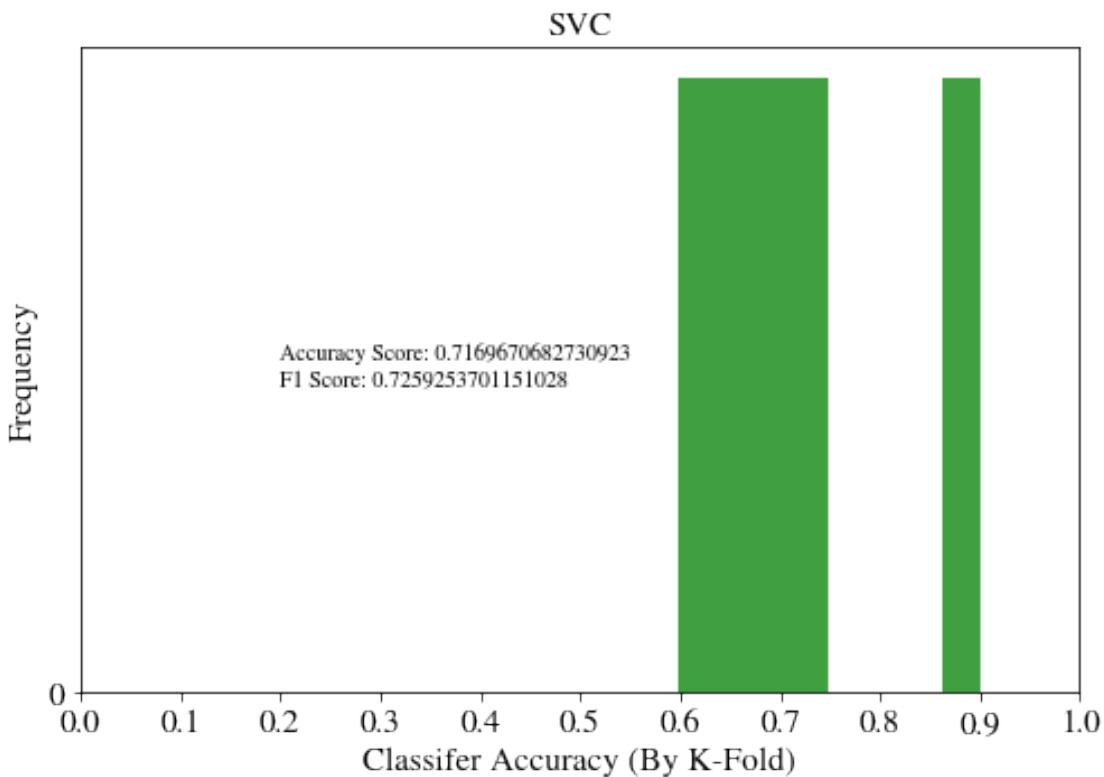
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,  

'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None,  

'splitter': 'best'}]}}
*****

```

Processing Model: SVC

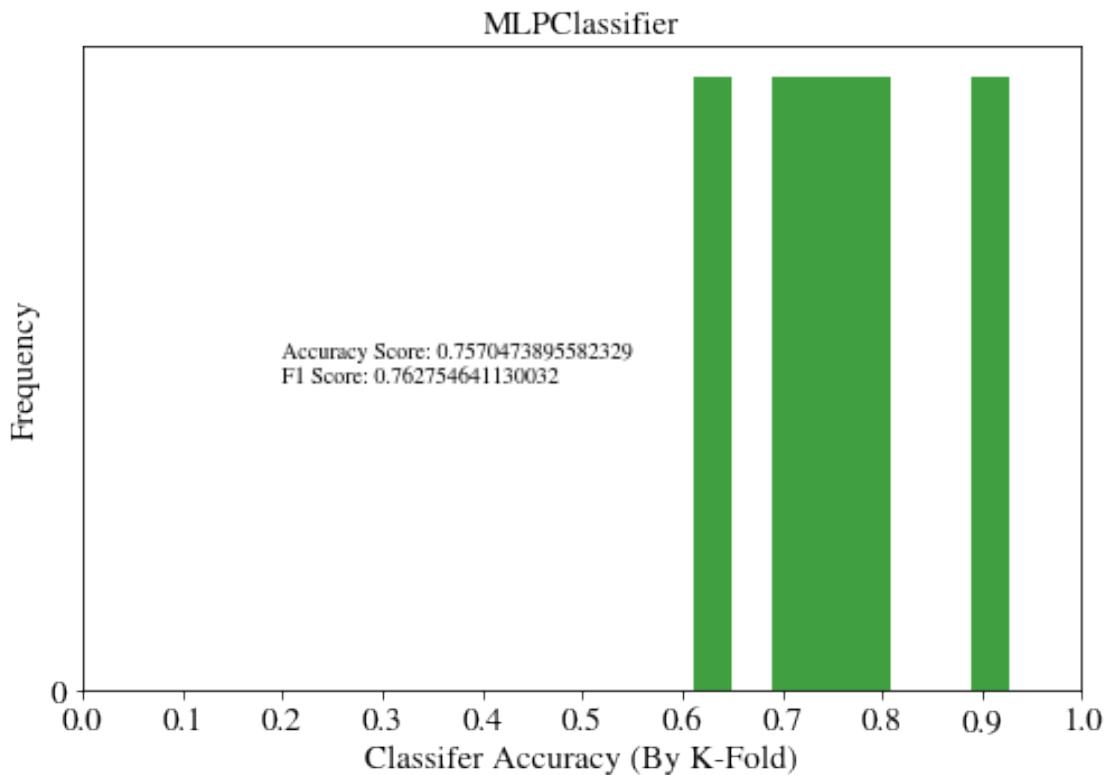


```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles', 'accuracy': [0.644, 0.732, 0.5983935742971888, 0.8995983935742972, 0.7108433734939759], 'avgAccuracy': 0.7169670682730923, 'f1': [0.6498693882465545, 0.7450254584392987, 0.597733873410639, 0.9168629230017248, 0.7201352074772971], 'avgF1': 0.7259253701151028, 'precision': [0.644, 0.732, 0.5983935742971888, 0.8995983935742972, 0.7108433734939759], 'avgPrecision': 0.7169670682730923, 'recall': [0.644, 0.732, 0.5983935742971888, 0.8995983935742972, 0.7108433734939759], 'avgRecall': 0.7169670682730923, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'rbf'}]}
```

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'linear', 'max_iter': -1, 'probability': False, 'random_state': None,
'shrinking': True, 'tol': 0.001, 'verbose': False}]]}
*****

```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles', 'accuracy': [0.748, 0.728, 0.6104417670682731, 0.927710843373494, 0.7710843373493976], 'avgAccuracy': 0.7570473895582329, 'f1': [0.7516048030524071, 0.7388493580885099, 0.6093513707811818, 0.9413247968953751, 0.7726428768326858], 'avgF1': 0.762754641130032, 'precision': [0.748, 0.728,
```

```

0.6104417670682731, 0.927710843373494, 0.7710843373493976], 'avgPrecision':  

0.7570473895582329, 'recall': [0.748, 0.728, 0.6104417670682731,  

0.927710843373494, 0.7710843373493976], 'avgRecall': 0.7570473895582329,  

'params': [{activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto',  

'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08,  

'hidden_layer_sizes': (100,), 'learning_rate': 'constant', 'learning_rate_init':  

0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change':  

10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle':  

True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose':  

False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  

Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  

Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  

lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles',  

'accuracy': [0.812, 0.836, 0.8674698795180723, 0.8875502008032129,  

0.7429718875502008], 'avgAccuracy': 0.8291983935742973, 'f1':  

[0.813200906871294, 0.8360664842854237, 0.8718665613811093, 0.9155551595926769,  

0.7559460144319022], 'avgF1': 0.8385270253124812, 'precision': [0.812, 0.836,  

0.8674698795180723, 0.8875502008032129, 0.7429718875502008], 'avgPrecision':  

0.8291983935742973, 'recall': [0.812, 0.836, 0.8674698795180723,  

0.8875502008032129, 0.7429718875502008], 'avgRecall': 0.8291983935742973,  

'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None,  

'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt',  

'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0,  

'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,  

'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score':  

False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

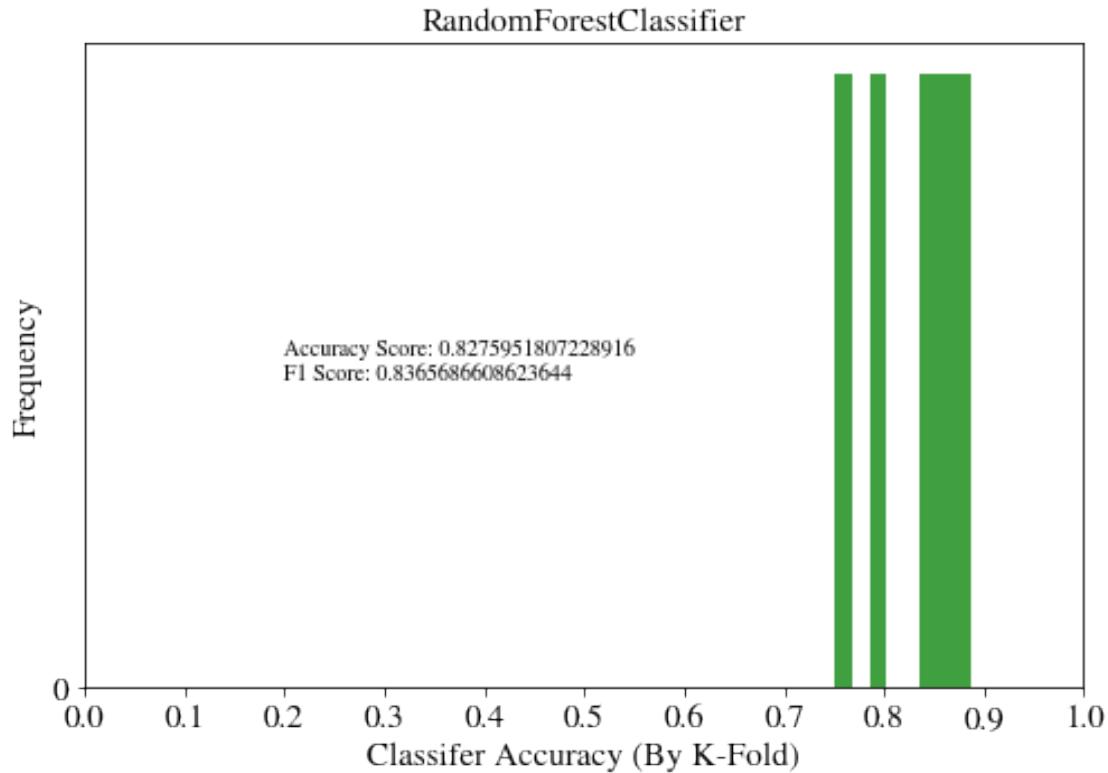
model	features \
0 RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB	Active inflammation?, Severity of Crypt Arch, ...
4 AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...
6 SVC	Active inflammation?, Severity of Crypt Arch, ...
7 MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...

	accuracy	f1	precision	recall	\
0	0.820392	0.829719	0.820392	0.820392	
1	0.744270	0.755875	0.744270	0.744270	
2	0.702525	0.711365	0.702525	0.702525	
3	0.612646	0.570002	0.612646	0.612646	
4	0.726496	0.737882	0.726496	0.726496	
5	0.765115	0.777071	0.765115	0.765115	
6	0.716967	0.725925	0.716967	0.716967	
7	0.744993	0.752546	0.744993	0.744993	

	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	{'C': 1, 'class_weight': None, 'dual': False, ...
3	{'priors': None, 'var_smoothing': 1e-09}
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...

Processing Model: RandomForestClassifier



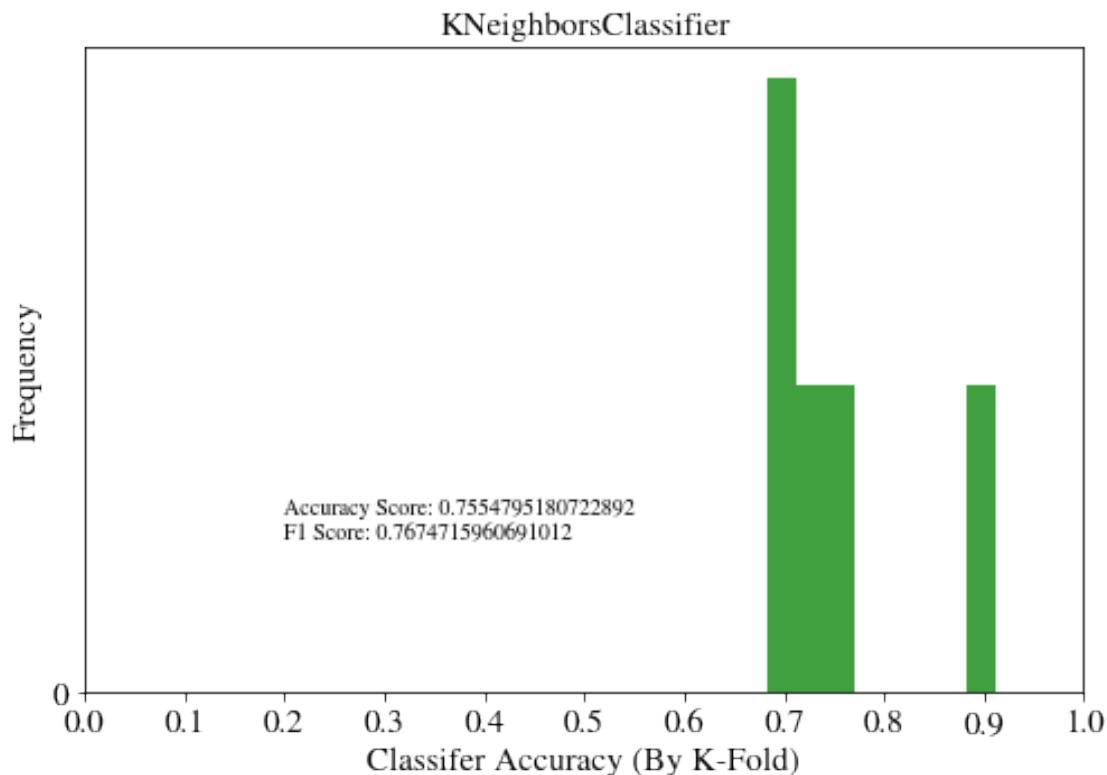
\*\*\*\*\*

```

* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy': [0.8, 0.844, 0.8554216867469879, 0.8875502008032129, 0.751004016064257], 'avgAccuracy': 0.8275951807228916, 'f1': [0.8012799525504152, 0.8450348370675508, 0.860061364742629, 0.9138940034074152, 0.7625731465438117], 'avgF1': 0.8365686608623644, 'precision': [0.8, 0.844, 0.8554216867469879, 0.8875502008032129, 0.751004016064257], 'avgPrecision': 0.8275951807228916, 'recall': [0.8, 0.844, 0.8554216867469879, 0.8875502008032129, 0.751004016064257], 'avgRecall': 0.8275951807228916, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 700, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

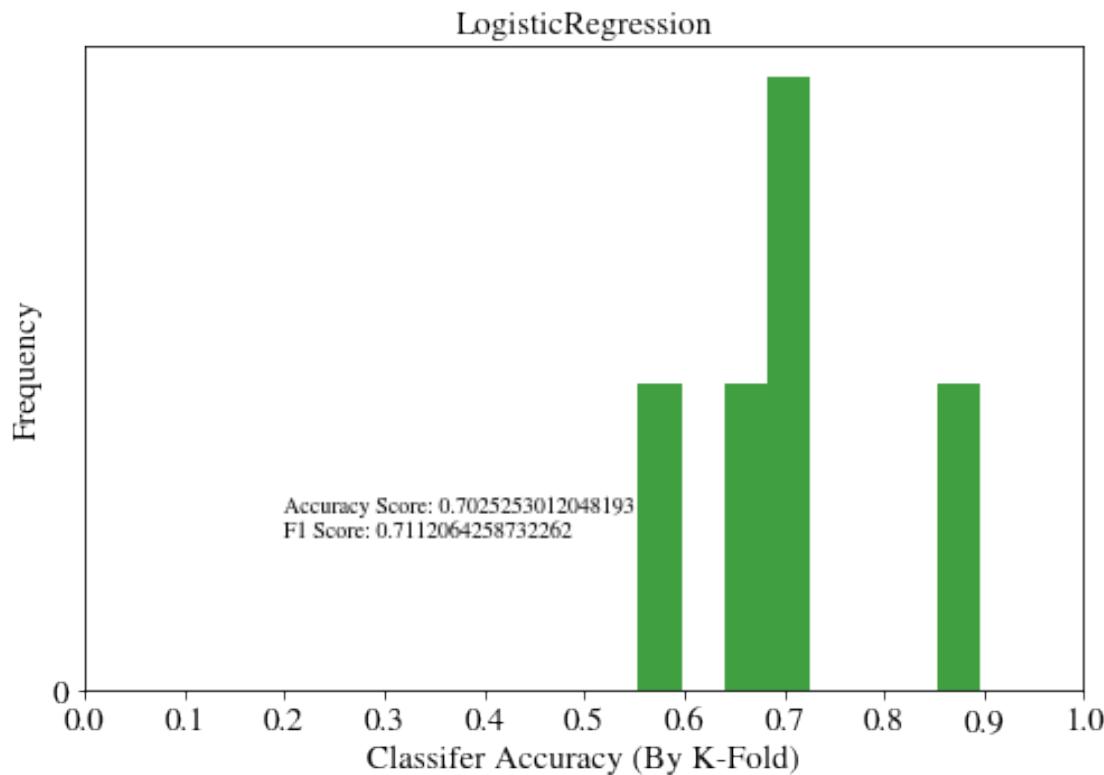
Processing Model: KNeighborsClassifier



```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy':  
[0.684, 0.744, 0.7349397590361446, 0.9116465863453815, 0.7028112449799196],  
'avgAccuracy': 0.7554795180722892, 'f1': [0.692163158596772, 0.7556137767783171,  
0.7442694804690071, 0.9268751305801239, 0.718436433921286], 'avgF1':  
0.7674715960691012, 'precision': [0.684, 0.744, 0.7349397590361446,  
0.9116465863453815, 0.7028112449799196], 'avgPrecision': 0.7554795180722892,  
'recall': [0.684, 0.744, 0.7349397590361446, 0.9116465863453815,  
0.7028112449799196], 'avgRecall': 0.7554795180722892, 'params': [{  
'algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1,  
'n_neighbors': 14, 'p': 2, 'weights': 'distance'}]}]
```

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Processing Model: LogisticRegression



\*\*\*\*\*

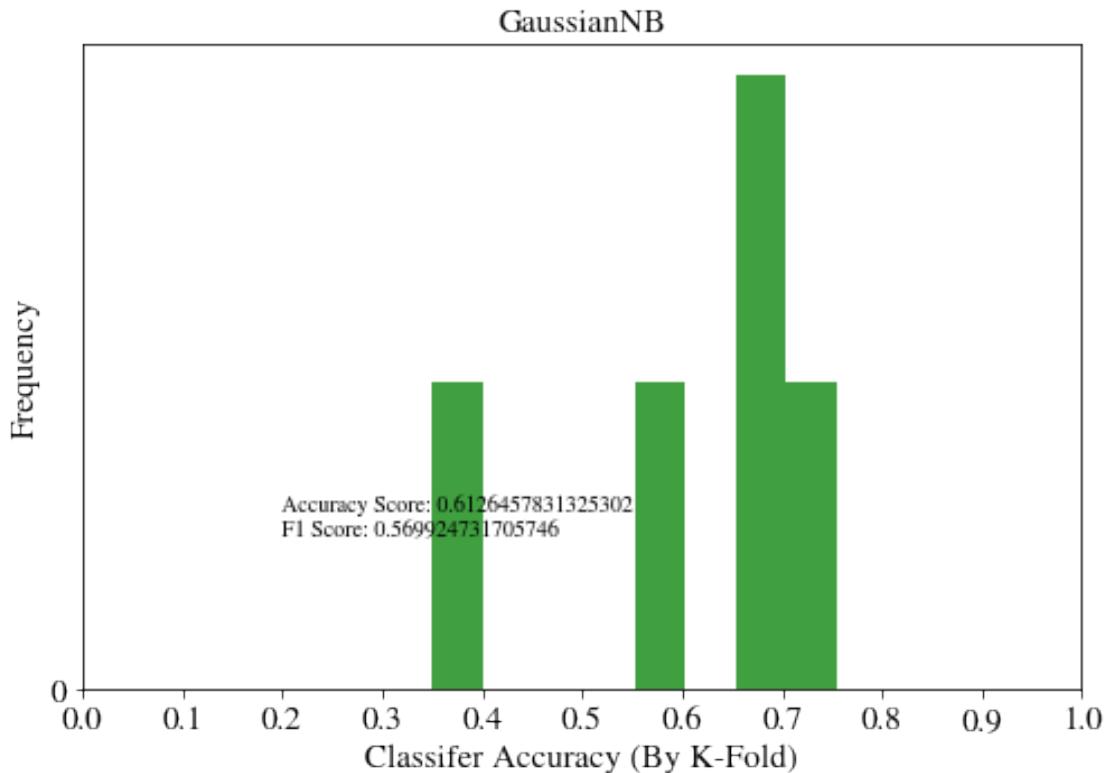
```
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy': [0.64, 0.716, 0.5542168674698795, 0.8955823293172691, 0.7068273092369478], 'avgAccuracy': 0.7025253012048193, 'f1': [0.6475787243787932, 0.7260595546558705, 0.5513998094764601, 0.9184093070611958, 0.7125847337938117], 'avgF1': 0.7112064258732262, 'precision': [0.64, 0.716, 0.5542168674698795, 0.8955823293172691, 0.7068273092369478], 'avgPrecision': 0.7025253012048193, 'recall': [0.64, 0.716, 0.5542168674698795, 0.8955823293172691,
```

```

0.7068273092369478], 'avgRecall': 0.7025253012048193, 'params': [ {'C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs':
-1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

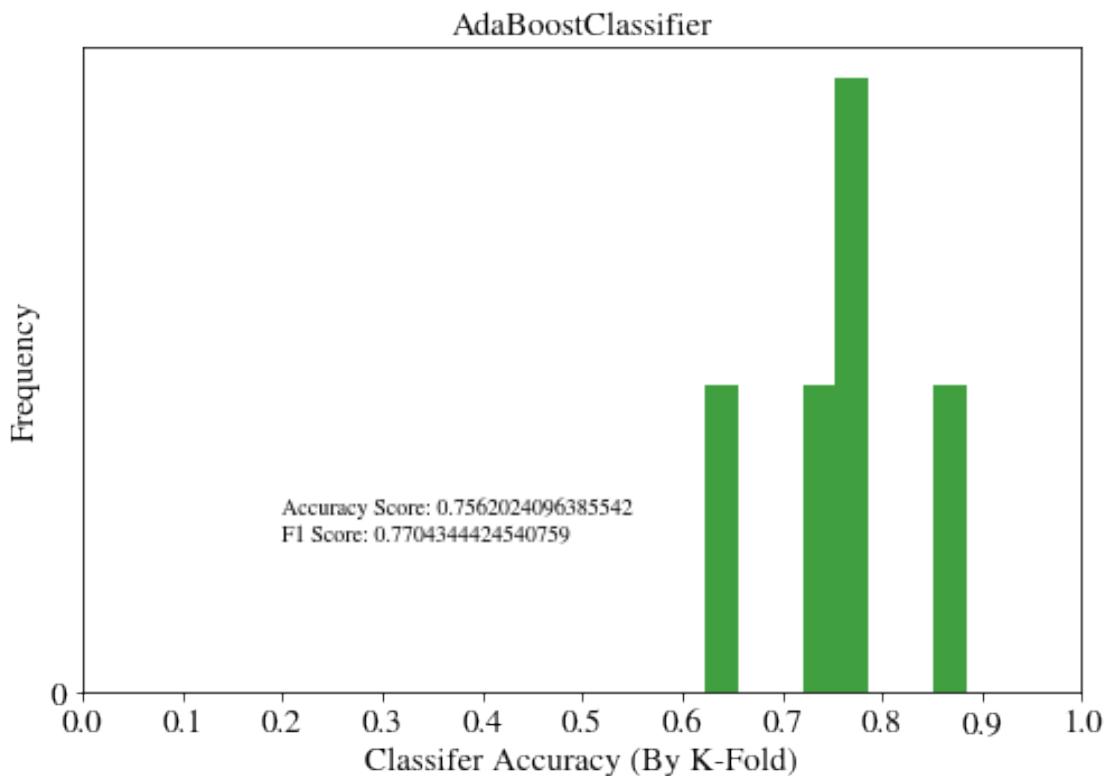
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina
propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy': [0.584,
0.672, 0.3493975903614458, 0.7550200803212851, 0.7028112449799196],
```

```

'avgAccuracy': 0.6126457831325302, 'f1': [0.552681447124797, 0.6288689014773975,
0.2770385974126309, 0.7336636489018139, 0.6573710636120903], 'avgF1':
0.569924731705746, 'precision': [0.584, 0.672, 0.3493975903614458,
0.7550200803212851, 0.7028112449799196], 'avgPrecision': 0.6126457831325302,
'recall': [0.584, 0.672, 0.3493975903614458, 0.7550200803212851,
0.7028112449799196], 'avgRecall': 0.6126457831325302, 'params': [{priors':
None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in

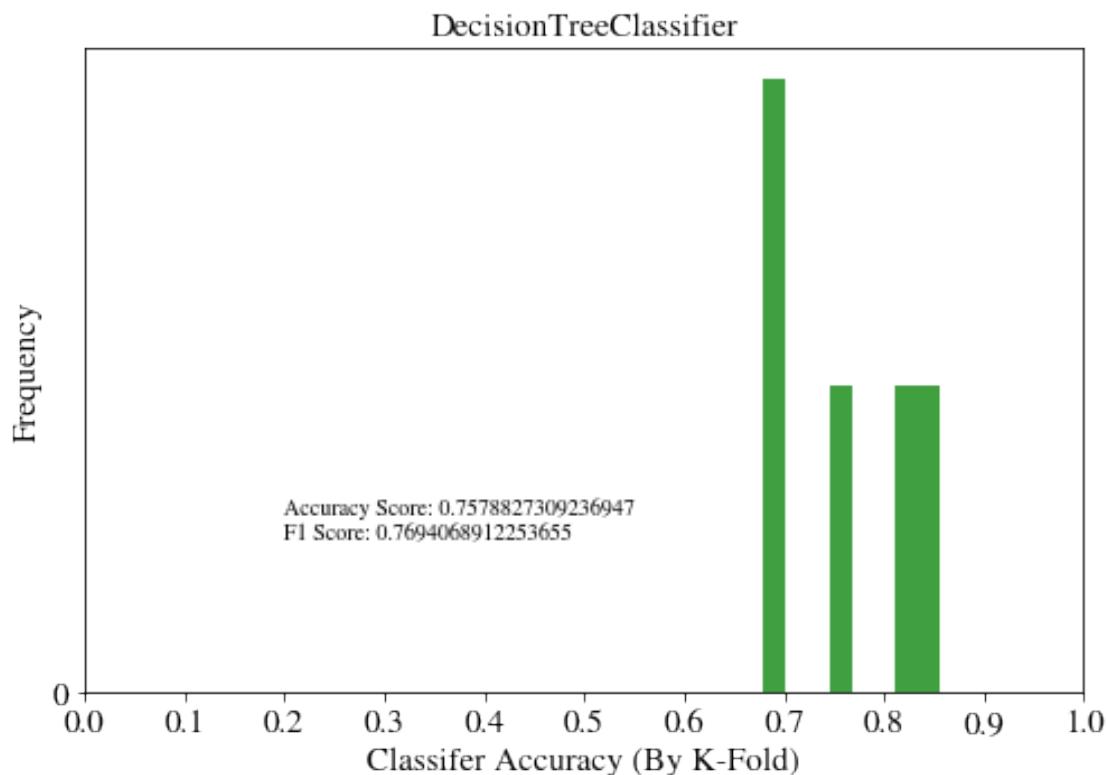
```

```

lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy':
[0.768, 0.76, 0.7469879518072289, 0.8835341365461847, 0.6224899598393574],
'avgAccuracy': 0.7562024096385542, 'f1': [0.7701202548599418,
0.7697275576036867, 0.7532971713694605, 0.9214400791014892, 0.6375871493358014],
'avgF1': 0.7704344424540759, 'precision': [0.768, 0.76, 0.7469879518072289,
0.8835341365461847, 0.6224899598393574], 'avgPrecision': 0.7562024096385542,
'recall': [0.768, 0.76, 0.7469879518072289, 0.8835341365461847,
0.6224899598393574], 'avgRecall': 0.7562024096385542, 'params': [{algorithm':
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 100,
'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



```

*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?',
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt

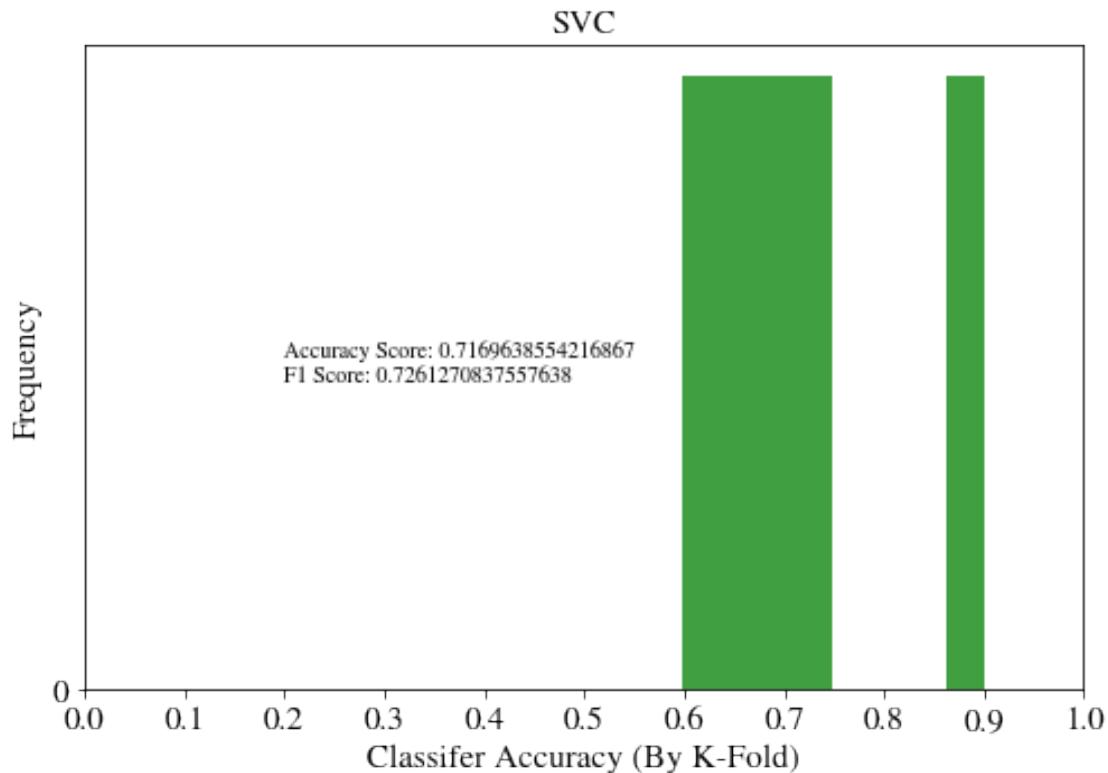
```

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abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in
lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy':
[0.684, 0.752, 0.8192771084337349, 0.8554216867469879, 0.678714859437751],
'avgAccuracy': 0.7578827309236947, 'f1': [0.6889838457529963,
0.7578975069726058, 0.8240464004319425, 0.8825014706893523, 0.6936052322799305],
'avgF1': 0.7694068912253655, 'precision': [0.684, 0.752, 0.8192771084337349,
0.8554216867469879, 0.678714859437751], 'avgPrecision': 0.7578827309236947,
'recall': [0.684, 0.752, 0.8192771084337349, 0.8554216867469879,
0.678714859437751], 'avgRecall': 0.7578827309236947, 'params': [{ccp_alpha':
0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None,
'max_features': 'log2', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****

```

Processing Model: SVC



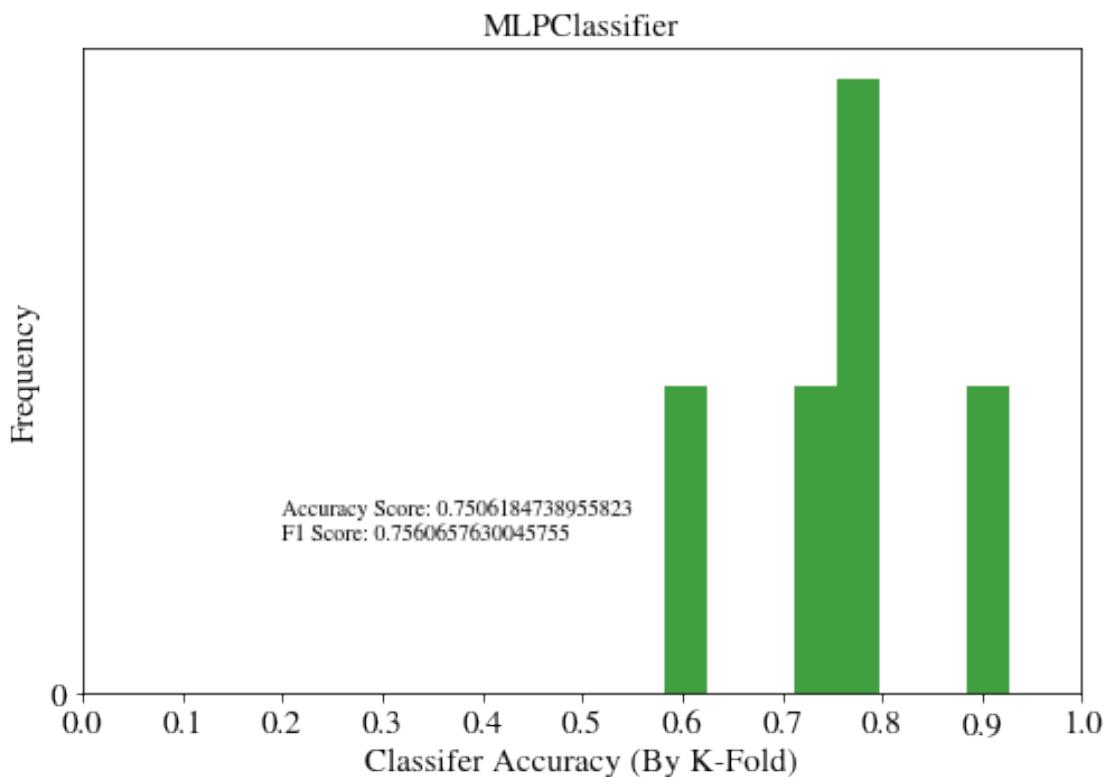
```

*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt

```

Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy': [0.644, 0.736, 0.5983935742971888, 0.8995983935742972, 0.7068273092369478], 'avgAccuracy': 0.7169638554216867, 'f1': [0.6498693882465545, 0.7486072888025881, 0.5987695209574222, 0.9168629230017248, 0.7165262977705295], 'avgF1': 0.7261270837557638, 'precision': [0.644, 0.736, 0.5983935742971888, 0.8995983935742972, 0.7068273092369478], 'avgPrecision': 0.7169638554216867, 'recall': [0.644, 0.736, 0.5983935742971888, 0.8995983935742972, 0.7068273092369478], 'avgRecall': 0.7169638554216867, 'params': [{ 'C': 1.0, 'break\_ties': False, 'cache\_size': 4000, 'class\_weight': None, 'coef0': 0.0, 'decision\_function\_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max\_iter': -1, 'probability': False, 'random\_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}  
\*\*\*\*\*

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy': [0.756, 0.724, 0.5823293172690763, 0.927710843373494, 0.7630522088353414], 'avgAccuracy': 0.7506184738955823, 'f1': [0.7601932263814617, 0.7353153543545361, 0.5797858750435013, 0.9395879881549267, 0.7654463710884516], 'avgF1': 0.7560657630045755, 'precision': [0.756, 0.724, 0.5823293172690763, 0.927710843373494, 0.7630522088353414], 'avgPrecision': 0.7506184738955823, 'recall': [0.756, 0.724, 0.5823293172690763, 0.927710843373494, 0.7630522088353414], 'avgRecall': 0.7506184738955823, 'params': [{activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'invscaling', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}

*****
*****
```

\* Best Performing Model and Params is:

```
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy': [0.8, 0.844, 0.8554216867469879, 0.8875502008032129, 0.751004016064257], 'avgAccuracy': 0.8275951807228916, 'f1': [0.8012799525504152, 0.8450348370675508, 0.860061364742629, 0.9138940034074152, 0.7625731465438117], 'avgF1': 0.8365686608623644, 'precision': [0.8, 0.844, 0.8554216867469879, 0.8875502008032129, 0.751004016064257], 'avgPrecision': 0.8275951807228916, 'recall': [0.8, 0.844, 0.8554216867469879, 0.8875502008032129,
```

```

0.751004016064257], 'avgRecall': 0.8275951807228916, 'params': [{}'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 700, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

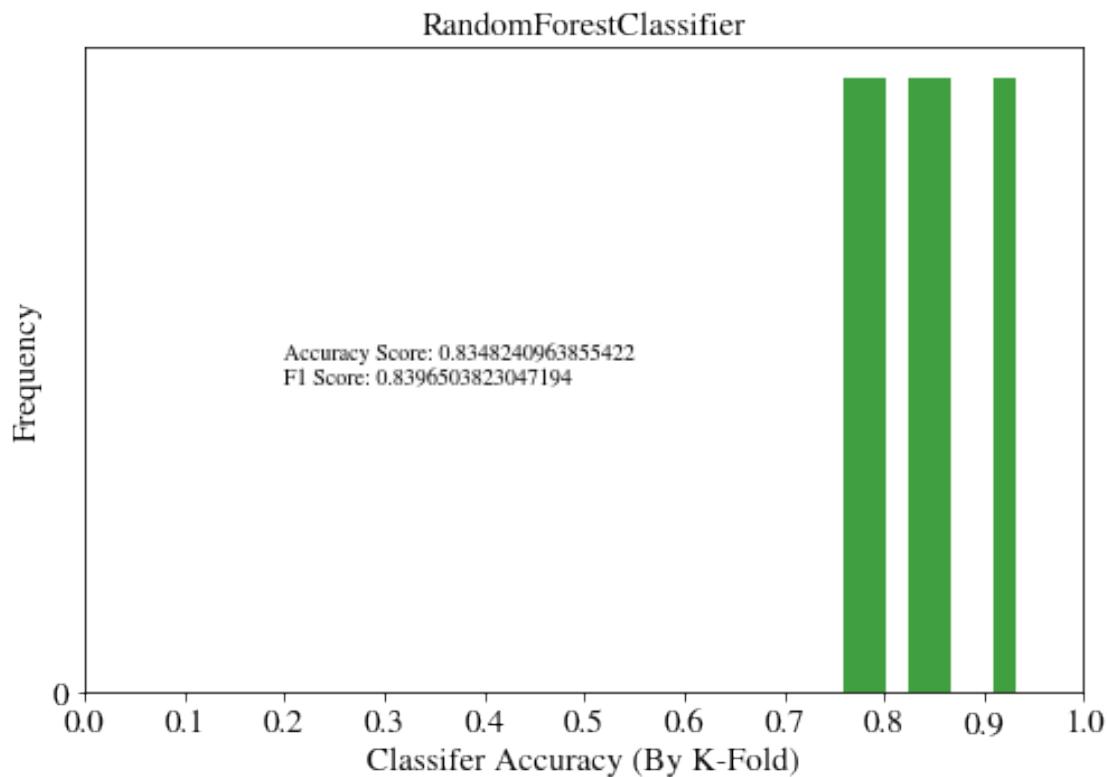
```

	model	features	\
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...	
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...	
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...	
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...	
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...	
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...	
6	SVC	Active inflammation?, Severity of Crypt Arch, ...	
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...	

	accuracy	f1	precision	recall	\
0	0.826811	0.835405	0.826811	0.826811	
1	0.750676	0.762282	0.750676	0.750676	
2	0.702525	0.711206	0.702525	0.702525	
3	0.612646	0.569925	0.612646	0.612646	
4	0.720090	0.731380	0.720090	0.720090	
5	0.744260	0.759423	0.744260	0.744260	
6	0.716964	0.726127	0.716964	0.716964	
7	0.725780	0.734710	0.725780	0.725780	

	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	{'C': 1, 'class_weight': None, 'dual': False, ...
3	{'priors': None, 'var_smoothing': 1e-09}
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...

Processing Model: RandomForestClassifier

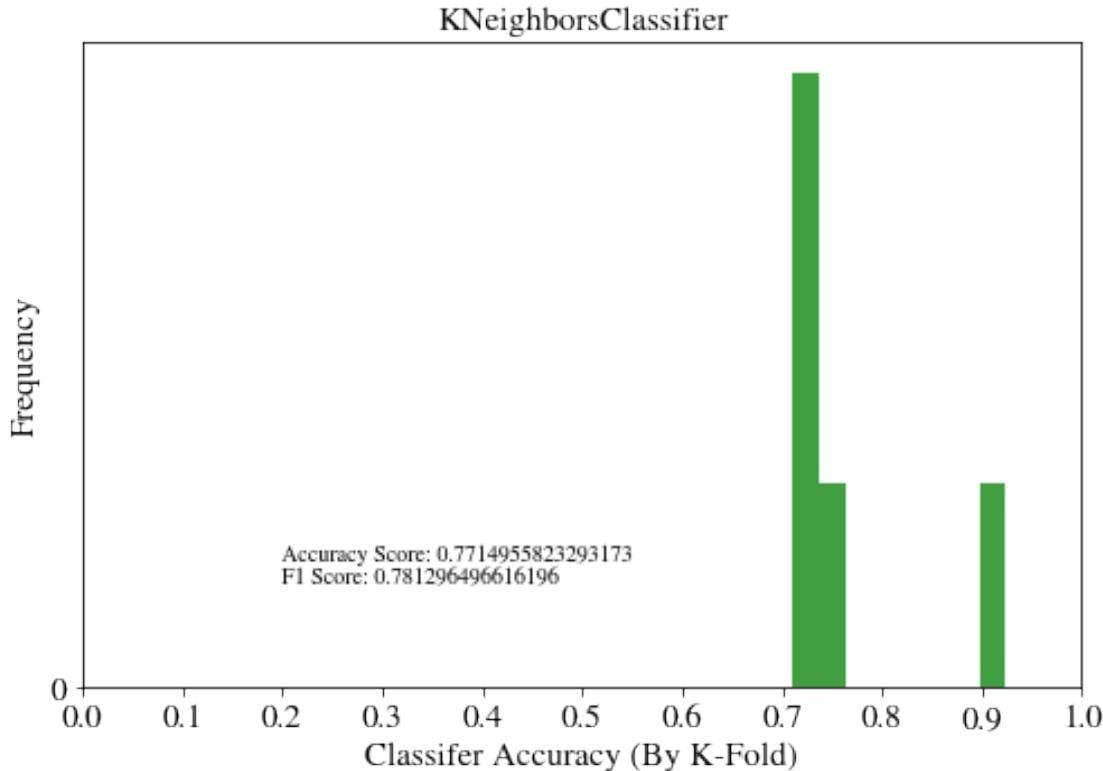


```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes', 'accuracy': [0.784, 0.86, 0.8393574297188755, 0.9317269076305221, 0.7590361445783133], 'avgAccuracy': 0.8348240963855422, 'f1': [0.7843484410157505, 0.857970794629736, 0.8446767429337789, 0.9469797597383218, 0.7642761732060102], 'avgF1': 0.8396503823047194, 'precision': [0.784, 0.86, 0.8393574297188755, 0.9317269076305221, 0.7590361445783133], 'avgPrecision': 0.8348240963855422, 'recall': [0.784, 0.86, 0.8393574297188755, 0.9317269076305221, 0.7590361445783133], 'avgRecall': 0.8348240963855422, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None}], 'tree_limit': 10}
```

```
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 700,
'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0,
'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



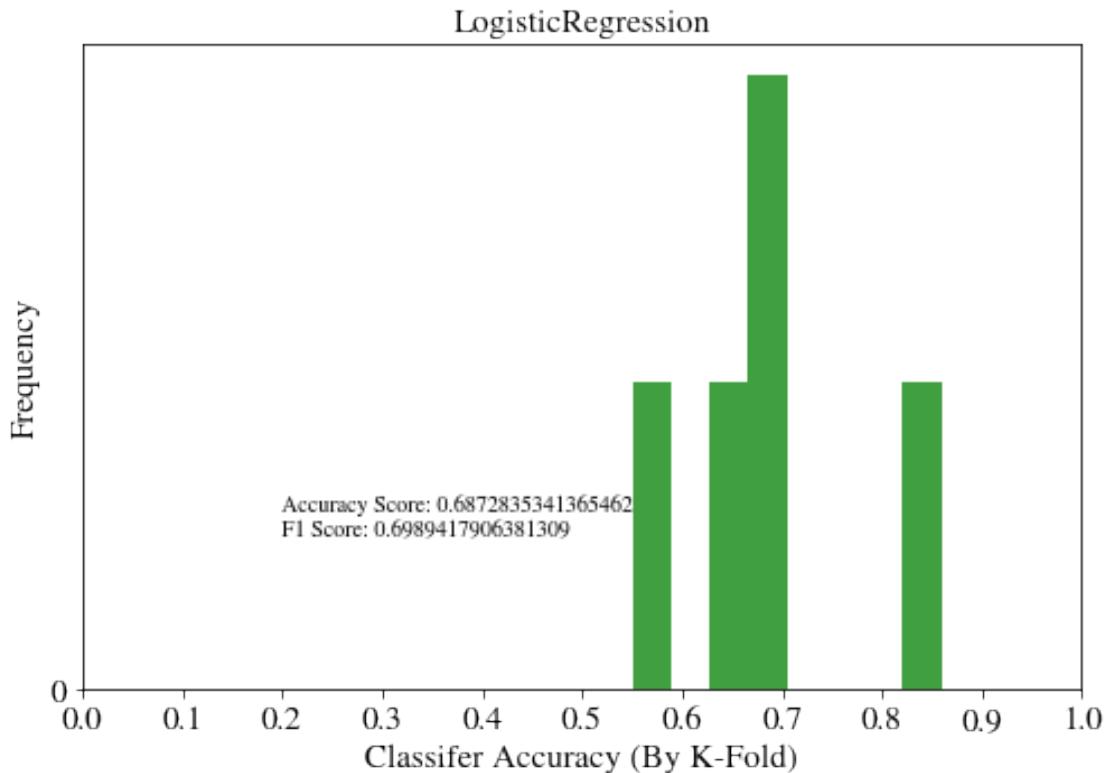
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?, Intraepithelial lymphocytes', 'accuracy': [0.724,  
0.764, 0.7108433734939759, 0.9236947791164659, 0.7349397590361446],  
'avgAccuracy': 0.7714955823293173, 'f1': [0.7281053927508135,
```

```

0.7762844402164218, 0.7163685043203115, 0.9391090373052905, 0.7466151084881426] ,
'avgF1': 0.781296496616196, 'precision': [0.724, 0.764, 0.7108433734939759,
0.9236947791164659, 0.7349397590361446], 'avgPrecision': 0.7714955823293173,
'recall': [0.724, 0.764, 0.7108433734939759, 0.9236947791164659,
0.7349397590361446], 'avgRecall': 0.7714955823293173, 'params': [{}{'algorithm':
'kd_tree', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None,
'n_jobs': -1, 'n_neighbors': 14, 'p': 2, 'weights': 'distance'}]]}
*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in

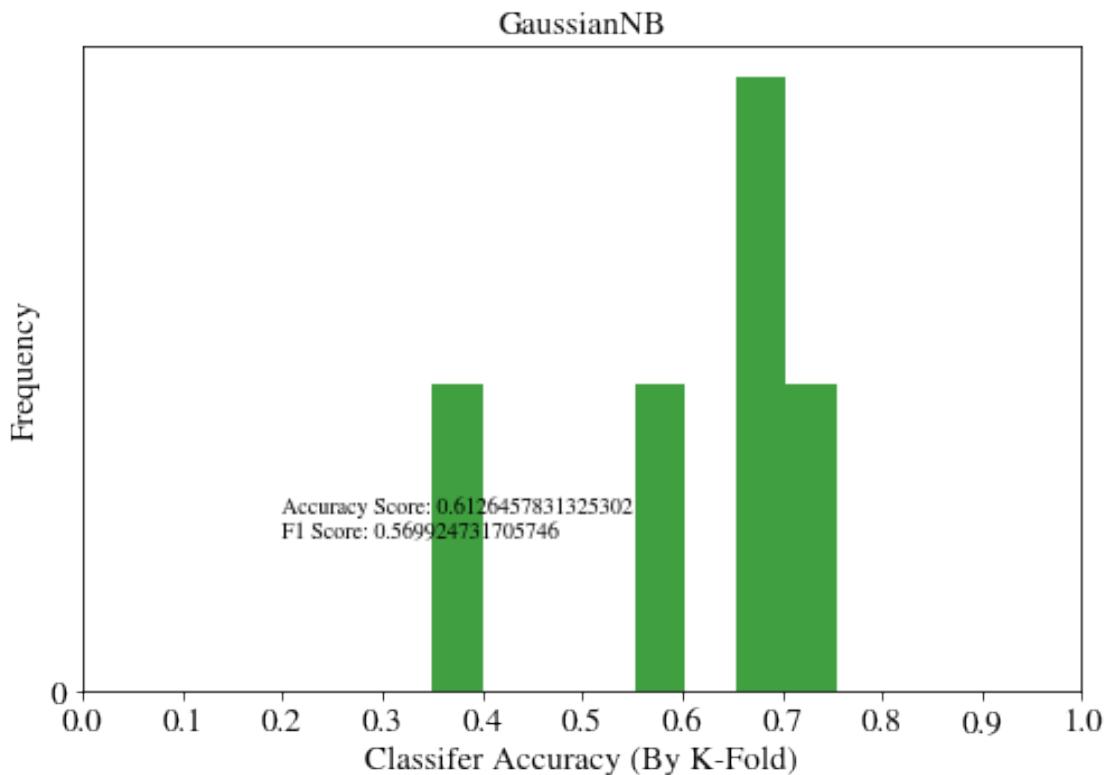
```

```

lamina propria cellularity?, Intraepithelial lymphocytes', 'accuracy': [0.64,
0.692, 0.5502008032128514, 0.8594377510040161, 0.6947791164658634],
'avgAccuracy': 0.6872835341365462, 'f1': [0.6473186036611324,
0.7025113636363638, 0.5497601110147492, 0.8946378483516264, 0.7004810265267826],
'avgF1': 0.6989417906381309, 'precision': [0.64, 0.692, 0.5502008032128514,
0.8594377510040161, 0.6947791164658634], 'avgPrecision': 0.6872835341365462,
'recall': [0.64, 0.692, 0.5502008032128514, 0.8594377510040161,
0.6947791164658634], 'avgRecall': 0.6872835341365462, 'params': [{C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs':
-1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial

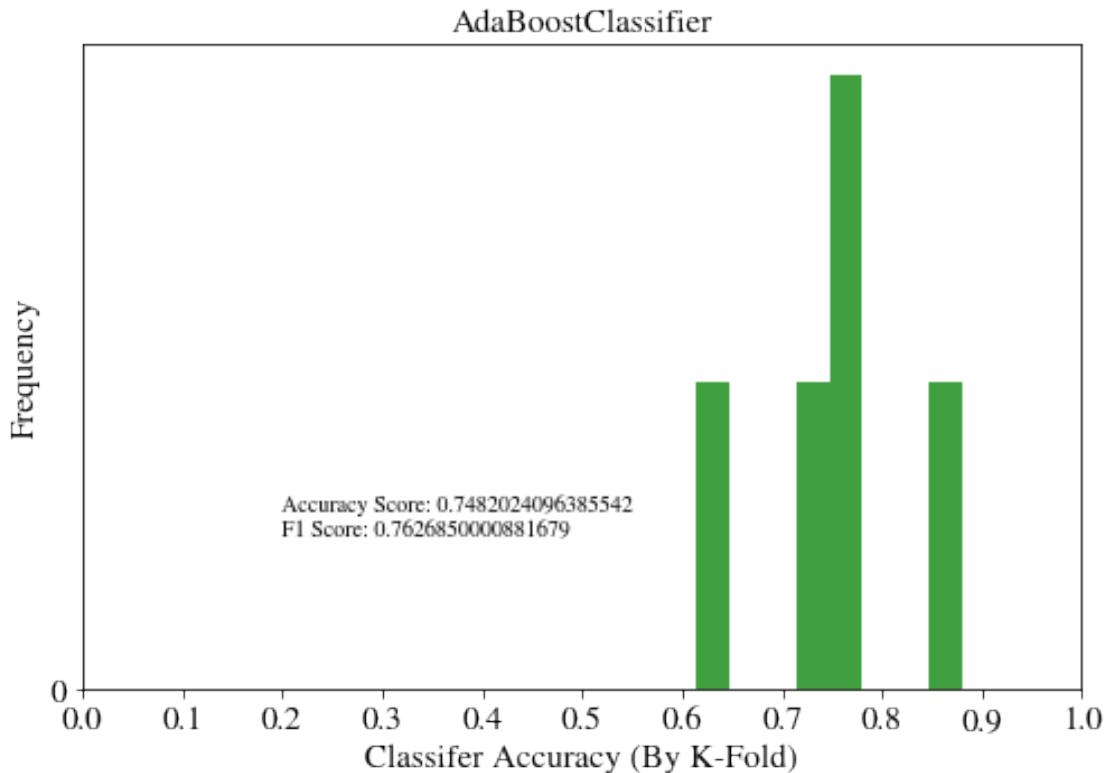
```

```

changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina
propria cellularity?, Intraepithelial lymphocytes', 'accuracy': [0.584, 0.672,
0.3493975903614458, 0.7550200803212851, 0.7028112449799196], 'avgAccuracy':
0.6126457831325302, 'f1': [0.552681447124797, 0.6288689014773975,
0.2770385974126309, 0.7336636489018139, 0.6573710636120903], 'avgF1':
0.569924731705746, 'precision': [0.584, 0.672, 0.3493975903614458,
0.7550200803212851, 0.7028112449799196], 'avgPrecision': 0.6126457831325302,
'recall': [0.584, 0.672, 0.3493975903614458, 0.7550200803212851,
0.7028112449799196], 'avgRecall': 0.6126457831325302, 'params': [{'priors':
None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

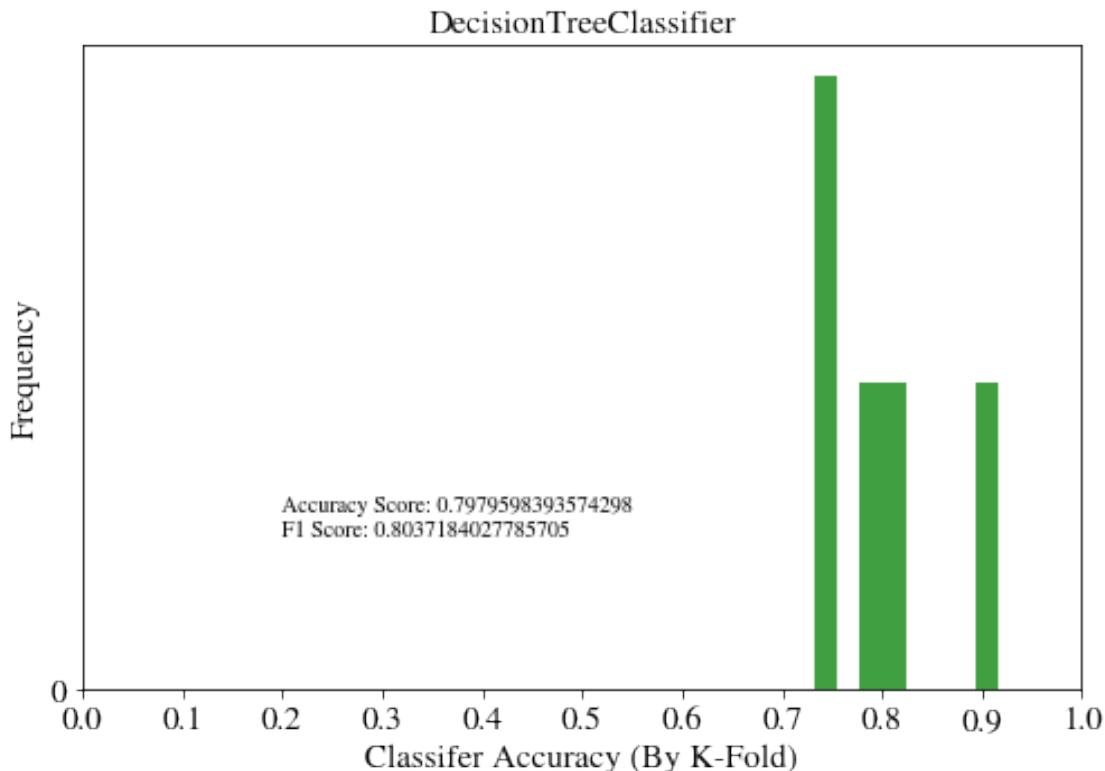
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?',
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &

```

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes', 'accuracy': [0.764, 0.724, 0.7590361445783133, 0.8795180722891566, 0.6144578313253012], 'avgAccuracy': 0.7482024096385542, 'f1': [0.769522288584227, 0.7384996355446899, 0.7646652118201602, 0.9116575742092858, 0.6290802902824761], 'avgF1': 0.7626850000881679, 'precision': [0.764, 0.724, 0.7590361445783133, 0.8795180722891566, 0.6144578313253012], 'avgPrecision': 0.7482024096385542, 'recall': [0.764, 0.724, 0.7590361445783133, 0.8795180722891566, 0.6144578313253012], 'avgRecall': 0.7482024096385542, 'params': [{}{'algorithm': 'SAMME.R', 'base\_estimator': None, 'learning\_rate': 1, 'n\_estimators': 50, 'random\_state': None}]}

\*\*\*\*\*

Processing Model: DecisionTreeClassifier



\*\*\*\*\*

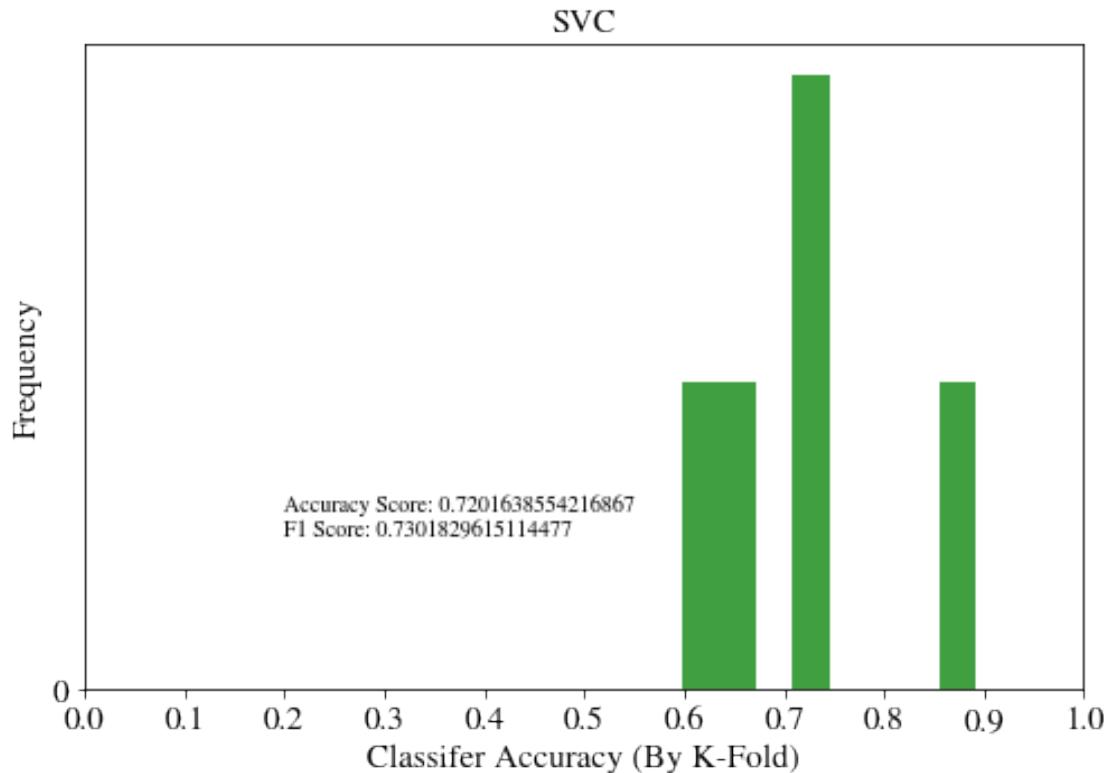
\* DecisionTreeClassifier

```

* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes', 'accuracy': [0.732, 0.808, 0.7951807228915663, 0.9156626506024096, 0.7389558232931727], 'avgAccuracy': 0.7979598393574298, 'f1': [0.7324002516698986, 0.8105973909131803, 0.8001785754650873, 0.9324384846797313, 0.7429773111649554], 'avgF1': 0.8037184027785705, 'precision': [0.732, 0.808, 0.7951807228915663, 0.9156626506024096, 0.7389558232931727], 'avgPrecision': 0.7979598393574298, 'recall': [0.732, 0.808, 0.7951807228915663, 0.9156626506024096, 0.7389558232931727], 'avgRecall': 0.7979598393574298, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'random'}]}
*****

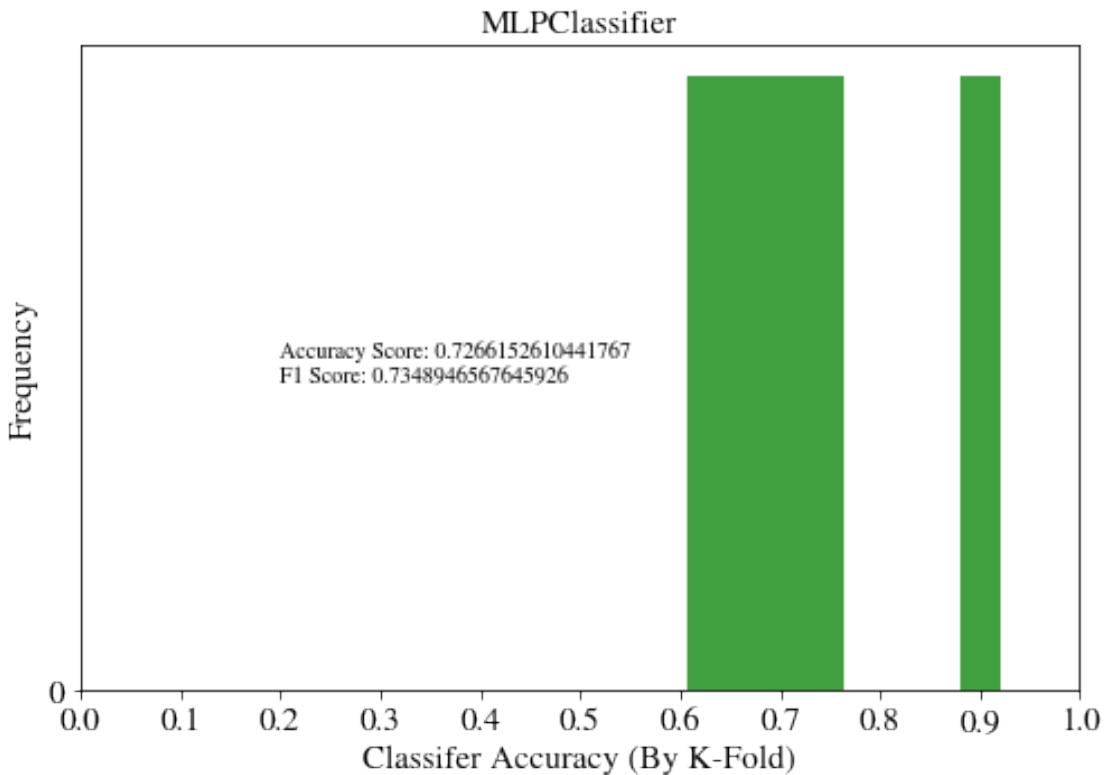
```

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes', 'accuracy': [0.664, 0.732, 0.5983935742971888, 0.891566265060241, 0.714859437751004], 'avgAccuracy': 0.7201638554216867, 'f1': [0.6708697781186119, 0.7444870779098284, 0.5997446014999347, 0.9115243309270528, 0.7242890191018106], 'avgF1': 0.7301829615114477, 'precision': [0.664, 0.732, 0.5983935742971888, 0.891566265060241, 0.714859437751004], 'avgPrecision': 0.7201638554216867, 'recall': [0.664, 0.732, 0.5983935742971888, 0.891566265060241, 0.714859437751004], 'avgRecall': 0.7201638554216867, 'params': [{ 'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina
propria cellularity?, Intraepithelial lymphocytes', 'accuracy': [0.66, 0.704,
0.606425702811245, 0.9196787148594378, 0.7429718875502008], 'avgAccuracy':
0.7266152610441767, 'f1': [0.6665131805083743, 0.7179680562109805,
0.6073313413706749, 0.9350929730482624, 0.747567732684671], 'avgF1':
0.7348946567645926, 'precision': [0.66, 0.704, 0.606425702811245,
0.9196787148594378, 0.7429718875502008], 'avgPrecision': 0.7266152610441767,
'recall': [0.66, 0.704, 0.606425702811245, 0.9196787148594378,
0.7429718875502008], 'avgRecall': 0.7266152610441767, 'params': [{'activation':
'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,)},
```

```

'learning_rate': 'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000,
'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum':
True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam',
'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start':
False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes', 'accuracy': [0.784, 0.86, 0.8393574297188755, 0.9317269076305221, 0.7590361445783133], 'avgAccuracy': 0.8348240963855422, 'f1': [0.7843484410157505, 0.857970794629736, 0.8446767429337789, 0.9469797597383218, 0.7642761732060102], 'avgF1': 0.8396503823047194, 'precision': [0.784, 0.86, 0.8393574297188755, 0.9317269076305221, 0.7590361445783133], 'avgPrecision': 0.8348240963855422, 'recall': [0.784, 0.86, 0.8393574297188755, 0.9317269076305221, 0.7590361445783133], 'avgRecall': 0.8348240963855422, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 700, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

	model	features	\		
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...			
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...			
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...			
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...			
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...			
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...			
6	SVC	Active inflammation?, Severity of Crypt Arch, ...			
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...			
	accuracy	f1	precision	recall	\
0	0.831618	0.835710	0.831618	0.831618	
1	0.766673	0.778381	0.766673	0.766673	
2	0.687284	0.698942	0.687284	0.687284	
3	0.612646	0.569925	0.612646	0.612646	

```

4 0.742545 0.752871 0.742545 0.742545
5 0.764263 0.774382 0.764263 0.764263
6 0.720164 0.730183 0.720164 0.720164
7 0.716973 0.730587 0.716973 0.716973

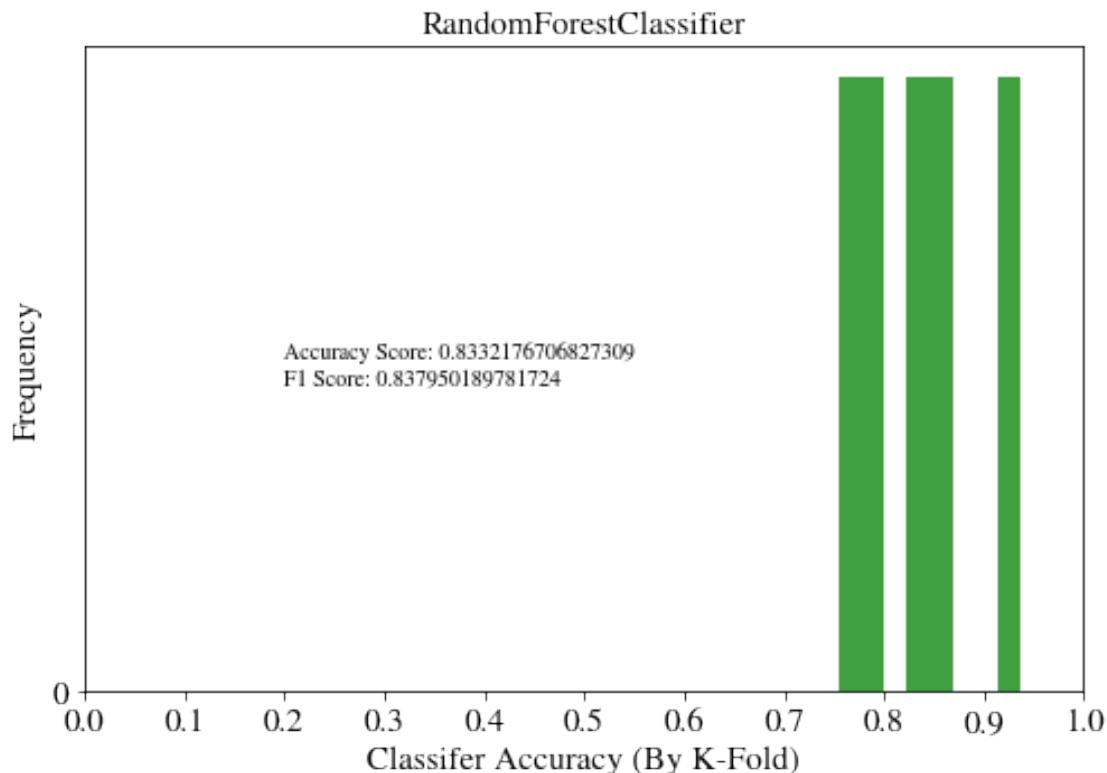
```

```

                    params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3         {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier



```

*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,

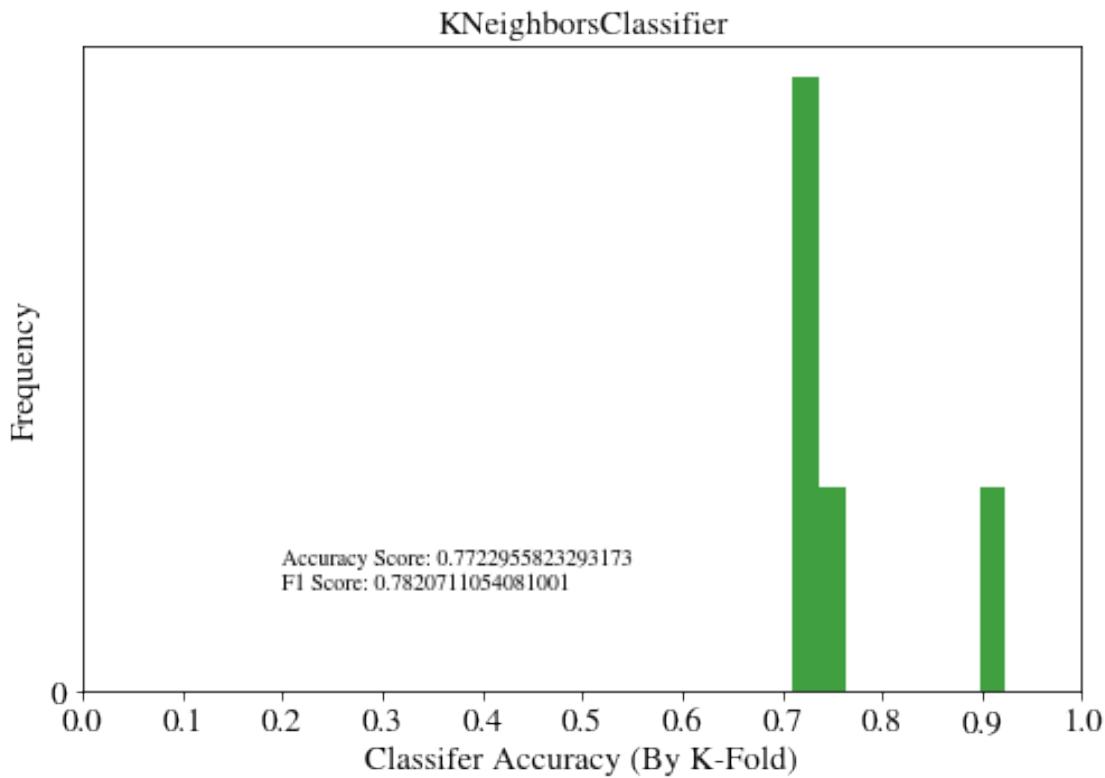
```

```

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in
lamina propria cellularity?', 'accuracy': [0.788, 0.856, 0.8313253012048193,
0.9357429718875502, 0.7550200803212851], 'avgAccuracy': 0.8332176706827309,
'f1': [0.7881521194687858, 0.8534399091400158, 0.8366911024997734,
0.9492011934886881, 0.7622666243113565], 'avgF1': 0.837950189781724,
'precision': [0.788, 0.856, 0.8313253012048193, 0.9357429718875502,
0.7550200803212851], 'avgPrecision': 0.8332176706827309, 'recall': [0.788,
0.856, 0.8313253012048193, 0.9357429718875502, 0.7550200803212851], 'avgRecall':
0.8332176706827309, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0,
'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features':
'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease':
0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 700, 'n_jobs': -1, 'oob_score':
False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

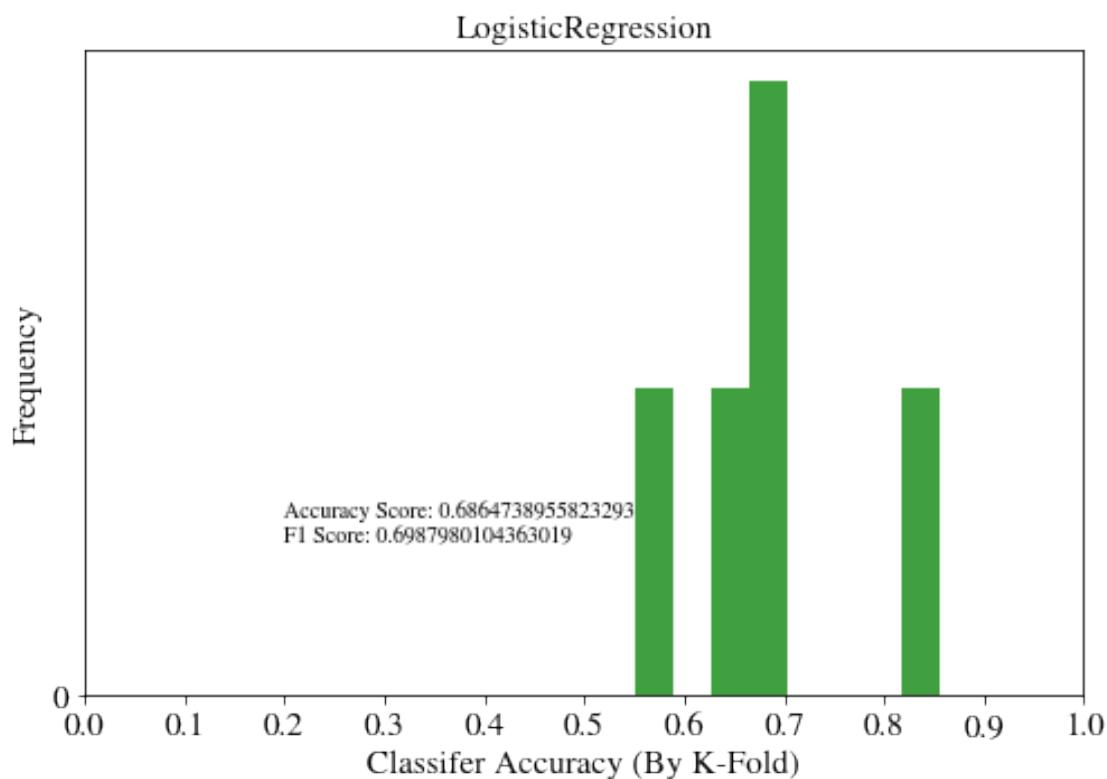
```

Processing Model: KNeighborsClassifier



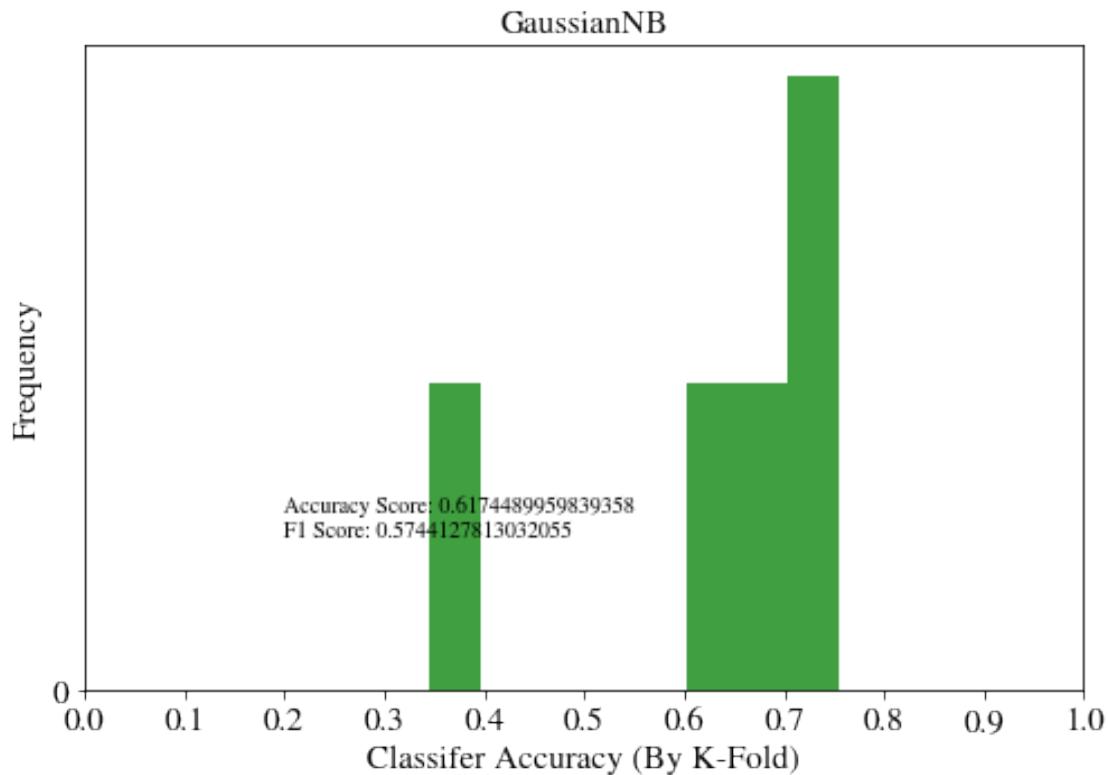
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?', 'accuracy': [0.728, 0.764, 0.7108433734939759, 0.9236947791164659, 0.7349397590361446], 'avgAccuracy': 0.7722955823293173, 'f1': [0.7319784367103341, 0.7762844402164218, 0.7163685043203115, 0.9391090373052905, 0.7466151084881426], 'avgF1': 0.7820711054081001, 'precision': [0.728, 0.764, 0.7108433734939759, 0.9236947791164659, 0.7349397590361446], 'avgPrecision': 0.7722955823293173, 'recall': [0.728, 0.764, 0.7108433734939759, 0.9236947791164659, 0.7349397590361446], 'avgRecall': 0.7722955823293173, 'params': [{'algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 14, 'p': 2, 'weights': 'distance'}]}
*****
```

Processing Model: LogisticRegression



```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?', 'accuracy': [0.644, 0.696, 0.5502008032128514,  
0.8554216867469879, 0.6867469879518072], 'avgAccuracy': 0.6864738955823293,  
'f1': [0.6515173780142648, 0.7067960405848894, 0.5497601110147492,  
0.892544969795147, 0.6933715527724591], 'avgF1': 0.6987980104363019,  
'precision': [0.644, 0.696, 0.5502008032128514, 0.8554216867469879,  
0.6867469879518072], 'avgPrecision': 0.6864738955823293, 'recall': [0.644,  
0.696, 0.5502008032128514, 0.8554216867469879, 0.6867469879518072], 'avgRecall':  
0.6864738955823293, 'params': [{ 'C': 1, 'class_weight': None, 'dual': False,  
'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None, 'max_iter':  
100, 'multi_class': 'multinomial', 'n_jobs': -1, 'penalty': 'l2',  
'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0,  
'warm_start': False}]}}
*****
```

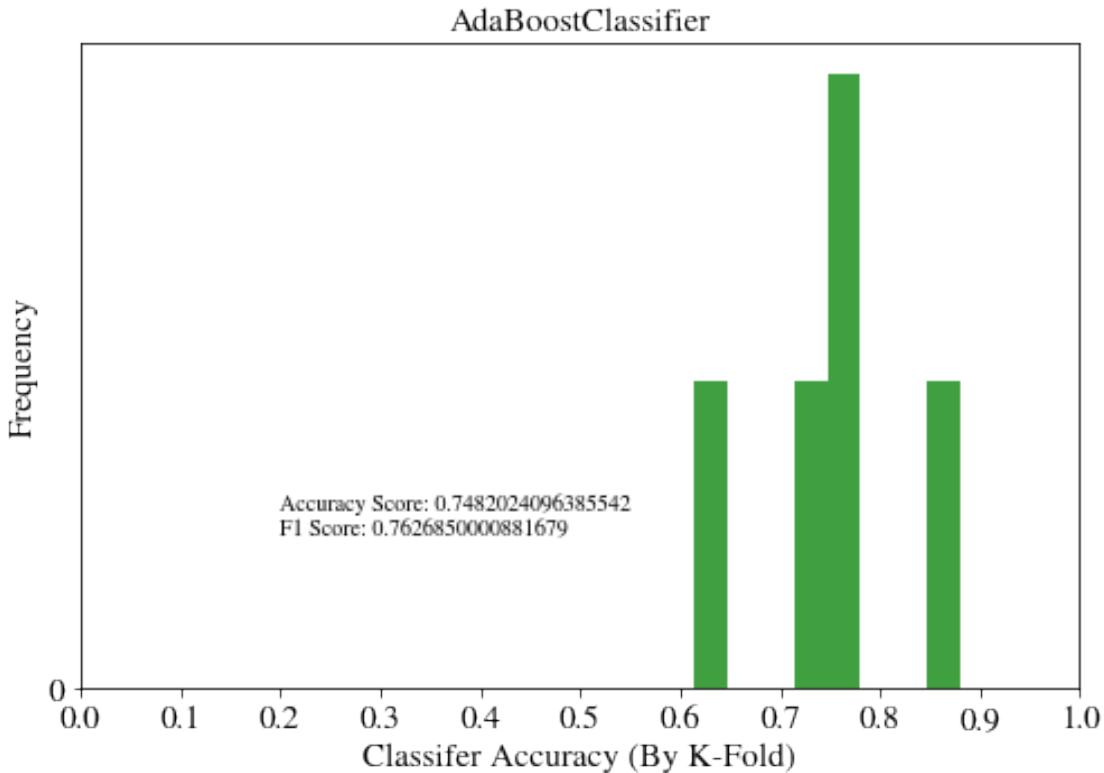
Processing Model: GaussianNB



```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?', 'accuracy': [0.604, 0.672, 0.3453815261044177, 0.7550200803212851, 0.7108433734939759], 'avgAccuracy': 0.6174489959839358, 'f1': [0.569188315683798, 0.6294854876782174, 0.273140029577297, 0.7353835958227662, 0.664866477753949], 'avgF1': 0.5744127813032055, 'precision': [0.604, 0.672, 0.3453815261044177, 0.7550200803212851, 0.7108433734939759], 'avgPrecision': 0.6174489959839358, 'recall': [0.604, 0.672, 0.3453815261044177, 0.7550200803212851, 0.7108433734939759], 'avgRecall': 0.6174489959839358, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}
```

\*\*\*\*\*

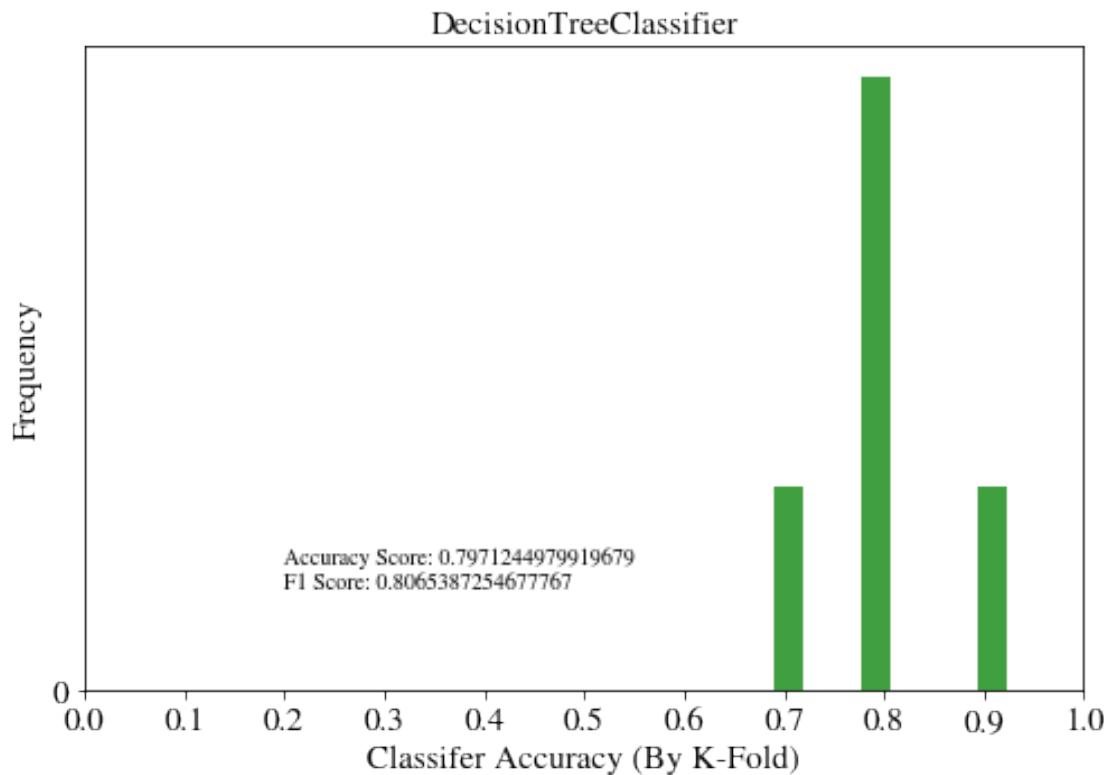
Processing Model: AdaBoostClassifier



```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?', 'accuracy': [0.764, 0.724, 0.7590361445783133,  
0.8795180722891566, 0.6144578313253012], 'avgAccuracy': 0.7482024096385542,  
'f1': [0.769522288584227, 0.7384996355446899, 0.7646652118201602,  
0.9116575742092858, 0.6290802902824761], 'avgF1': 0.7626850000881679,  
'precision': [0.764, 0.724, 0.7590361445783133, 0.8795180722891566,  
0.6144578313253012], 'avgPrecision': 0.7482024096385542, 'recall': [0.764,  
0.724, 0.7590361445783133, 0.8795180722891566, 0.6144578313253012], 'avgRecall':  
0.7482024096385542, 'params': [{'algorithm': 'SAMME.R', 'base_estimator': None,  
'learning_rate': 1, 'n_estimators': 50, 'random_state': None}]}}
```

\*\*\*\*\*

Processing Model: DecisionTreeClassifier

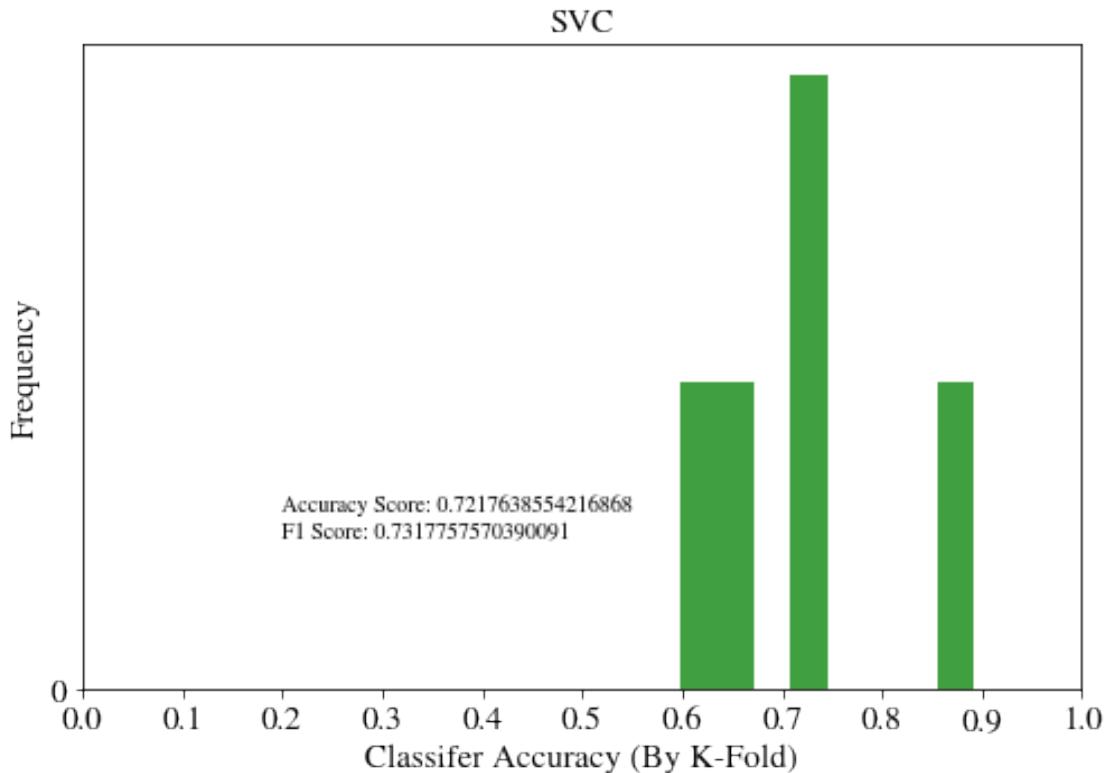


\*\*\*\*\*

```
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?', 'accuracy': [0.78, 0.8, 0.7911646586345381, 0.9236947791164659, 0.6907630522088354], 'avgAccuracy': 0.7971244979919679, 'f1': [0.7830043142043142, 0.8068975934459806, 0.7967870987114638, 0.9407879519050345, 0.7052166690720907], 'avgF1': 0.8065387254677767, 'precision': [0.78, 0.8, 0.7911646586345381, 0.9236947791164659, 0.6907630522088354], 'avgPrecision': 0.7971244979919679, 'recall': [0.78, 0.8, 0.7911646586345381, 0.9236947791164659, 0.6907630522088354], 'avgRecall':
```

```
0.7971244979919679, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}  
*****
```

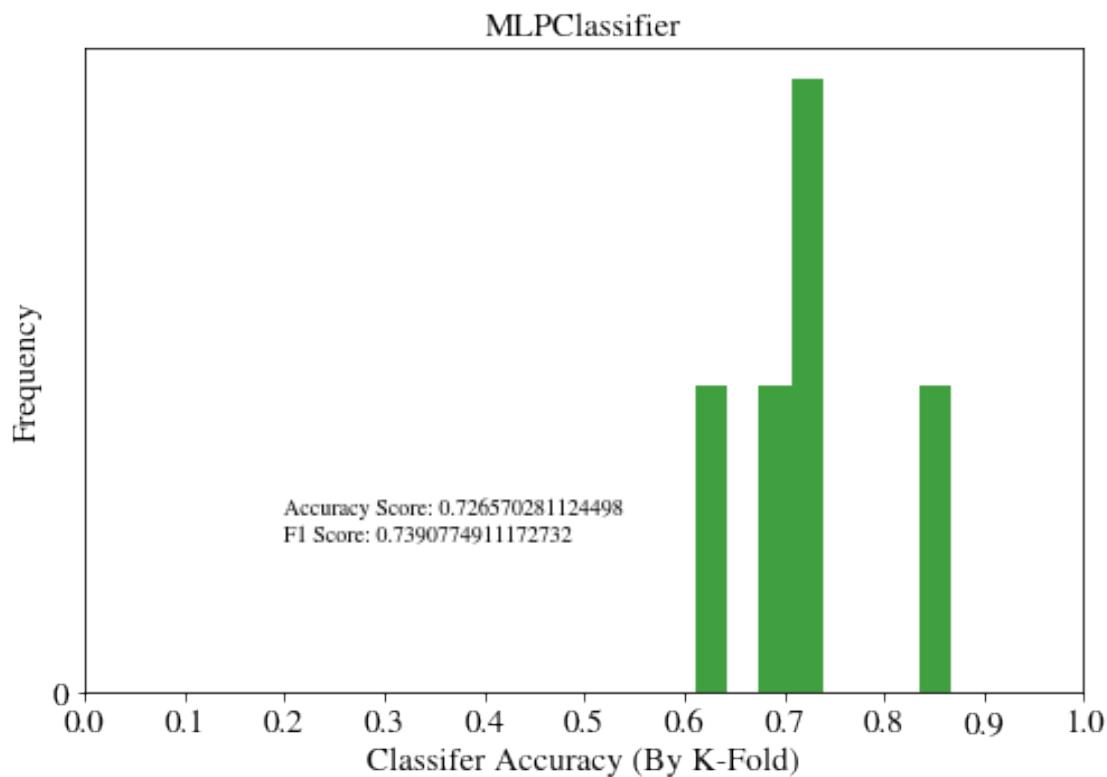
Processing Model: SVC



```
*****  
* SVC  
* Best Params Result:  
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?', 'accuracy': [0.668, 0.736, 0.5983935742971888, 0.891566265060241, 0.714859437751004], 'avgAccuracy': 0.7217638554216868, 'f1':
```

```
[0.6747135448636591, 0.7486072888025881, 0.5997446014999347, 0.9115243309270528,
0.7242890191018106], 'avgF1': 0.7317757570390091, 'precision': [0.668, 0.736,
0.5983935742971888, 0.891566265060241, 0.714859437751004], 'avgPrecision':
0.7217638554216868, 'recall': [0.668, 0.736, 0.5983935742971888,
0.891566265060241, 0.714859437751004], 'avgRecall': 0.7217638554216868,
'params': [{C: 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None,
'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale',
'kernel': 'linear', 'max_iter': -1, 'probability': False,
'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal'}
```

```

granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina
propria cellularity?', 'accuracy': [0.716, 0.704, 0.6104417670682731,
0.8674698795180723, 0.7349397590361446], 'avgAccuracy': 0.726570281124498, 'f1':
[0.7215616182546077, 0.7183702818064046, 0.6118367401761848, 0.9027175436525275,
0.740901271696641], 'avgF1': 0.7390774911172732, 'precision': [0.716, 0.704,
0.6104417670682731, 0.8674698795180723, 0.7349397590361446], 'avgPrecision':
0.726570281124498, 'recall': [0.716, 0.704, 0.6104417670682731,
0.8674698795180723, 0.7349397590361446], 'avgRecall': 0.726570281124498,
'params': [{activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto',
'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08,
'hidden_layer_sizes': (100,), 'learning_rate': 'invscaling',
'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5,
'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in
lamina propria cellularity?', 'accuracy': [0.788, 0.856, 0.8313253012048193,
0.9357429718875502, 0.7550200803212851], 'avgAccuracy': 0.8332176706827309,
'f1': [0.7881521194687858, 0.8534399091400158, 0.8366911024997734,
0.9492011934886881, 0.7622666243113565], 'avgF1': 0.837950189781724,
'precision': [0.788, 0.856, 0.8313253012048193, 0.9357429718875502,
0.7550200803212851], 'avgPrecision': 0.8332176706827309, 'recall': [0.788,
0.856, 0.8313253012048193, 0.9357429718875502, 0.7550200803212851], 'avgRecall':
0.8332176706827309, 'params': [{bootstrap': True, 'ccp_alpha': 0.0,
'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features':
'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease':
0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 700, 'n_jobs': -1, 'oob_score':
False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

model	features \
0 RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB	Active inflammation?, Severity of Crypt Arch, ...

```

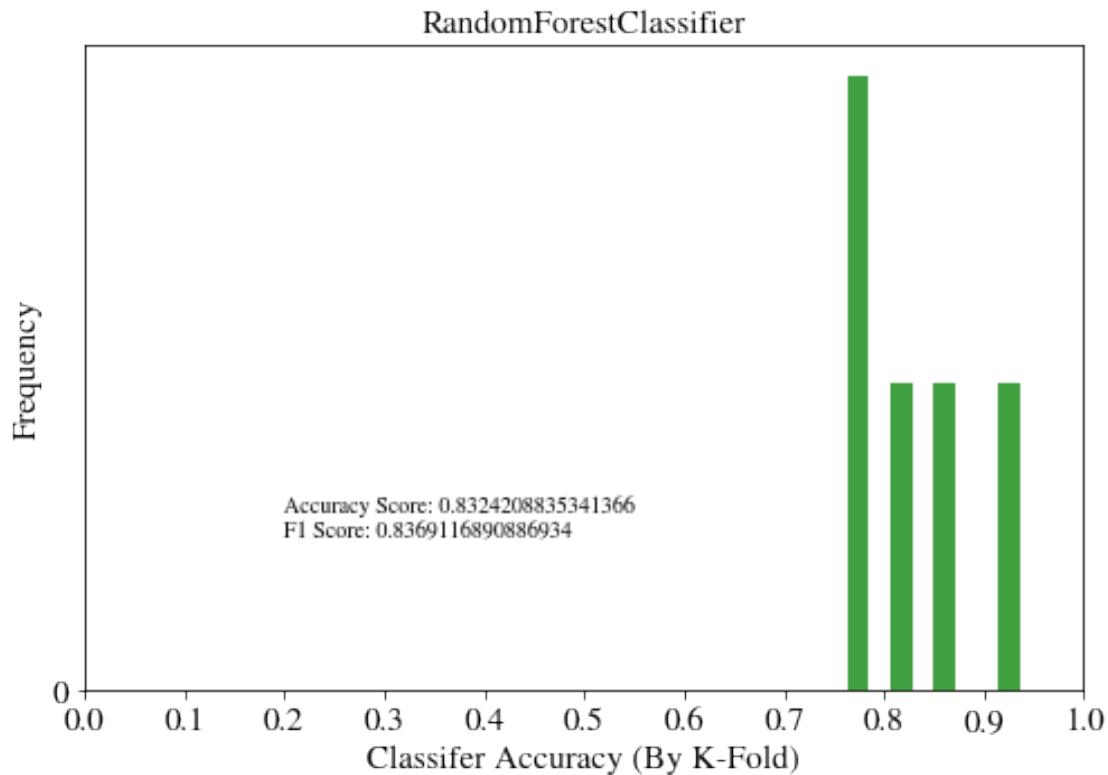
4      AdaBoostClassifier Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier Active inflammation?, Severity of Crypt Arch, ...
6          SVC Active inflammation?, Severity of Crypt Arch, ...
7      MLPClassifier Active inflammation?, Severity of Crypt Arch, ...

    accuracy      f1  precision   recall  \
0  0.826802  0.831627  0.826802  0.826802
1  0.765076  0.776400  0.765076  0.765076
2  0.686474  0.698798  0.686474  0.686474
3  0.617449  0.574413  0.617449  0.617449
4  0.733735  0.738241  0.733735  0.733735
5  0.767470  0.776208  0.767470  0.767470
6  0.721764  0.731776  0.721764  0.721764
7  0.720945  0.732986  0.720945  0.720945

                                params
0  {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1  {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2  {'C': 1, 'class_weight': None, 'dual': False, ...
3      {'priors': None, 'var_smoothing': 1e-09}
4  {'algorithm': 'SAMME.R', 'base_estimator': Non...
5  {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6  {'C': 1.0, 'break_ties': False, 'cache_size': ...
7  {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

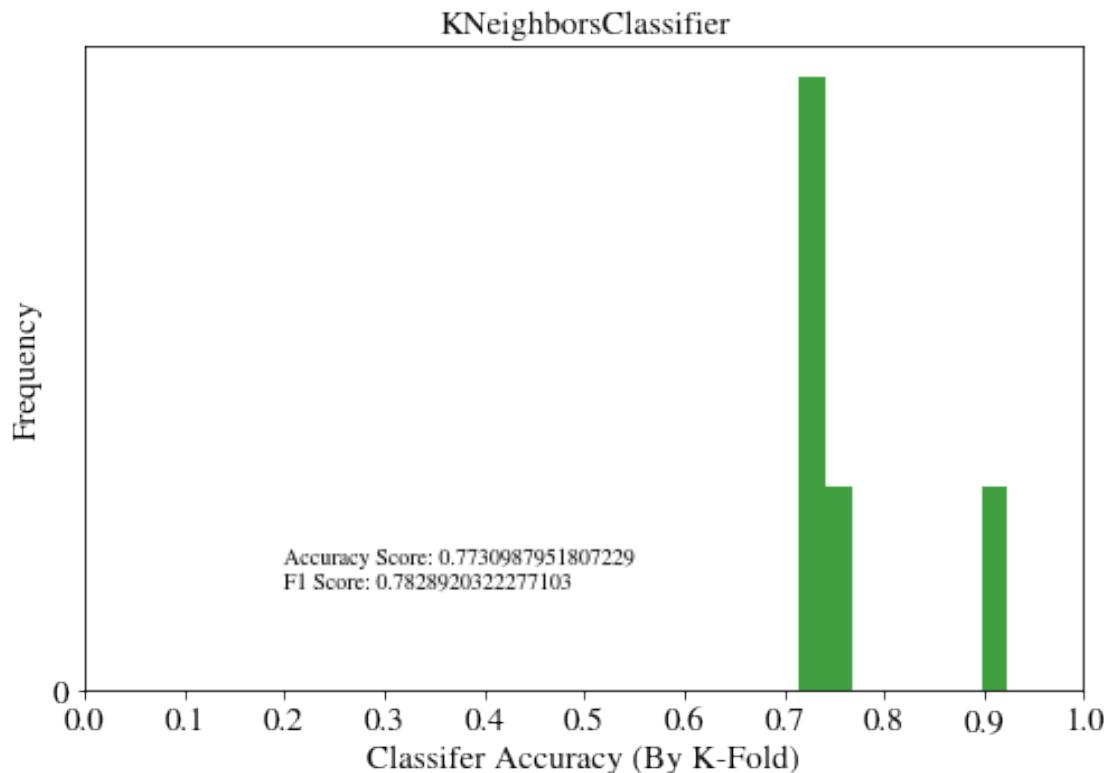
Processing Model: RandomForestClassifier



```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?', 'accuracy': [0.78, 0.856, 0.8273092369477911, 0.9357429718875502, 0.7630522088353414], 'avgAccuracy': 0.8324208835341366, 'f1': [0.7798363394168718, 0.8534399091400158, 0.8326986034629208, 0.9492011934886881, 0.7693823999349707], 'avgF1': 0.8369116890886934, 'precision': [0.78, 0.856, 0.8273092369477911, 0.9357429718875502, 0.7630522088353414], 'avgPrecision': 0.8324208835341366, 'recall': [0.78, 0.856, 0.8273092369477911, 0.9357429718875502, 0.7630522088353414], 'avgRecall': 0.8324208835341366, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2}]}*****
```

```
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 700,  
'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0,  
'warm_start': False}]]  
*****
```

Processing Model: KNeighborsClassifier



```
*****  
* KNeighborsClassifier  
* Best Params Result:  
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?', 'accuracy': [0.728, 0.764,  
0.714859437751004, 0.9236947791164659, 0.7349397590361446], 'avgAccuracy':  
0.7730987951807229, 'f1': [0.7319784367103341, 0.7762844402164218,  
0.7204731384183625, 0.9391090373052905, 0.7466151084881426], 'avgF1':  
0.7828920322277103, 'precision': [0.728, 0.764, 0.714859437751004,
```

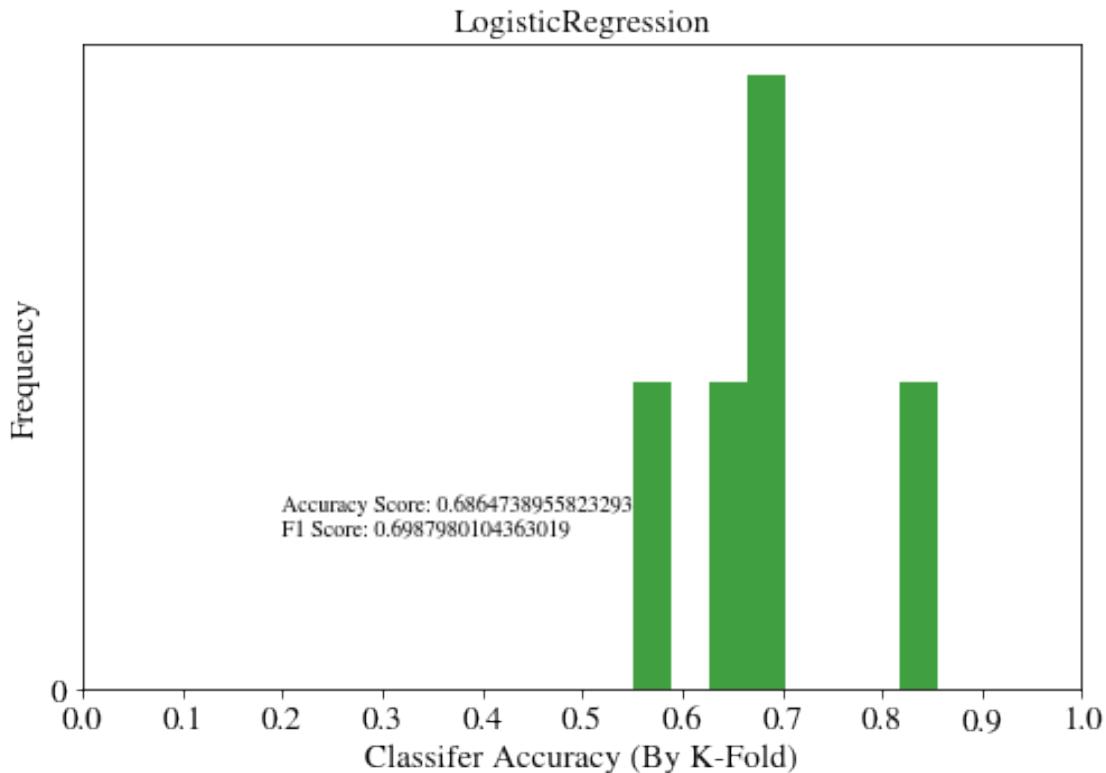
```

0.9236947791164659, 0.7349397590361446], 'avgPrecision': 0.7730987951807229,
'recall': [0.728, 0.764, 0.714859437751004, 0.9236947791164659,
0.7349397590361446], 'avgRecall': 0.7730987951807229, 'params': [{algorithm':
'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs':
-1, 'n_neighbors': 14, 'p': 2, 'weights': 'distance'}]}

*****

```

Processing Model: LogisticRegression



```

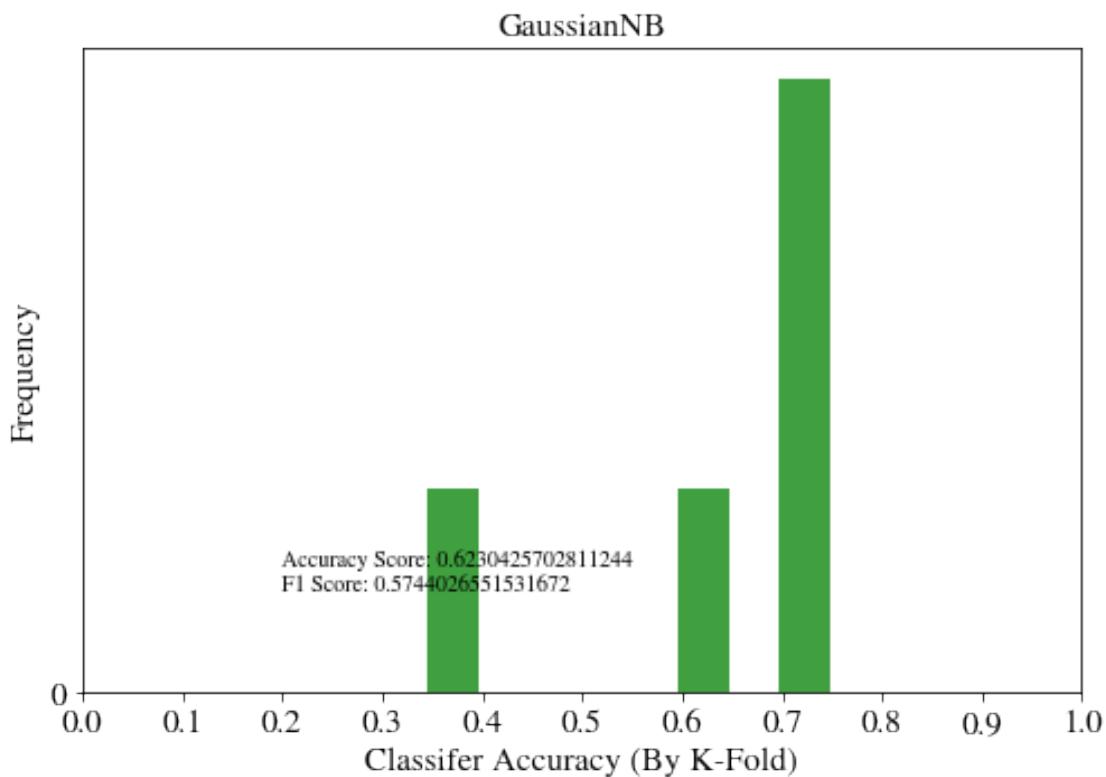
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?', 'accuracy': [0.644, 0.696,  
0.5502008032128514, 0.8554216867469879, 0.6867469879518072], 'avgAccuracy':  
0.6864738955823293, 'f1': [0.6515173780142648, 0.7067960405848894,
```

```

0.5497601110147492, 0.892544969795147, 0.6933715527724591], 'avgF1':
0.6987980104363019, 'precision': [0.644, 0.696, 0.5502008032128514,
0.8554216867469879, 0.6867469879518072], 'avgPrecision': 0.6864738955823293,
'recall': [0.644, 0.696, 0.5502008032128514, 0.8554216867469879,
0.6867469879518072], 'avgRecall': 0.6864738955823293, 'params': [{'C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs':
-1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal

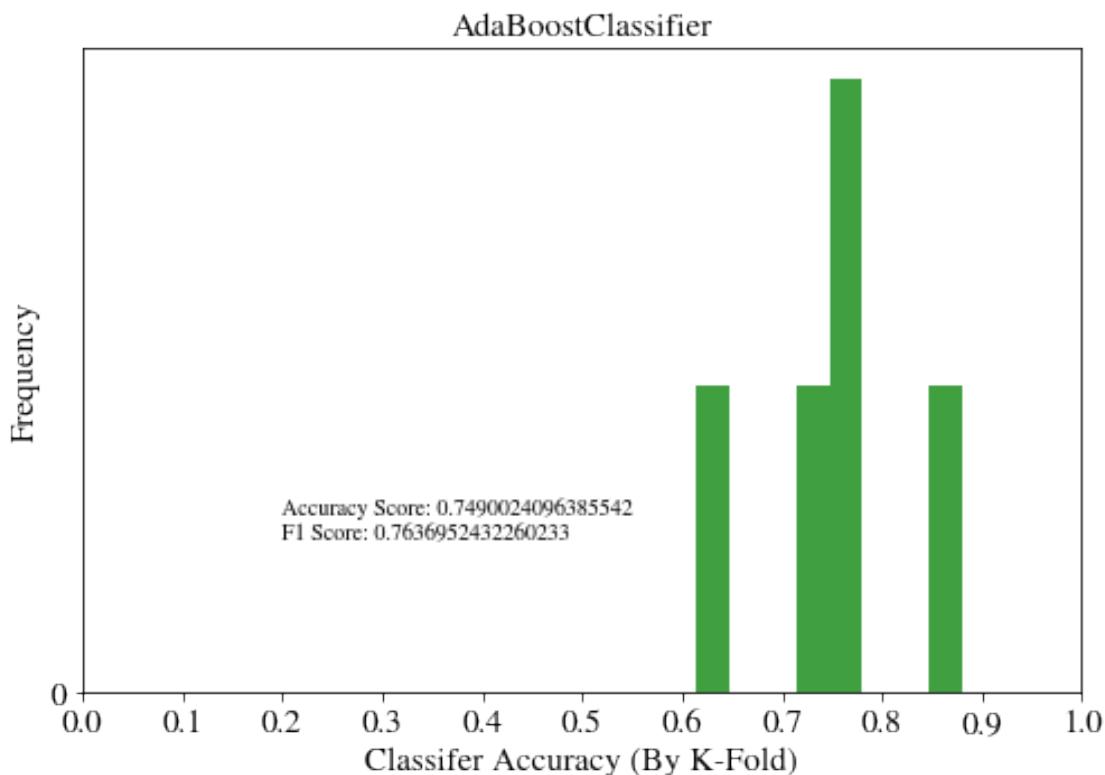
```

```

granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?', 'accuracy': [0.612, 0.7,
0.3453815261044177, 0.7469879518072289, 0.7108433734939759], 'avgAccuracy':
0.6230425702811244, 'f1': [0.5703163370466703, 0.6525334754751052,
0.26205392838981134, 0.7229966988372337, 0.6641128360170154], 'avgF1':
0.5744026551531672, 'precision': [0.612, 0.7, 0.3453815261044177,
0.7469879518072289, 0.7108433734939759], 'avgPrecision': 0.6230425702811244,
'recall': [0.612, 0.7, 0.3453815261044177, 0.7469879518072289,
0.7108433734939759], 'avgRecall': 0.6230425702811244, 'params': [{'priors':
None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt

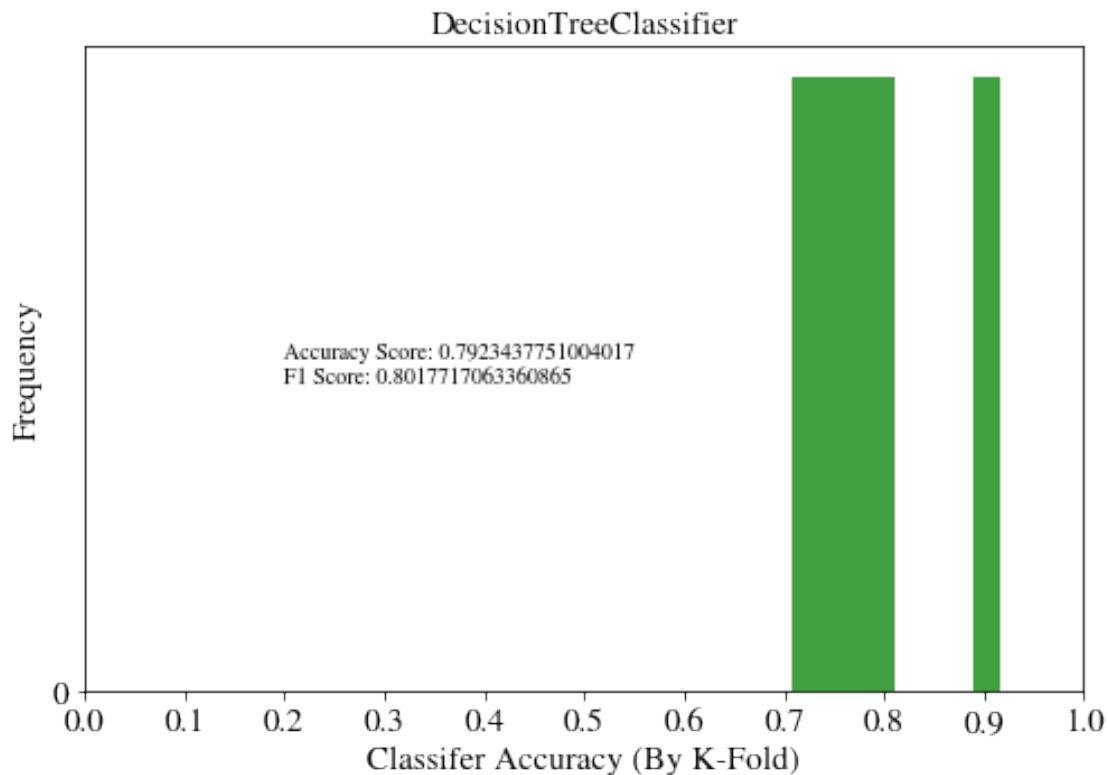
```

```

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,
Increased lymphoid aggregates in lamina propria?', 'accuracy': [0.768, 0.724,
0.7590361445783133, 0.8795180722891566, 0.6144578313253012], 'avgAccuracy':
0.7490024096385542, 'f1': [0.7745735042735044, 0.7384996355446899,
0.7646652118201602, 0.9116575742092858, 0.6290802902824761], 'avgF1':
0.7636952432260233, 'precision': [0.768, 0.724, 0.7590361445783133,
0.8795180722891566, 0.6144578313253012], 'avgPrecision': 0.7490024096385542,
'recall': [0.768, 0.724, 0.7590361445783133, 0.8795180722891566,
0.6144578313253012], 'avgRecall': 0.7490024096385542, 'params': [{algorithm':
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 50,
'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



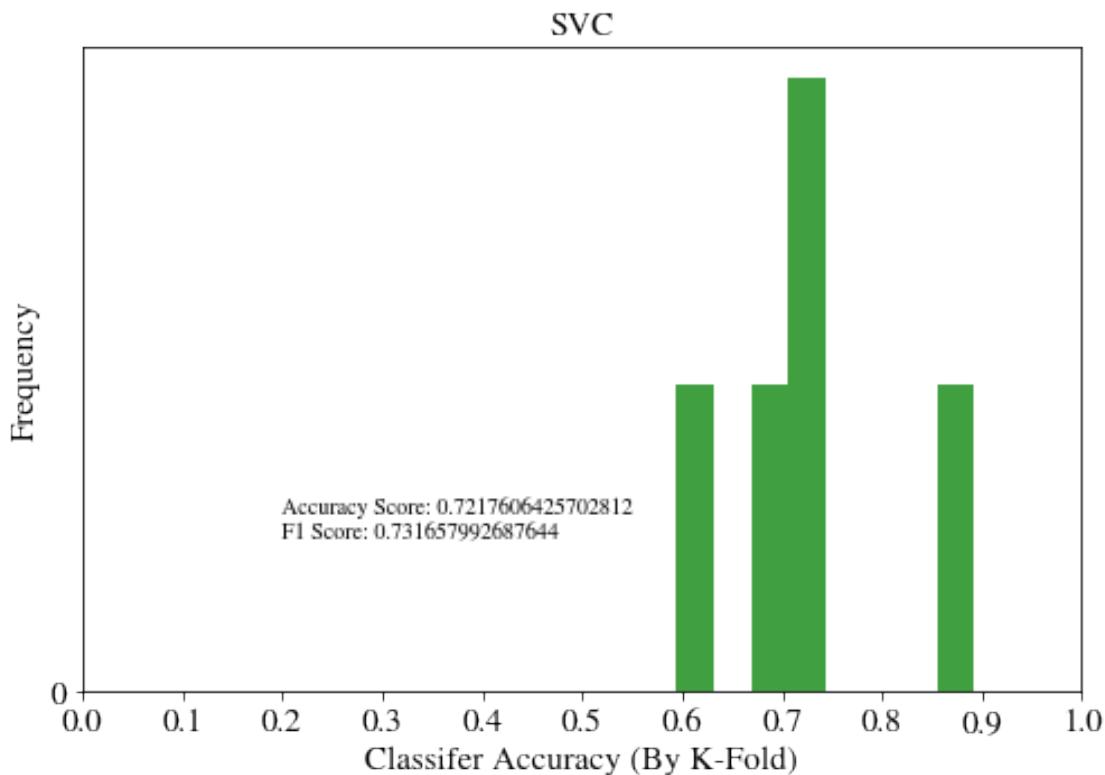
```

*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?',
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,

```

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
 Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
 abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
 Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
 Increased lymphoid aggregates in lamina propria?', 'accuracy': [0.752, 0.78,  
 0.8072289156626506, 0.9156626506024096, 0.7068273092369478], 'avgAccuracy':  
 0.7923437751004017, 'f1': [0.7555122958912432, 0.7851198979631678,  
 0.8118047903440908, 0.9361916996929669, 0.720229847788964], 'avgF1':  
 0.8017717063360865, 'precision': [0.752, 0.78, 0.8072289156626506,  
 0.9156626506024096, 0.7068273092369478], 'avgPrecision': 0.7923437751004017,  
 'recall': [0.752, 0.78, 0.8072289156626506, 0.9156626506024096,  
 0.7068273092369478], 'avgRecall': 0.7923437751004017, 'params': [{ccp\_alpha':  
 0.0, 'class\_weight': None, 'criterion': 'entropy', 'max\_depth': None,  
 'max\_features': 'auto', 'max\_leaf\_nodes': None, 'min\_impurity\_decrease': 0.0,  
 'min\_impurity\_split': None, 'min\_samples\_leaf': 1, 'min\_samples\_split': 2,  
 'min\_weight\_fraction\_leaf': 0.0, 'random\_state': None, 'splitter': 'best'}]}  
\*\*\*\*\*

Processing Model: SVC



\*\*\*\*\*

\* SVC

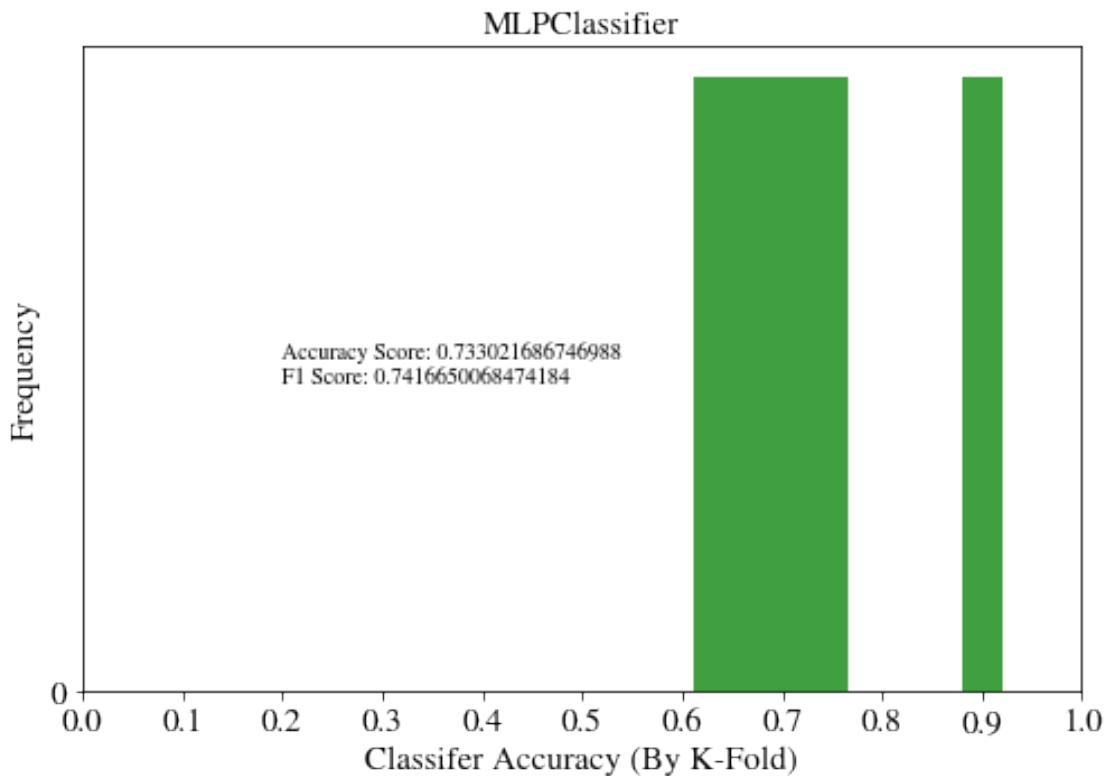
\* Best Params Result:

```

* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?', 'accuracy': [0.672, 0.736, 0.5943775100401606, 0.891566265060241, 0.714859437751004], 'avgAccuracy': 0.7217606425702812, 'f1': [0.6787383866499815, 0.7486072888025881, 0.5951309379567867, 0.9115243309270528, 0.7242890191018106], 'avgF1': 0.731657992687644, 'precision': [0.672, 0.736, 0.5943775100401606, 0.891566265060241, 0.714859437751004], 'avgPrecision': 0.7217606425702812, 'recall': [0.672, 0.736, 0.5943775100401606, 0.891566265060241, 0.714859437751004], 'avgRecall': 0.7217606425702812, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?', 'accuracy': [0.664, 0.724, 0.6104417670682731, 0.9196787148594378, 0.7469879518072289], 'avgAccuracy': 0.733021686746988, 'f1': [0.6706754885045859, 0.7385663614587823, 0.6118367401761848, 0.9350929730482624, 0.7521534710492768], 'avgF1': 0.7416650068474184, 'precision': [0.664, 0.724, 0.6104417670682731, 0.9196787148594378, 0.7469879518072289], 'avgPrecision': 0.733021686746988, 'recall': [0.664, 0.724, 0.6104417670682731, 0.9196787148594378, 0.7469879518072289], 'avgRecall': 0.733021686746988, 'params': [{activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'invscaling', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?', 'accuracy': [0.78, 0.856, 0.8273092369477911, 0.9357429718875502, 0.7630522088353414], 'avgAccuracy': 0.8324208835341366, 'f1': [0.7798363394168718, 0.8534399091400158, 0.8326986034629208, 0.9492011934886881, 0.7693823999349707], 'avgF1': 0.8369116890886934, 'precision': [0.78, 0.856, 0.8273092369477911, 0.9357429718875502, 0.7630522088353414], 'avgPrecision': 0.8324208835341366, 'recall': [0.78, 0.856, 0.8273092369477911, 0.9357429718875502, 0.7630522088353414], 'avgRecall': 0.8324208835341366, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2}]}*****
```

```

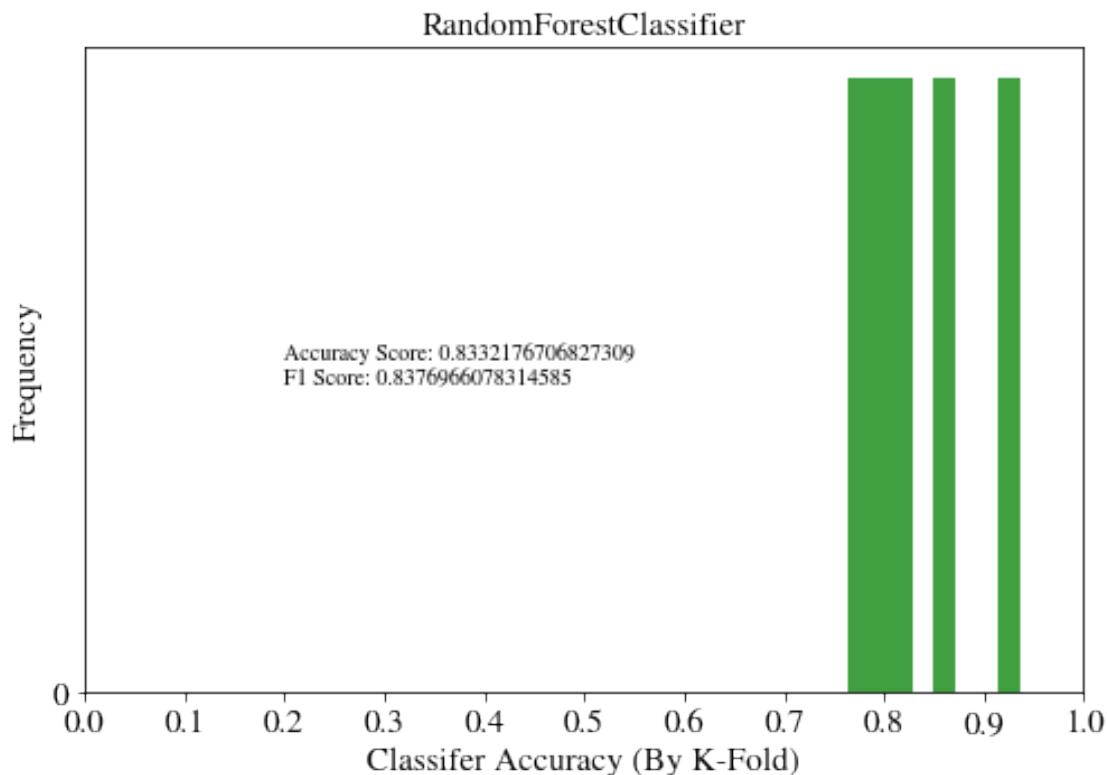
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 700,
'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0,
'warm_start': False}]}
*****
model features \
0 RandomForestClassifier Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB Active inflammation?, Severity of Crypt Arch, ...
4 AdaBoostClassifier Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier Active inflammation?, Severity of Crypt Arch, ...
6 SVC Active inflammation?, Severity of Crypt Arch, ...
7 MLPClassifier Active inflammation?, Severity of Crypt Arch, ...

accuracy f1 precision recall \
0 0.830008 0.834708 0.830008 0.830008
1 0.765880 0.777115 0.765880 0.765880
2 0.686474 0.698798 0.686474 0.686474
3 0.623043 0.574403 0.623043 0.623043
4 0.729729 0.736390 0.729729 0.729729
5 0.789934 0.796281 0.789934 0.789934
6 0.721761 0.731658 0.721761 0.721761
7 0.710545 0.722100 0.710545 0.710545

params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3 {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

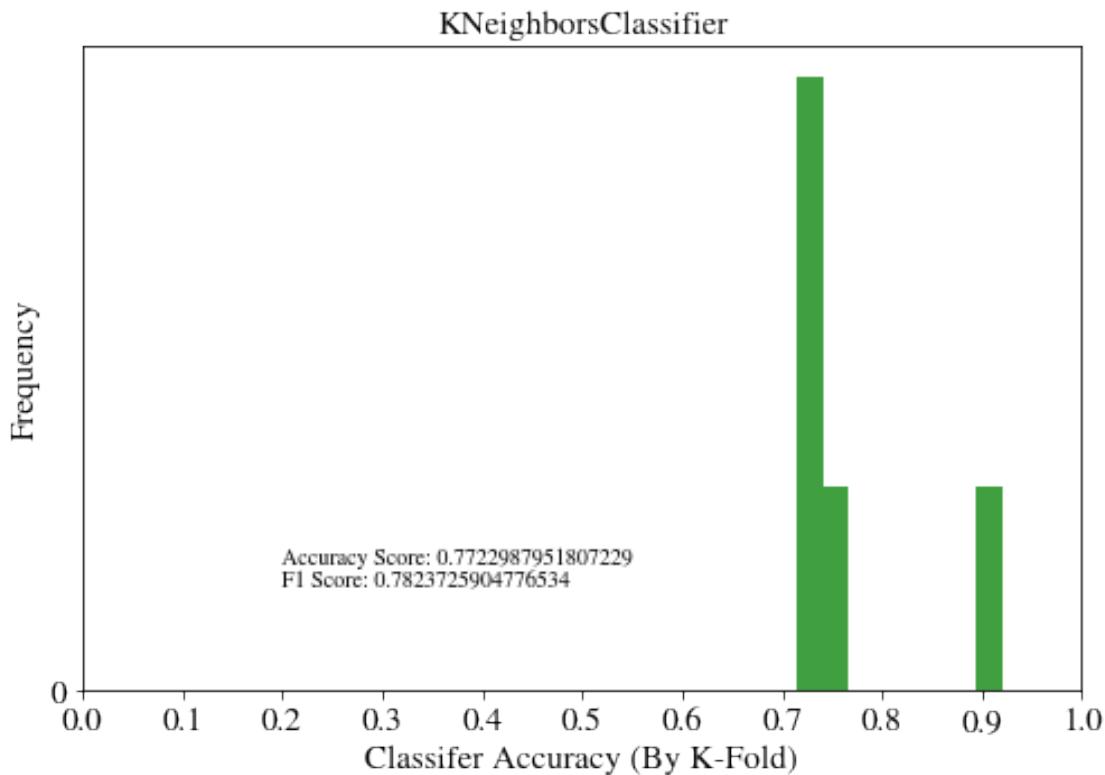
Processing Model: RandomForestClassifier



```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation', 'accuracy': [0.788, 0.856, 0.8232931726907631, 0.9357429718875502, 0.7630522088353414], 'avgAccuracy': 0.8332176706827309, 'f1': [0.786629708950831, 0.8543432502456894, 0.8287055946342051, 0.9494220853915963, 0.7693823999349707], 'avgF1': 0.8376966078314585, 'precision': [0.788, 0.856, 0.8232931726907631, 0.9357429718875502, 0.7630522088353414], 'avgPrecision': 0.8332176706827309, 'recall': [0.788, 0.856, 0.8232931726907631, 0.9357429718875502, 0.7630522088353414], 'avgRecall': 0.8332176706827309, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2}]}*****
```

```
'min_weight_fraction_leaf': 0.0, 'n_estimators': 700, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]]}
*****
```

Processing Model: KNeighborsClassifier



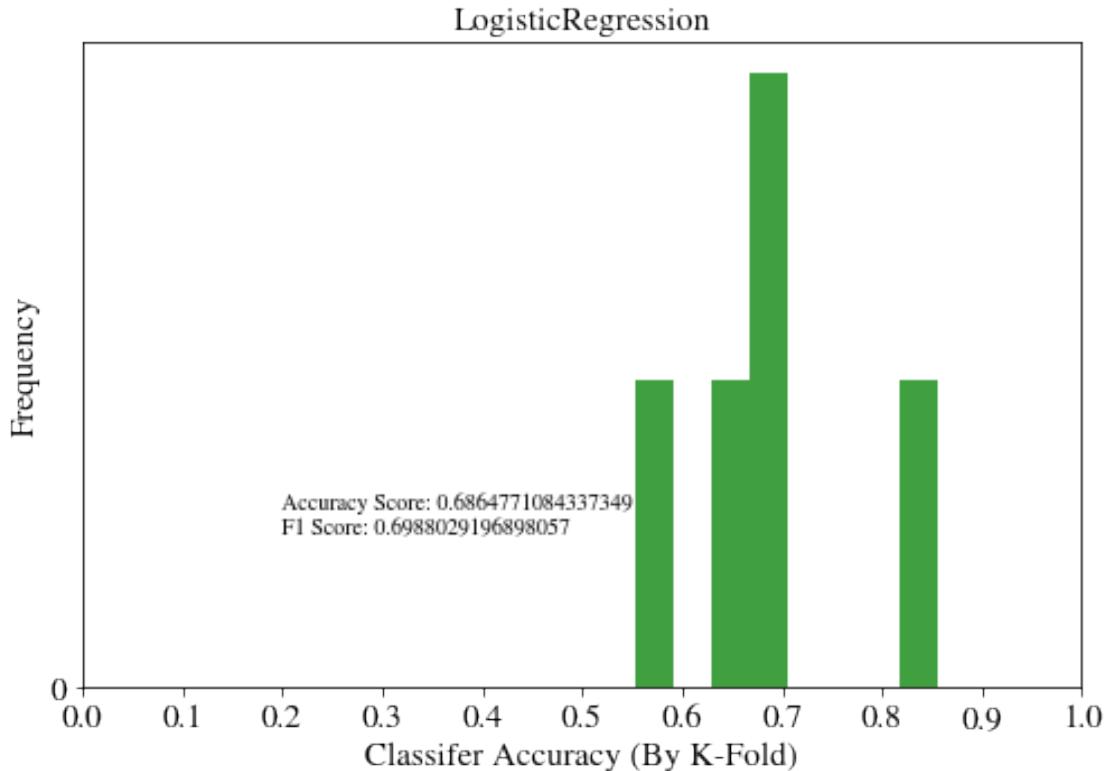
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation', 'accuracy': [0.728, 0.76, 0.714859437751004, 0.9196787148594378, 0.7389558232931727], 'avgAccuracy': 0.7722987951807229, 'f1': [0.7319784367103341, 0.7726407690445728, 0.7199124962738154, 0.9368622880705895, 0.750468962288955], 'avgF1': 0.7823725904776534, 'precision': [0.728, 0.76, 0.714859437751004, 0.9196787148594378, 0.7389558232931727], 'avgPrecision': 0.7722987951807229, 'recall': [0.728, 0.76, 0.714859437751004,
```

```

0.9196787148594378, 0.7389558232931727], 'avgRecall': 0.7722987951807229,
'params': [{}{'algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski',
'metric_params': None, 'n_jobs': -1, 'n_neighbors': 14, 'p': 2, 'weights':
'distance'}]]}
*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation',  
'accuracy': [0.644, 0.692, 0.5542168674698795, 0.8554216867469879,  
0.6867469879518072], 'avgAccuracy': 0.6864771084337349, 'f1':  
[0.6515173780142648, 0.7031942175471588, 0.5542438542853997, 0.892544969795147,  
0.6925141788070583], 'avgF1': 0.6988029196898057, 'precision': [0.644, 0.692,
```

```

0.5542168674698795, 0.8554216867469879, 0.6867469879518072], 'avgPrecision':  

0.6864771084337349, 'recall': [0.644, 0.692, 0.5542168674698795,  

0.8554216867469879, 0.6867469879518072], 'avgRecall': 0.6864771084337349,  

'params': [{C': 1, 'class_weight': None, 'dual': False, 'fit_intercept': True,  

'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class':  

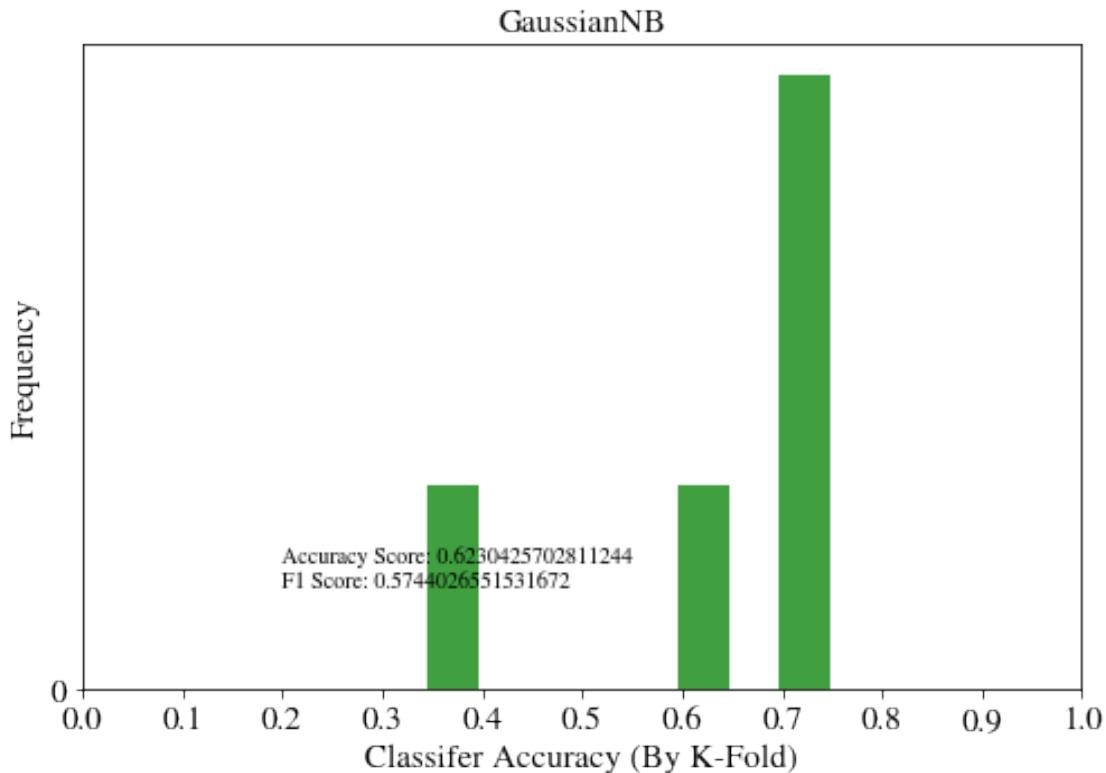
'multinomial', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver':  

'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}  

*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of  

Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal  

increase in lamina propria cellularity, Lamina propria polymorphs, Crypt  

architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial  

changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing  

pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses  

polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal  

granulomas, Basal histiocytic cells, Sex, Method of confirmation', 'accuracy':  

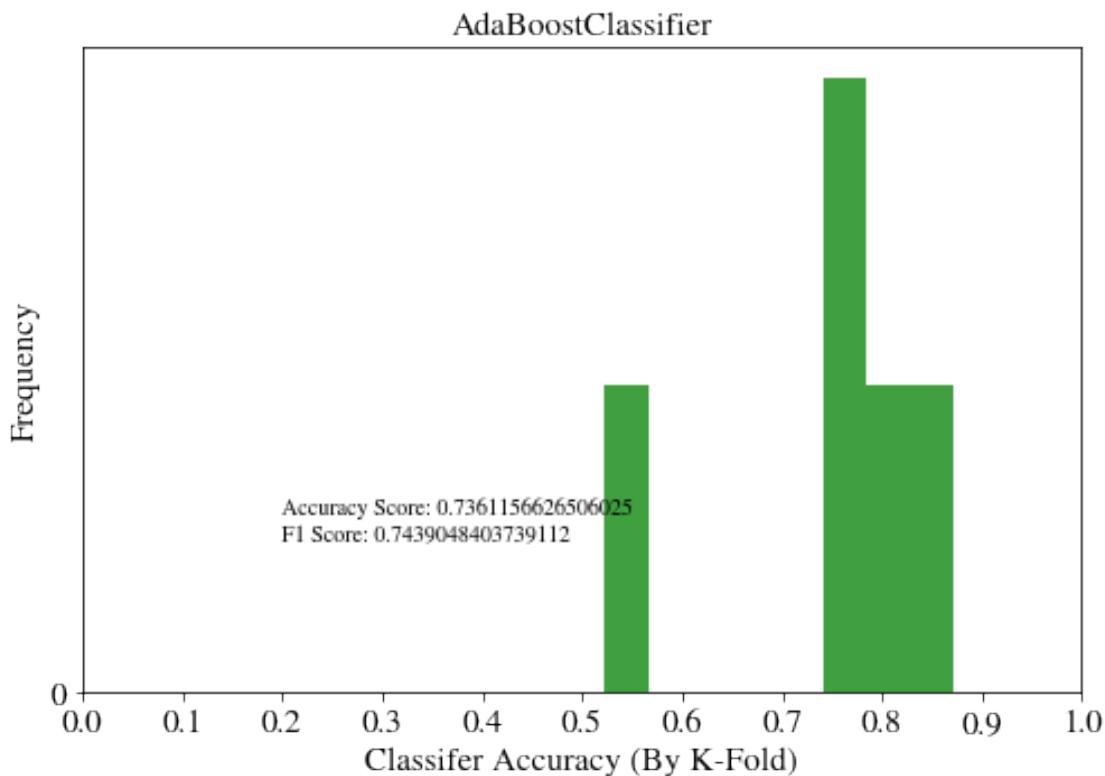
[0.612, 0.7, 0.3453815261044177, 0.7469879518072289, 0.7108433734939759],
```

```

'avgAccuracy': 0.6230425702811244, 'f1': [0.5703163370466703,
0.6525334754751052, 0.26205392838981134, 0.7229966988372337,
0.6641128360170154], 'avgF1': 0.5744026551531672, 'precision': [0.612, 0.7,
0.3453815261044177, 0.7469879518072289, 0.7108433734939759], 'avgPrecision':
0.6230425702811244, 'recall': [0.612, 0.7, 0.3453815261044177,
0.7469879518072289, 0.7108433734939759], 'avgRecall': 0.6230425702811244,
'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

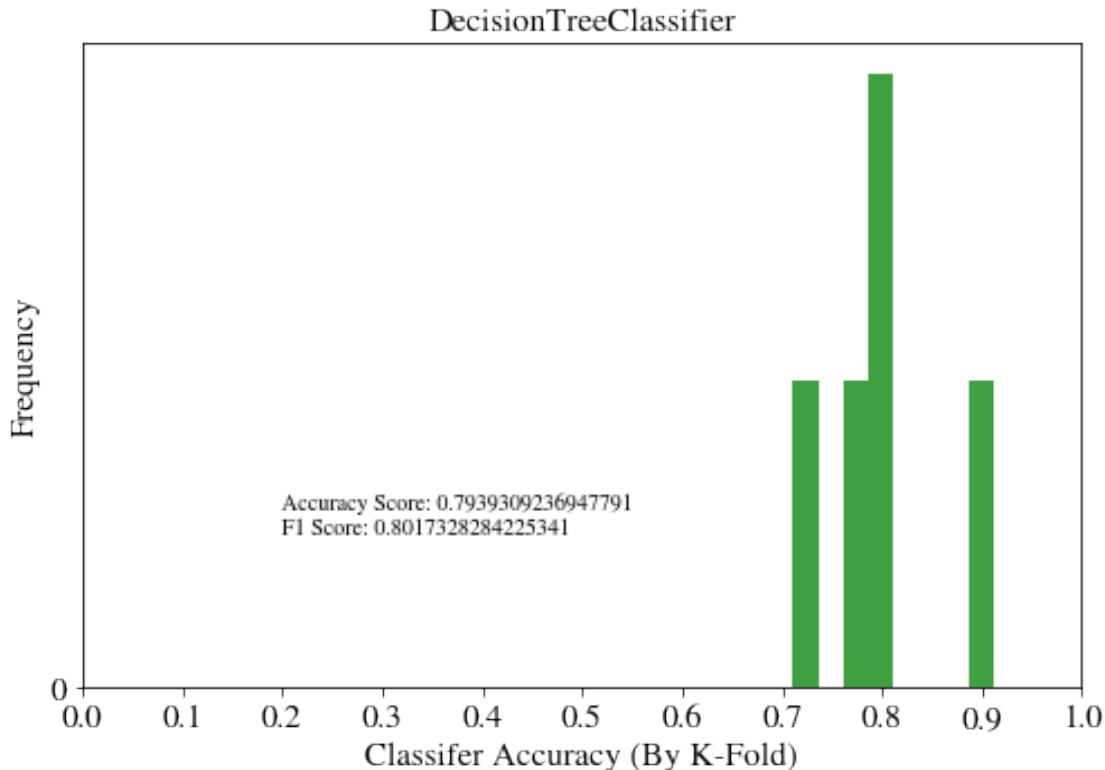
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation',
'accuracy': [0.748, 0.788, 0.751004016064257, 0.8714859437751004,
```

```

0.5220883534136547], 'avgAccuracy': 0.7361156626506025, 'f1':
[0.7539368421052631, 0.7920261861464706, 0.7564118716678138, 0.9065167298837837,
0.5106325720662253], 'avgF1': 0.7439048403739112, 'precision': [0.748, 0.788,
0.751004016064257, 0.8714859437751004, 0.5220883534136547], 'avgPrecision':
0.7361156626506025, 'recall': [0.748, 0.788, 0.751004016064257,
0.8714859437751004, 0.5220883534136547], 'avgRecall': 0.7361156626506025,
'params': [{'algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1,
'n_estimators': 50, 'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



```

*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation',

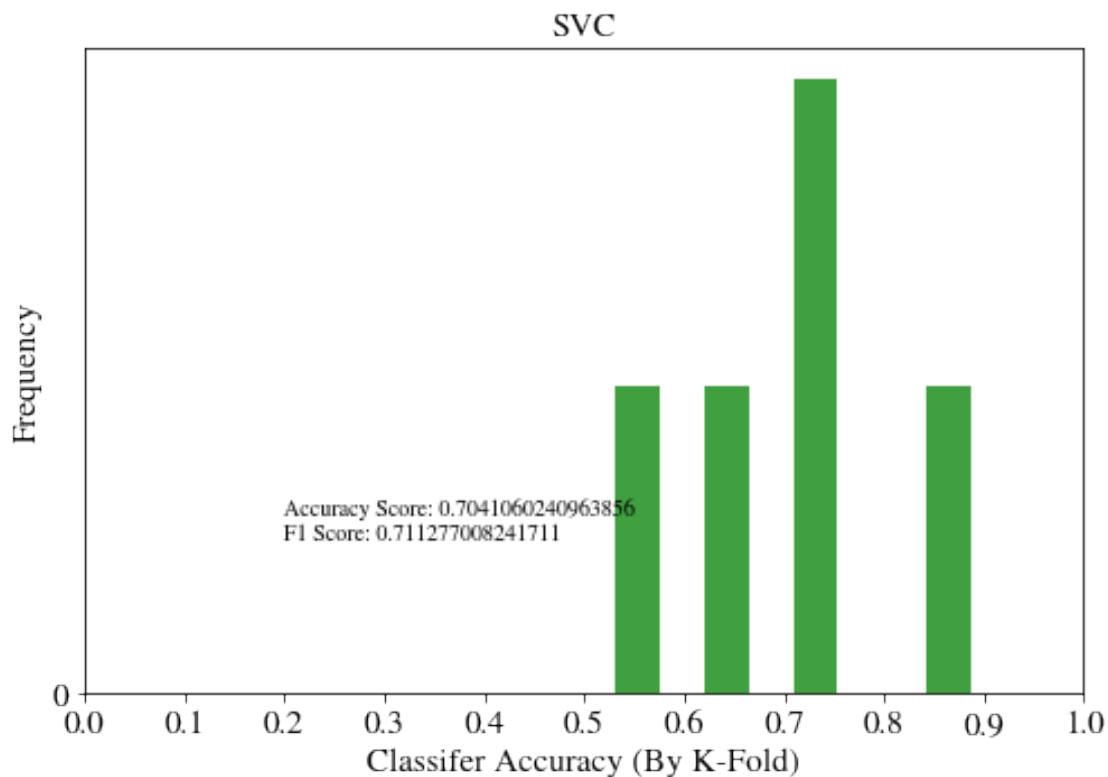
```

```

'accuracy': [0.764, 0.792, 0.7911646586345381, 0.9116465863453815,
0.7108433734939759], 'avgAccuracy': 0.7939309236947791, 'f1': [0.76549198056337,
0.7921286327005559, 0.7965508189093156, 0.9368990767271568, 0.7175936332122722],
'avgF1': 0.8017328284225341, 'precision': [0.764, 0.792, 0.7911646586345381,
0.9116465863453815, 0.7108433734939759], 'avgPrecision': 0.7939309236947791,
'recall': [0.764, 0.792, 0.7911646586345381, 0.9116465863453815,
0.7108433734939759], 'avgRecall': 0.7939309236947791, 'params': [{ccp_alpha':
0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None,
'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****

```

Processing Model: SVC



```

*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt
Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in
lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,
Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,
Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists

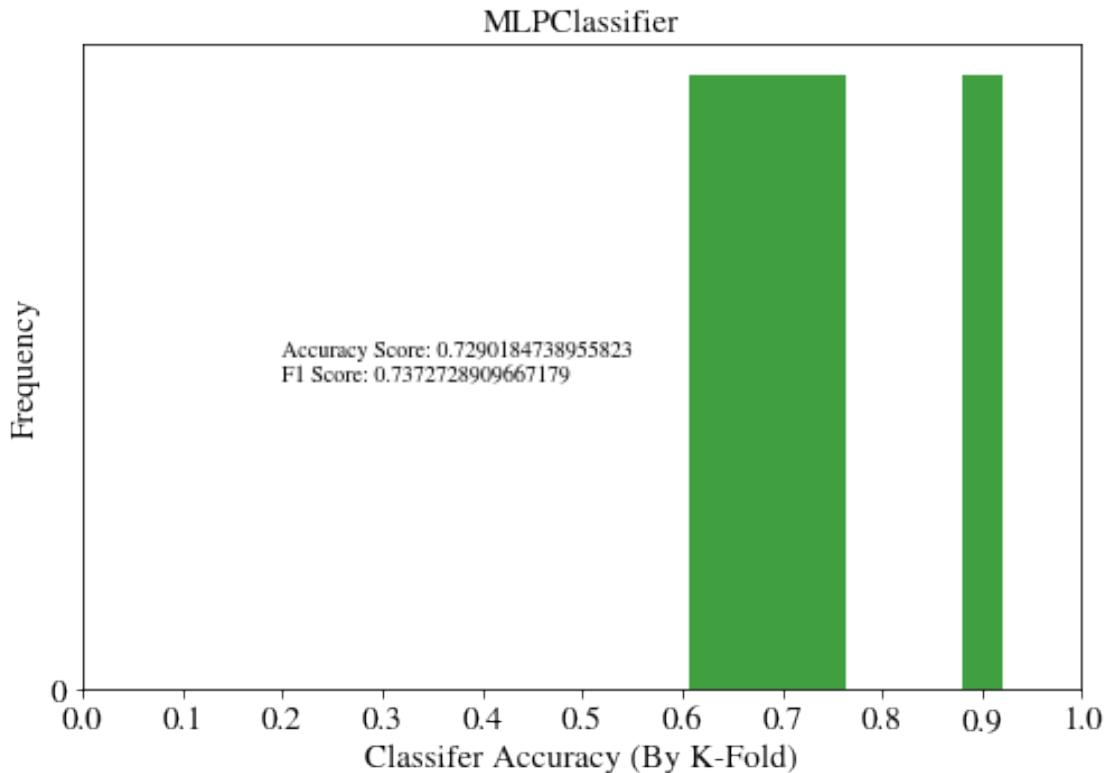
```

```

diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina
propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal
histiocytic cells, Sex, Method of confirmation', 'accuracy': [0.66, 0.728,
0.5301204819277109, 0.8875502008032129, 0.714859437751004], 'avgAccuracy':
0.7041060240963856, 'f1': [0.6666002938348524, 0.741433586337761,
0.5152696686702893, 0.9087924732638418, 0.7242890191018106], 'avgF1':
0.711277008241711, 'precision': [0.66, 0.728, 0.5301204819277109,
0.8875502008032129, 0.714859437751004], 'avgPrecision': 0.7041060240963856,
'recall': [0.66, 0.728, 0.5301204819277109, 0.8875502008032129,
0.714859437751004], 'avgRecall': 0.7041060240963856, 'params': [{'
C': 1.0,
'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0,
'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':
'linear', 'max_iter': -1, 'probability': False, 'random_state': None,
'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```

*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal

```

```

increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation', 'accuracy':
[0.66, 0.712, 0.606425702811245, 0.9196787148594378, 0.7469879518072289],
'avgAccuracy': 0.7290184738955823, 'f1': [0.6666002938348524,
0.7260351575007857, 0.6073313413706749, 0.9350929730482624, 0.7513046890790139],
'avgF1': 0.7372728909667179, 'precision': [0.66, 0.712, 0.606425702811245,
0.9196787148594378, 0.7469879518072289], 'avgPrecision': 0.7290184738955823,
'recall': [0.66, 0.712, 0.606425702811245, 0.9196787148594378,
0.7469879518072289], 'avgRecall': 0.7290184738955823, 'params': [{activation':
'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum':
True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam',
'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start':
False}]]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation', 'accuracy': [0.788, 0.856, 0.8232931726907631, 0.9357429718875502, 0.7630522088353414], 'avgAccuracy': 0.8332176706827309, 'f1': [0.786629708950831, 0.8543432502456894, 0.8287055946342051, 0.9494220853915963, 0.7693823999349707], 'avgF1': 0.8376966078314585, 'precision': [0.788, 0.856, 0.8232931726907631, 0.9357429718875502, 0.7630522088353414], 'avgPrecision': 0.8332176706827309, 'recall': [0.788, 0.856, 0.8232931726907631, 0.9357429718875502, 0.7630522088353414], 'avgRecall': 0.8332176706827309, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 700, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

model	features \
0 RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...

```

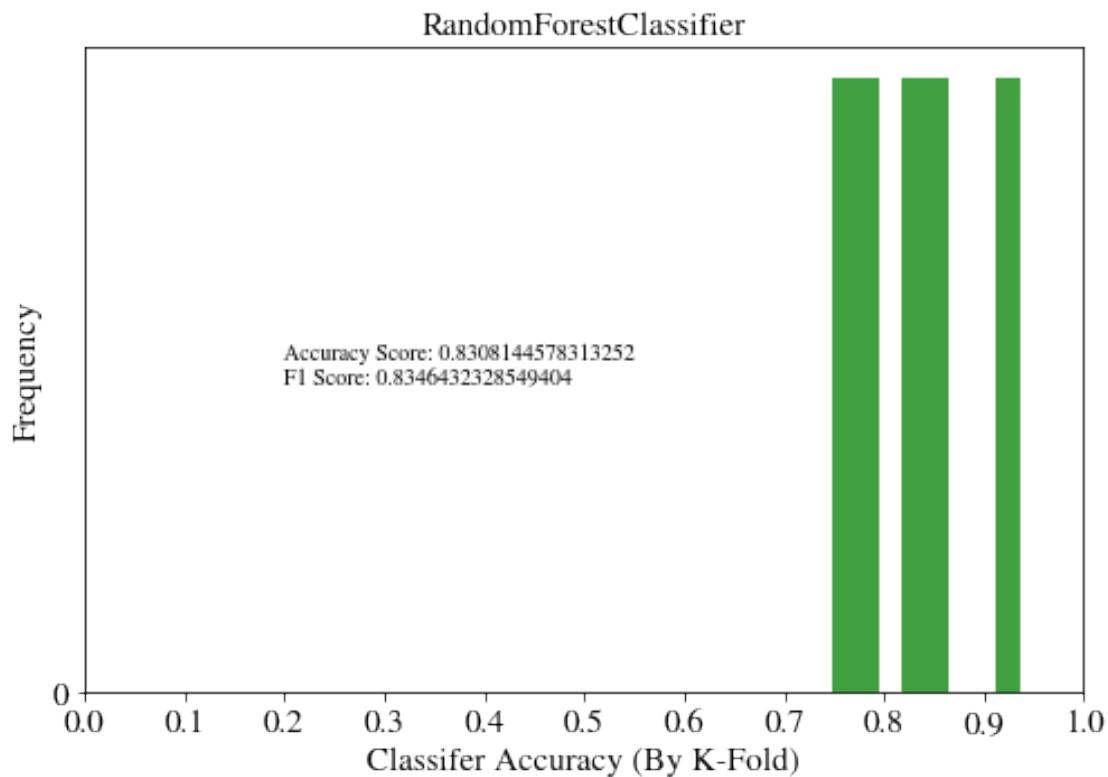
1 KNeighborsClassifier Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB Active inflammation?, Severity of Crypt Arch, ...
4 AdaBoostClassifier Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier Active inflammation?, Severity of Crypt Arch, ...
6 SVC Active inflammation?, Severity of Crypt Arch, ...
7 MLPClassifier Active inflammation?, Severity of Crypt Arch, ...

accuracy      f1  precision   recall  \
0 0.830011  0.834631  0.830011  0.830011
1 0.763473  0.775215  0.763473  0.763473
2 0.686477  0.698803  0.686477  0.686477
3 0.623043  0.574403  0.623043  0.623043
4 0.732132  0.742984  0.732132  0.732132
5 0.770683  0.780004  0.770683  0.770683
6 0.704106  0.711277  0.704106  0.704106
7 0.714567  0.728096  0.714567  0.714567

                                params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3 {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier

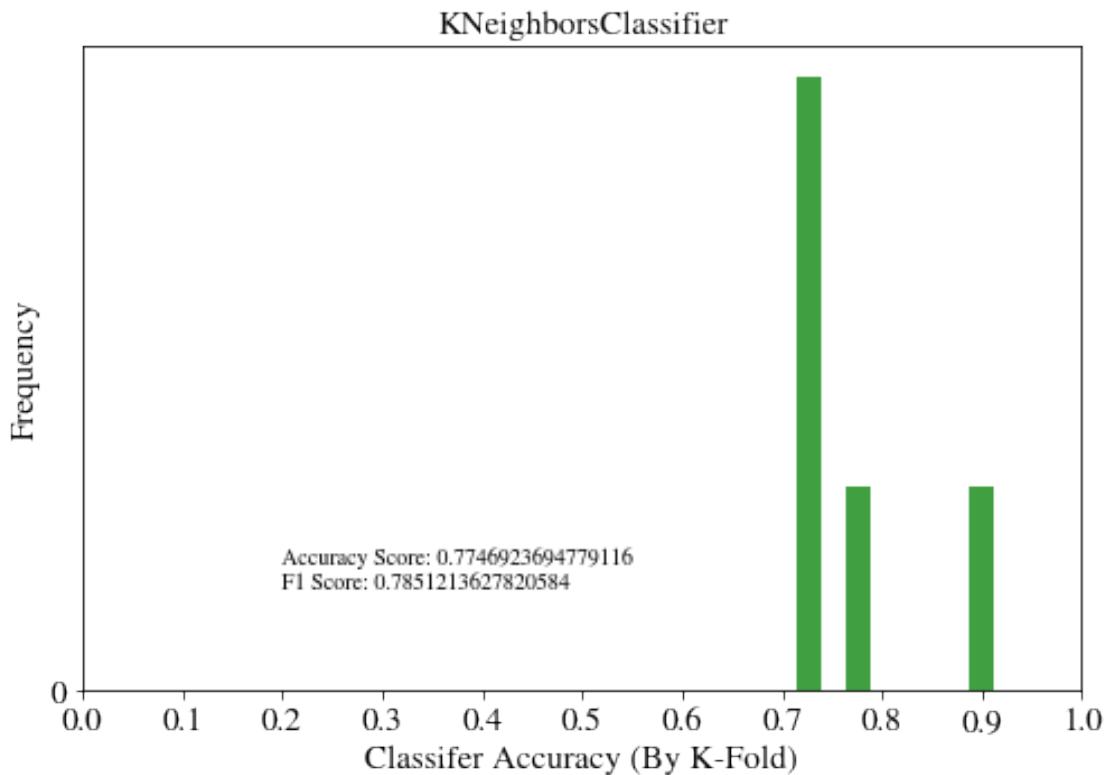


```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex', 'accuracy': [0.78, 0.856, 0.8353413654618473, 0.9357429718875502, 0.7469879518072289], 'avgAccuracy': 0.8308144578313252, 'f1': [0.7795010339122027, 0.8524858181818181, 0.8414200373539021, 0.9454091437382768, 0.7544001310885018], 'avgF1': 0.8346432328549404, 'precision': [0.78, 0.856, 0.8353413654618473, 0.9357429718875502, 0.7469879518072289], 'avgPrecision': 0.8308144578313252, 'recall': [0.78, 0.856, 0.8353413654618473, 0.9357429718875502, 0.7469879518072289], 'avgRecall': 0.8308144578313252, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 100, 'random_state': 42}]}*****
```

```
'n_estimators': 200, 'n_jobs': -1, 'oob_score': False, 'random_state': None,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



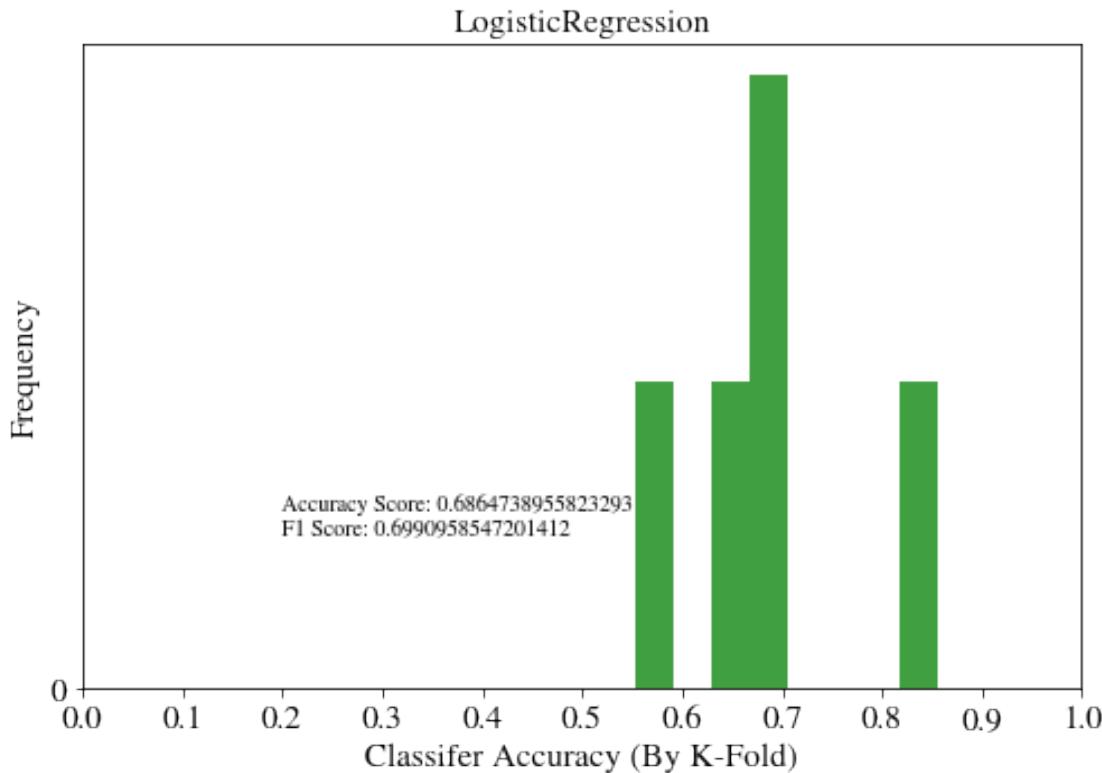
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex', 'accuracy': [0.736, 0.772,  
0.714859437751004, 0.9116465863453815, 0.7389558232931727], 'avgAccuracy':  
0.7746923694779116, 'f1': [0.7397384221916191, 0.7827992743398509,  
0.7207223088002178, 0.9318778462896489, 0.750468962288955], 'avgF1':  
0.7851213627820584, 'precision': [0.736, 0.772, 0.714859437751004,  
0.9116465863453815, 0.7389558232931727], 'avgPrecision': 0.7746923694779116,  
'recall': [0.736, 0.772, 0.714859437751004, 0.9116465863453815,
```

```

0.7389558232931727], 'avgRecall': 0.7746923694779116, 'params': [{}{'algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 12, 'p': 2, 'weights': 'distance'}]}
*****

```

Processing Model: LogisticRegression



```

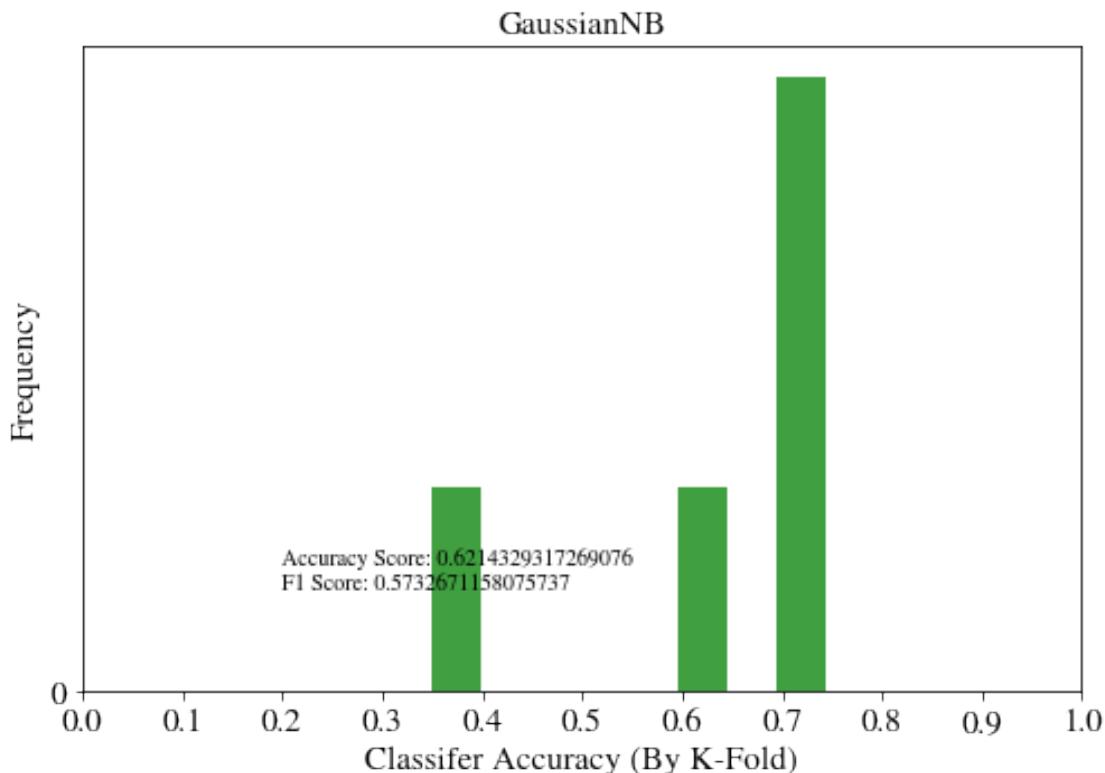
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex', 'accuracy': [0.644, 0.696,  
0.5542168674698795, 0.8554216867469879, 0.6827309236947792], 'avgAccuracy':  
0.6864738955823293, 'f1': [0.6515173780142648, 0.7070664392236676,  
0.5547561522211567, 0.892544969795147, 0.6895943343464702], 'avgF1':  
0.6990958547201412, 'precision': [0.644, 0.696, 0.5542168674698795,  
0.8554216867469879, 0.6827309236947792], 'avgPrecision': 0.6864738955823293,
```

```

'recall': [0.644, 0.696, 0.5542168674698795, 0.8554216867469879,
0.6827309236947792], 'avgRecall': 0.6864738955823293, 'params': [{'
C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs':
-1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

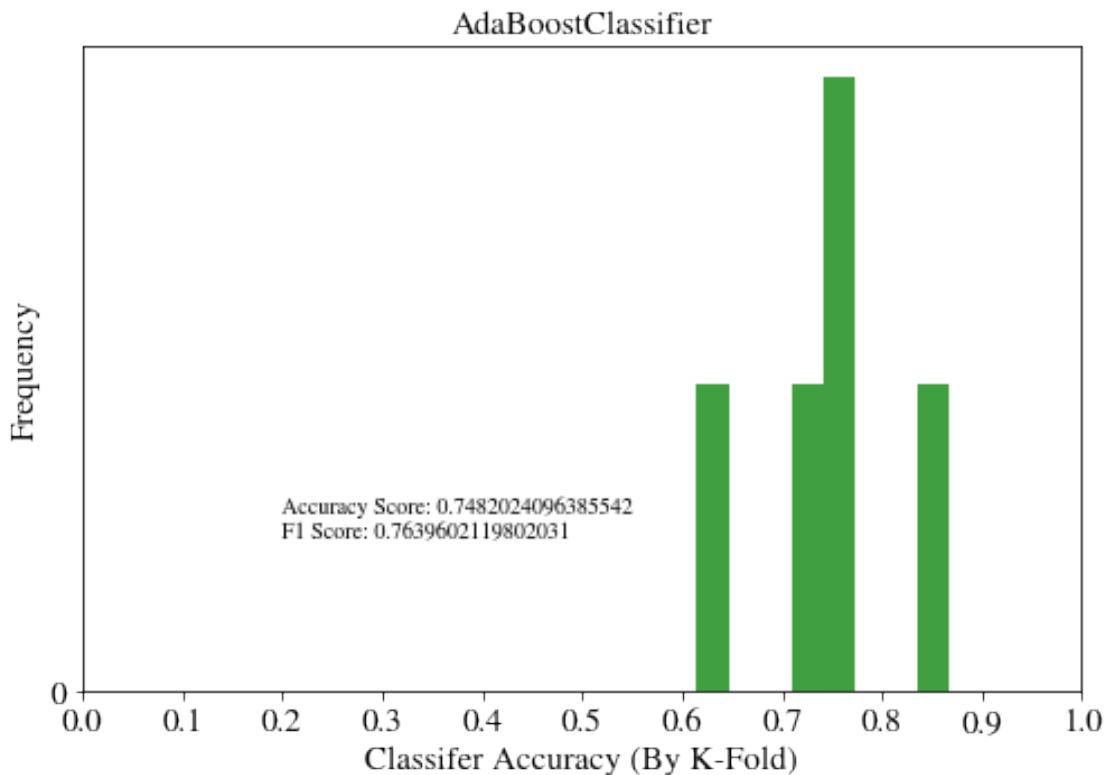
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex', 'accuracy': [0.616, 0.7,
0.3493975903614458, 0.7429718875502008, 0.6987951807228916], 'avgAccuracy':
0.6214329317269076, 'f1': [0.5743860234578201, 0.6533296173711151,
```

```

0.26429635828605347, 0.7209942130727635, 0.6533293668501166], 'avgF1':
0.5732671158075737, 'precision': [0.616, 0.7, 0.3493975903614458,
0.7429718875502008, 0.6987951807228916], 'avgPrecision': 0.6214329317269076,
'recall': [0.616, 0.7, 0.3493975903614458, 0.7429718875502008,
0.6987951807228916], 'avgRecall': 0.6214329317269076, 'params': [{'priors':
None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

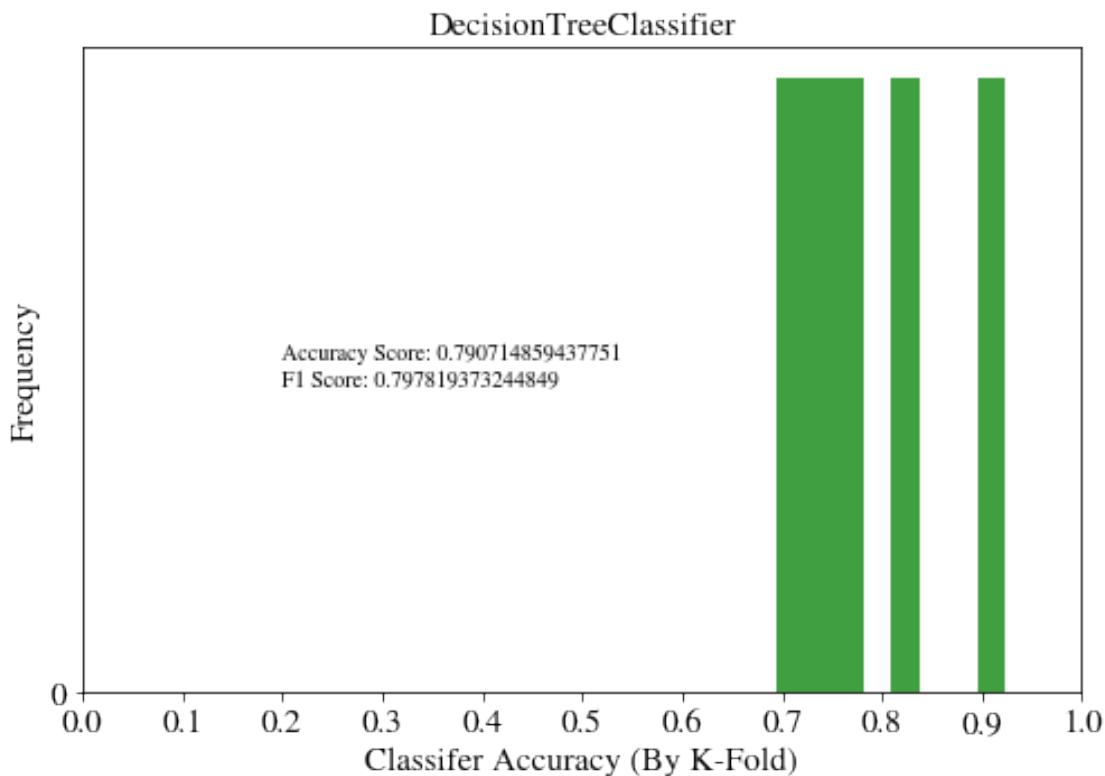
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex', 'accuracy': [0.736, 0.752, 0.7710843373493976, 0.8674698795180723, 0.6144578313253012], 'avgAccuracy': 0.7482024096385542, 'f1': [0.7415755725190839, 0.7651572536716337,
```

```

0.7774378031904204, 0.8997312209418317, 0.6358992095780461], 'avgF1':
0.7639602119802031, 'precision': [0.736, 0.752, 0.7710843373493976,
0.8674698795180723, 0.6144578313253012], 'avgPrecision': 0.7482024096385542,
'recall': [0.736, 0.752, 0.7710843373493976, 0.8674698795180723,
0.6144578313253012], 'avgRecall': 0.7482024096385542, 'params': [{algorithm':
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 100,
'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



```

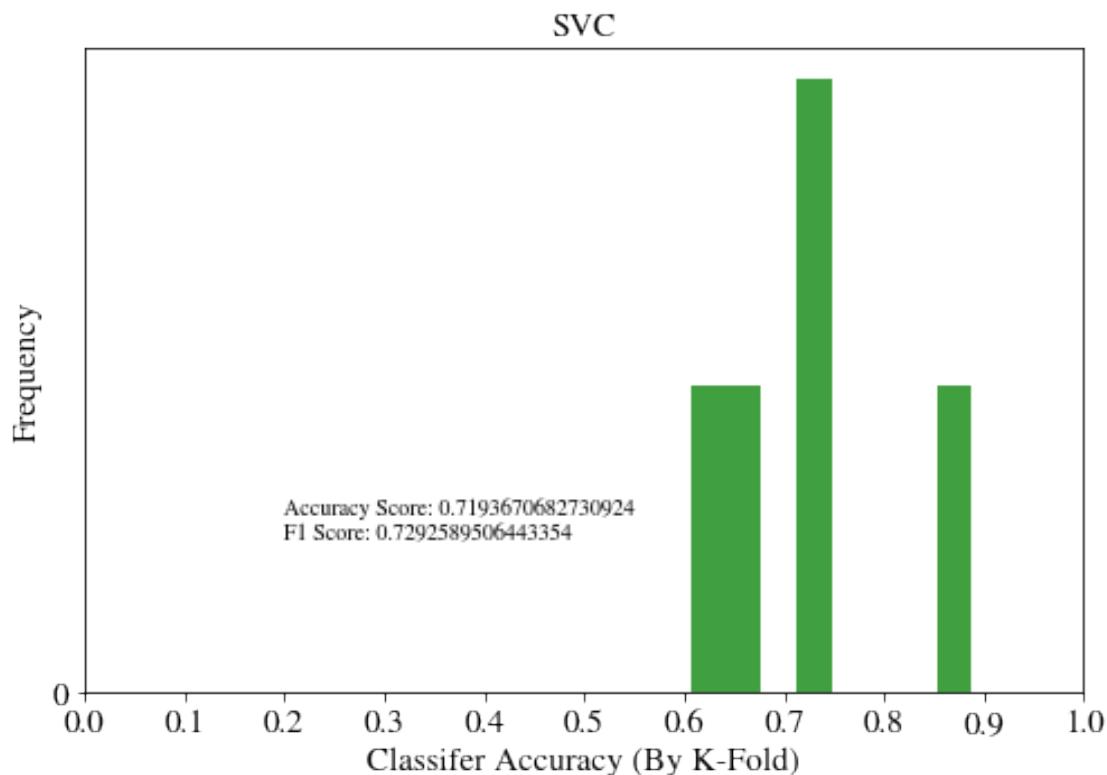
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex', 'accuracy': [0.732, 0.828,  
0.7751004016064257, 0.9236947791164659, 0.6947791164658634], 'avgAccuracy':
```

```

0.790714859437751, 'f1': [0.7319724058583545, 0.825237214280254,
0.7848948414098742, 0.9402637476937555, 0.7067286569820068], 'avgF1':
0.797819373244849, 'precision': [0.732, 0.828, 0.7751004016064257,
0.9236947791164659, 0.6947791164658634], 'avgPrecision': 0.790714859437751,
'recall': [0.732, 0.828, 0.7751004016064257, 0.9236947791164659,
0.6947791164658634], 'avgRecall': 0.790714859437751, 'params': [{'
ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None,
'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****

```

Processing Model: SVC



```

*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt
Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in
lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,
Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,
Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists
diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina

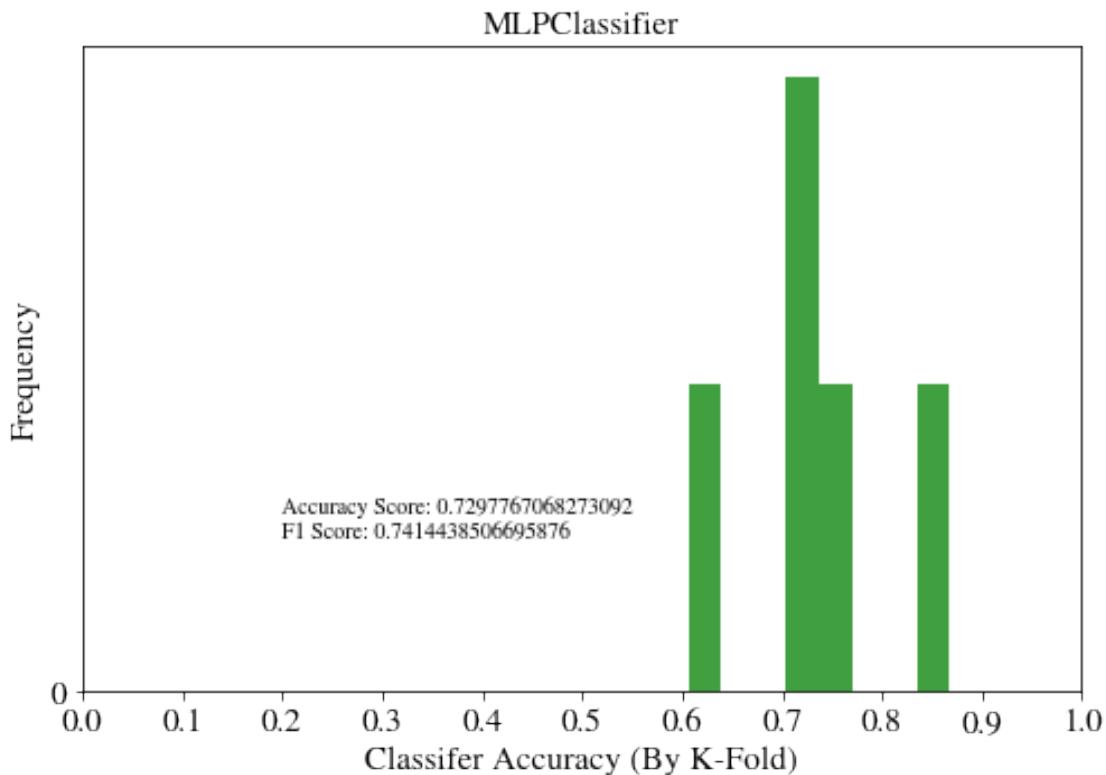
```

```

propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal
histiocytic cells, Sex', 'accuracy': [0.656, 0.732, 0.606425702811245,
0.8875502008032129, 0.714859437751004], 'avgAccuracy': 0.7193670682730924, 'f1':
[0.6626529299037235, 0.7436796767676769, 0.6068806541846241, 0.9087924732638418,
0.7242890191018106], 'avgF1': 0.7292589506443354, 'precision': [0.656, 0.732,
0.606425702811245, 0.8875502008032129, 0.714859437751004], 'avgPrecision':
0.7193670682730924, 'recall': [0.656, 0.732, 0.606425702811245,
0.8875502008032129, 0.714859437751004], 'avgRecall': 0.7193670682730924,
'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight':
None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma':
'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False,
'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```

*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial

```

```

changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex', 'accuracy': [0.712, 0.716,
0.606425702811245, 0.8674698795180723, 0.7469879518072289], 'avgAccuracy':
0.7297767068273092, 'f1': [0.7178415971404832, 0.7287226890756303,
0.607451731342416, 0.9006623631062487, 0.7525408726831597], 'avgF1':
0.7414438506695876, 'precision': [0.712, 0.716, 0.606425702811245,
0.8674698795180723, 0.7469879518072289], 'avgPrecision': 0.7297767068273092,
'recall': [0.712, 0.716, 0.606425702811245, 0.8674698795180723,
0.7469879518072289], 'avgRecall': 0.7297767068273092, 'params': [{activation':
'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex', 'accuracy': [0.78, 0.856, 0.8353413654618473, 0.9357429718875502, 0.7469879518072289], 'avgAccuracy': 0.8308144578313252, 'f1': [0.7795010339122027, 0.8524858181818181, 0.8414200373539021, 0.9454091437382768, 0.7544001310885018], 'avgF1': 0.8346432328549404, 'precision': [0.78, 0.856, 0.8353413654618473, 0.9357429718875502, 0.7469879518072289], 'avgPrecision': 0.8308144578313252, 'recall': [0.78, 0.856, 0.8353413654618473, 0.9357429718875502, 0.7469879518072289], 'avgRecall': 0.8308144578313252, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

model	features \
0 RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...

```

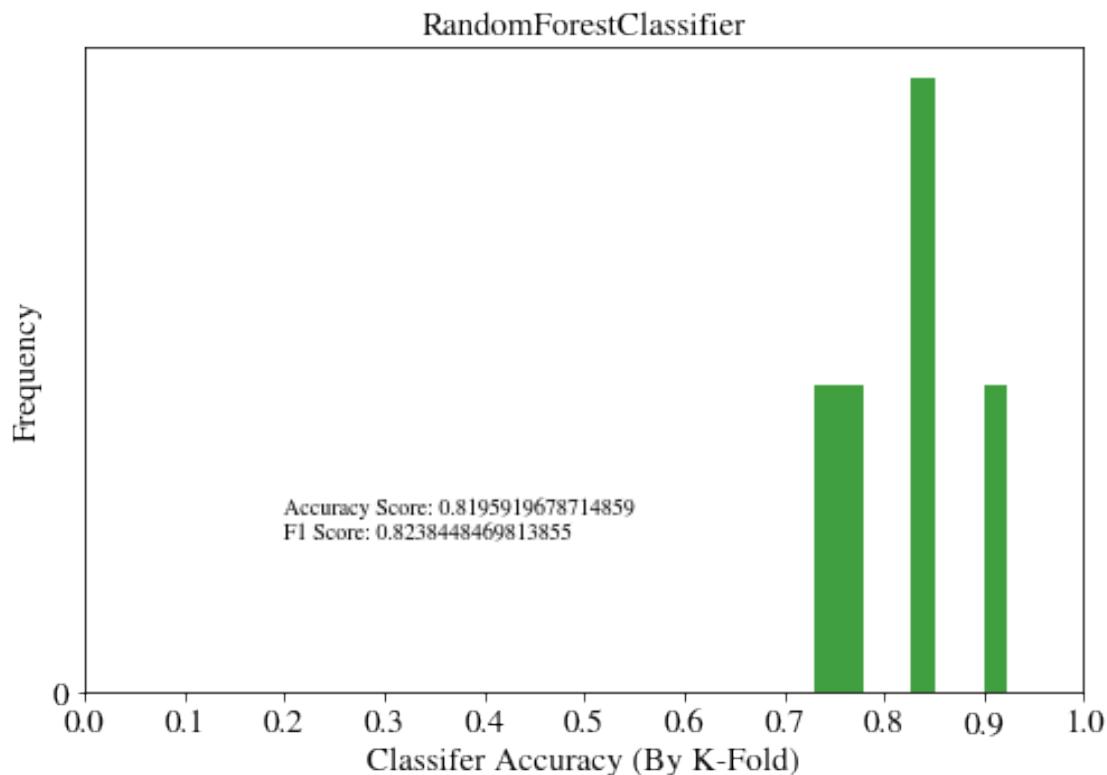
3      GaussianNB  Active inflammation?, Severity of Crypt Arch, ...
4      AdaBoostClassifier  Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier  Active inflammation?, Severity of Crypt Arch, ...
6          SVC  Active inflammation?, Severity of Crypt Arch, ...
7      MLPClassifier  Active inflammation?, Severity of Crypt Arch, ...

accuracy      f1  precision  recall  \
0  0.827602  0.831613  0.827602  0.827602
1  0.765876  0.777462  0.765876  0.765876
2  0.686474  0.699096  0.686474  0.686474
3  0.621433  0.573267  0.621433  0.621433
4  0.743438  0.758760  0.743438  0.743438
5  0.766673  0.776639  0.766673  0.766673
6  0.719367  0.729259  0.719367  0.719367
7  0.713754  0.726331  0.713754  0.713754

                                params
0  {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1  {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2  {'C': 1, 'class_weight': None, 'dual': False, ...
3      {'priors': None, 'var_smoothing': 1e-09}
4  {'algorithm': 'SAMME.R', 'base_estimator': Non...
5  {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6  {'C': 1.0, 'break_ties': False, 'cache_size': ...
7  {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier

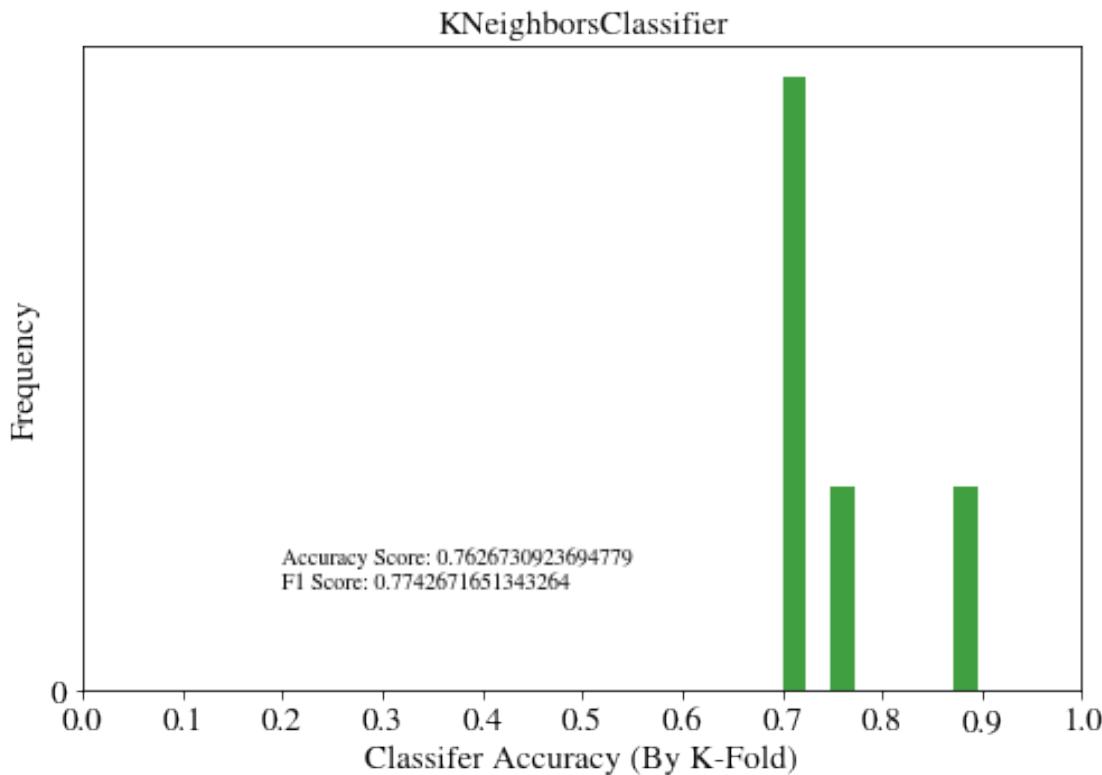


```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells', 'accuracy': [0.772, 0.836, 0.8353413654618473, 0.9236947791164659, 0.7309236947791165], 'avgAccuracy': 0.8195919678714859, 'f1': [0.772909546119789, 0.8309398482280999, 0.841596589315639, 0.9388218244517653, 0.7349564267916341], 'avgF1': 0.8238448469813855, 'precision': [0.772, 0.836, 0.8353413654618473, 0.9236947791164659, 0.7309236947791165], 'avgPrecision': 0.8195919678714859, 'recall': [0.772, 0.836, 0.8353413654618473, 0.9236947791164659, 0.7309236947791165], 'avgRecall': 0.8195919678714859, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 100, 'oob_score': False, 'random_state': 42, 'verbose': 0}], 'best_params': {'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 100, 'oob_score': False, 'random_state': 42, 'verbose': 0}, 'best_score': 0.8195919678714859}
```

```
'n_estimators': 200, 'n_jobs': -1, 'oob_score': False, 'random_state': None,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



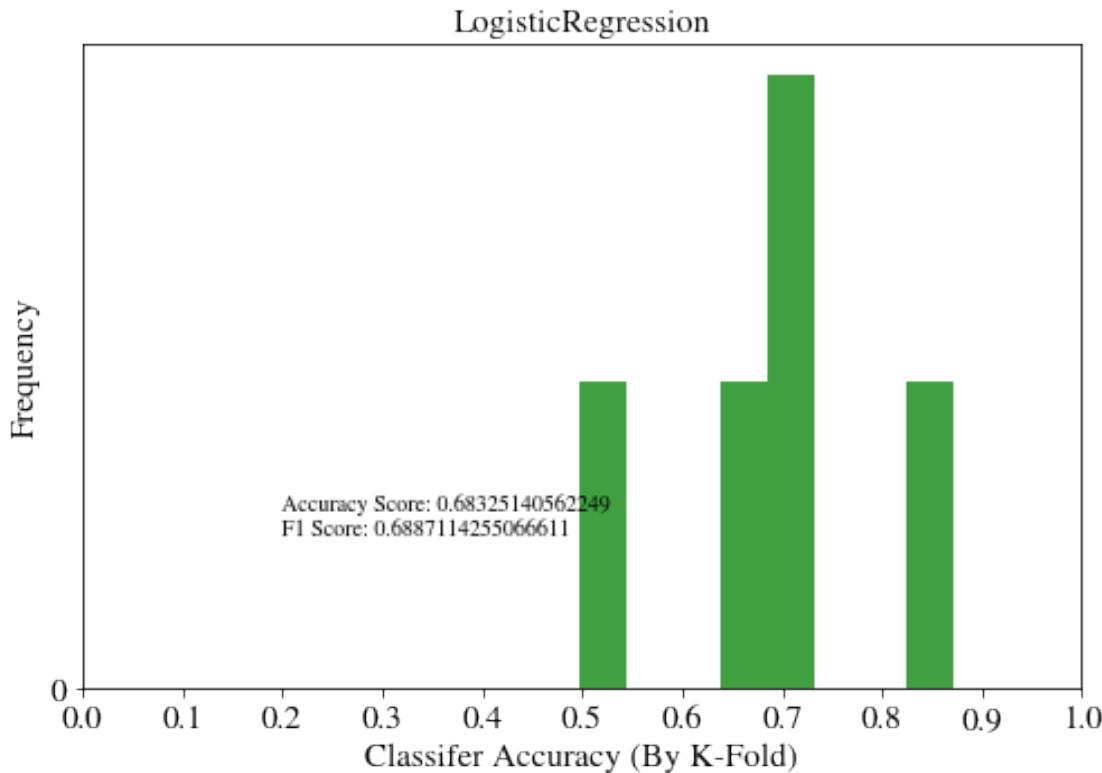
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells', 'accuracy': [0.7, 0.772,  
0.7228915662650602, 0.8955823293172691, 0.7228915662650602], 'avgAccuracy':  
0.7626730923694779, 'f1': [0.705693483980808, 0.7783788706739526,  
0.728489924360571, 0.9266940288627036, 0.7320795177935968], 'avgF1':  
0.7742671651343264, 'precision': [0.7, 0.772, 0.7228915662650602,  
0.8955823293172691, 0.7228915662650602], 'avgPrecision': 0.7626730923694779,  
'recall': [0.7, 0.772, 0.7228915662650602, 0.8955823293172691,
```

```

0.7228915662650602], 'avgRecall': 0.7626730923694779, 'params': [{}{'algorithm': 'kd_tree', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 14, 'p': 2, 'weights': 'distance'}]]}
*****

```

Processing Model: LogisticRegression



```

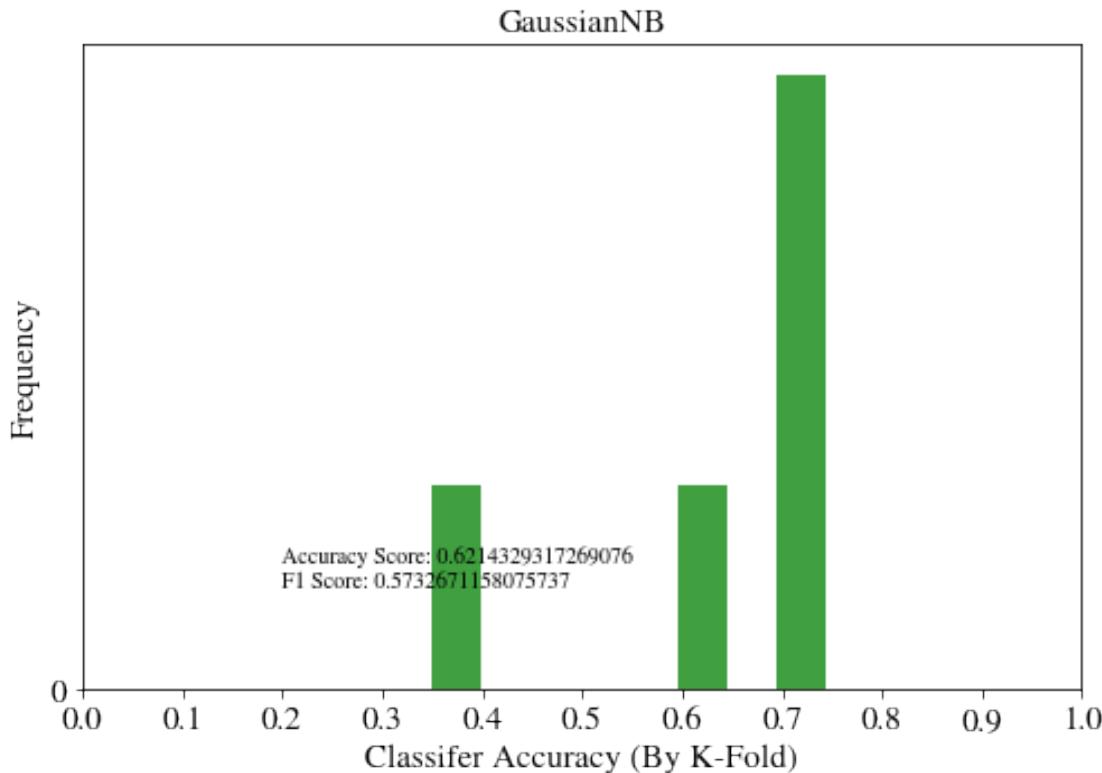
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells', 'accuracy': [0.644, 0.708,  
0.4979919678714859, 0.8714859437751004, 0.6947791164658634], 'avgAccuracy':  
0.68325140562249, 'f1': [0.6529822888447414, 0.7178517553726835,  
0.4695538886056692, 0.9009413968269467, 0.7022277978832643], 'avgF1':  
0.6887114255066611, 'precision': [0.644, 0.708, 0.4979919678714859,  
0.8714859437751004, 0.6947791164658634], 'avgPrecision': 0.68325140562249,
```

```

'recall': [0.644, 0.708, 0.4979919678714859, 0.8714859437751004,
0.6947791164658634], 'avgRecall': 0.68325140562249, 'params': [{'C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs':
-1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

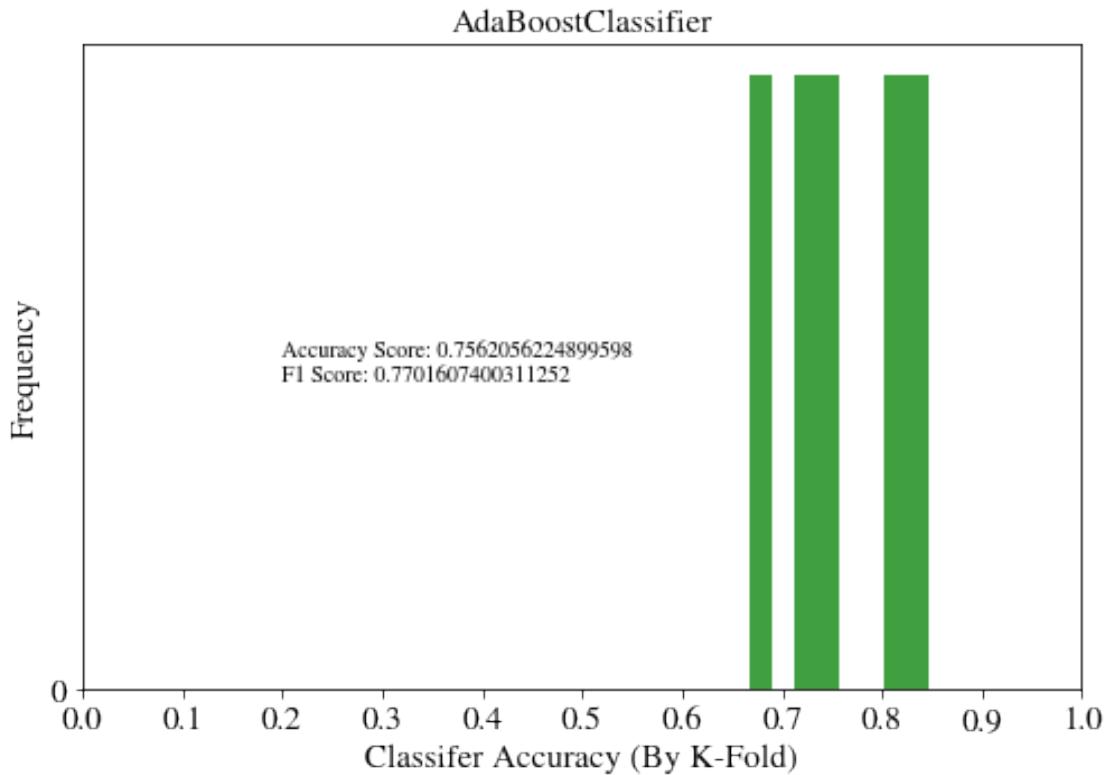
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells', 'accuracy': [0.616, 0.7,
0.3493975903614458, 0.7429718875502008, 0.6987951807228916], 'avgAccuracy':
0.6214329317269076, 'f1': [0.5743860234578201, 0.6533296173711151,
```

```

0.26429635828605347, 0.7209942130727635, 0.6533293668501166], 'avgF1':
0.5732671158075737, 'precision': [0.616, 0.7, 0.3493975903614458,
0.7429718875502008, 0.6987951807228916], 'avgPrecision': 0.6214329317269076,
'recall': [0.616, 0.7, 0.3493975903614458, 0.7429718875502008,
0.6987951807228916], 'avgRecall': 0.6214329317269076, 'params': [{'priors':
None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells', 'accuracy': [0.72, 0.804,  
0.7429718875502008, 0.8473895582329317, 0.6666666666666666], 'avgAccuracy':  
0.7562056224899598, 'f1': [0.7251825853682078, 0.8088976554656587,
```

```

0.7432984685996734, 0.8884841692350799, 0.6849408214870063], 'avgF1':  

0.7701607400311252, 'precision': [0.72, 0.804, 0.7429718875502008,  

0.8473895582329317, 0.6666666666666666], 'avgPrecision': 0.7562056224899598,  

'recall': [0.72, 0.804, 0.7429718875502008, 0.8473895582329317,  

0.6666666666666666], 'avgRecall': 0.7562056224899598, 'params': [{  

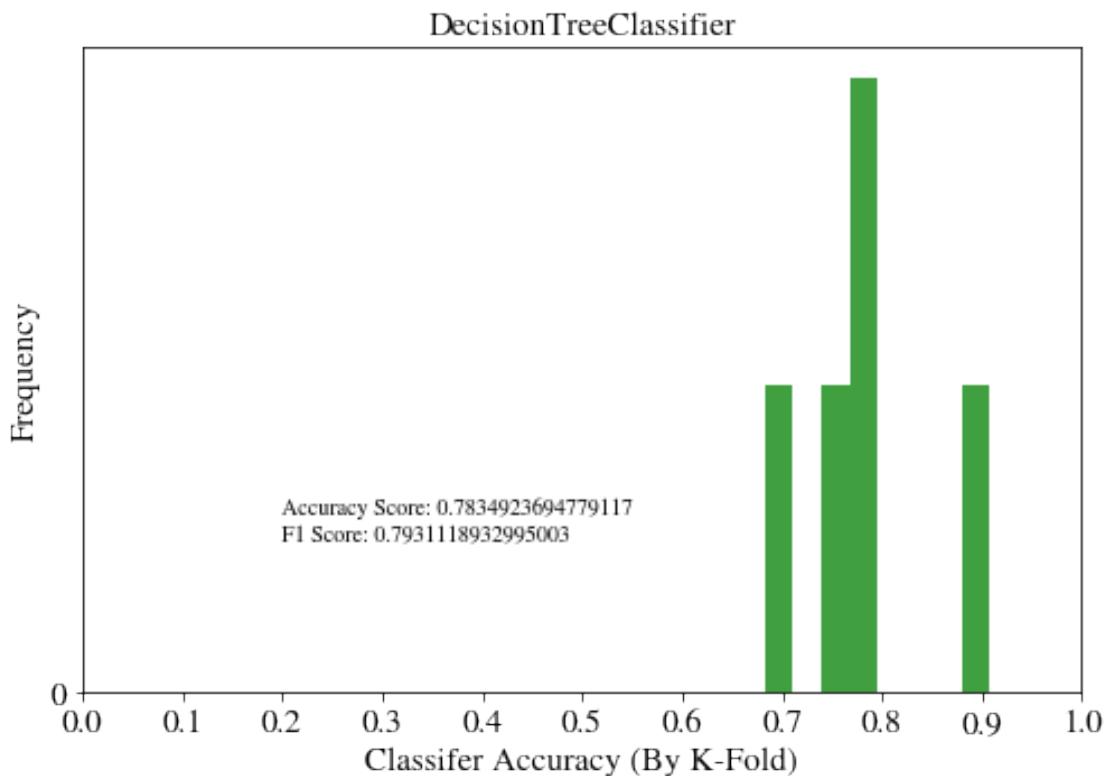
'algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 300,  

'random_state': None}]}  

*****

```

Processing Model: DecisionTreeClassifier



```

*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  

Submucosal granulomas, Basal histiocytic cells', 'accuracy': [0.764, 0.788,  

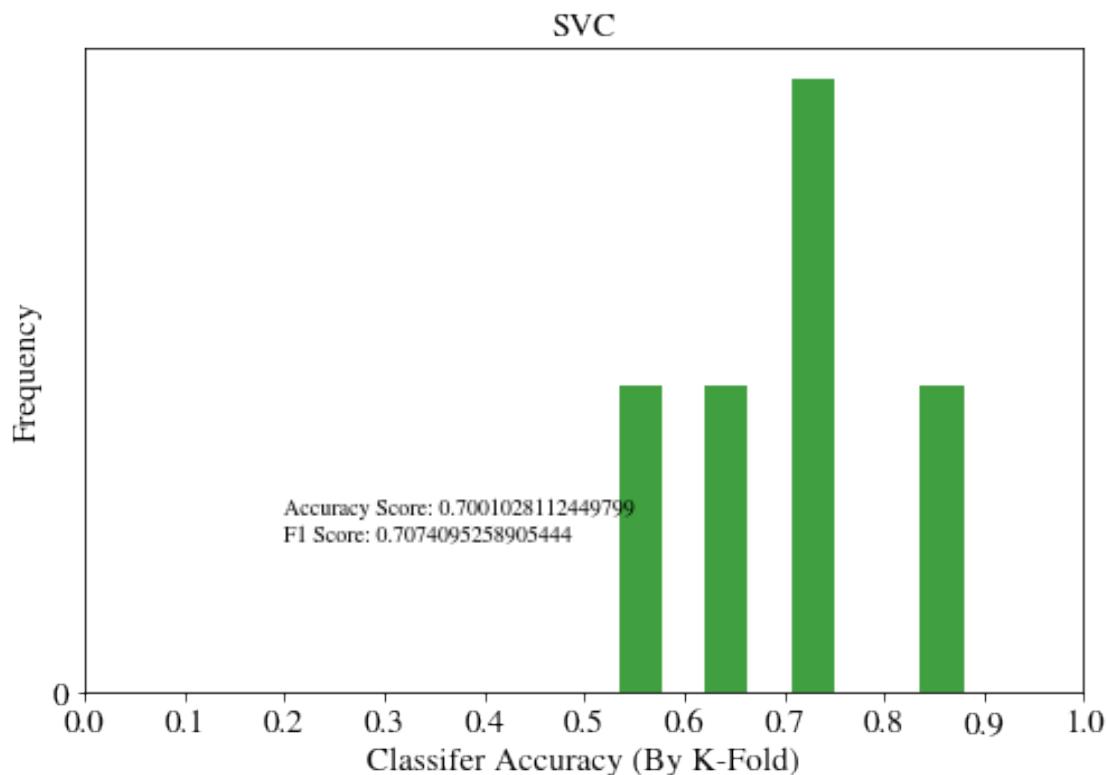
0.7751004016064257, 0.9076305220883534, 0.6827309236947792], 'avgAccuracy':
```

```

0.7834923694779117, 'f1': [0.7697912741706436, 0.790306127152758,
0.7814546785067165, 0.9314622227791003, 0.6925451638882828], 'avgF1':
0.7931118932995003, 'precision': [0.764, 0.788, 0.7751004016064257,
0.9076305220883534, 0.6827309236947792], 'avgPrecision': 0.7834923694779117,
'recall': [0.764, 0.788, 0.7751004016064257, 0.9076305220883534,
0.6827309236947792], 'avgRecall': 0.7834923694779117, 'params': [{'ccp_alpha':
0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None,
'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****

```

Processing Model: SVC



```

*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt
Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in
lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,
Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,
Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists
diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina

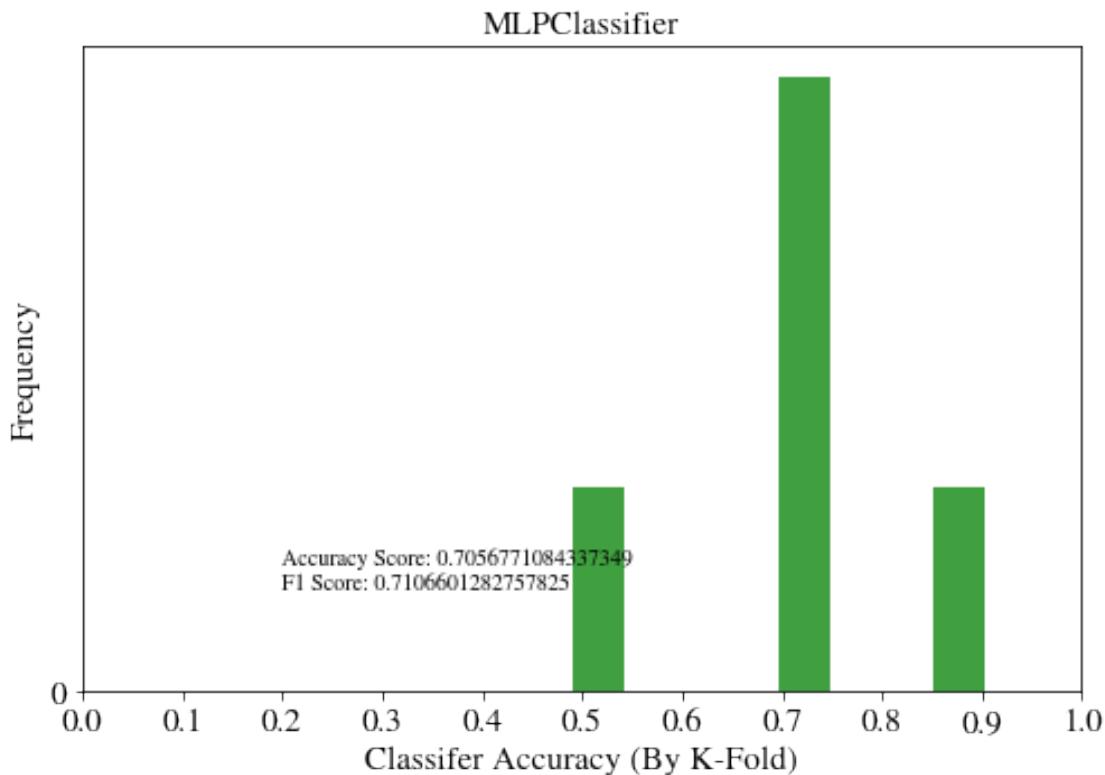
```

```

propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal
histiocytic cells', 'accuracy': [0.656, 0.716, 0.5341365461847389,
0.8795180722891566, 0.714859437751004], 'avgAccuracy': 0.7001028112449799, 'f1':
[0.6626529299037235, 0.7293018597095743, 0.5171454232403913, 0.903198669477267,
0.7247487471217662], 'avgF1': 0.7074095258905444, 'precision': [0.656, 0.716,
0.5341365461847389, 0.8795180722891566, 0.714859437751004], 'avgPrecision':
0.7001028112449799, 'recall': [0.656, 0.716, 0.5341365461847389,
0.8795180722891566, 0.714859437751004], 'avgRecall': 0.7001028112449799,
'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight':
None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma':
'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False,
'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```

*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial

```

```

changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells', 'accuracy': [0.712, 0.72,
0.4899598393574297, 0.9036144578313253, 0.7028112449799196], 'avgAccuracy':
0.7056771084337349, 'f1': [0.7183457794491985, 0.7332605042016808,
0.46327499431105224, 0.925305419579367, 0.713113943837614], 'avgF1':
0.7106601282757825, 'precision': [0.712, 0.72, 0.4899598393574297,
0.9036144578313253, 0.7028112449799196], 'avgPrecision': 0.7056771084337349,
'recall': [0.712, 0.72, 0.4899598393574297, 0.9036144578313253,
0.7028112449799196], 'avgRecall': 0.7056771084337349, 'params': [{activation':
'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells', 'accuracy': [0.772, 0.836, 0.8353413654618473, 0.9236947791164659, 0.7309236947791165], 'avgAccuracy': 0.8195919678714859, 'f1': [0.772909546119789, 0.8309398482280999, 0.841596589315639, 0.9388218244517653, 0.7349564267916341], 'avgF1': 0.8238448469813855, 'precision': [0.772, 0.836, 0.8353413654618473, 0.9236947791164659, 0.7309236947791165], 'avgPrecision': 0.8195919678714859, 'recall': [0.772, 0.836, 0.8353413654618473, 0.9236947791164659, 0.7309236947791165], 'avgRecall': 0.8195919678714859, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
model features \
0 RandomForestClassifier Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression Active inflammation?, Severity of Crypt Arch, ...

```

```

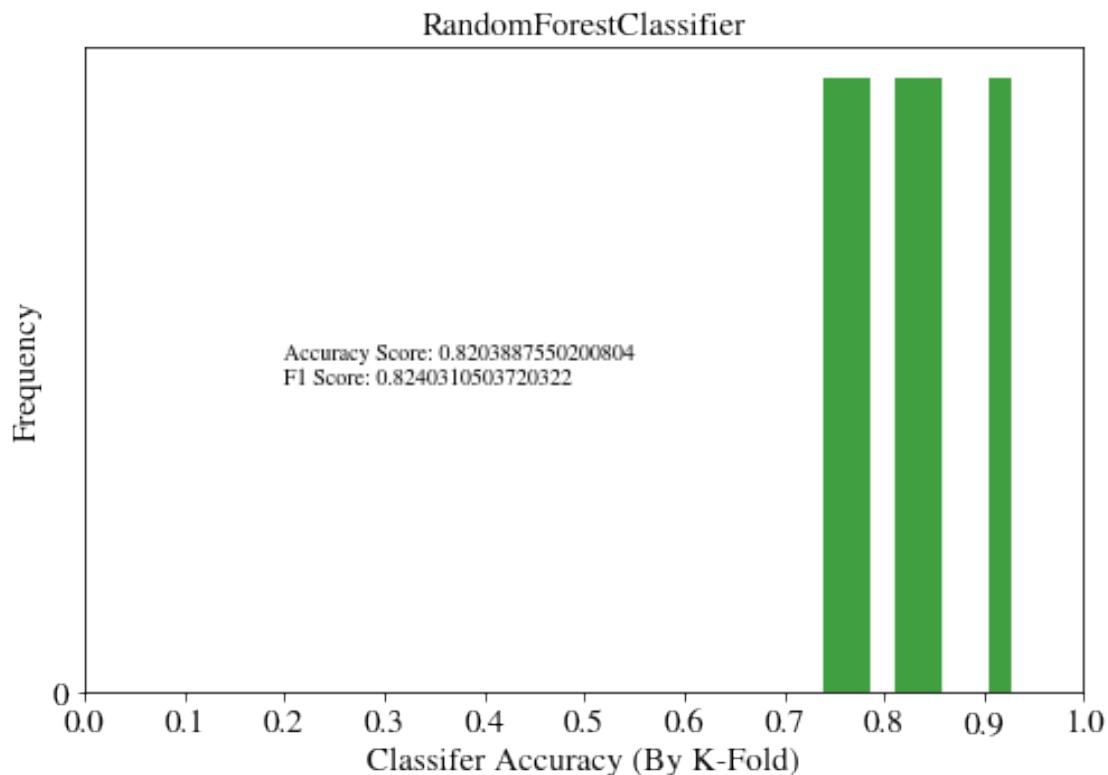
3      GaussianNB  Active inflammation?, Severity of Crypt Arch, ...
4      AdaBoostClassifier  Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier  Active inflammation?, Severity of Crypt Arch, ...
6          SVC  Active inflammation?, Severity of Crypt Arch, ...
7      MLPClassifier  Active inflammation?, Severity of Crypt Arch, ...

    accuracy      f1  precision   recall  \
0  0.813179  0.817929  0.813179  0.813179
1  0.757870  0.770136  0.757870  0.757870
2  0.683251  0.688711  0.683251  0.683251
3  0.621433  0.573267  0.621433  0.621433
4  0.756206  0.770161  0.756206  0.756206
5  0.763460  0.773140  0.763460  0.763460
6  0.700103  0.707410  0.700103  0.700103
7  0.700067  0.707921  0.700067  0.700067

                                params
0  {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1  {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2  {'C': 1, 'class_weight': None, 'dual': False, ...
3      {'priors': None, 'var_smoothing': 1e-09}
4  {'algorithm': 'SAMME.R', 'base_estimator': Non...
5  {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6  {'C': 1.0, 'break_ties': False, 'cache_size': ...
7  {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier

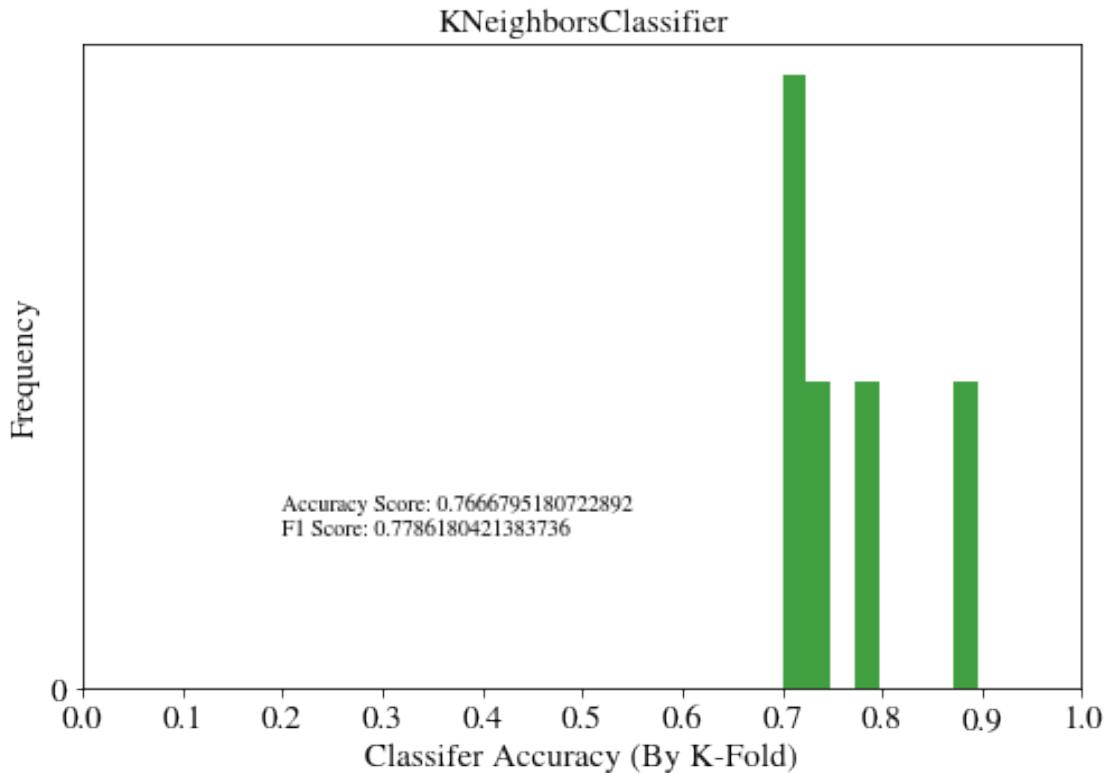


```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas', 'accuracy': [0.776, 0.84, 0.8192771084337349, 0.927710843373494, 0.7389558232931727], 'avgAccuracy': 0.8203887550200804, 'f1': [0.7766664971392244, 0.8339628402826885, 0.8254627231186004, 0.9410717381220082, 0.7429914531976394], 'avgF1': 0.8240310503720322, 'precision': [0.776, 0.84, 0.8192771084337349, 0.927710843373494, 0.7389558232931727], 'avgPrecision': 0.8203887550200804, 'recall': [0.776, 0.84, 0.8192771084337349, 0.927710843373494, 0.7389558232931727], 'avgRecall': 0.8203887550200804, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score':
```

```
True, 'random_state': None, 'verbose': 0, 'warm_start': False}]]}
*****

```

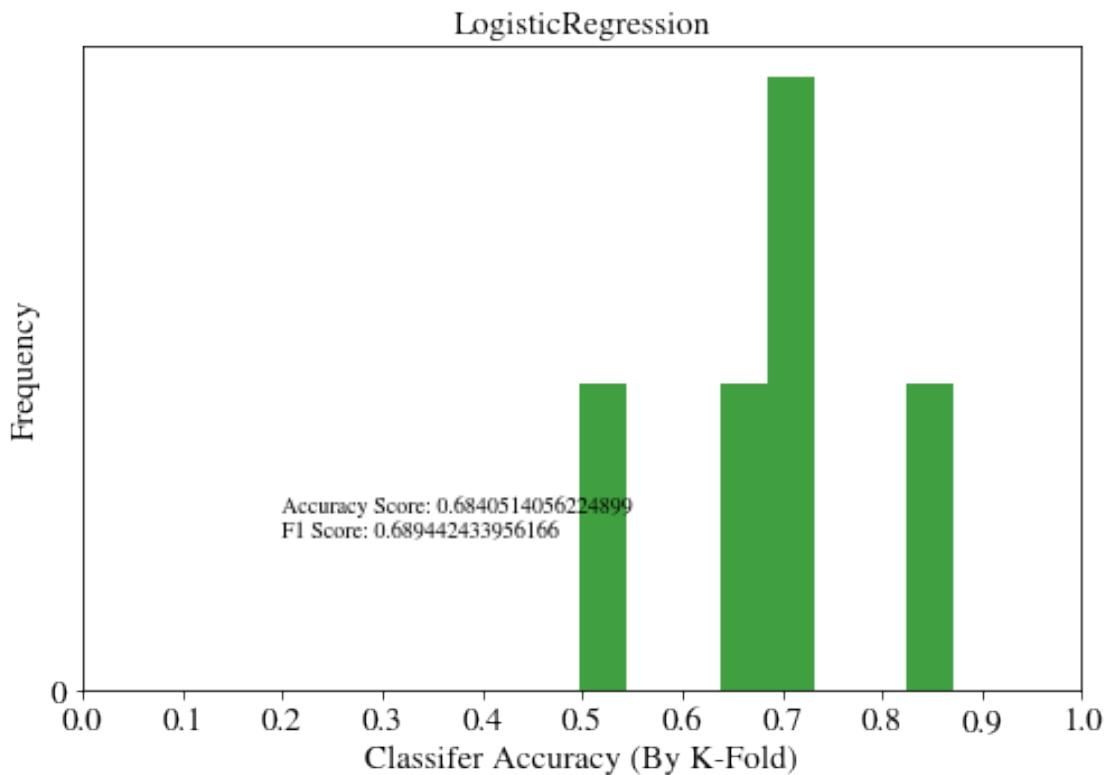
Processing Model: KNeighborsClassifier



```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas', 'accuracy': [0.7, 0.784, 0.7389558232931727,  
0.8955823293172691, 0.714859437751004], 'avgAccuracy': 0.7666795180722892, 'f1':  
[0.7064394569471624, 0.7911990988223246, 0.7447150953176057, 0.9261677998018709,  
0.7245687598029042], 'avgF1': 0.7786180421383736, 'precision': [0.7, 0.784,  
0.7389558232931727, 0.8955823293172691, 0.714859437751004], 'avgPrecision':  
0.7666795180722892, 'recall': [0.7, 0.784, 0.7389558232931727,  
0.8955823293172691, 0.714859437751004], 'avgRecall': 0.7666795180722892,  
'params': [{'algorithm': 'kd_tree', 'leaf_size': 30, 'metric': 'minkowski',
```

```
'metric_params': None, 'n_jobs': -1, 'n_neighbors': 14, 'p': 2, 'weights': 'distance'}]}}
*****
```

Processing Model: LogisticRegression



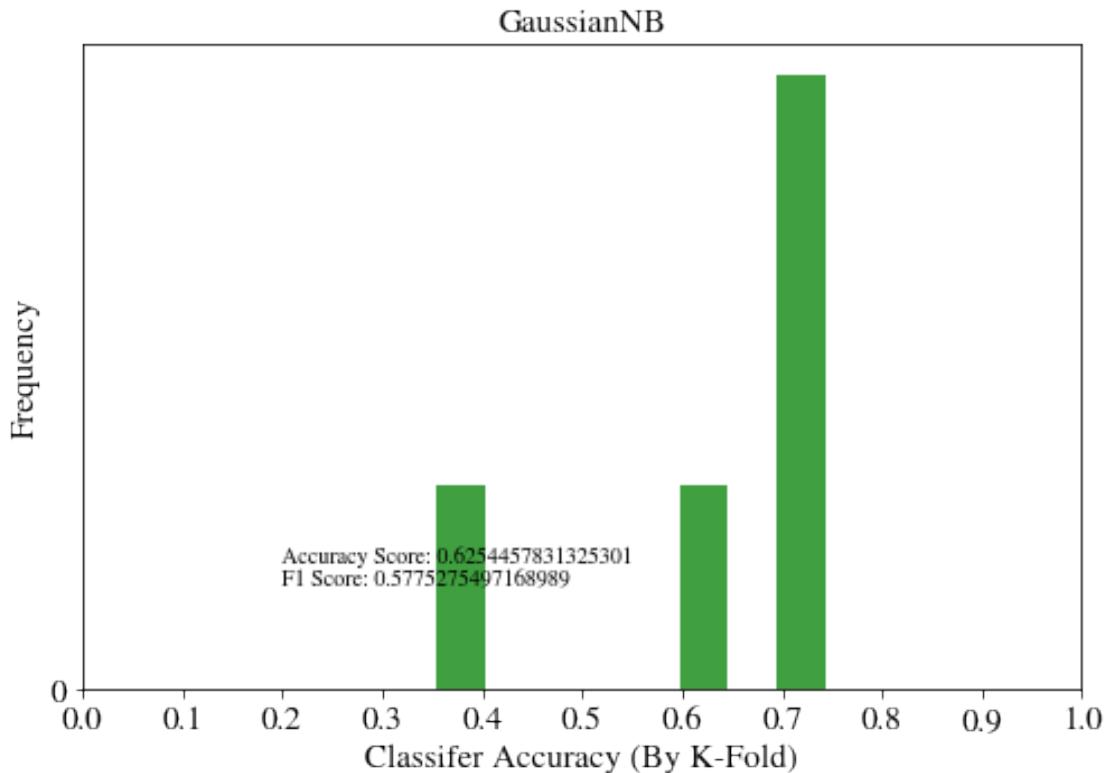
```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas', 'accuracy': [0.64, 0.716, 0.4979919678714859,  
0.8714859437751004, 0.6947791164658634], 'avgAccuracy': 0.6840514056224899,  
'f1': [0.648939384083606, 0.7264462935725085, 0.4695538886056692,  
0.9009413968269467, 0.7013312066920999], 'avgF1': 0.689442433956166,  
'precision': [0.64, 0.716, 0.4979919678714859, 0.8714859437751004,  
0.6947791164658634], 'avgPrecision': 0.6840514056224899, 'recall': [0.64, 0.716,  
0.4979919678714859, 0.8714859437751004, 0.6947791164658634], 'avgRecall':
```

```

0.6840514056224899, 'params': [{ 'C': 1, 'class_weight': None, 'dual': False,
'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs': -1, 'penalty': 'l2',
'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0,
'warm_start': False}]}
*****

```

Processing Model: GaussianNB

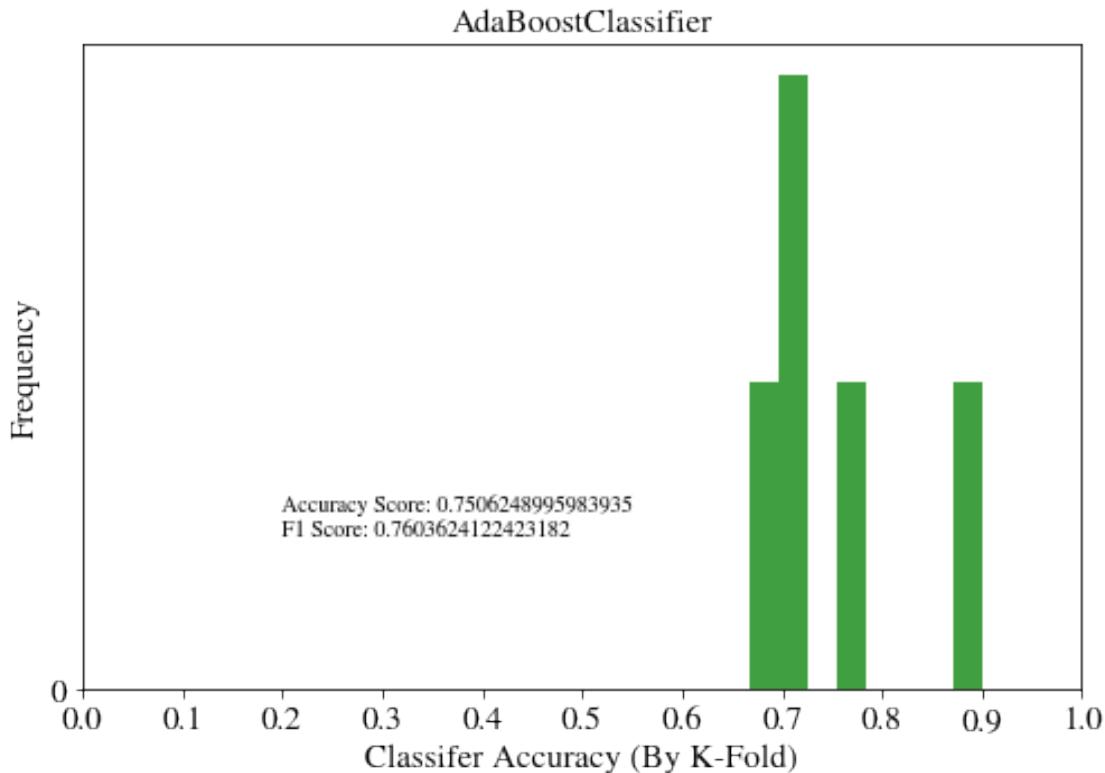


```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas', 'accuracy': [0.616, 0.704, 0.3534136546184739, 0.7429718875502008, 0.7108433734939759], 'avgAccuracy': 0.6254457831325301, 'f1': [0.5743860234578201, 0.6566827155717494, 0.26652222321870095, 0.7209942130727635, 0.6690525732634606], 'avgF1': 0.5775275497168989,
```

```
'precision': [0.616, 0.704, 0.3534136546184739, 0.7429718875502008,
0.7108433734939759], 'avgPrecision': 0.6254457831325301, 'recall': [0.616,
0.704, 0.3534136546184739, 0.7429718875502008, 0.7108433734939759], 'avgRecall':
0.6254457831325301, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}}
*****
```

Processing Model: AdaBoostClassifier



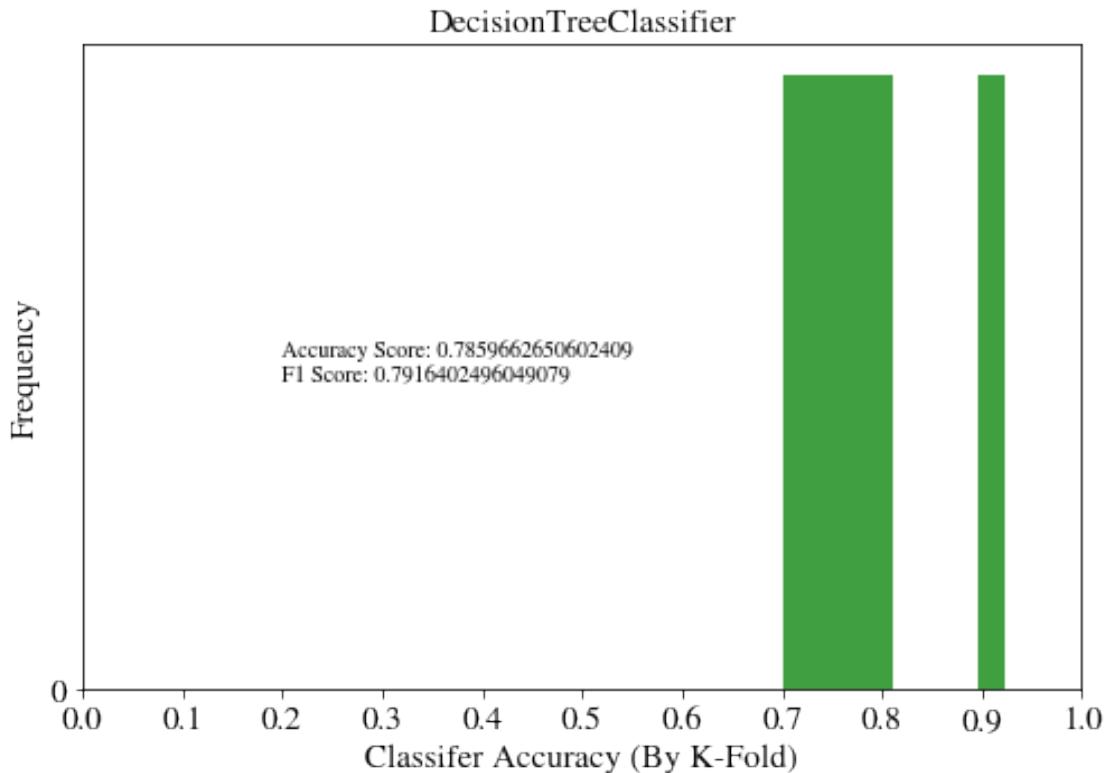
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas', 'accuracy': [0.7, 0.772, 0.714859437751004, 0.8995983935742972, 0.6666666666666666], 'avgAccuracy': 0.7506248995983935, 'f1': [0.6979960785782974, 0.7765887300252313, 0.7201478275748696, 0.922138603546186, 0.6849408214870063], 'avgF1': 0.7603624122423182, 'precision': [0.7, 0.772, 0.714859437751004, 0.8995983935742972,
```

```

0.6666666666666666], 'avgPrecision': 0.7506248995983935, 'recall': [0.7, 0.772,
0.714859437751004, 0.8995983935742972, 0.6666666666666666], 'avgRecall':
0.7506248995983935, 'params': [{'algorithm': 'SAMME.R', 'base_estimator': None,
'learning_rate': 1, 'n_estimators': 300, 'random_state': None}]}}
*****

```

Processing Model: DecisionTreeClassifier



```

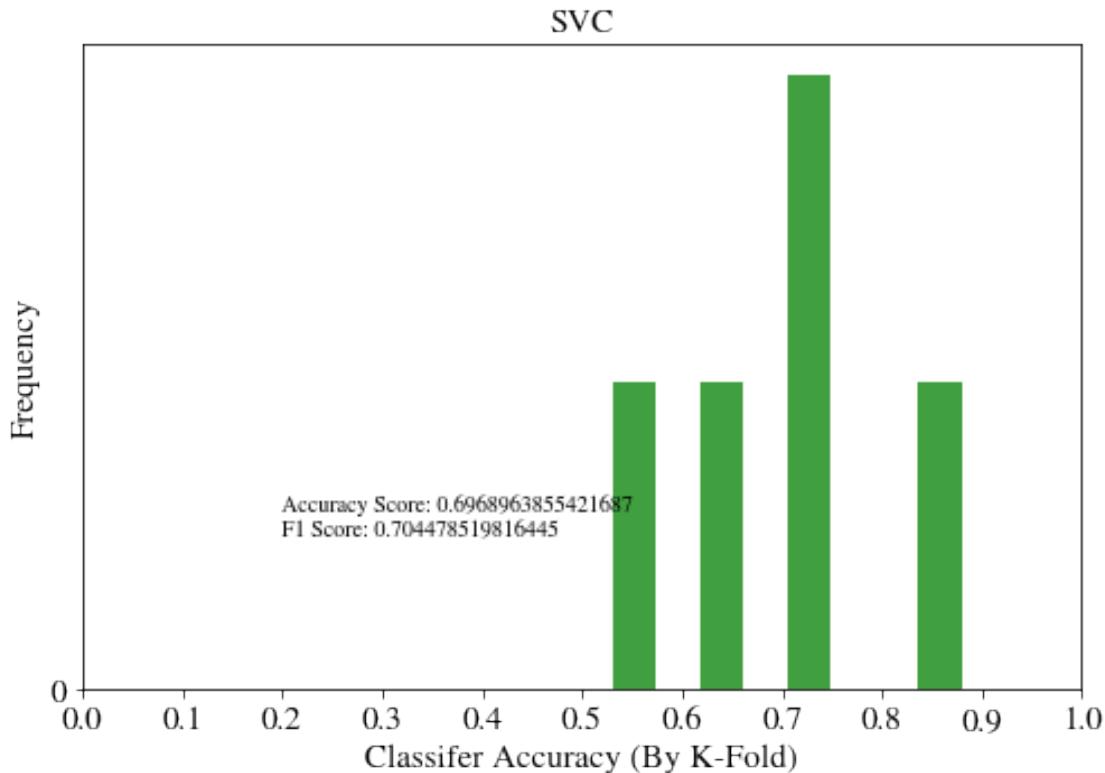
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas', 'accuracy': [0.7, 0.772, 0.7951807228915663, 0.9236947791164659, 0.7389558232931727], 'avgAccuracy': 0.7859662650602409, 'f1': [0.7059734560527223, 0.7746715881272951, 0.8011899529140561, 0.9422307150309717, 0.734135535899494], 'avgF1': 0.7916402496049079, 'precision': [0.7, 0.772, 0.7951807228915663, 0.9236947791164659,
```

```

0.7389558232931727], 'avgPrecision': 0.7859662650602409, 'recall': [0.7, 0.772,
0.7951807228915663, 0.9236947791164659, 0.7389558232931727], 'avgRecall':
0.7859662650602409, 'params': [{'ccp_alpha': 0.0, 'class_weight': None,
'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt',
'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split':
None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf':
0.0, 'random_state': None, 'splitter': 'random'}]}
*****

```

Processing Model: SVC



```

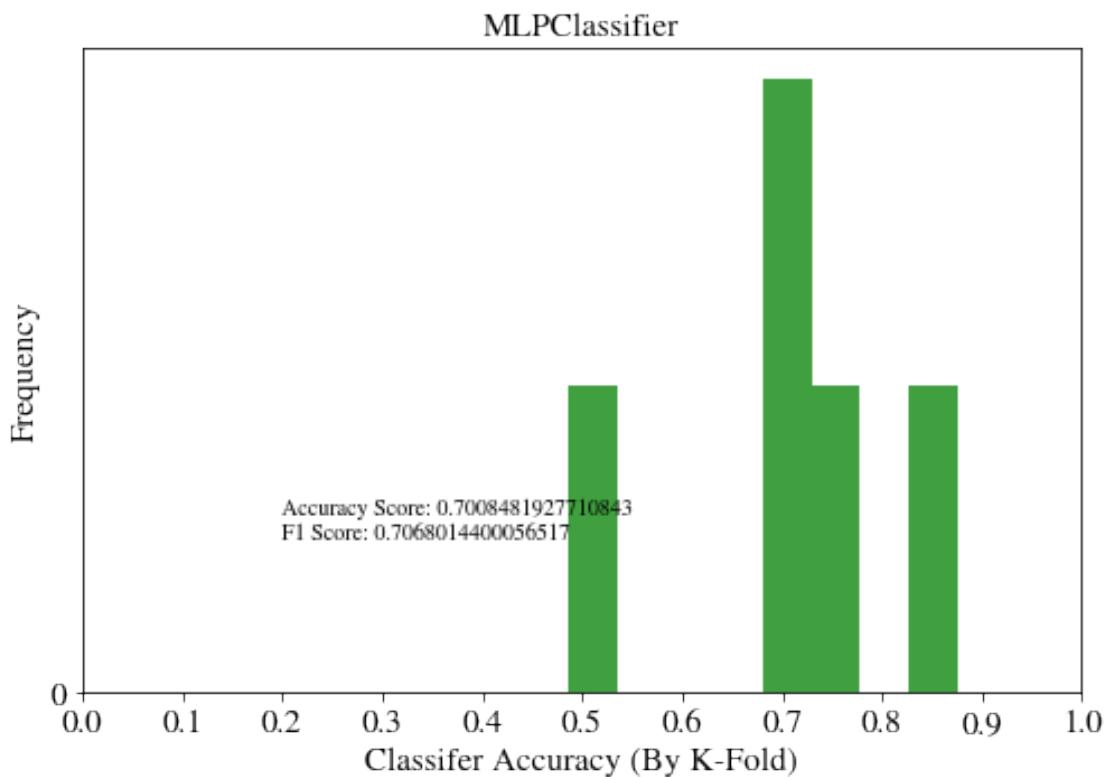
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt
Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in
lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,
Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,
Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists
diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina
propria granulomas, Crypt abscesses extent, Submucosal granulomas', 'accuracy':
[0.648, 0.716, 0.5301204819277109, 0.8795180722891566, 0.7108433734939759],
'avgAccuracy': 0.6968963855421687, 'f1': [0.6545388965541685, 0.729734234452394,
```

```

0.513846338692965, 0.903198669477267, 0.7210744599054304], 'avgF1':
0.704478519816445, 'precision': [0.648, 0.716, 0.5301204819277109,
0.8795180722891566, 0.7108433734939759], 'avgPrecision': 0.6968963855421687,
'recall': [0.648, 0.716, 0.5301204819277109, 0.8795180722891566,
0.7108433734939759], 'avgRecall': 0.6968963855421687, 'params': [{'C': 1.0,
'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0,
'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':
'linear', 'max_iter': -1, 'probability': False, 'random_state': None,
'shrinking': True, 'tol': 0.001, 'verbose']: }]}
*****

```

Processing Model: MLPClassifier



```

*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal

```

```

granulomas', 'accuracy': [0.712, 0.732, 0.4859437751004016, 0.8755020080321285,
0.6987951807228916], 'avgAccuracy': 0.7008481927710843, 'f1':
[0.718876623260294, 0.7450548963186864, 0.46009481602854535, 0.902088236963803,
0.7078926274569298], 'avgF1': 0.7068014400056517, 'precision': [0.712, 0.732,
0.4859437751004016, 0.8755020080321285, 0.6987951807228916], 'avgPrecision':
0.7008481927710843, 'recall': [0.712, 0.732, 0.4859437751004016,
0.8755020080321285, 0.6987951807228916], 'avgRecall': 0.7008481927710843,
'params': [{activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto',
'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08,
'hidden_layer_sizes': (100,), 'learning_rate': 'invscaling',
'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5,
'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas', 'accuracy': [0.776, 0.84, 0.8192771084337349, 0.927710843373494, 0.7389558232931727], 'avgAccuracy': 0.8203887550200804, 'f1':
[0.7766664971392244, 0.8339628402826885, 0.8254627231186004, 0.9410717381220082, 0.7429914531976394], 'avgF1': 0.8240310503720322, 'precision': [0.776, 0.84, 0.8192771084337349, 0.927710843373494, 0.7389558232931727], 'avgPrecision':
0.8203887550200804, 'recall': [0.776, 0.84, 0.8192771084337349, 0.927710843373494, 0.7389558232931727], 'avgRecall': 0.8203887550200804,
'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None,
'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto',
'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score':
True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

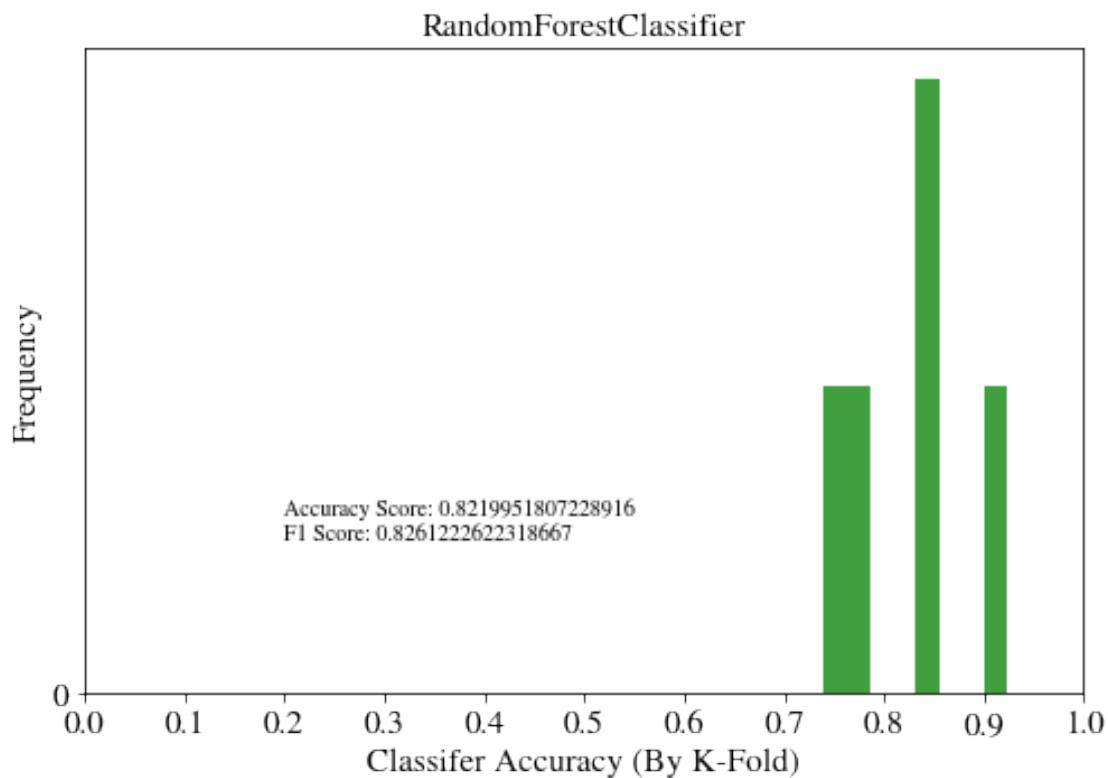
	model	features \
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...
6	SVC	Active inflammation?, Severity of Crypt Arch, ...
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...

	accuracy	f1	precision	recall	\
0	0.813979	0.817475	0.813979	0.813979	
1	0.759467	0.772137	0.759467	0.759467	
2	0.684051	0.689442	0.684051	0.684051	
3	0.625446	0.577528	0.625446	0.625446	
4	0.750625	0.760362	0.750625	0.750625	
5	0.773131	0.783872	0.773131	0.773131	
6	0.696896	0.704479	0.696896	0.696896	
7	0.692058	0.698736	0.692058	0.692058	

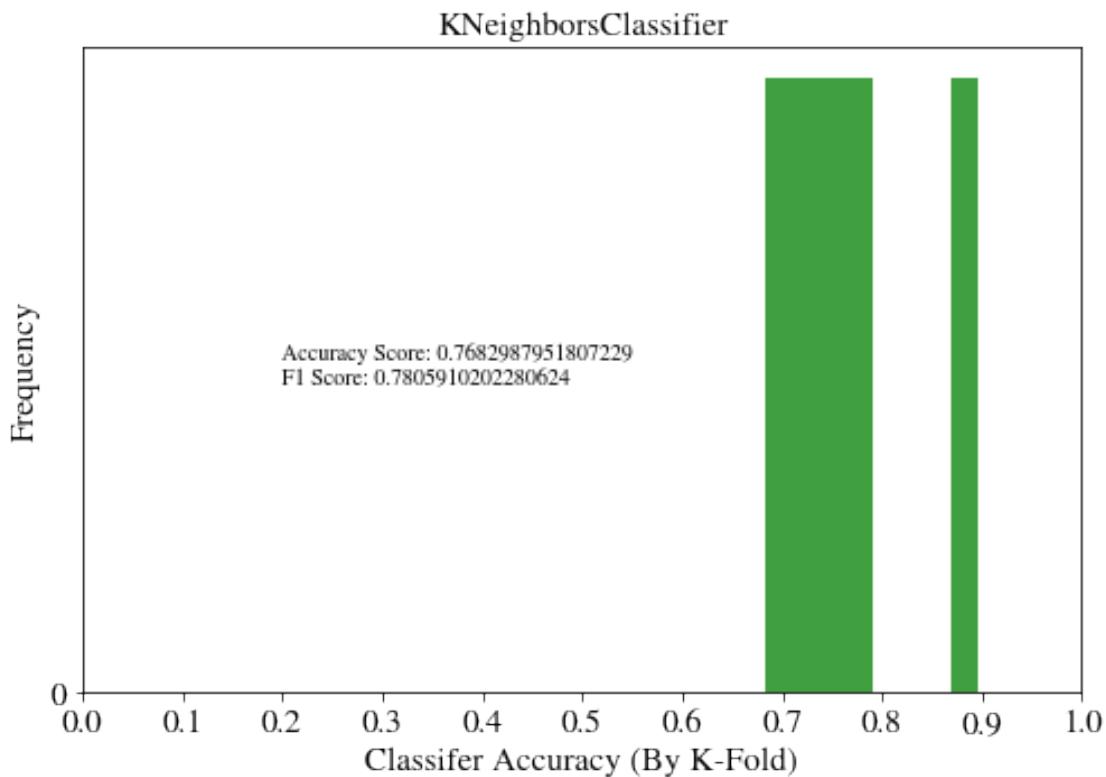
	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	{'C': 1, 'class_weight': None, 'dual': False, ...
3	{'priors': None, 'var_smoothing': 1e-09}
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...

Processing Model: RandomForestClassifier



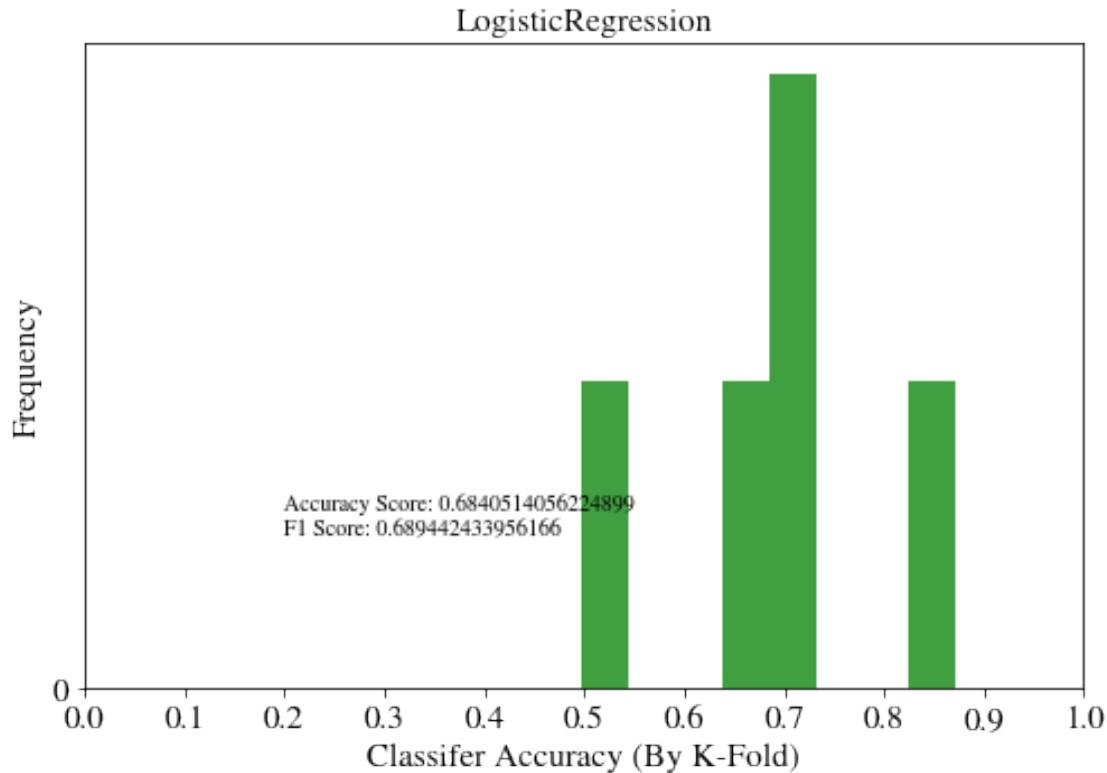
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent', 'accuracy': [0.78, 0.836, 0.8313253012048193, 0.9236947791164659, 0.7389558232931727], 'avgAccuracy': 0.8219951807228916, 'f1': [0.7804267558528427, 0.830808625365094, 0.8375626522919922, 0.9388218244517653, 0.7429914531976394], 'avgF1': 0.8261222622318667, 'precision': [0.78, 0.836, 0.8313253012048193, 0.9236947791164659, 0.7389558232931727], 'avgPrecision': 0.8219951807228916, 'recall': [0.78, 0.836, 0.8313253012048193, 0.9236947791164659, 0.7389558232931727], 'avgRecall': 0.8219951807228916, 'params': [{ 'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}}
*****
```

Processing Model: KNeighborsClassifier



```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent',  
'accuracy': [0.684, 0.784, 0.7309236947791165, 0.8955823293172691,  
0.7469879518072289], 'avgAccuracy': 0.7682987951807229, 'f1':  
[0.6922471857532823, 0.7933199999999999, 0.7371299387789383, 0.9266940288627036,  
0.7535639477453877], 'avgF1': 0.7805910202280624, 'precision': [0.684, 0.784,  
0.7309236947791165, 0.8955823293172691, 0.7469879518072289], 'avgPrecision':  
0.7682987951807229, 'recall': [0.684, 0.784, 0.7309236947791165,  
0.8955823293172691, 0.7469879518072289], 'avgRecall': 0.7682987951807229,  
'params': [{}'algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski',  
'metric_params': None, 'n_jobs': -1, 'n_neighbors': 16, 'p': 2, 'weights':  
'distance'}]}}
*****
```

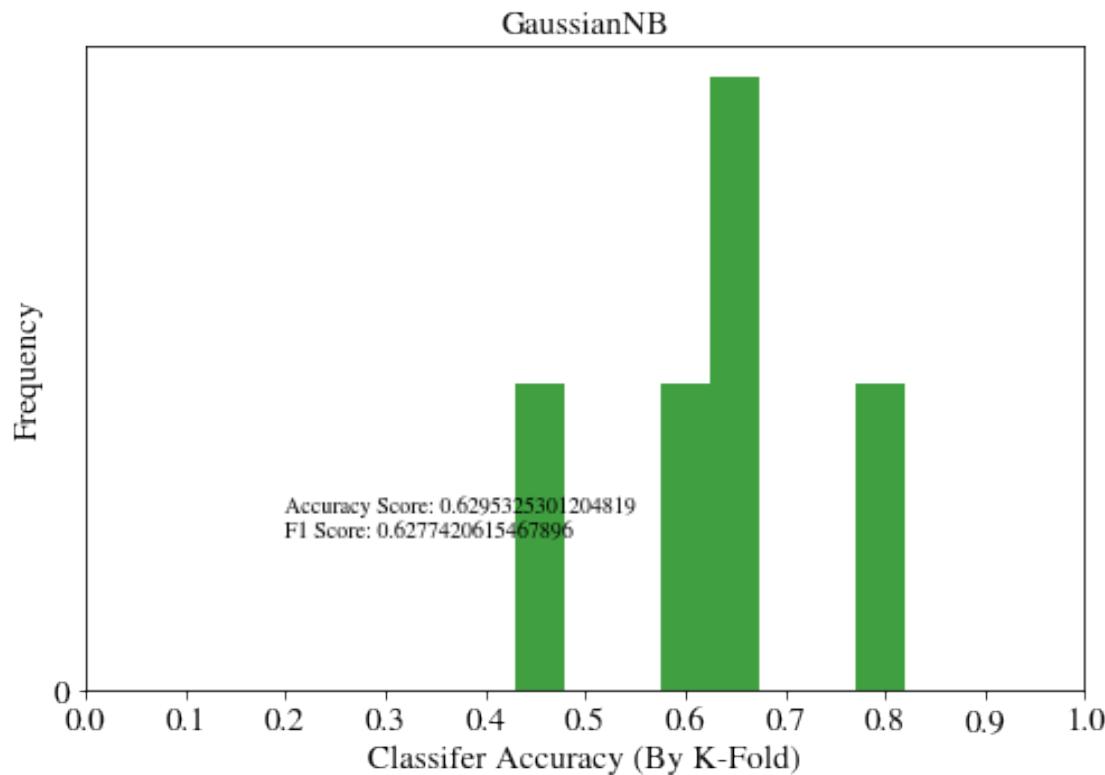
Processing Model: LogisticRegression



```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent',  
'accuracy': [0.64, 0.716, 0.4979919678714859, 0.8714859437751004,  
0.6947791164658634], 'avgAccuracy': 0.6840514056224899, 'f1':  
[0.648939384083606, 0.7264462935725085, 0.4695538886056692, 0.9009413968269467,  
0.7013312066920999], 'avgF1': 0.689442433956166, 'precision': [0.64, 0.716,  
0.4979919678714859, 0.8714859437751004, 0.6947791164658634], 'avgPrecision':  
0.6840514056224899, 'recall': [0.64, 0.716, 0.4979919678714859,  
0.8714859437751004, 0.6947791164658634], 'avgRecall': 0.6840514056224899,  
'params': [{C': 1, 'class_weight': None, 'dual': False, 'fit_intercept': True,  
'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class':  
'multinomial', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver':  
'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}}
```

\*\*\*\*\*

Processing Model: GaussianNB

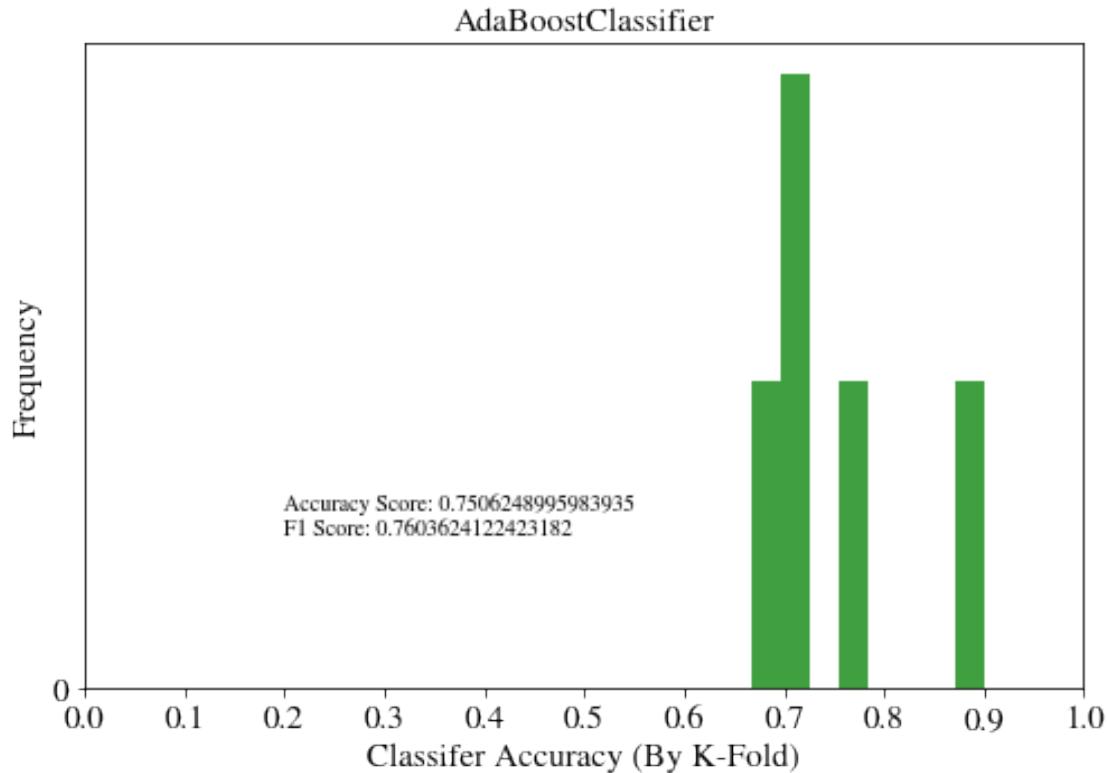


\*\*\*\*\*

\* GaussianNB  
\* Best Params Result:  
\* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent', 'accuracy': [0.58, 0.652, 0.42971887550200805, 0.8192771084337349, 0.6666666666666666], 'avgAccuracy': 0.6295325301204819, 'f1': [0.5855474178403756, 0.643024990250421, 0.4360372748608907, 0.8170616511418715, 0.6570389736403893], 'avgF1': 0.6277420615467896, 'precision': [0.58, 0.652, 0.42971887550200805, 0.8192771084337349, 0.6666666666666666], 'avgPrecision': 0.6295325301204819, 'recall': [0.58, 0.652, 0.42971887550200805, 0.8192771084337349, 0.6666666666666666], 'avgRecall': 0.6295325301204819, 'params': [{'priors': None, 'var\_smoothing': 1e-09}]}

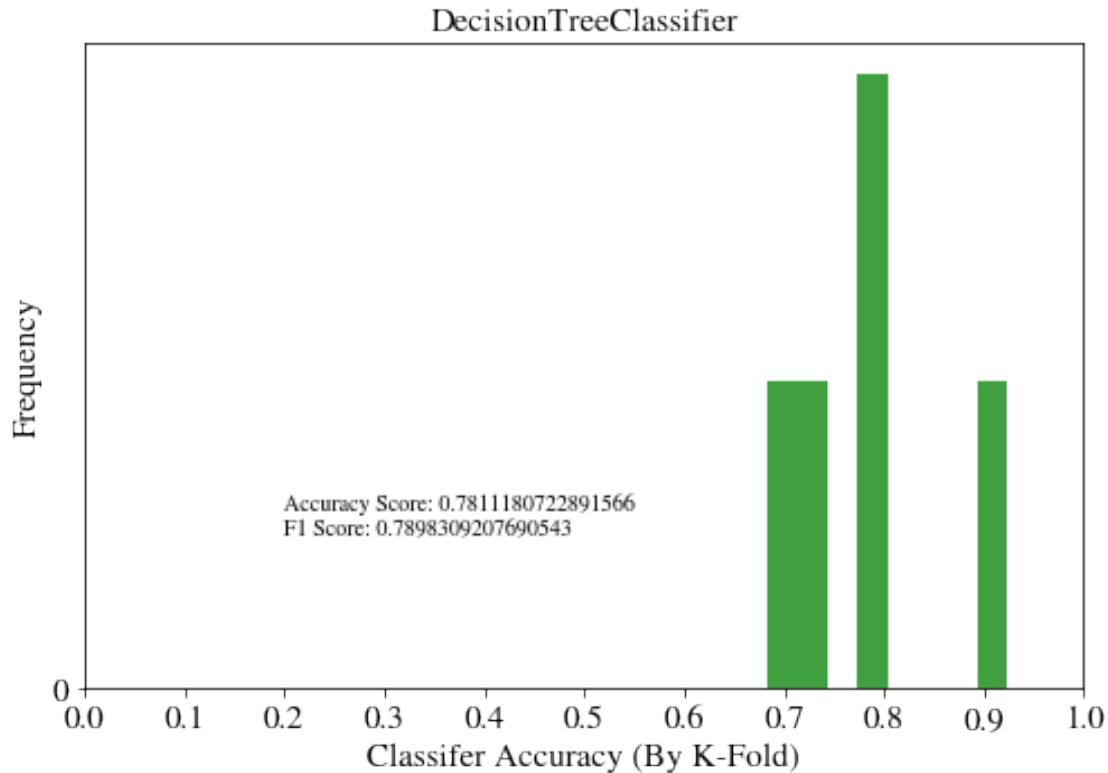
\*\*\*\*\*

Processing Model: AdaBoostClassifier



```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent',  
'accuracy': [0.7, 0.772, 0.714859437751004, 0.8995983935742972,  
0.6666666666666666], 'avgAccuracy': 0.7506248995983935, 'f1':  
[0.6979960785782974, 0.7765887300252313, 0.7201478275748696, 0.922138603546186,  
0.6849408214870063], 'avgF1': 0.7603624122423182, 'precision': [0.7, 0.772,  
0.714859437751004, 0.8995983935742972, 0.6666666666666666], 'avgPrecision':  
0.7506248995983935, 'recall': [0.7, 0.772, 0.714859437751004,  
0.8995983935742972, 0.6666666666666666], 'avgRecall': 0.7506248995983935,  
'params': [{'algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1,  
'n_estimators': 300, 'random_state': None}]}  
*****
```

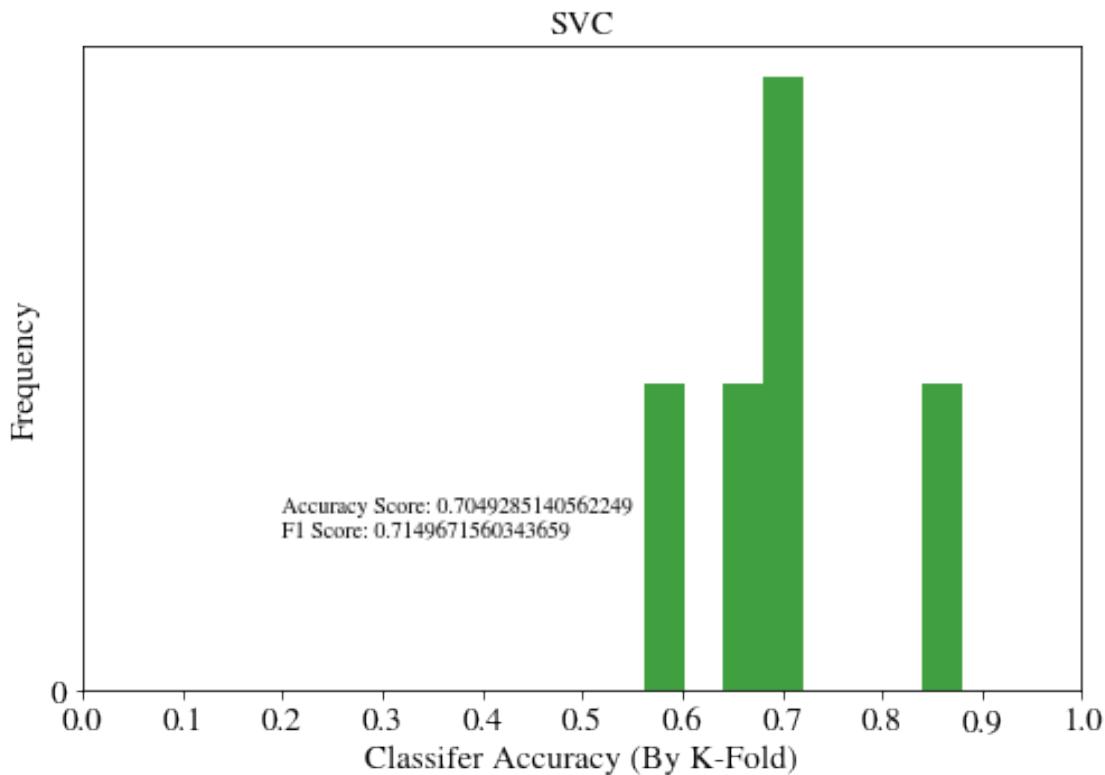
Processing Model: DecisionTreeClassifier



```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent', 'accuracy': [0.716, 0.792, 0.7911646586345381, 0.9236947791164659, 0.6827309236947792], 'avgAccuracy': 0.7811180722891566, 'f1': [0.721791924945552, 0.7967000000000001, 0.7967056267485175, 0.9401470616766582, 0.6938099904745433], 'avgF1': 0.7898309207690543, 'precision': [0.716, 0.792, 0.7911646586345381, 0.9236947791164659, 0.6827309236947792], 'avgPrecision': 0.7811180722891566, 'recall': [0.716, 0.792, 0.7911646586345381, 0.9236947791164659, 0.6827309236947792], 'avgRecall': 0.7811180722891566, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2}], 'support': [1, 1, 1, 1, 1]}*****
```

```
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None,  
'splitter': 'random'}]}  
*****
```

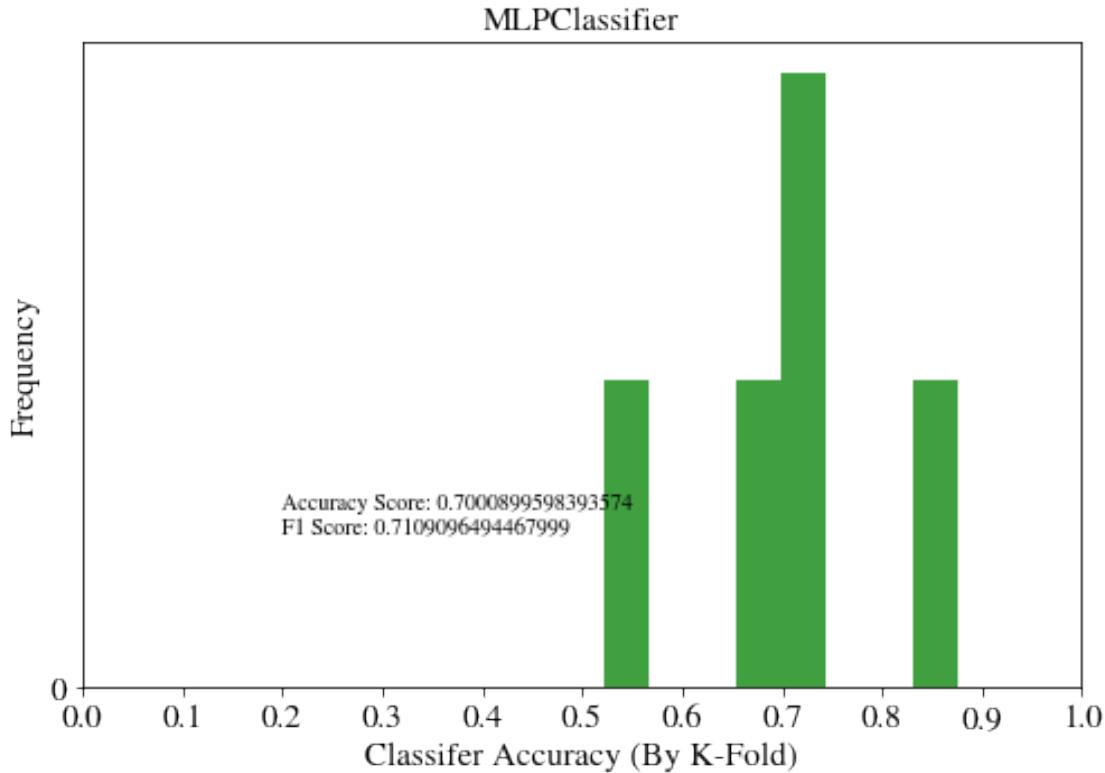
Processing Model: SVC



```
*****  
* SVC  
* Best Params Result:  
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent', 'accuracy': [0.648, 0.716, 0.5622489959839357, 0.8795180722891566, 0.7188755020080321], 'avgAccuracy': 0.7049285140562249, 'f1': [0.6545388965541685, 0.729734234452394, 0.5589564007864332, 0.903198669477267, 0.7284075789015669], 'avgF1': 0.7149671560343659, 'precision': [0.648, 0.716, 0.5622489959839357, 0.8795180722891566, 0.7188755020080321], 'avgPrecision': 0.7049285140562249, 'recall': [0.648, 0.716, 0.5622489959839357, 0.8795180722891566, 0.7188755020080321], 'avgRecall': 0.7049285140562249, 'params': [{C: 1.0, 'weight': 1}]}  
*****
```

```
'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0,
'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':
'linear', 'max_iter': -1, 'probability': False, 'random_state': None,
'shrinking': True, 'tol': 0.001, 'verbose': False}]}}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent', 'accuracy':
[0.66, 0.728, 0.5220883534136547, 0.8755020080321285, 0.714859437751004],
'avgAccuracy': 0.7000899598393574, 'f1': [0.6668460724717772,
0.7414096220654806, 0.5208909728881915, 0.902088236963803, 0.723313342844747],
'avgF1': 0.7109096494467999, 'precision': [0.66, 0.728, 0.5220883534136547,
0.8755020080321285, 0.714859437751004], 'avgPrecision': 0.7000899598393574,
```

```

'recall': [0.66, 0.728, 0.5220883534136547, 0.8755020080321285,
0.714859437751004], 'avgRecall': 0.7000899598393574, 'params': [{activation':
'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'invscaling', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}}

*****
*****  

* Best Performing Model and Params is:  

* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent', 'accuracy': [0.78, 0.836, 0.8313253012048193, 0.9236947791164659, 0.7389558232931727], 'avgAccuracy': 0.8219951807228916, 'f1': [0.7804267558528427, 0.830808625365094, 0.8375626522919922, 0.9388218244517653, 0.7429914531976394], 'avgF1': 0.8261222622318667, 'precision': [0.78, 0.836, 0.8313253012048193, 0.9236947791164659, 0.7389558232931727], 'avgPrecision': 0.8219951807228916, 'recall': [0.78, 0.836, 0.8313253012048193, 0.9236947791164659, 0.7389558232931727], 'avgRecall': 0.8219951807228916, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}}

*****

```

	model	features \			
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...			
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...			
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...			
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...			
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...			
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...			
6	SVC	Active inflammation?, Severity of Crypt Arch, ...			
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...			
	accuracy	f1	precision	recall	\
0	0.817976	0.822467	0.817976	0.817976	
1	0.761876	0.774752	0.761876	0.761876	
2	0.684051	0.689442	0.684051	0.684051	

```

3 0.629533 0.627742 0.629533 0.629533
4 0.750625 0.760362 0.750625 0.750625
5 0.781118 0.789831 0.781118 0.781118
6 0.704929 0.714967 0.704929 0.704929
7 0.695271 0.703731 0.695271 0.695271

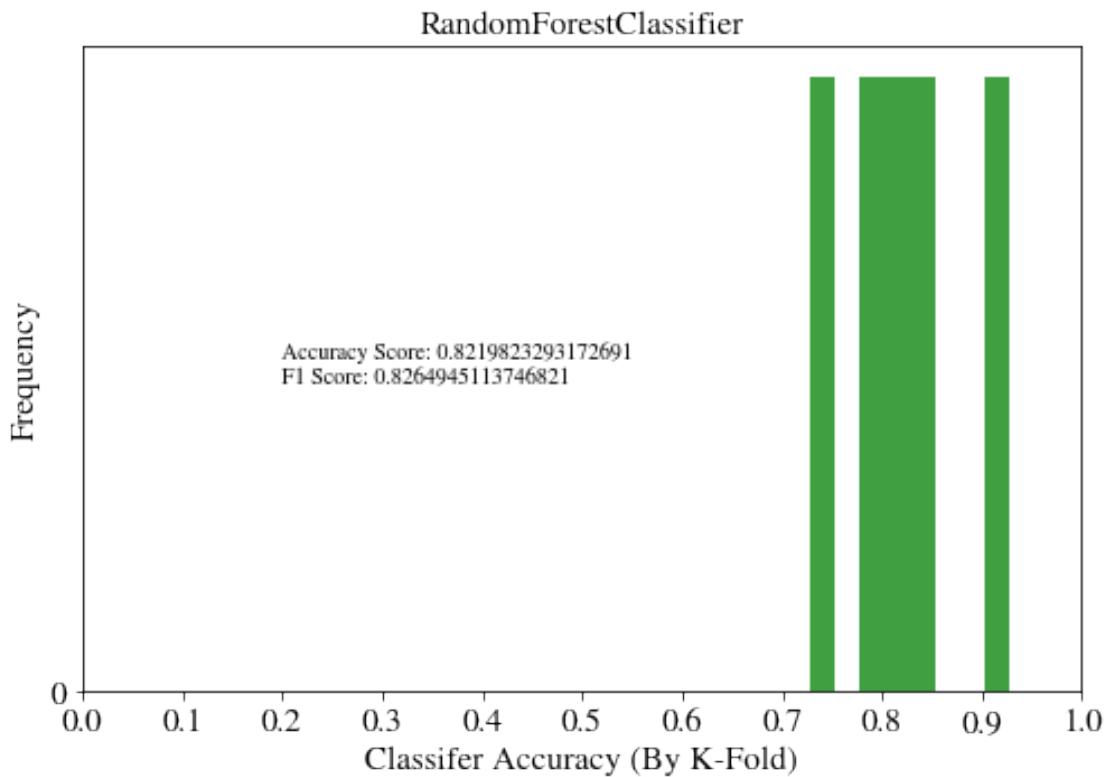
```

```

params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3     {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier



```

*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &

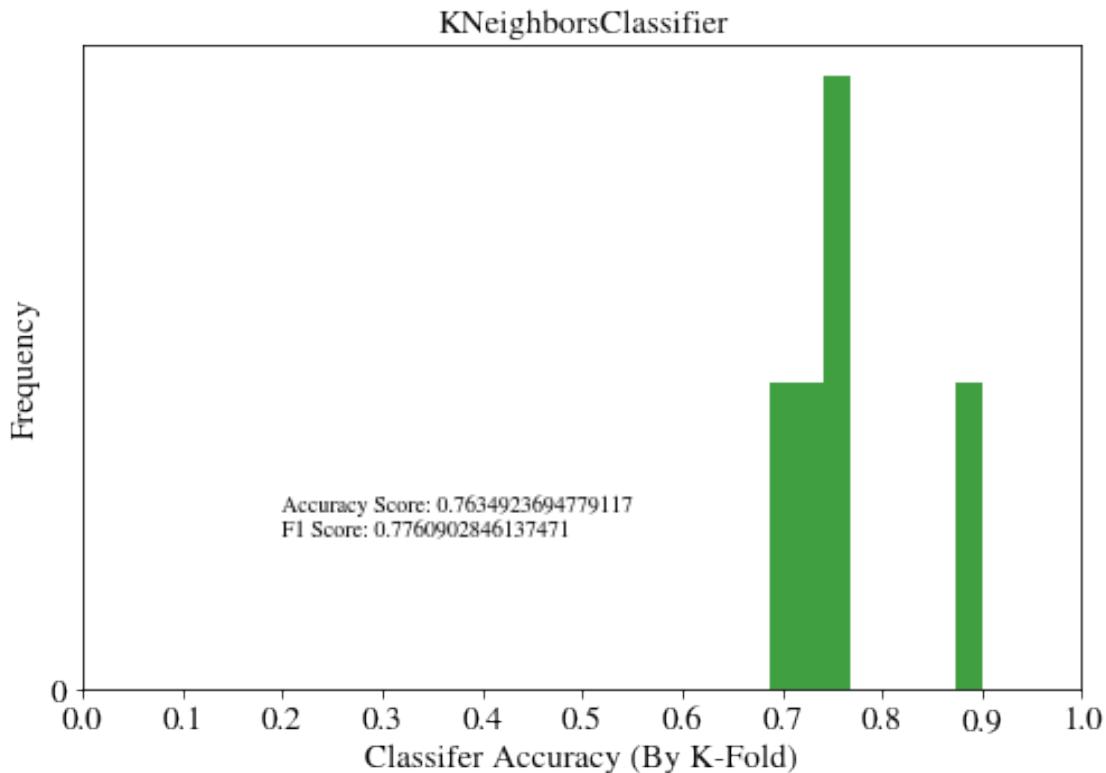
```

```

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs, Lamina propria granulomas', 'accuracy': [0.792, 0.84,
0.8232931726907631, 0.927710843373494, 0.7269076305220884], 'avgAccuracy':
0.8219823293172691, 'f1': [0.7933593897012079, 0.8352161616161616,
0.8294962720494635, 0.9430378655752774, 0.7313628679313001], 'avgF1':
0.8264945113746821, 'precision': [0.792, 0.84, 0.8232931726907631,
0.927710843373494, 0.7269076305220884], 'avgPrecision': 0.8219823293172691,
'recall': [0.792, 0.84, 0.8232931726907631, 0.927710843373494,
0.7269076305220884], 'avgRecall': 0.8219823293172691, 'params': [{bootstrap':
True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy',
'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None,
'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None,
'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0,
'n_estimators': 200, 'n_jobs': -1, 'oob_score': False, 'random_state': None,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



```
*****

```

```

* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs, Lamina propria granulomas', 'accuracy': [0.688, 0.764,  

0.7228915662650602, 0.8995983935742972, 0.7429718875502008], 'avgAccuracy':  

0.7634923694779117, 'f1': [0.6961808273027784, 0.775695450081833,  

0.7291491752219664, 0.9292748748538319, 0.7501510956083254], 'avgF1':  

0.7760902846137471, 'precision': [0.688, 0.764, 0.7228915662650602,  

0.8995983935742972, 0.7429718875502008], 'avgPrecision': 0.7634923694779117,  

'recall': [0.688, 0.764, 0.7228915662650602, 0.8995983935742972,  

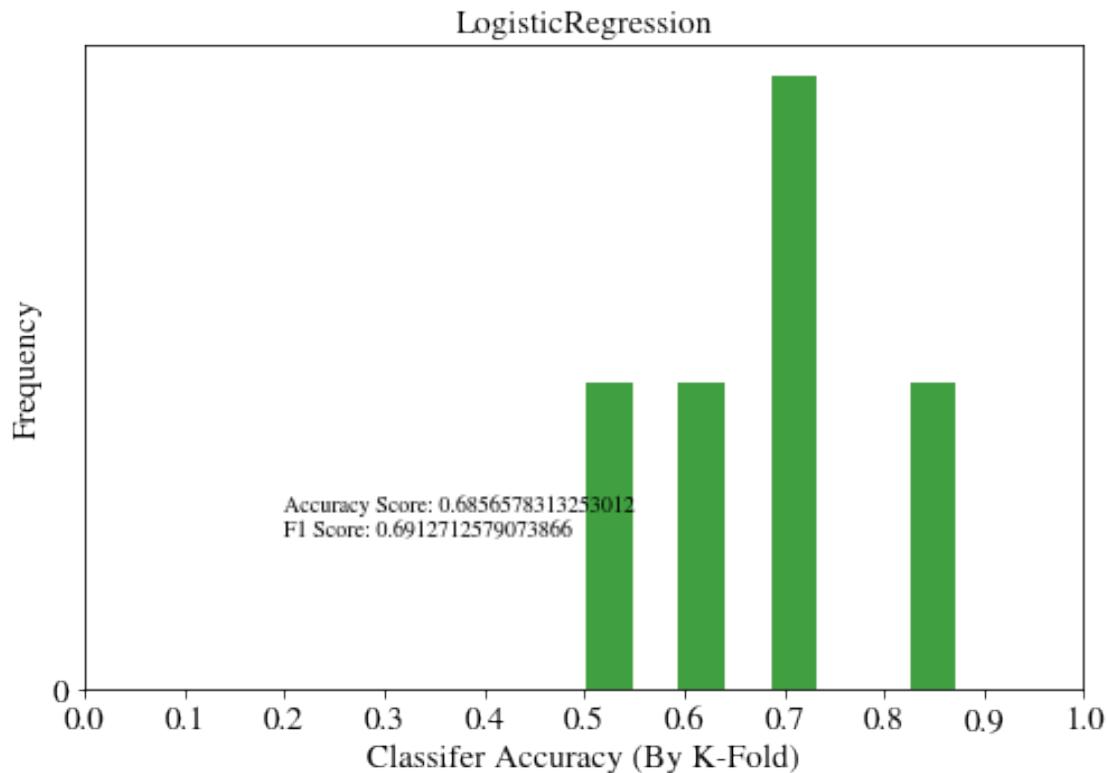
0.7429718875502008], 'avgRecall': 0.7634923694779117, 'params': [{  

'algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1,  

'n_neighbors': 16, 'p': 2, 'weights': 'distance'}]}
*****

```

Processing Model: LogisticRegression



```
*****

```

```

* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs, Lamina propria granulomas', 'accuracy': [0.636, 0.72,  

0.5020080321285141, 0.8714859437751004, 0.6987951807228916], 'avgAccuracy':  

0.6856578313253012, 'f1': [0.6445309169594243, 0.7307065560688479,  

0.4752684600772605, 0.9009413968269467, 0.7049089596044538], 'avgF1':  

0.6912712579073866, 'precision': [0.636, 0.72, 0.5020080321285141,  

0.8714859437751004, 0.6987951807228916], 'avgPrecision': 0.6856578313253012,  

'recall': [0.636, 0.72, 0.5020080321285141, 0.8714859437751004,  

0.6987951807228916], 'avgRecall': 0.6856578313253012, 'params': [{ 'C': 1,  

'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':  

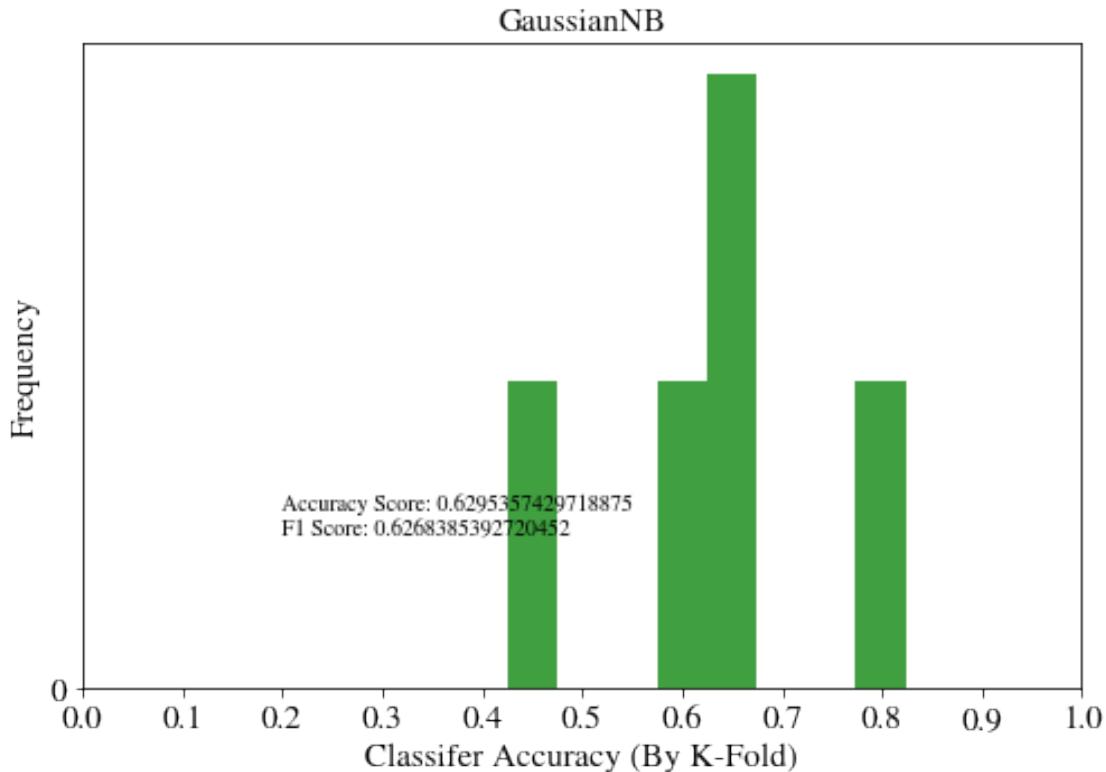
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs':  

-1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,  

'verbose': 0, 'warm_start': False}]}
*****

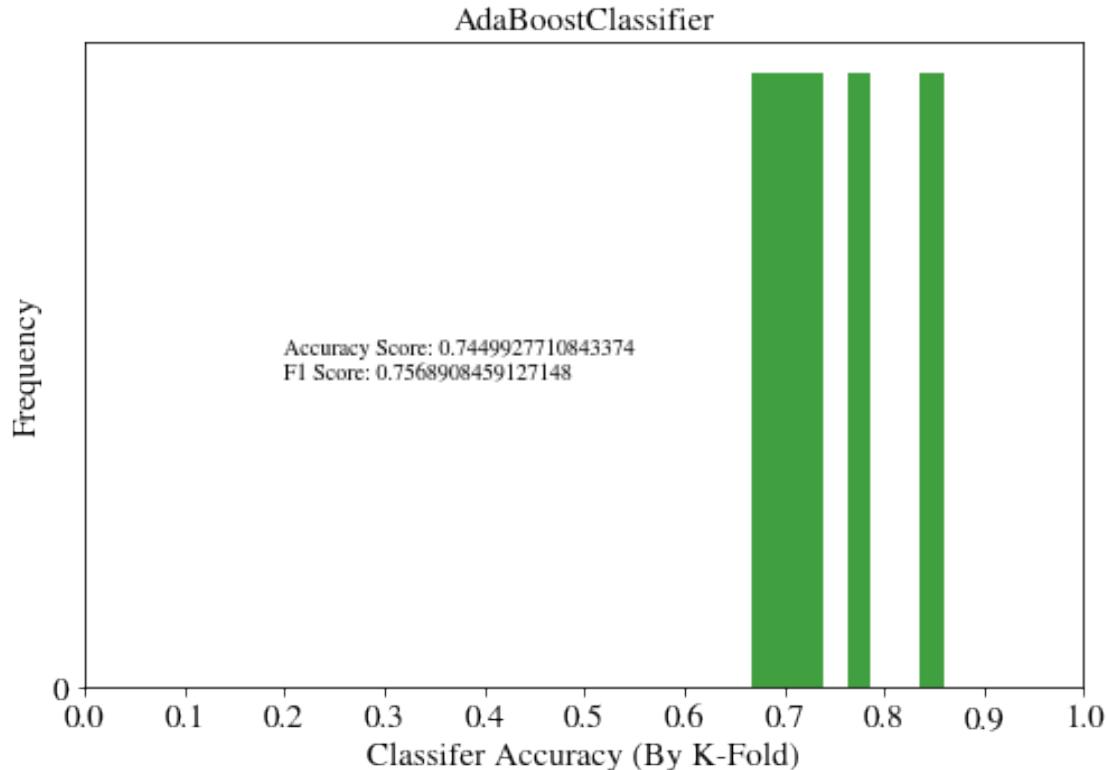
```

Processing Model: GaussianNB



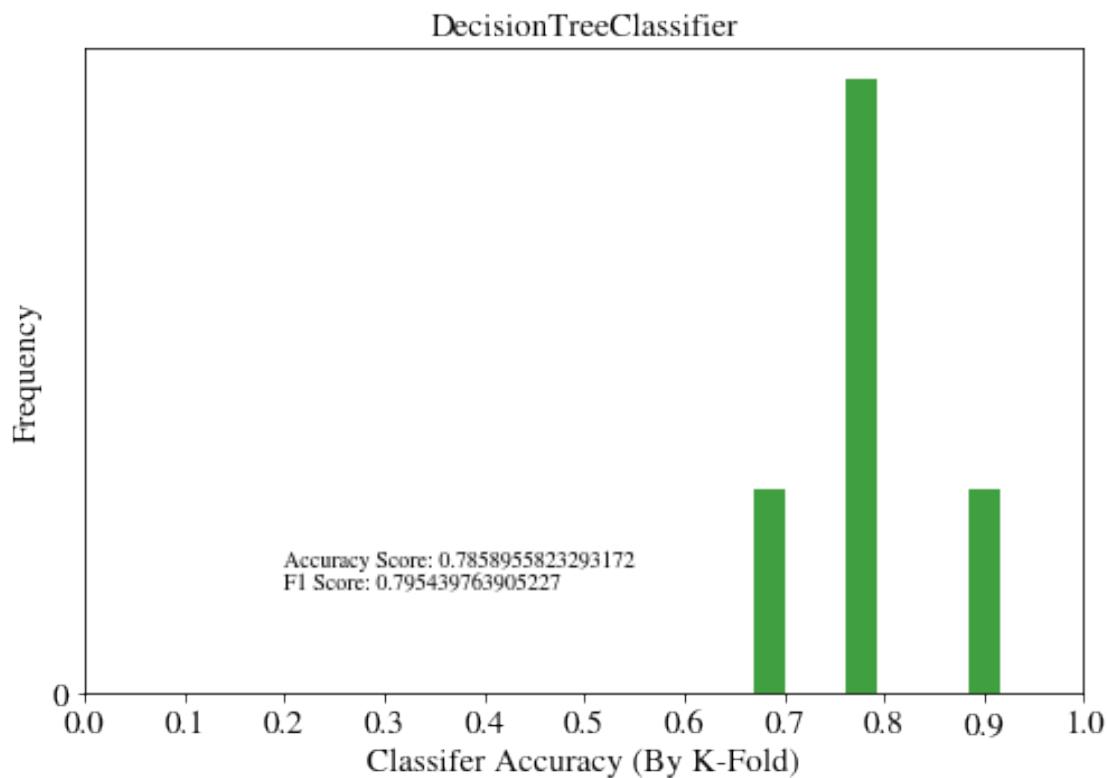
```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas', 'accuracy': [0.576, 0.652, 0.42570281124497994, 0.8232931726907631, 0.6706827309236948], 'avgAccuracy': 0.6295357429718875, 'f1': [0.581474614572588, 0.643024990250421, 0.42724419809771724, 0.8228878361744192, 0.6595610572650807], 'avgF1': 0.6268385392720452, 'precision': [0.576, 0.652, 0.42570281124497994, 0.8232931726907631, 0.6706827309236948], 'avgPrecision': 0.6295357429718875, 'recall': [0.576, 0.652, 0.42570281124497994, 0.8232931726907631, 0.6706827309236948], 'avgRecall': 0.6295357429718875, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}
```

Processing Model: AdaBoostClassifier



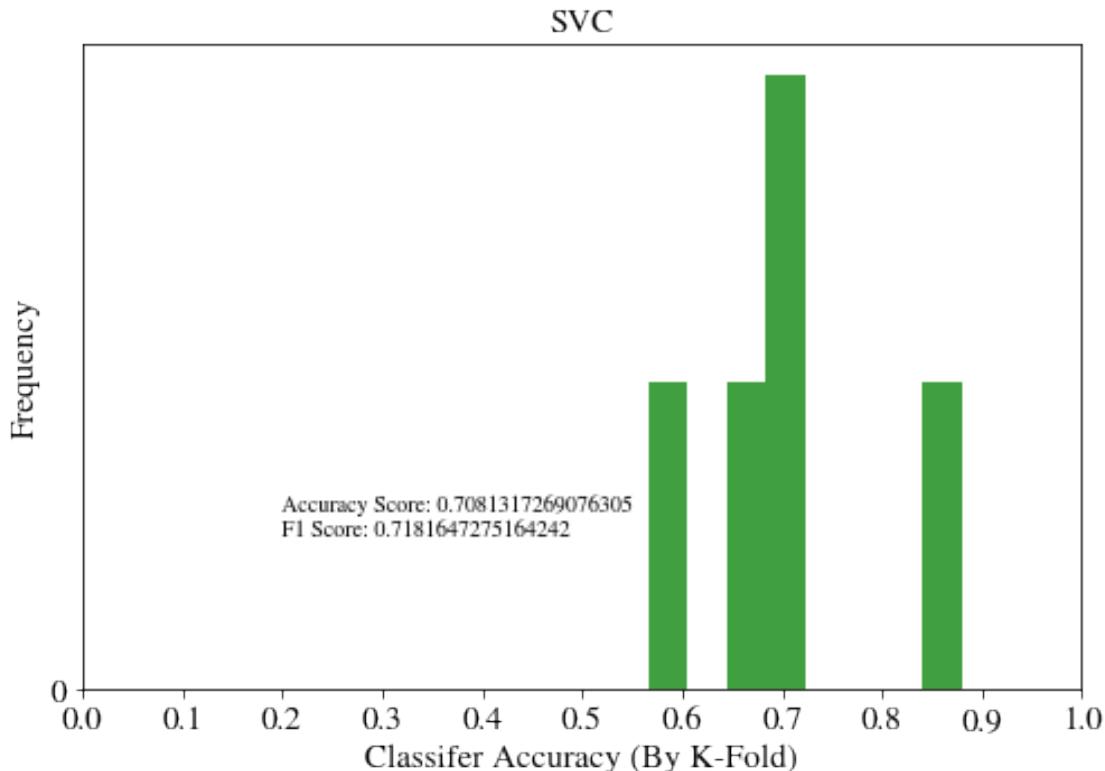
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas', 'accuracy': [0.7, 0.784, 0.714859437751004, 0.8594377510040161, 0.6666666666666666], 'avgAccuracy': 0.7449927710843374, 'f1': [0.6979960785782974, 0.7845305605341651, 0.7201478275748696, 0.8968389413892356, 0.6849408214870063], 'avgF1': 0.7568908459127148, 'precision': [0.7, 0.784, 0.714859437751004, 0.8594377510040161, 0.6666666666666666], 'avgPrecision': 0.7449927710843374, 'recall': [0.7, 0.784, 0.714859437751004, 0.8594377510040161, 0.6666666666666666], 'avgRecall': 0.7449927710843374, 'params': [{"algorithm": 'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 300, 'random_state': None}]}
*****
```

Processing Model: DecisionTreeClassifier



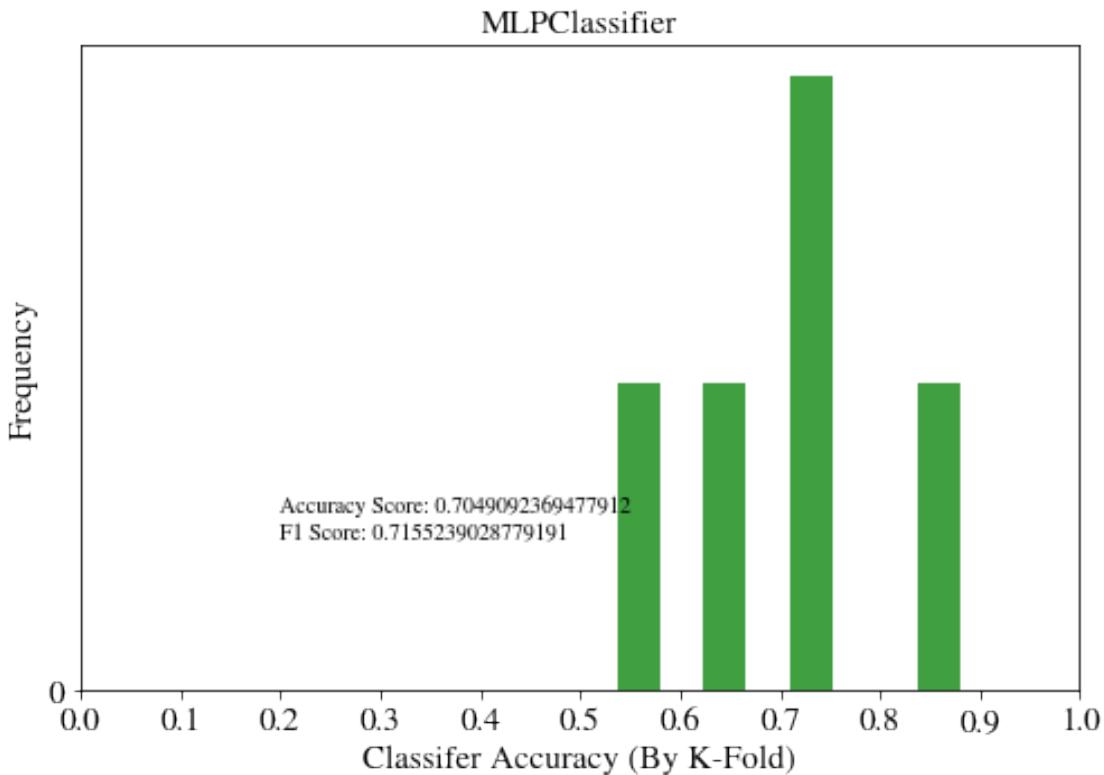
```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas', 'accuracy': [0.768, 0.792, 0.7831325301204819, 0.9156626506024096, 0.6706827309236948], 'avgAccuracy': 0.7858955823293172, 'f1': [0.7740820679993241, 0.7966746689066658, 0.7897327162735878, 0.9345838944804701, 0.682125471866087], 'avgF1': 0.795439763905227, 'precision': [0.768, 0.792, 0.7831325301204819, 0.9156626506024096, 0.6706827309236948], 'avgPrecision': 0.7858955823293172, 'recall': [0.768, 0.792, 0.7831325301204819, 0.9156626506024096, 0.6706827309236948], 'avgRecall': 0.7858955823293172, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****
```

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas', 'accuracy': [0.656, 0.72, 0.5662650602409639, 0.8795180722891566, 0.7188755020080321], 'avgAccuracy': 0.7081317269076305, 'f1': [0.6626529299037235, 0.732912, 0.563652459299564, 0.903198669477267, 0.7284075789015669], 'avgF1': 0.7181647275164242, 'precision': [0.656, 0.72, 0.5662650602409639, 0.8795180722891566, 0.7188755020080321], 'avgPrecision': 0.7081317269076305, 'recall': [0.656, 0.72, 0.5662650602409639, 0.8795180722891566, 0.7188755020080321], 'avgRecall': 0.7081317269076305, 'params': [{ 'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas', 'accuracy': [0.66, 0.728,
0.5381526104417671, 0.8795180722891566, 0.7188755020080321], 'avgAccuracy':
0.7049092369477912, 'f1': [0.6668578089800687, 0.7409747899159663,
0.5389974962611953, 0.904961147962637, 0.725828271269728], 'avgF1':
0.7155239028779191, 'precision': [0.66, 0.728, 0.5381526104417671,
0.8795180722891566, 0.7188755020080321], 'avgPrecision': 0.7049092369477912,
'recall': [0.66, 0.728, 0.5381526104417671, 0.8795180722891566,
0.7188755020080321], 'avgRecall': 0.7049092369477912, 'params': [{activation':
'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'invscaling', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum':
True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'warm_start': False}]}*****
```

```

'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start':
False}]}}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas', 'accuracy': [0.792, 0.84, 0.8232931726907631, 0.927710843373494, 0.7269076305220884], 'avgAccuracy': 0.8219823293172691, 'f1': [0.7933593897012079, 0.8352161616161616, 0.8294962720494635, 0.9430378655752774, 0.7313628679313001], 'avgF1': 0.8264945113746821, 'precision': [0.792, 0.84, 0.8232931726907631, 0.927710843373494, 0.7269076305220884], 'avgPrecision': 0.8219823293172691, 'recall': [0.792, 0.84, 0.8232931726907631, 0.927710843373494, 0.7269076305220884], 'avgRecall': 0.8219823293172691, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
model features \
0 RandomForestClassifier Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB Active inflammation?, Severity of Crypt Arch, ...
4 AdaBoostClassifier Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier Active inflammation?, Severity of Crypt Arch, ...
6 SVC Active inflammation?, Severity of Crypt Arch, ...
7 MLPClassifier Active inflammation?, Severity of Crypt Arch, ...

accuracy      f1  precision   recall \
0  0.813960  0.818488  0.813960  0.813960
1  0.758673  0.771995  0.758673  0.758673
2  0.685658  0.691271  0.685658  0.685658
3  0.629536  0.626839  0.629536  0.629536
4  0.744993  0.756891  0.744993  0.744993
5  0.757854  0.769570  0.757854  0.757854
6  0.708132  0.718165  0.708132  0.708132
7  0.688055  0.694262  0.688055  0.688055

params

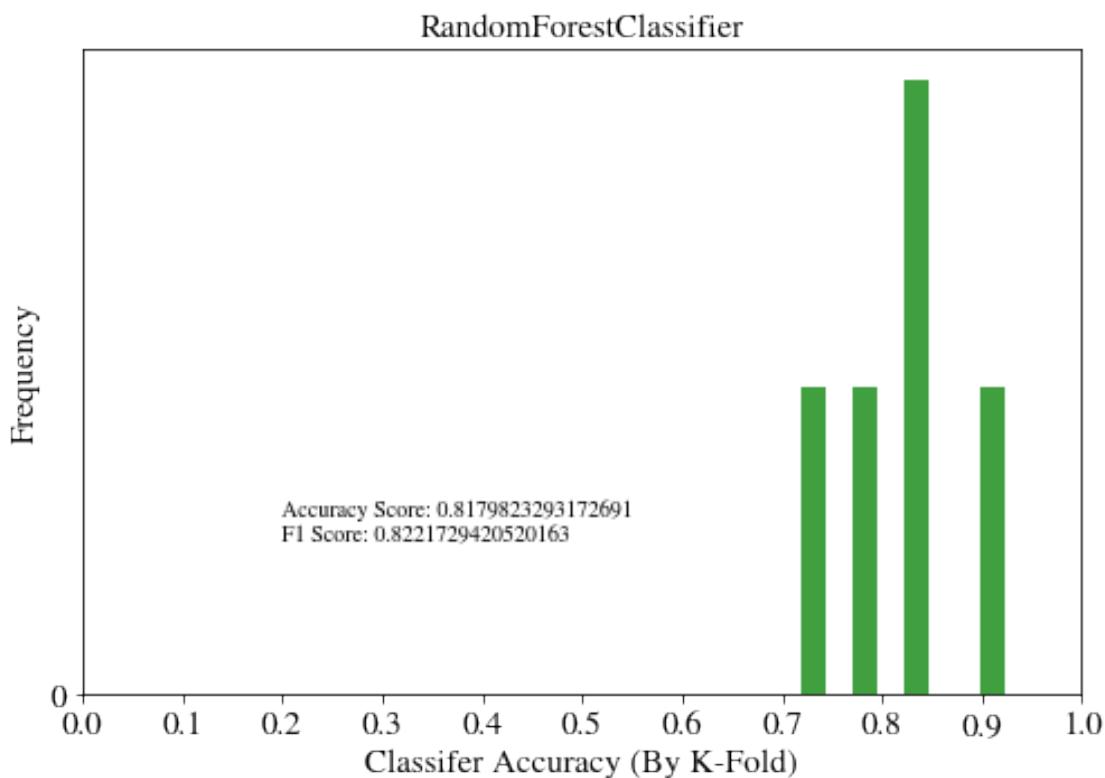
```

```

0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3         {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier



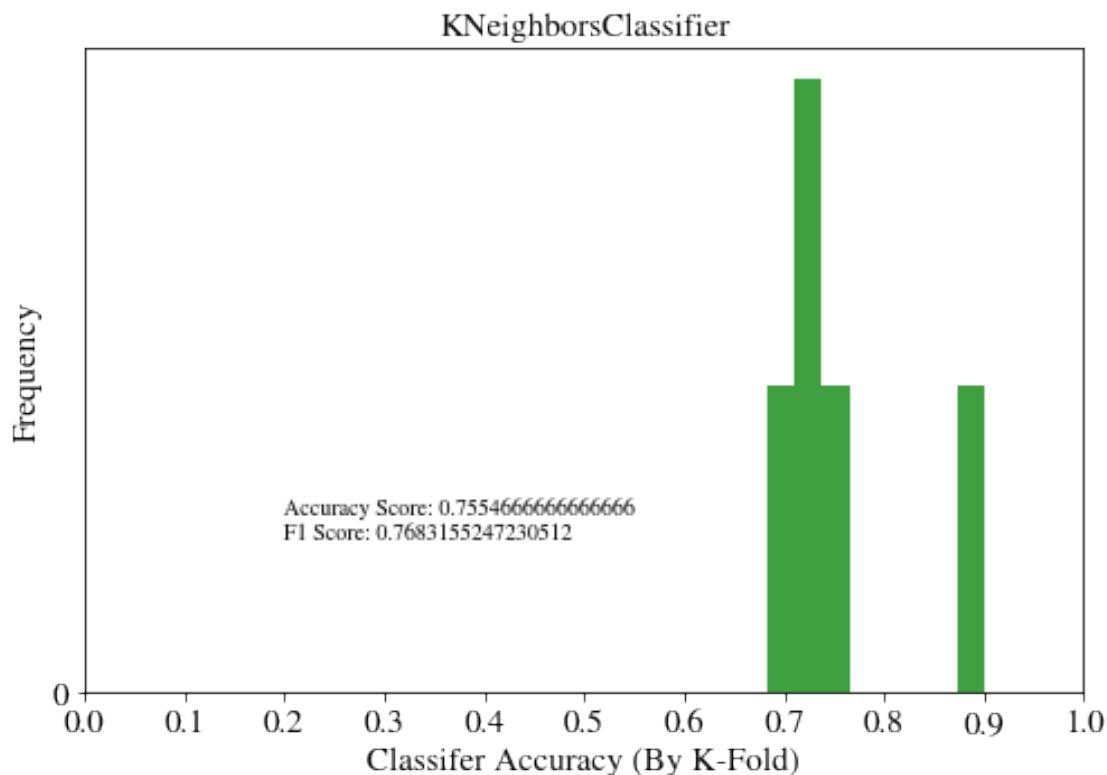
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs', 'accuracy': [0.772, 0.84, 0.8353413654618473,  
0.9236947791164659, 0.7188755020080321], 'avgAccuracy': 0.8179823293172691,  
'f1': [0.772909546119789, 0.8343230654609732, 0.8416270059817923,
```

```

0.9388218244517653, 0.7231832682457618], 'avgF1': 0.8221729420520163,
'precision': [0.772, 0.84, 0.8353413654618473, 0.9236947791164659,
0.7188755020080321], 'avgPrecision': 0.8179823293172691, 'recall': [0.772, 0.84,
0.8353413654618473, 0.9236947791164659, 0.7188755020080321], 'avgRecall':
0.8179823293172691, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0,
'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features':
'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease':
0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score':
True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



```

*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt

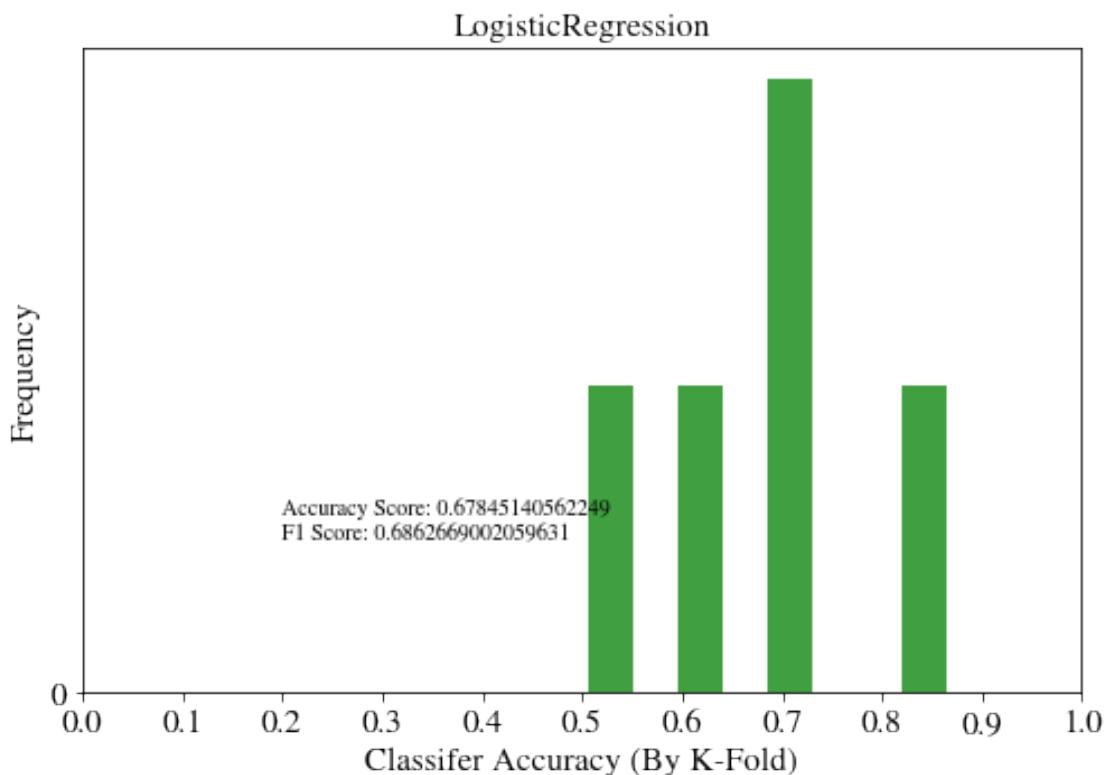
```

```

abscesses polymorphs', 'accuracy': [0.684, 0.76, 0.714859437751004,
0.8995983935742972, 0.7188755020080321], 'avgAccuracy': 0.7554666666666666,
'f1': [0.6922471857532823, 0.7706588121632503, 0.721473915398755,
0.9292748748538319, 0.7279228354461365], 'avgF1': 0.7683155247230512,
'precision': [0.684, 0.76, 0.714859437751004, 0.8995983935742972,
0.7188755020080321], 'avgPrecision': 0.7554666666666666, 'recall': [0.684, 0.76,
0.714859437751004, 0.8995983935742972, 0.7188755020080321], 'avgRecall':
0.7554666666666666, 'params': [{algorithm': 'brute', 'leaf_size': 30, 'metric':
'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 16, 'p': 2,
'weights': 'distance'}]}
*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt

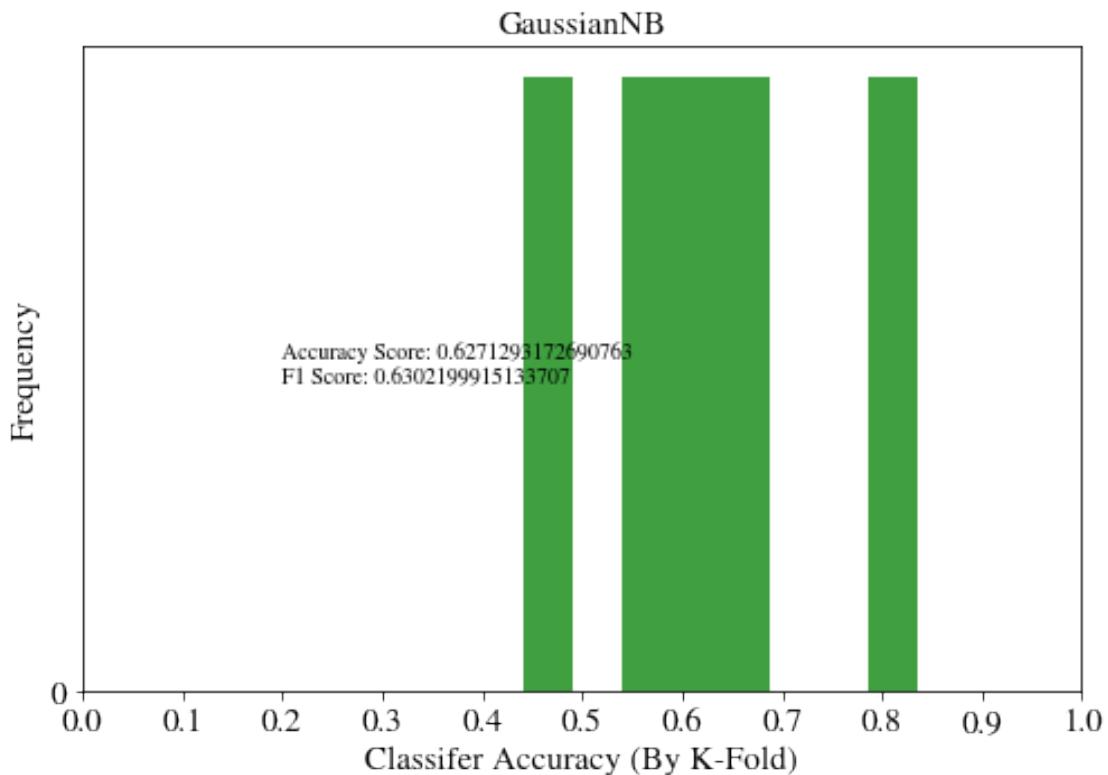
```

```

abscesses polymorphs', 'accuracy': [0.636, 0.692, 0.5060240963855421,
0.8634538152610441, 0.6947791164658634], 'avgAccuracy': 0.67845140562249, 'f1':
[0.6448814141324404, 0.7045493388644024, 0.48563548976377785,
0.8949370515770949, 0.7013312066920999], 'avgF1': 0.6862669002059631,
'precision': [0.636, 0.692, 0.5060240963855421, 0.8634538152610441,
0.6947791164658634], 'avgPrecision': 0.67845140562249, 'recall': [0.636, 0.692,
0.5060240963855421, 0.8634538152610441, 0.6947791164658634], 'avgRecall':
0.67845140562249, 'params': [{'C': 1, 'class_weight': None, 'dual': False,
'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None, 'max_iter':
100, 'multi_class': 'multinomial', 'n_jobs': -1, 'penalty': 'l2',
'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0,
'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial

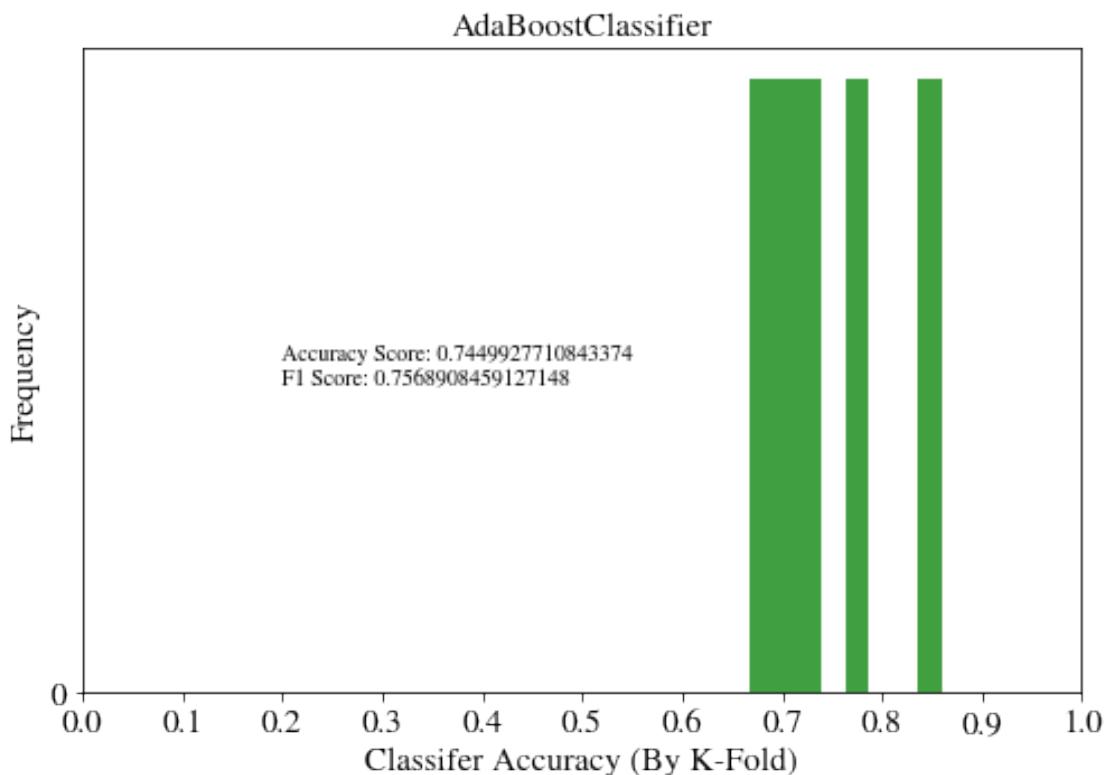
```

```

changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs', 'accuracy': [0.584, 0.64, 0.44176706827309237, 0.8353413654618473,
0.6345381526104418], 'avgAccuracy': 0.6271293172690763, 'f1':
[0.595006216194477, 0.636535593220339, 0.4586877367373483, 0.8348099571615193,
0.62606045425317], 'avgF1': 0.6302199915133707, 'precision': [0.584, 0.64,
0.44176706827309237, 0.8353413654618473, 0.6345381526104418], 'avgPrecision':
0.6271293172690763, 'recall': [0.584, 0.64, 0.44176706827309237,
0.8353413654618473, 0.6345381526104418], 'avgRecall': 0.6271293172690763,
'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,'
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt

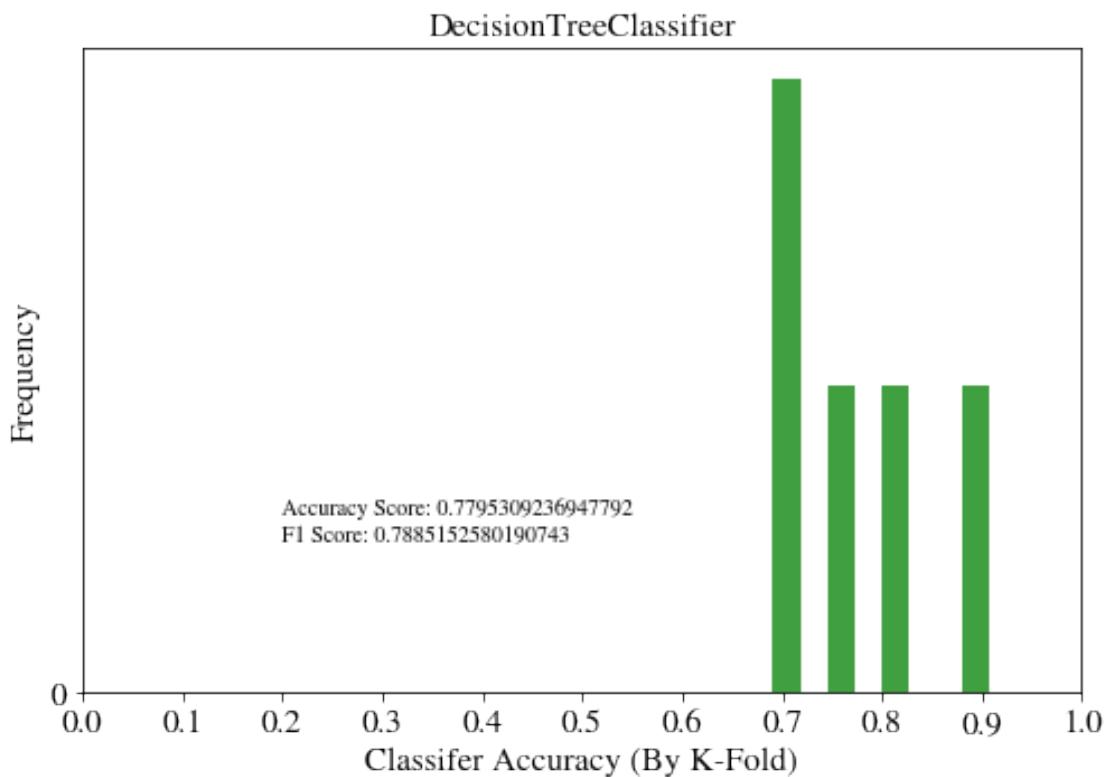
```

```

'absceses polymorphs', 'accuracy': [0.7, 0.784, 0.714859437751004,
0.8594377510040161, 0.6666666666666666], 'avgAccuracy': 0.7449927710843374,
'f1': [0.6979960785782974, 0.7845305605341651, 0.7201478275748696,
0.8968389413892356, 0.6849408214870063], 'avgF1': 0.7568908459127148,
'precision': [0.7, 0.784, 0.714859437751004, 0.8594377510040161,
0.6666666666666666], 'avgPrecision': 0.7449927710843374, 'recall': [0.7, 0.784,
0.714859437751004, 0.8594377510040161, 0.6666666666666666], 'avgRecall':
0.7449927710843374, 'params': [{'algorithm': 'SAMME.R', 'base_estimator': None,
'learning_rate': 1, 'n_estimators': 300, 'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



```

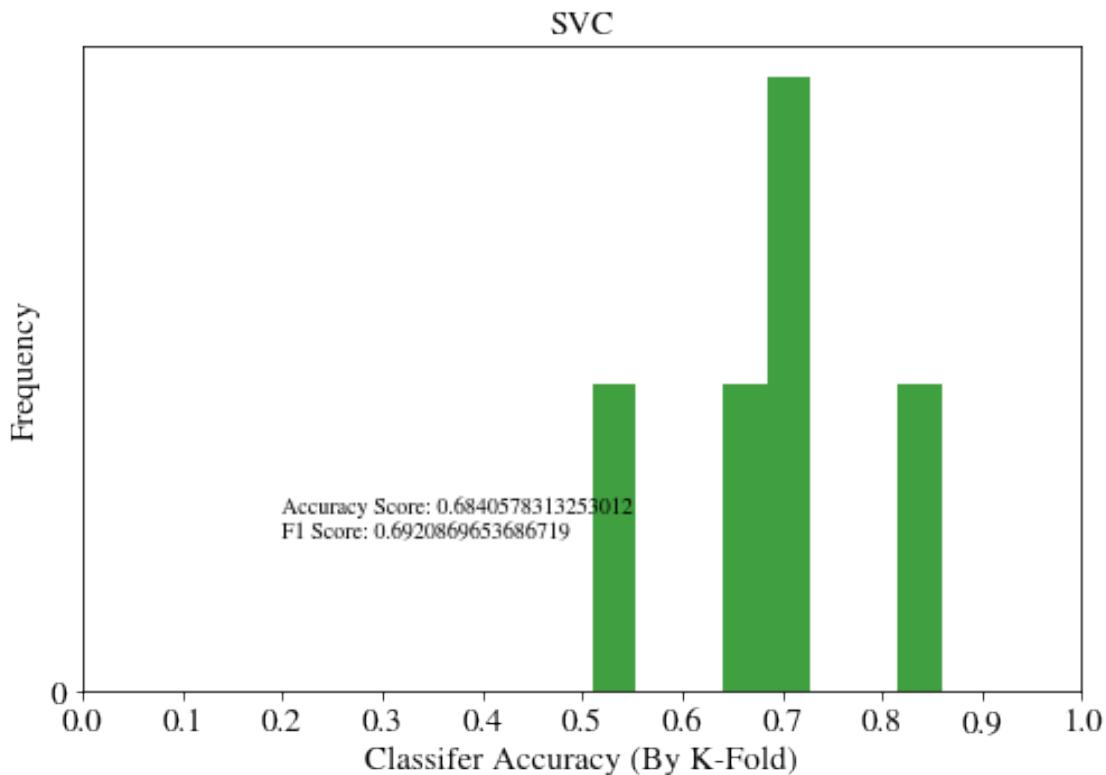
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,',
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
absceses polymorphs', 'accuracy': [0.716, 0.768, 0.8152610441767069,
```

```

0.9076305220883534, 0.6907630522088354], 'avgAccuracy': 0.7795309236947792,
'f1': [0.7192352975461911, 0.7709260808970713, 0.8214580596383672,
0.9314622227791003, 0.6994946292346419], 'avgF1': 0.7885152580190743,
'precision': [0.716, 0.768, 0.8152610441767069, 0.9076305220883534,
0.6907630522088354], 'avgPrecision': 0.7795309236947792, 'recall': [0.716,
0.768, 0.8152610441767069, 0.9076305220883534, 0.6907630522088354], 'avgRecall':
0.7795309236947792, 'params': [{'ccp_alpha': 0.0, 'class_weight': None,
'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt',
'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split':
None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf':
0.0, 'random_state': None, 'splitter': 'best'}]}
*****

```

Processing Model: SVC



```

*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt
Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in
lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,
Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,
Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists

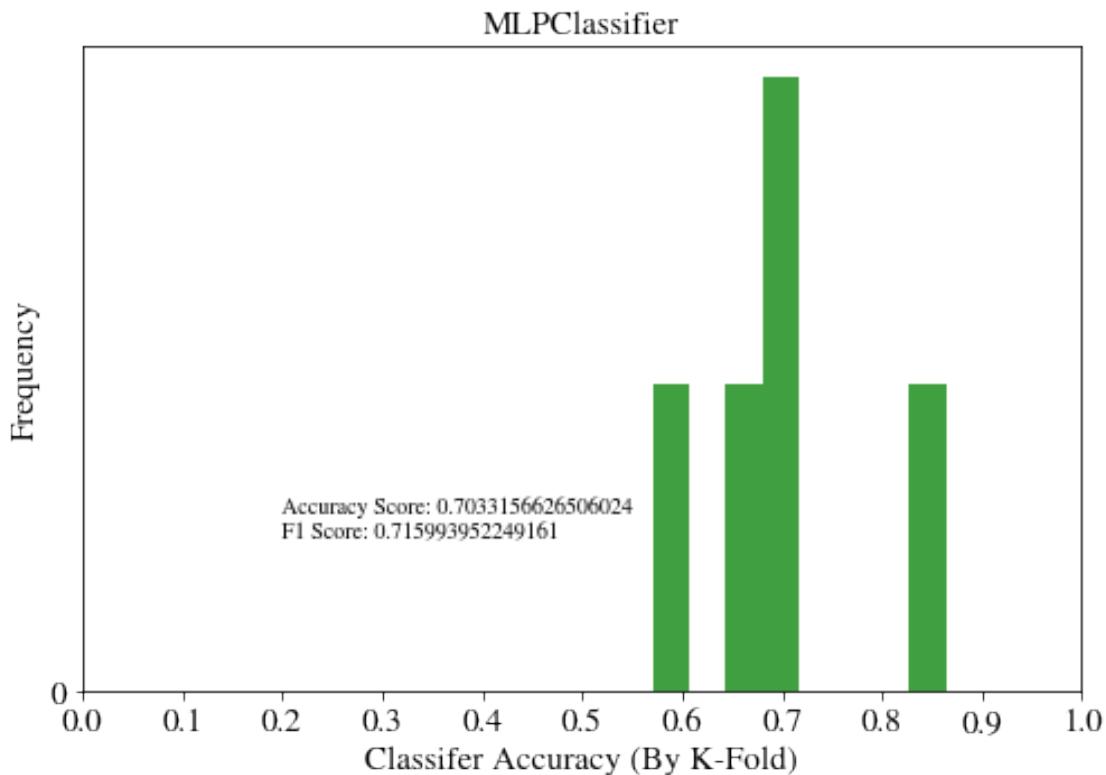
```

```

diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs',
'accuracy': [0.648, 0.7, 0.5100401606425703, 0.8594377510040161,
0.7028112449799196], 'avgAccuracy': 0.6840578313253012, 'f1':
[0.6543442940038685, 0.7155075614045583, 0.4885014152406301, 0.8884051388020276,
0.7136764173922749], 'avgF1': 0.6920869653686719, 'precision': [0.648, 0.7,
0.5100401606425703, 0.8594377510040161, 0.7028112449799196], 'avgPrecision':
0.6840578313253012, 'recall': [0.648, 0.7, 0.5100401606425703,
0.8594377510040161, 0.7028112449799196], 'avgRecall': 0.6840578313253012,
'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight':
None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma':
'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False,
'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```

*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial

```

```

changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs', 'accuracy': [0.66, 0.712, 0.570281124497992, 0.8634538152610441,
0.7108433734939759], 'avgAccuracy': 0.7033156626506024, 'f1':
[0.666587234042553, 0.7263824175824176, 0.5752557267397114, 0.893184587174028,
0.7185597957070945], 'avgF1': 0.715993952249161, 'precision': [0.66, 0.712,
0.570281124497992, 0.8634538152610441, 0.7108433734939759], 'avgPrecision':
0.7033156626506024, 'recall': [0.66, 0.712, 0.570281124497992,
0.8634538152610441, 0.7108433734939759], 'avgRecall': 0.7033156626506024,
'params': [{activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto',
'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08,
'hidden_layer_sizes': (100,), 'learning_rate': 'adaptive', 'learning_rate_init':
0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum': 0.9, 'n_iter_no_change':
10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle':
True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose':
False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs', 'accuracy': [0.772, 0.84, 0.8353413654618473,
0.9236947791164659, 0.7188755020080321], 'avgAccuracy': 0.8179823293172691,
'f1': [0.772909546119789, 0.8343230654609732, 0.8416270059817923,
0.9388218244517653, 0.7231832682457618], 'avgF1': 0.8221729420520163,
'precision': [0.772, 0.84, 0.8353413654618473, 0.9236947791164659,
0.7188755020080321], 'avgPrecision': 0.8179823293172691, 'recall': [0.772, 0.84,
0.8353413654618473, 0.9236947791164659, 0.7188755020080321], 'avgRecall':
0.8179823293172691, 'params': [{bootstrap': True, 'ccp_alpha': 0.0,
'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features':
'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease':
0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score':
True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

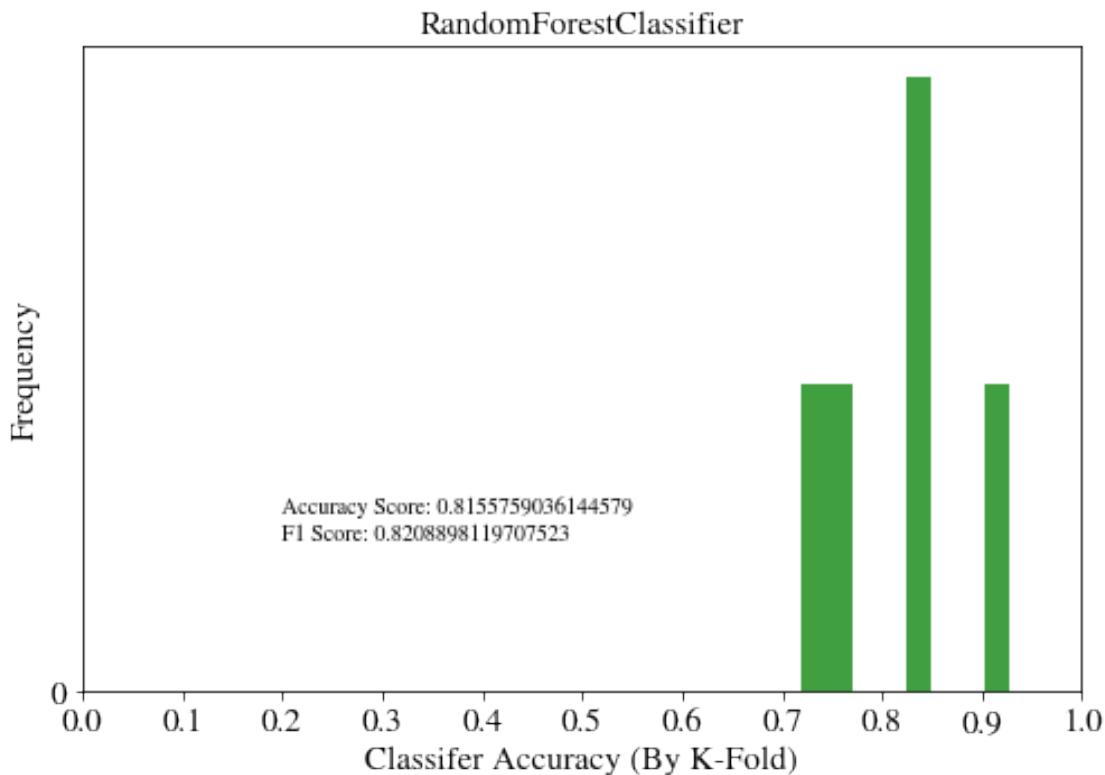
model	features \
0 RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB	Active inflammation?, Severity of Crypt Arch, ...
4 AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...
6 SVC	Active inflammation?, Severity of Crypt Arch, ...

7 MLPClassifier Active inflammation?, Severity of Crypt Arch, ...

```
accuracy      f1  precision   recall  \
0  0.813982  0.818733  0.813982  0.813982
1  0.753060  0.766252  0.753060  0.753060
2  0.678451  0.686267  0.678451  0.678451
3  0.627129  0.630220  0.627129  0.627129
4  0.744993  0.756891  0.744993  0.744993
5  0.765105  0.774485  0.765105  0.765105
6  0.684058  0.692087  0.684058  0.684058
7  0.684845  0.693596  0.684845  0.684845

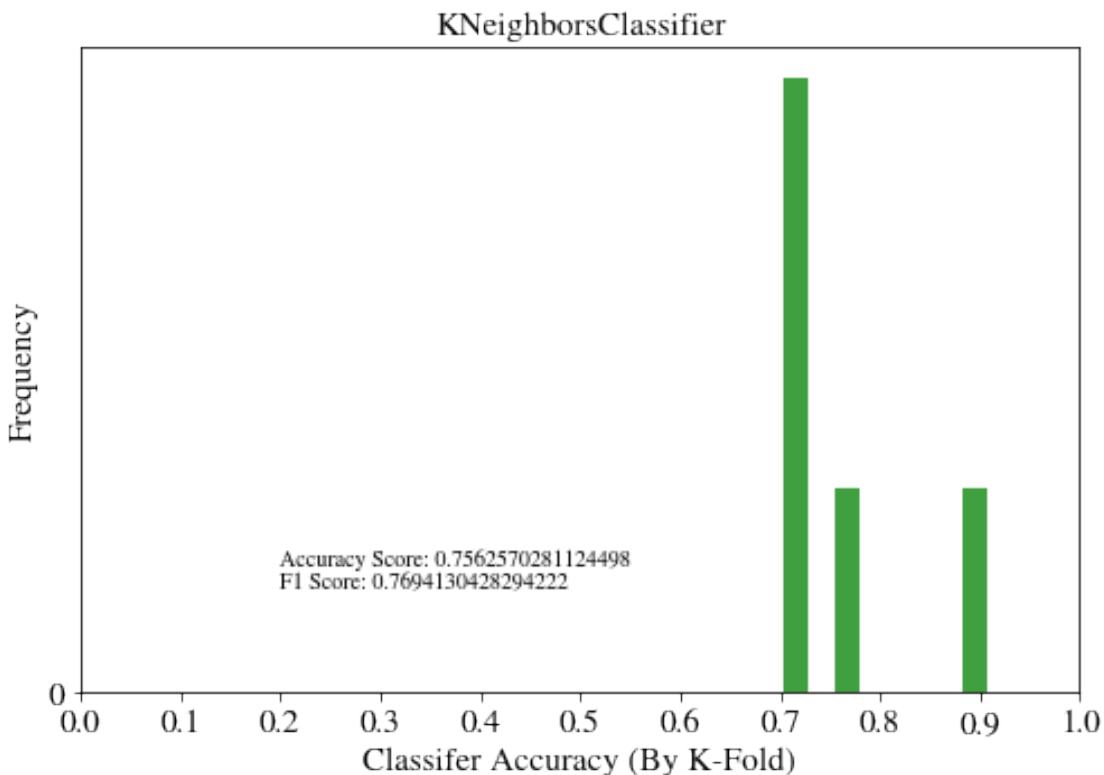
params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3     {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...
```

Processing Model: RandomForestClassifier



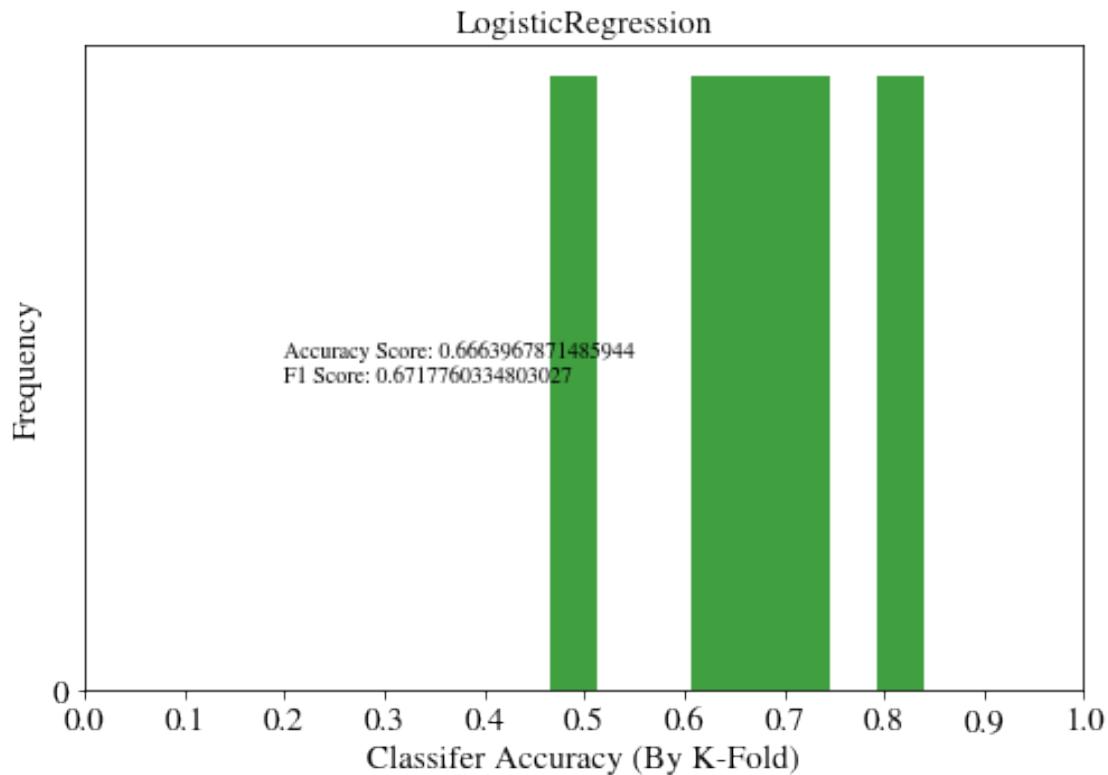
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy': [0.768, 0.84, 0.8232931726907631, 0.927710843373494, 0.7188755020080321], 'avgAccuracy': 0.8155759036144579, 'f1': [0.7699294056202101, 0.8390826371288213, 0.8295430119967707, 0.9410717381220082, 0.7248222669859513], 'avgF1': 0.8208898119707523, 'precision': [0.768, 0.84, 0.8232931726907631, 0.927710843373494, 0.7188755020080321], 'avgPrecision': 0.8155759036144579, 'recall': [0.768, 0.84, 0.8232931726907631, 0.927710843373494, 0.7188755020080321], 'avgRecall': 0.8155759036144579, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
```

Processing Model: KNeighborsClassifier



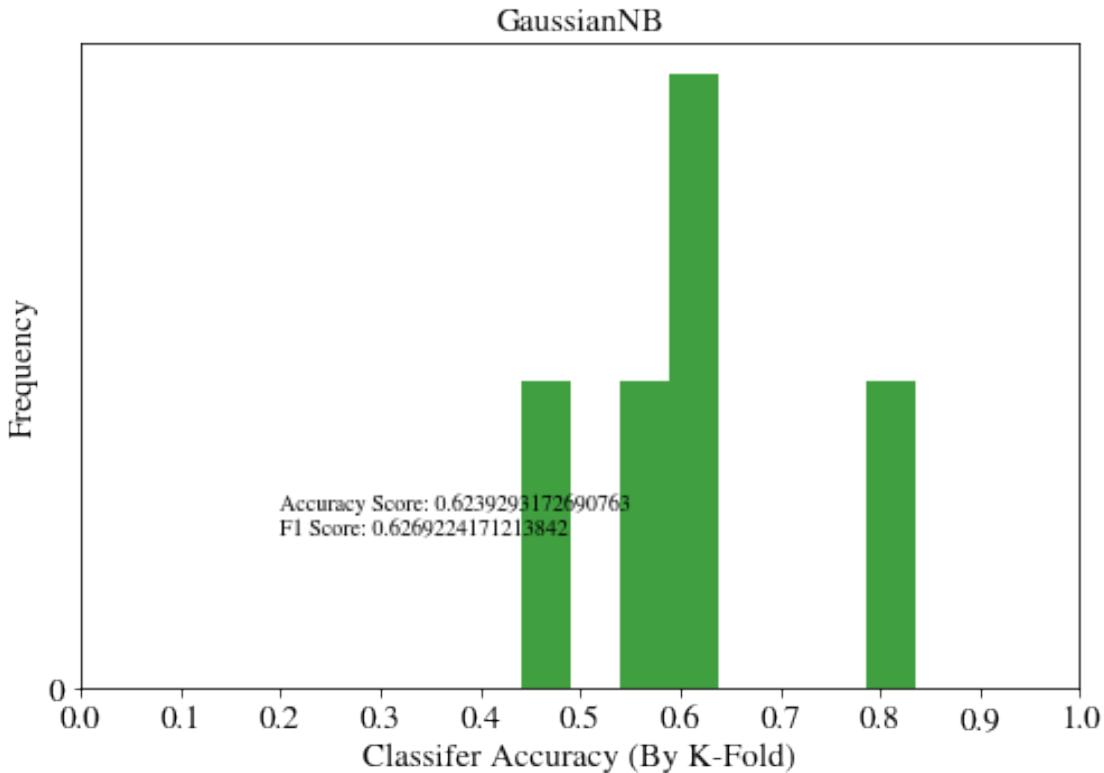
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy':  
[0.704, 0.756, 0.7028112449799196, 0.9076305220883534, 0.7108433734939759],  
'avgAccuracy': 0.7562570281124498, 'f1': [0.7119396732299959,  
0.7677376807706376, 0.7090957157455672, 0.9343201376936316, 0.7239720067072789],  
'avgF1': 0.7694130428294222, 'precision': [0.704, 0.756, 0.7028112449799196,  
0.9076305220883534, 0.7108433734939759], 'avgPrecision': 0.7562570281124498,  
'recall': [0.704, 0.756, 0.7028112449799196, 0.9076305220883534,  
0.7108433734939759], 'avgRecall': 0.7562570281124498, 'params': [{  
'algorithm': 'brute', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None,  
'n_jobs': -1, 'n_neighbors': 16, 'p': 2, 'weights': 'distance'}]}  
*****
```

Processing Model: LogisticRegression



```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy':  
[0.632, 0.704, 0.46586345381526106, 0.8393574297188755, 0.6907630522088354],  
'avgAccuracy': 0.6663967871485944, 'f1': [0.6408078085209663,  
0.7163417395779722, 0.42833058513772376, 0.8756599431433599,  
0.6977400910214915], 'avgF1': 0.6717760334803027, 'precision': [0.632, 0.704,  
0.46586345381526106, 0.8393574297188755, 0.6907630522088354], 'avgPrecision':  
0.6663967871485944, 'recall': [0.632, 0.704, 0.46586345381526106,  
0.8393574297188755, 0.6907630522088354], 'avgRecall': 0.6663967871485944,  
'params': [{'C': 1, 'class_weight': None, 'dual': False, 'fit_intercept': True,  
'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class':  
'multinomial', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver':  
'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}  
*****
```

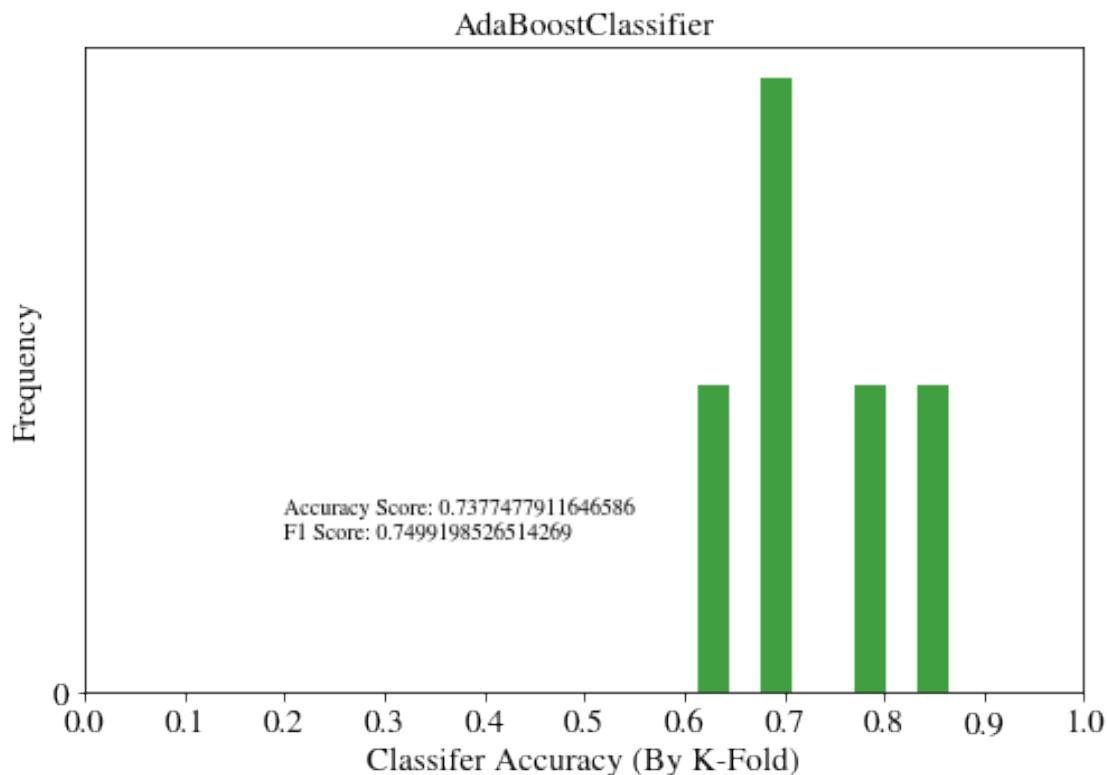
Processing Model: GaussianNB



```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy': [0.58, 0.628, 0.44176706827309237, 0.8353413654618473, 0.6345381526104418], 'avgAccuracy': 0.6239293172690763, 'f1': [0.5901852270249915, 0.6246739573679333, 0.4582884423127284, 0.8348099571615193, 0.6266545017397482], 'avgF1': 0.6269224171213842, 'precision': [0.58, 0.628, 0.44176706827309237, 0.8353413654618473, 0.6345381526104418], 'avgPrecision': 0.6239293172690763, 'recall': [0.58, 0.628, 0.44176706827309237, 0.8353413654618473, 0.6345381526104418], 'avgRecall': 0.6239293172690763, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}
```

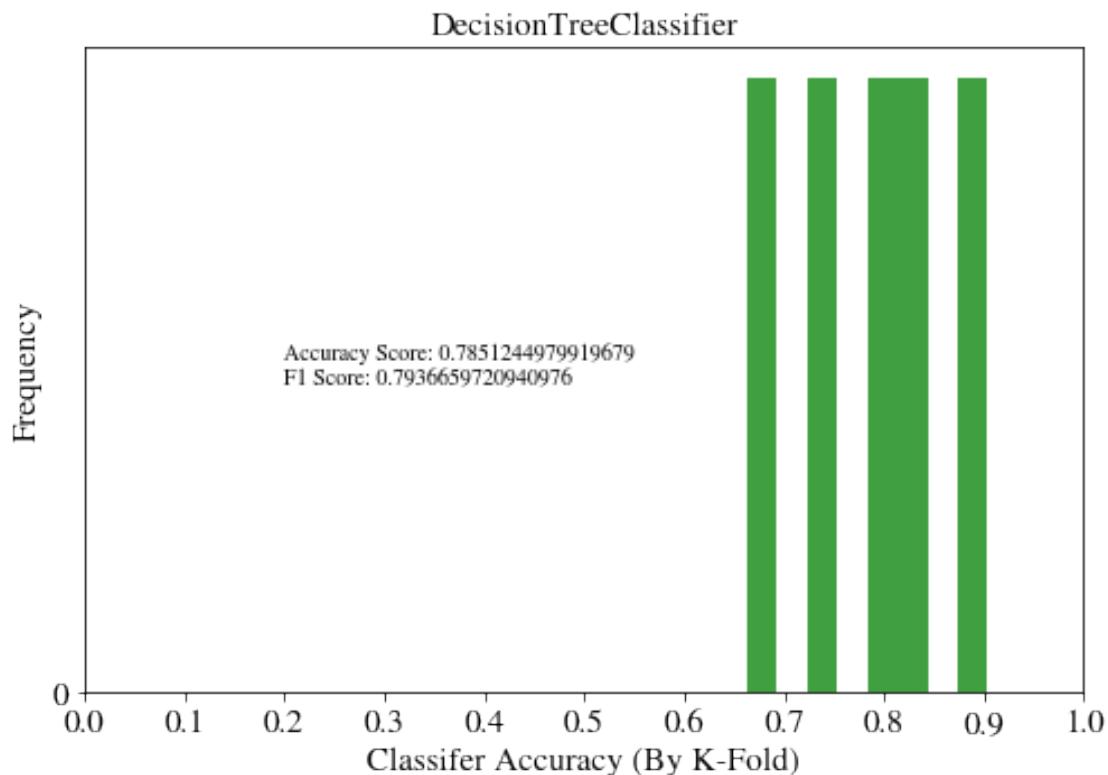
\*\*\*\*\*

Processing Model: AdaBoostClassifier



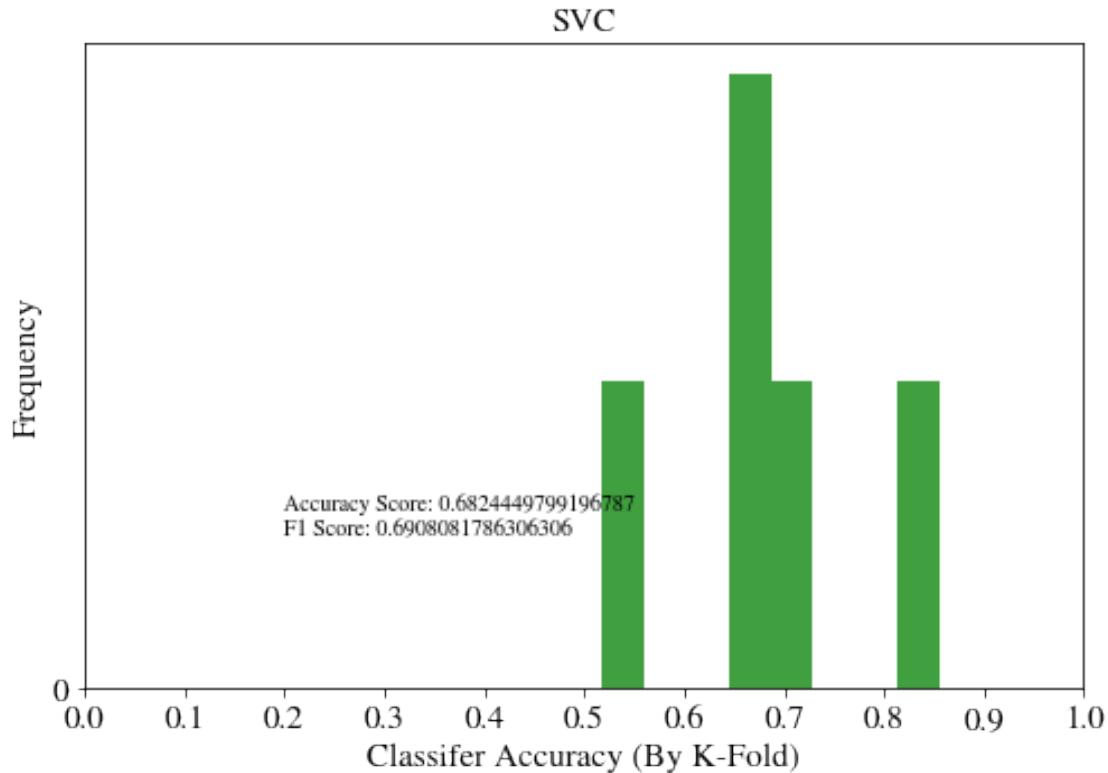
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy':  
[0.704, 0.8, 0.7068273092369478, 0.8634538152610441, 0.6144578313253012],  
'avgAccuracy': 0.7377477911646586, 'f1': [0.7006857163673454,  
0.7993653977661273, 0.7130806018956604, 0.9012201023969025, 0.635247444831099],  
'avgF1': 0.7499198526514269, 'precision': [0.704, 0.8, 0.7068273092369478,  
0.8634538152610441, 0.6144578313253012], 'avgPrecision': 0.7377477911646586,  
'recall': [0.704, 0.8, 0.7068273092369478, 0.8634538152610441,  
0.6144578313253012], 'avgRecall': 0.7377477911646586, 'params': [{algorithm':  
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 300,  
'random_state': None}]}
*****
```

Processing Model: DecisionTreeClassifier



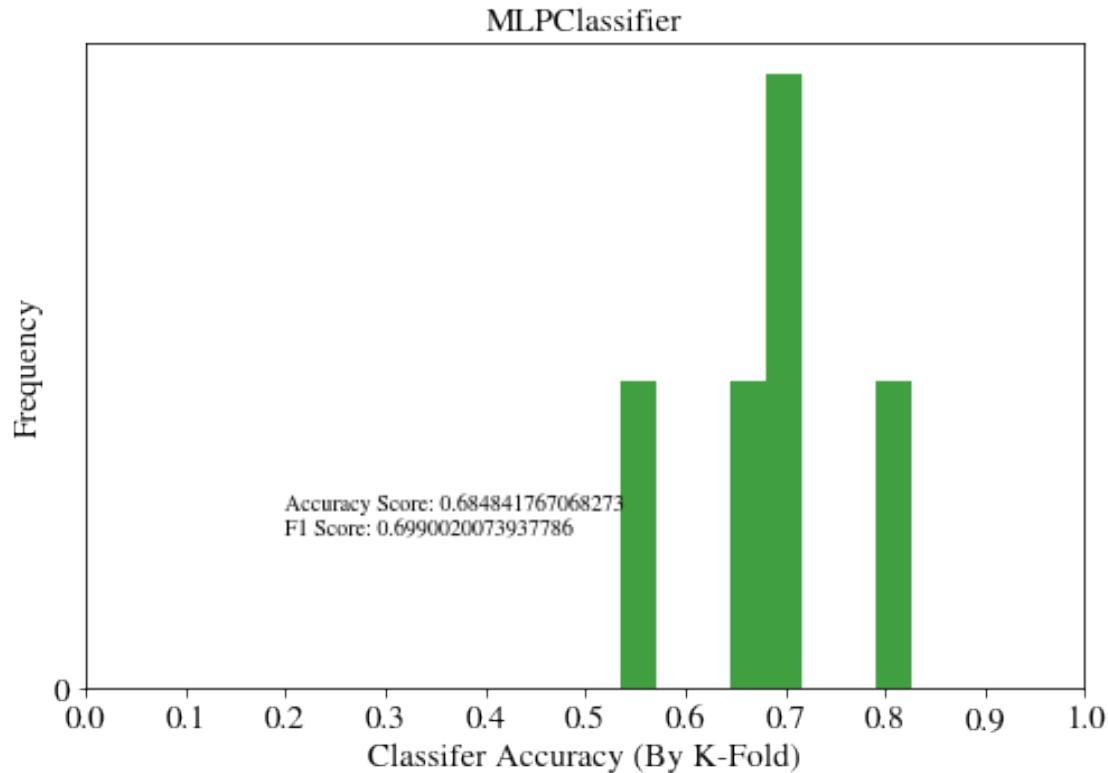
```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy': [0.728, 0.792, 0.8393574297188755, 0.9036144578313253, 0.6626506024096386], 'avgAccuracy': 0.7851244979919679, 'f1': [0.7335285136955545, 0.7944929115619529, 0.84566111603918, 0.9225093746832879, 0.6721379444905127], 'avgF1': 0.7936659720940976, 'precision': [0.728, 0.792, 0.8393574297188755, 0.9036144578313253, 0.6626506024096386], 'avgPrecision': 0.7851244979919679, 'recall': [0.728, 0.792, 0.8393574297188755, 0.9036144578313253, 0.6626506024096386], 'avgRecall': 0.7851244979919679, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****
```

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy': [0.648, 0.708, 0.5180722891566265, 0.8554216867469879, 0.6827309236947792], 'avgAccuracy': 0.6824449799196787, 'f1': [0.6543442940038685, 0.7231826227193875, 0.4963582865926183, 0.8852984973602275, 0.6948571924770515], 'avgF1': 0.6908081786306306, 'precision': [0.648, 0.708, 0.5180722891566265, 0.8554216867469879, 0.6827309236947792], 'avgPrecision': 0.6824449799196787, 'recall': [0.648, 0.708, 0.5180722891566265, 0.8554216867469879, 0.6827309236947792], 'avgRecall': 0.6824449799196787, 'params': [{C: 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy': [0.656, 0.716, 0.5341365461847389, 0.8273092369477911, 0.6907630522088354], 'avgAccuracy': 0.684841767068273, 'f1': [0.6627607582946096, 0.7310991638946327, 0.5354918644428278, 0.8636117503722756, 0.7020464999645473], 'avgF1': 0.6990020073937786, 'precision': [0.656, 0.716, 0.5341365461847389, 0.8273092369477911, 0.6907630522088354], 'avgPrecision': 0.684841767068273, 'recall': [0.656, 0.716, 0.5341365461847389, 0.8273092369477911, 0.6907630522088354], 'avgRecall': 0.684841767068273, 'params': [{"activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum':
```

```

True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam',
'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start':
False}]}}

*****
*****  

* Best Performing Model and Params is:  

* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy':  

[0.768, 0.84, 0.8232931726907631, 0.927710843373494, 0.7188755020080321],  

'avgAccuracy': 0.8155759036144579, 'f1': [0.7699294056202101,  

0.8390826371288213, 0.8295430119967707, 0.9410717381220082, 0.7248222669859513],  

'avgF1': 0.8208898119707523, 'precision': [0.768, 0.84, 0.8232931726907631,  

0.927710843373494, 0.7188755020080321], 'avgPrecision': 0.8155759036144579,  

'recall': [0.768, 0.84, 0.8232931726907631, 0.927710843373494,  

0.7188755020080321], 'avgRecall': 0.8155759036144579, 'params': [{bootstrap':  

True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy',  

'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None,  

'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None,  

'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0,  

'n_estimators': 200, 'n_jobs': -1, 'oob_score': True, 'random_state': None,  

'verbose': 0, 'warm_start': False}]}}

*****

```

	model	features \			
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...			
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...			
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...			
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...			
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...			
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...			
6	SVC	Active inflammation?, Severity of Crypt Arch, ...			
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...			
	accuracy	f1	precision	recall	\
0	0.807557	0.813110	0.807557	0.807557	
1	0.753854	0.767800	0.753854	0.753854	
2	0.666397	0.671776	0.666397	0.666397	
3	0.623929	0.626922	0.623929	0.623929	
4	0.737748	0.749920	0.737748	0.737748	
5	0.765896	0.775972	0.765896	0.765896	
6	0.682445	0.690808	0.682445	0.682445	
7	0.680022	0.688909	0.680022	0.680022	

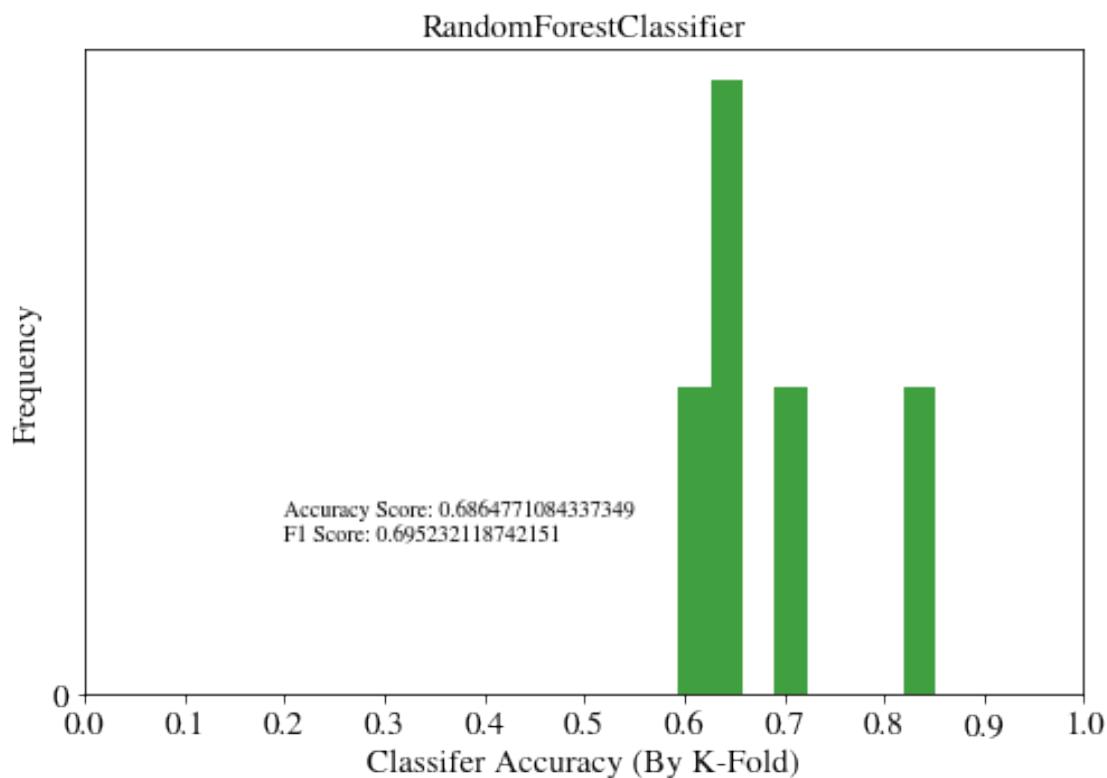
params

```

0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3         {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier



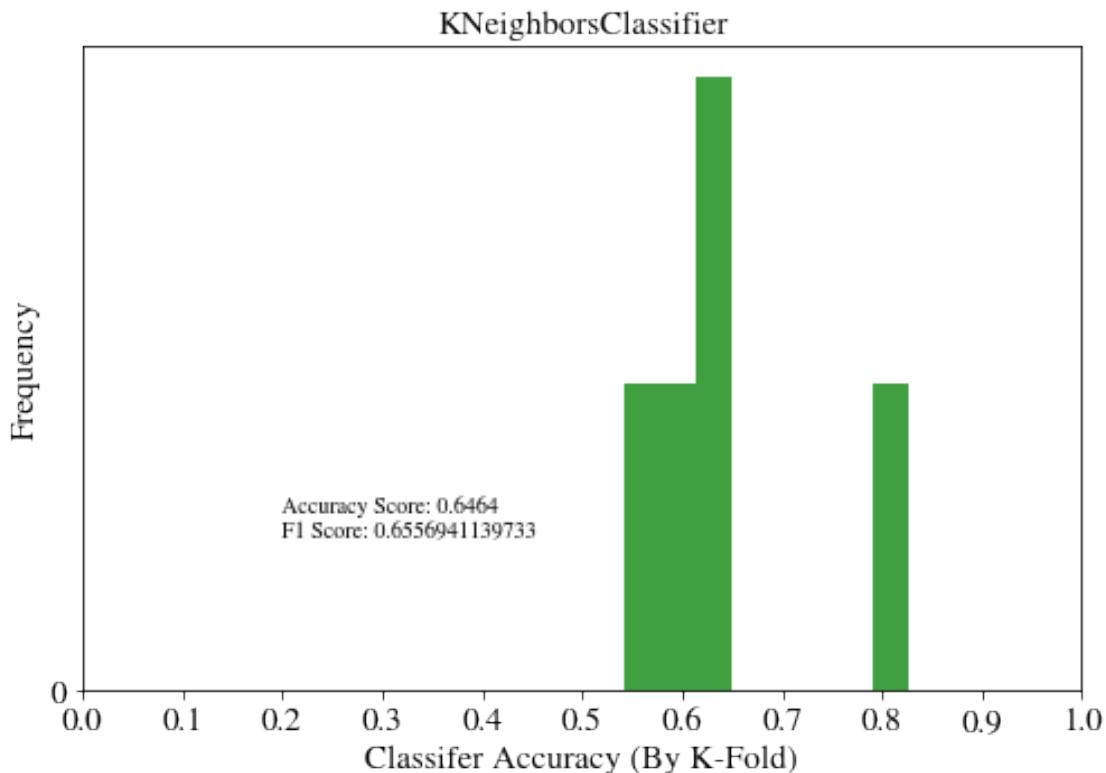
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis', 'accuracy': [0.644, 0.692,  
0.5943775100401606, 0.8514056224899599, 0.6506024096385542], 'avgAccuracy':  
0.6864771084337349, 'f1': [0.647642959056718, 0.6858956591964466,  
0.6409392710586637, 0.8527955722219878, 0.6488871321769386], 'avgF1':
```

```

0.695232118742151, 'precision': [0.644, 0.692, 0.5943775100401606,
0.8514056224899599, 0.6506024096385542], 'avgPrecision': 0.6864771084337349,
'recall': [0.644, 0.692, 0.5943775100401606, 0.8514056224899599,
0.6506024096385542], 'avgRecall': 0.6864771084337349, 'params': [{bootstrap':
True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy',
'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None,
'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None,
'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0,
'n_estimators': 700, 'n_jobs': -1, 'oob_score': True, 'random_state': None,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



```

*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis', 'accuracy': [0.592, 0.64, 0.5421686746987951,

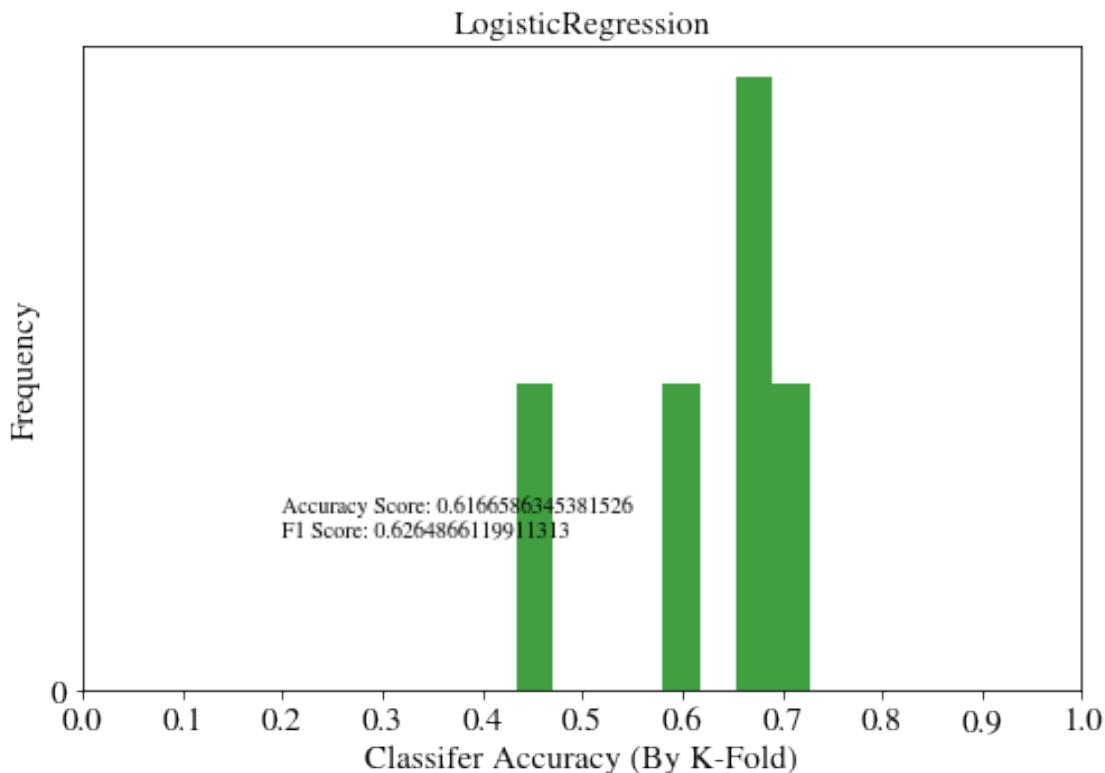
```

```

0.8273092369477911, 0.6305220883534136], 'avgAccuracy': 0.6464, 'f1':
[0.5998860061756097, 0.6464513480619676, 0.5676315444271304, 0.8347332098716466,
0.6297684613301456], 'avgF1': 0.6556941139733, 'precision': [0.592, 0.64,
0.5421686746987951, 0.8273092369477911, 0.6305220883534136], 'avgPrecision':
0.6464, 'recall': [0.592, 0.64, 0.5421686746987951, 0.8273092369477911,
0.6305220883534136], 'avgRecall': 0.6464, 'params': [{algorithm': 'auto',
'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1,
'n_neighbors': 14, 'p': 2, 'weights': 'distance'}]}
*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis', 'accuracy': [0.604, 0.656,
0.43373493975903615, 0.7269076305220884, 0.6626506024096386], 'avgAccuracy':
0.6166586345381526, 'f1': [0.6159222172764769, 0.6576281917531595,

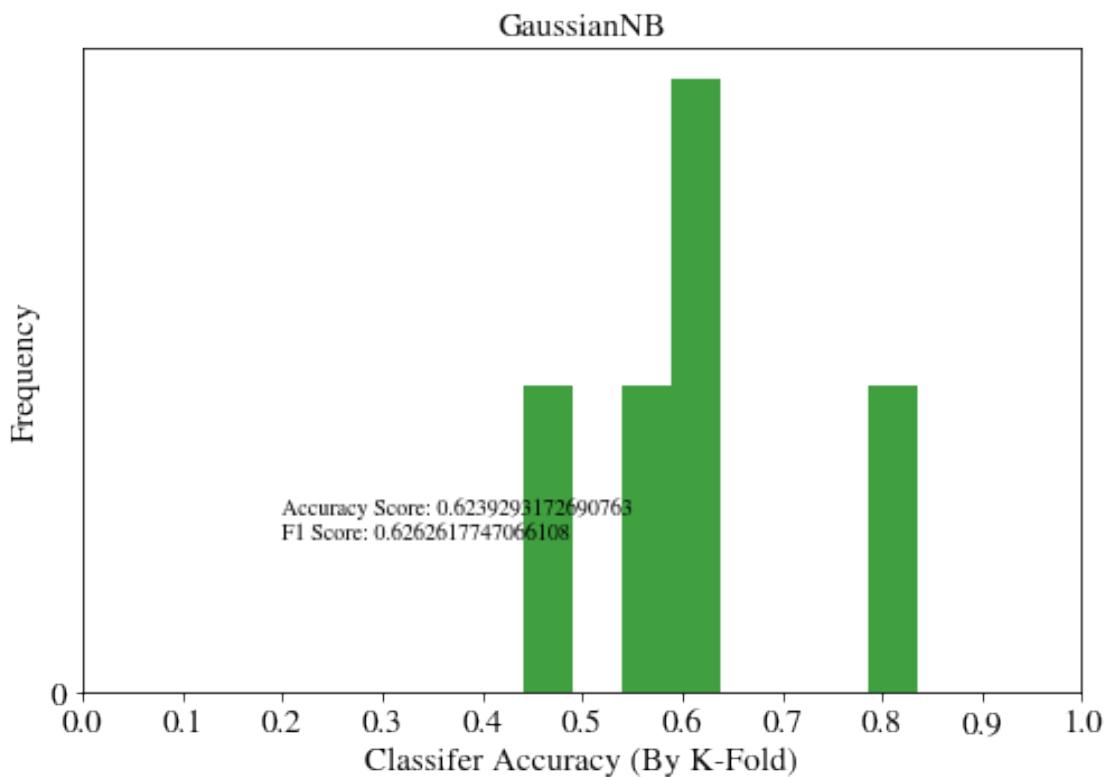
```

```

0.42607846300427843, 0.772008820808388, 0.6607953671133536], 'avgF1':
0.6264866119911313, 'precision': [0.604, 0.656, 0.43373493975903615,
0.7269076305220884, 0.6626506024096386], 'avgPrecision': 0.6166586345381526,
'recall': [0.604, 0.656, 0.43373493975903615, 0.7269076305220884,
0.6626506024096386], 'avgRecall': 0.6166586345381526, 'params': [{'C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs':
-1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis', 'accuracy': [0.58, 0.628, 0.44176706827309237,
0.8353413654618473, 0.6345381526104418], 'avgAccuracy': 0.6239293172690763,

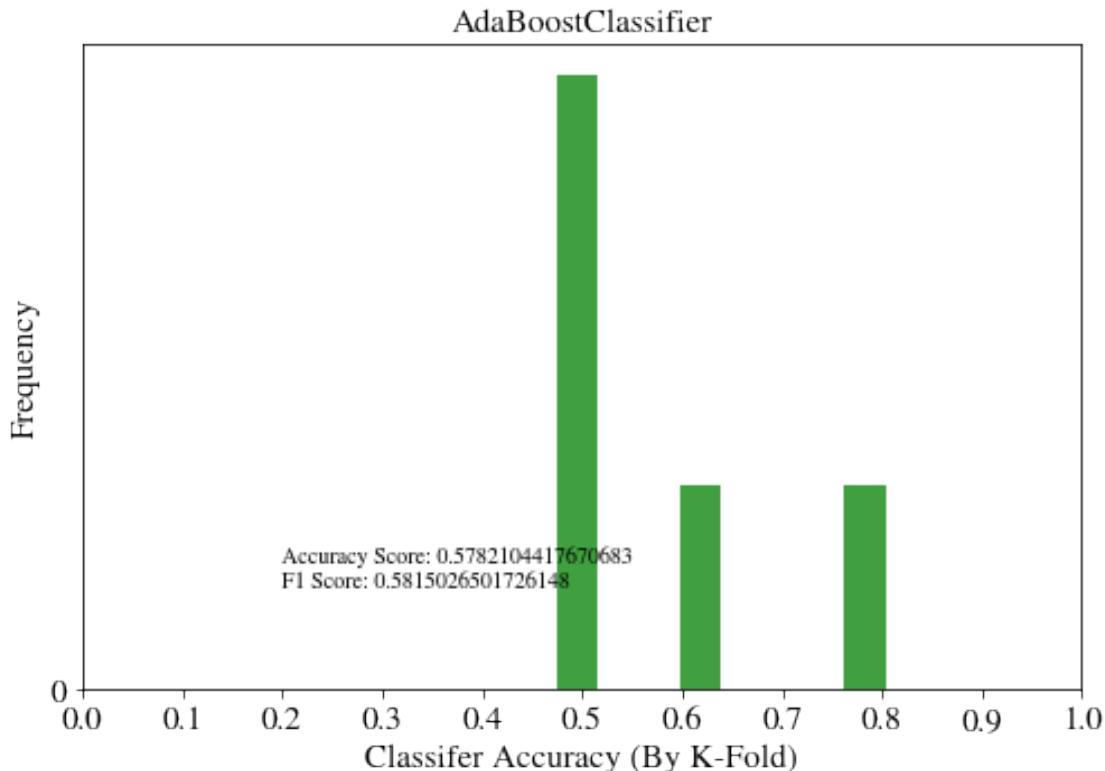
```

```

'f1': [0.5879195229959204, 0.6224981684981685, 0.4594267231376977,
0.8348099571615193, 0.6266545017397482], 'avgF1': 0.6262617747066108,
'precision': [0.58, 0.628, 0.44176706827309237, 0.8353413654618473,
0.6345381526104418], 'avgPrecision': 0.6239293172690763, 'recall': [0.58, 0.628,
0.44176706827309237, 0.8353413654618473, 0.6345381526104418], 'avgRecall':
0.6239293172690763, 'params': {'priors': None, 'var_smoothing': 1e-09}}}
*****

```

Processing Model: AdaBoostClassifier



```

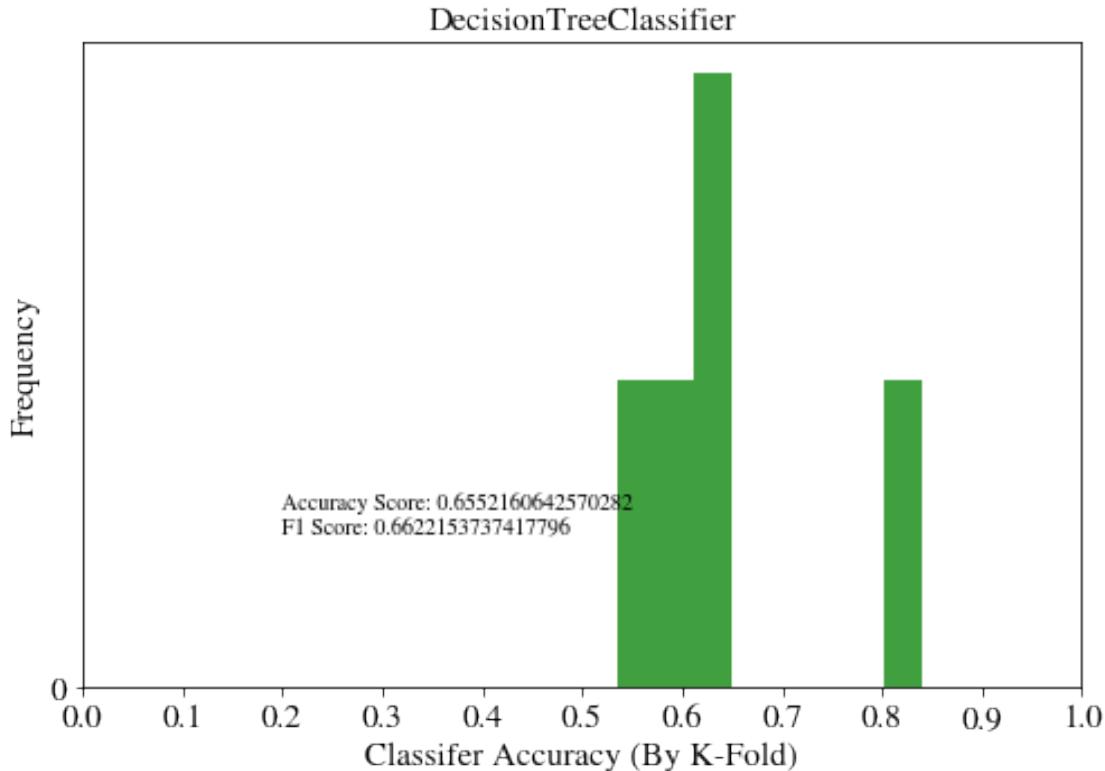
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis', 'accuracy': [0.5, 0.628, 0.4738955823293173, 0.8032128514056225, 0.4859437751004016], 'avgAccuracy': 0.5782104417670683, 'f1': [0.5017889615842672, 0.6246355275325767, 0.5061752050904321, 0.8138106357531544, 0.4611029209026438], 'avgF1': 0.5815026501726148, 'precision': [0.5, 0.628, 0.4738955823293173, 0.8032128514056225,
```

```

0.4859437751004016], 'avgPrecision': 0.5782104417670683, 'recall': [0.5, 0.628,
0.4738955823293173, 0.8032128514056225, 0.4859437751004016], 'avgRecall':
0.5782104417670683, 'params': [{'algorithm': 'SAMME.R', 'base_estimator': None,
'learning_rate': 1, 'n_estimators': 100, 'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



```

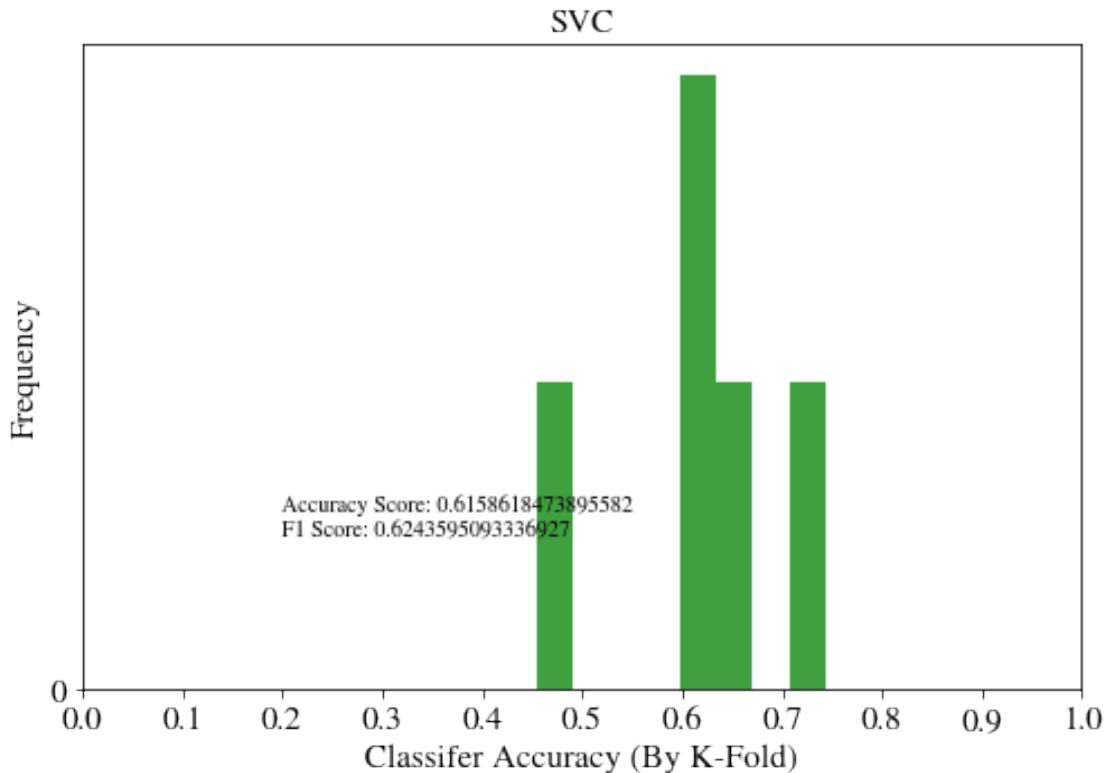
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis', 'accuracy': [0.608, 0.648, 0.5341365461847389, 0.8393574297188755, 0.6465863453815262], 'avgAccuracy': 0.6552160642570282, 'f1': [0.6146628276621946, 0.6386801843317972, 0.574532152692374, 0.8439362145254207, 0.6392654894971115], 'avgF1': 0.6622153737417796, 'precision': [0.608, 0.648, 0.5341365461847389, 0.8393574297188755, 0.6465863453815262], 'avgPrecision': 0.6552160642570282, 'recall': [0.608, 0.648, 0.5341365461847389, 0.8393574297188755,
```

```

0.6465863453815262], 'avgRecall': 0.6552160642570282, 'params': [{}{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]]}
*****

```

Processing Model: SVC



```

*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis', 'accuracy': [0.604, 0.648, 0.4538152610441767, 0.7429718875502008, 0.6305220883534136], 'avgAccuracy': 0.6158618473895582, 'f1': [0.6169347220578373, 0.6484738302816723, 0.4663611343725105, 0.7642067030261591, 0.6258211569302842], 'avgF1': 0.6243595093336927, 'precision': [0.604, 0.648, 0.4538152610441767, 0.7429718875502008, 0.6305220883534136], 'avgPrecision': 0.6158618473895582, 'recall': [0.604, 0.648, 0.4538152610441767,

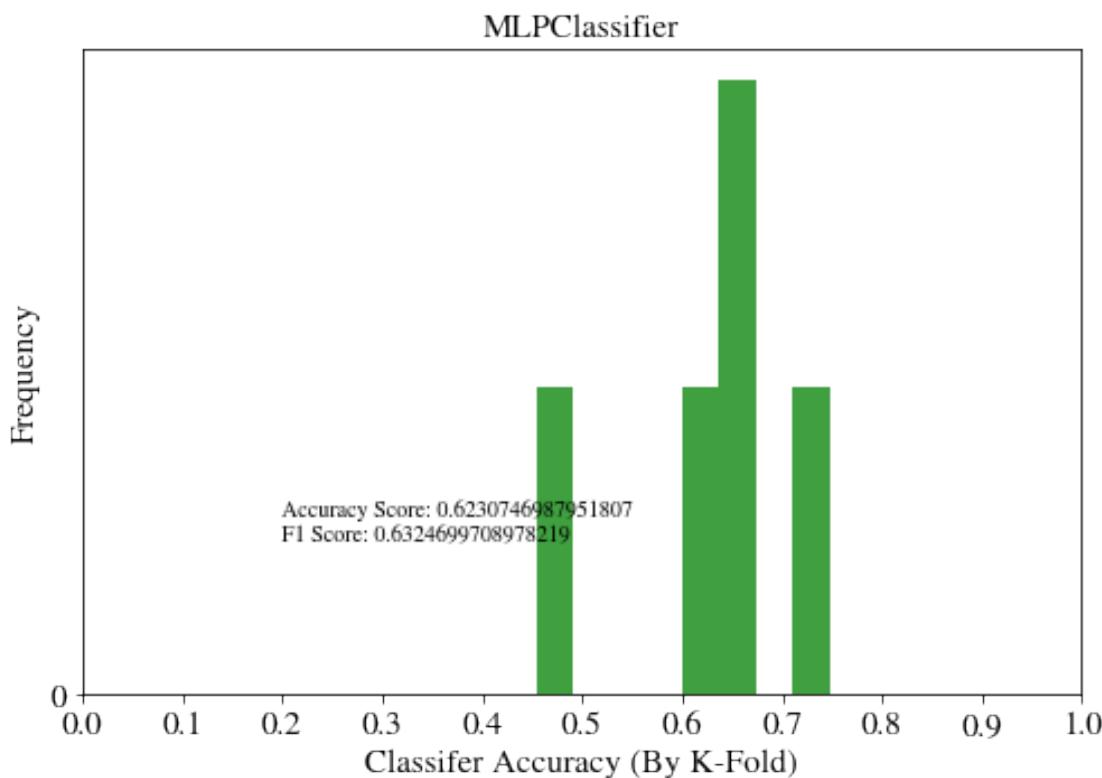
```

```

0.7429718875502008, 0.6305220883534136], 'avgRecall': 0.6158618473895582,
'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```

*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis', 'accuracy': [0.612, 0.66, 0.4538152610441767, 0.7469879518072289, 0.642570281124498], 'avgAccuracy': 0.6230746987951807, 'f1': [0.6246094486308962, 0.6680214727800935, 0.4559887411371683, 0.7779565875211168, 0.6357736044198344], 'avgF1': 0.6324699708978219, 'precision': [0.612, 0.66, 0.4538152610441767, 0.7469879518072289, 0.642570281124498], 'avgPrecision': 0.6230746987951807, 'recall': [0.612, 0.66, 0.4538152610441767,
```

```

0.7469879518072289, 0.642570281124498], 'avgRecall': 0.6230746987951807,
'params': [ {'activation': 'identity', 'alpha': 0.0001, 'batch_size': 'auto',
'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08,
'hidden_layer_sizes': (100,), 'learning_rate': 'adaptive', 'learning_rate_init':
0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change':
10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle':
True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose':
False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis', 'accuracy': [0.644, 0.692, 0.5943775100401606, 0.8514056224899599, 0.6506024096385542], 'avgAccuracy': 0.6864771084337349, 'f1': [0.647642959056718, 0.6858956591964466, 0.6409392710586637, 0.8527955722219878, 0.6488871321769386], 'avgF1': 0.695232118742151, 'precision': [0.644, 0.692, 0.5943775100401606, 0.8514056224899599, 0.6506024096385542], 'avgPrecision': 0.6864771084337349, 'recall': [0.644, 0.692, 0.5943775100401606, 0.8514056224899599, 0.6506024096385542], 'avgRecall': 0.6864771084337349, 'params': [ {'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 700, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
model features \
0 RandomForestClassifier Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB Active inflammation?, Severity of Crypt Arch, ...
4 AdaBoostClassifier Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier Active inflammation?, Severity of Crypt Arch, ...
6 SVC Active inflammation?, Severity of Crypt Arch, ...
7 MLPClassifier Active inflammation?, Severity of Crypt Arch, ...

accuracy      f1  precision    recall  \
0  0.683274  0.691576  0.683274  0.683274
1  0.475322  0.462916  0.475322  0.475322
2  0.616659  0.626487  0.616659  0.616659
3  0.623929  0.626262  0.623929  0.623929
4  0.568630  0.573068  0.568630  0.568630

```

```

5 0.645584 0.655616 0.645584 0.645584
6 0.615862 0.624360 0.615862 0.615862
7 0.612652 0.619066 0.612652 0.612652

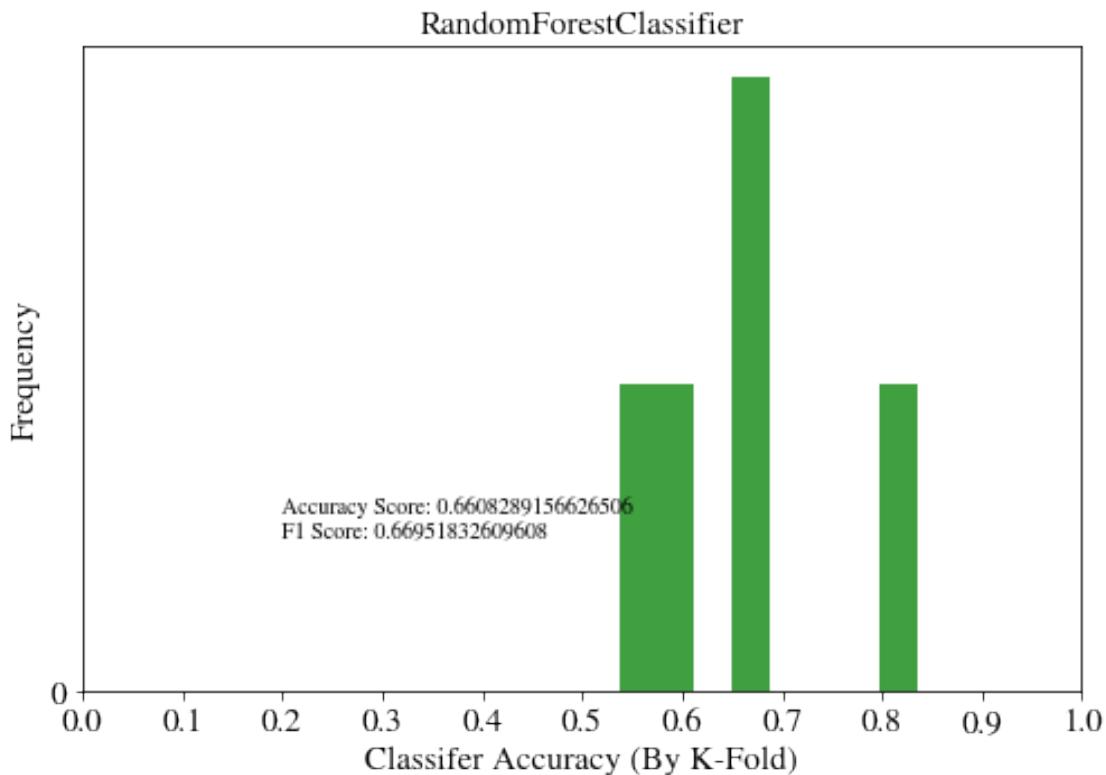
```

```

                                params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3          {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier



```

*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,

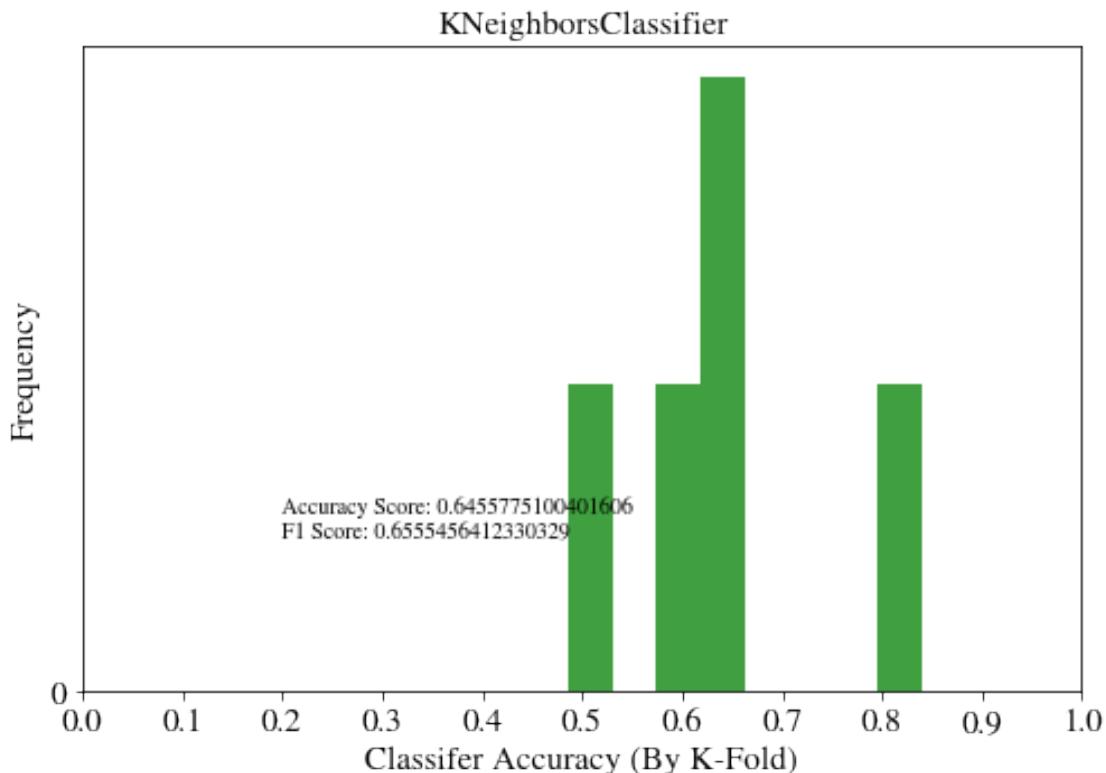
```

```

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs',
'accuracy': [0.612, 0.656, 0.5381526104417671, 0.8353413654618473,
0.6626506024096386], 'avgAccuracy': 0.6608289156626506, 'f1':
[0.6121041355970933, 0.6657469445613413, 0.5744890589583157, 0.8397912326481907,
0.6554602587154591], 'avgF1': 0.66951832609608, 'precision': [0.612, 0.656,
0.5381526104417671, 0.8353413654618473, 0.6626506024096386], 'avgPrecision':
0.6608289156626506, 'recall': [0.612, 0.656, 0.5381526104417671,
0.8353413654618473, 0.6626506024096386], 'avgRecall': 0.6608289156626506,
'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None,
'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt',
'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score':
False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



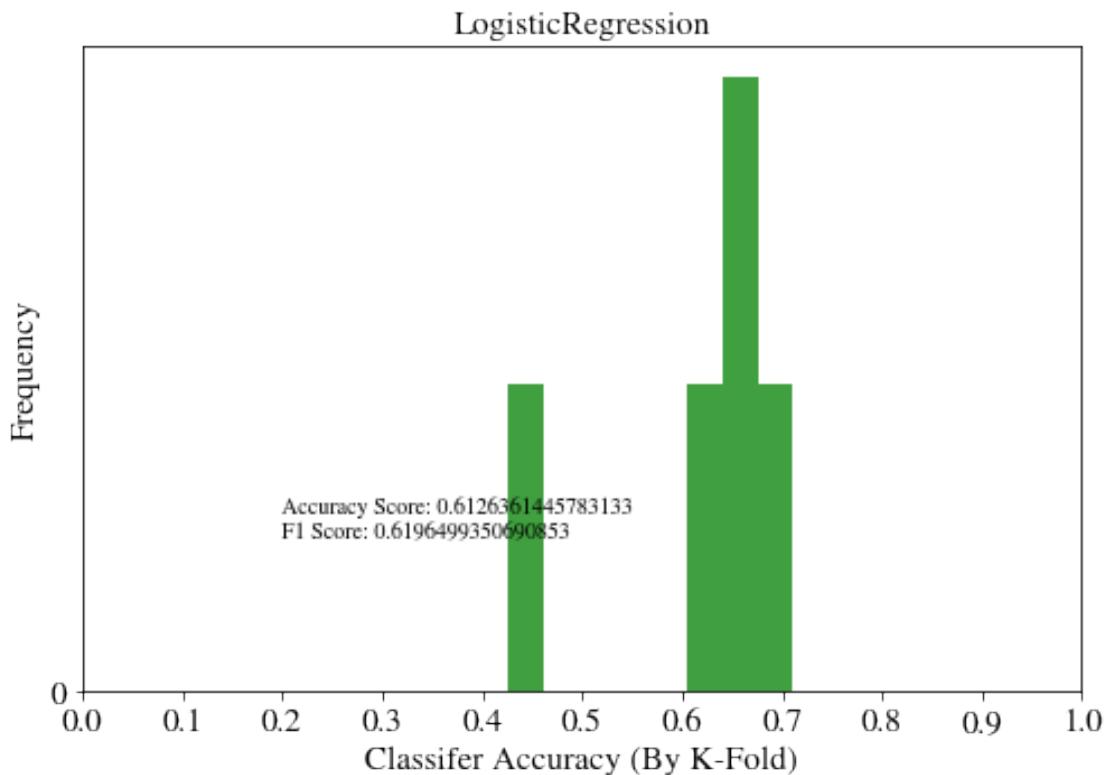
```

*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?',
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &

```

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs', 'accuracy': [0.616, 0.64, 0.4859437751004016, 0.8393574297188755, 0.6465863453815262], 'avgAccuracy': 0.6455775100401606, 'f1': [0.6277088827645514, 0.655394417560512, 0.5015120794416321, 0.8468982312227634, 0.6462145951757058], 'avgF1': 0.6555456412330329, 'precision': [0.616, 0.64, 0.4859437751004016, 0.8393574297188755, 0.6465863453815262], 'avgPrecision': 0.6455775100401606, 'recall': [0.616, 0.64, 0.4859437751004016, 0.8393574297188755, 0.6465863453815262], 'avgRecall': 0.6455775100401606, 'params': [{ 'algorithm': 'ball\_tree', 'leaf\_size': 30, 'metric': 'minkowski', 'metric\_params': None, 'n\_jobs': -1, 'n\_neighbors': 13, 'p': 2, 'weights': 'uniform'}]}  
\*\*\*\*\*

Processing Model: LogisticRegression



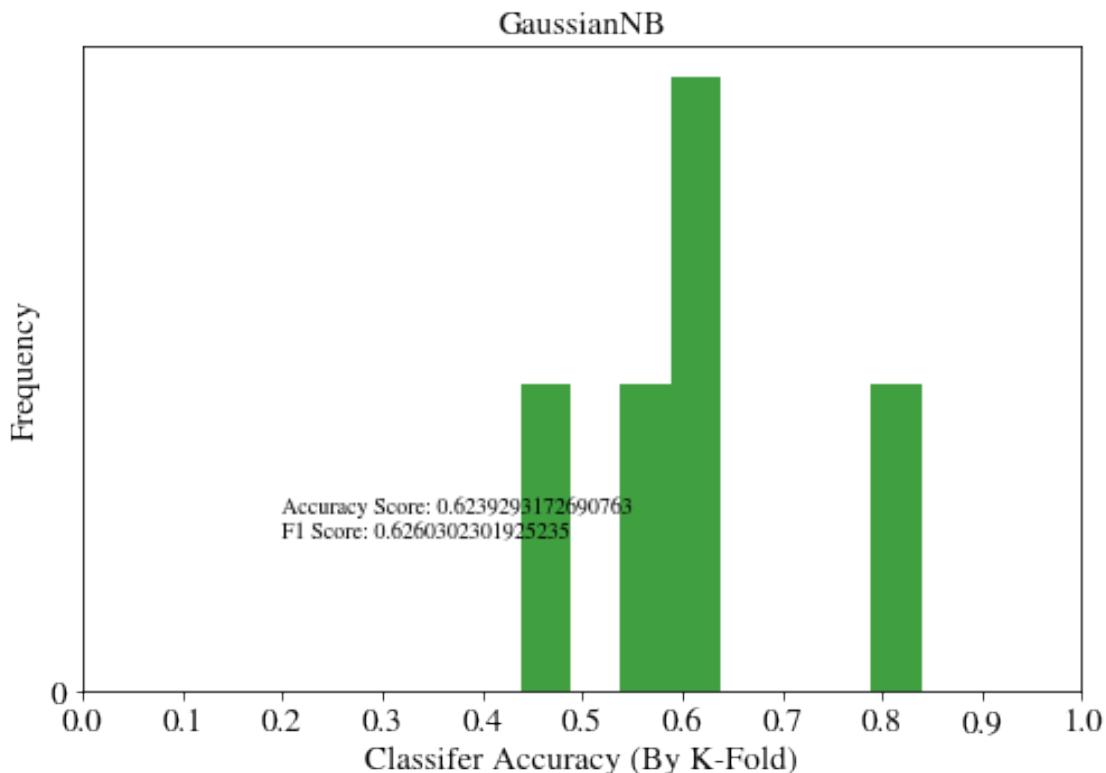
\*\*\*\*\*  
\* LogisticRegression  
\* Best Params Result:  
\* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,'}

```

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs',
'accuracy': [0.608, 0.66, 0.42570281124497994, 0.7108433734939759,
0.6586345381526104], 'avgAccuracy': 0.6126361445783133, 'f1':
[0.6183170636774872, 0.6614158567774936, 0.412666880906058, 0.7559525260665718,
0.6498973479178156], 'avgF1': 0.6196499350690853, 'precision': [0.608, 0.66,
0.42570281124497994, 0.7108433734939759, 0.6586345381526104], 'avgPrecision':
0.6126361445783133, 'recall': [0.608, 0.66, 0.42570281124497994,
0.7108433734939759, 0.6586345381526104], 'avgRecall': 0.6126361445783133,
'params': [{C': 1, 'class_weight': None, 'dual': False, 'fit_intercept': True,
'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class':
'multinomial', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver':
'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt

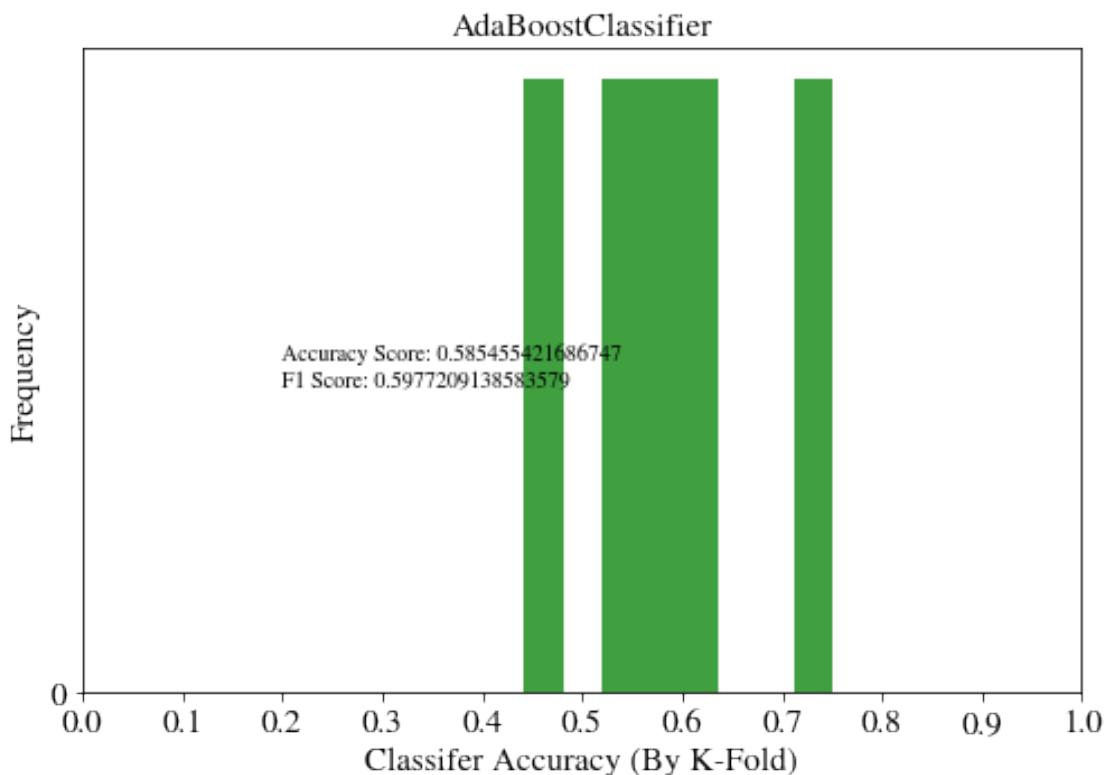
```

```

architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs', 'accuracy':
[0.58, 0.628, 0.43775100401606426, 0.8393574297188755, 0.6345381526104418],
'avgAccuracy': 0.6239293172690763, 'f1': [0.5865654969364207,
0.6224981684981685, 0.45591973995984364, 0.8385132438284361,
0.6266545017397482], 'avgF1': 0.6260302301925235, 'precision': [0.58, 0.628,
0.43775100401606426, 0.8393574297188755, 0.6345381526104418], 'avgPrecision':
0.6239293172690763, 'recall': [0.58, 0.628, 0.43775100401606426,
0.8393574297188755, 0.6345381526104418], 'avgRecall': 0.6239293172690763,
'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?',
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs',
'accuracy': [0.588, 0.52, 0.44176706827309237, 0.751004016064257,

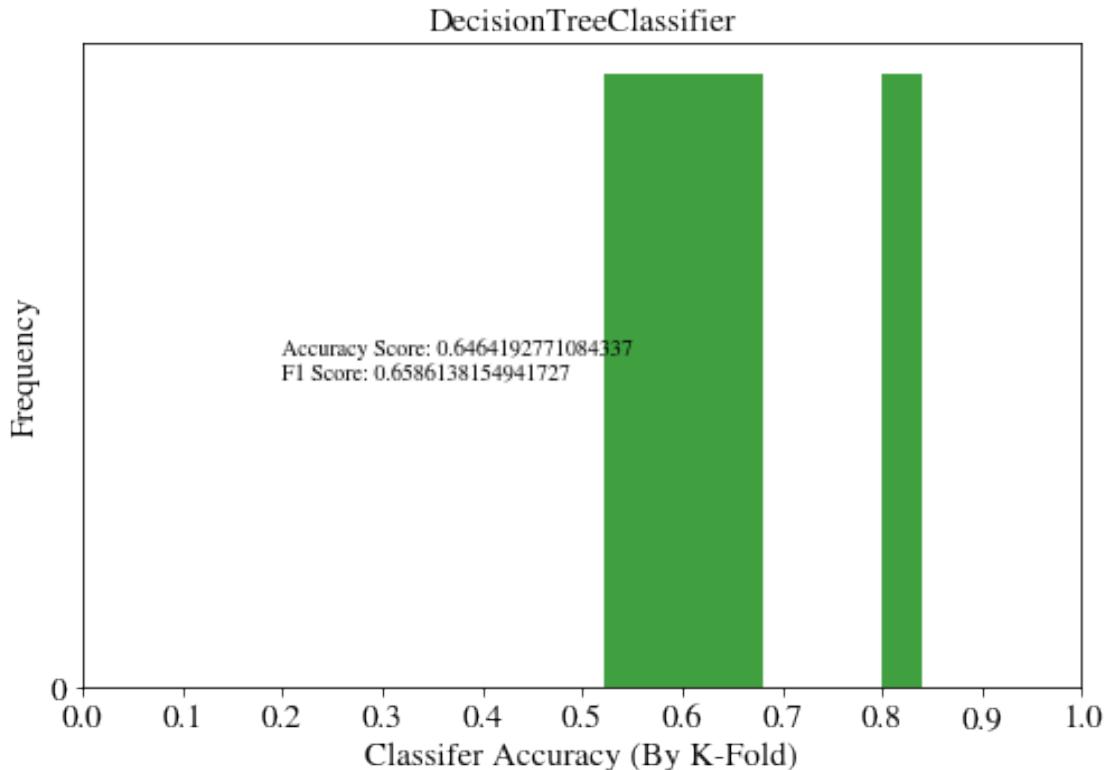
```

```

0.6265060240963856], 'avgAccuracy': 0.585455421686747, 'f1':
[0.5888060810724383, 0.5331240613994286, 0.467673529944063, 0.7710843373493976,
0.6279165595264623], 'avgF1': 0.5977209138583579, 'precision': [0.588, 0.52,
0.44176706827309237, 0.751004016064257, 0.6265060240963856], 'avgPrecision':
0.585455421686747, 'recall': [0.588, 0.52, 0.44176706827309237,
0.751004016064257, 0.6265060240963856], 'avgRecall': 0.585455421686747,
'params': [{algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1,
'n_estimators': 100, 'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



```

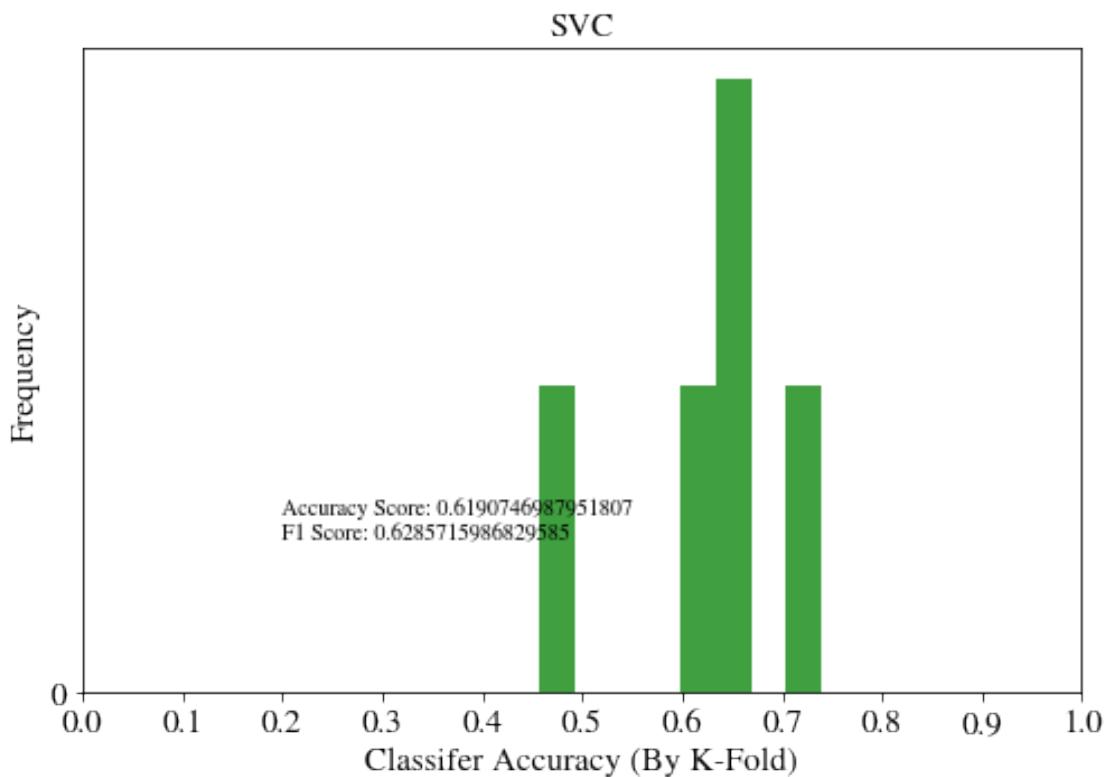
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs',  
'accuracy': [0.588, 0.62, 0.5220883534136547, 0.8393574297188755,  
0.6626506024096386], 'avgAccuracy': 0.6464192771084337, 'f1':  
[0.588539706113235, 0.6316382643430067, 0.5591561648894429, 0.8443034473016638,
```

```

0.6694314948235153], 'avgF1': 0.6586138154941727, 'precision': [0.588, 0.62,
0.5220883534136547, 0.8393574297188755, 0.6626506024096386], 'avgPrecision':
0.6464192771084337, 'recall': [0.588, 0.62, 0.5220883534136547,
0.8393574297188755, 0.6626506024096386], 'avgRecall': 0.6464192771084337,
'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy',
'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None,
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None,
'splitter': 'best'}]}}
*****

```

Processing Model: SVC



```

*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt
Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in
lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,
Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,
Cryptitis extent, Mucin depletion, Cryptitis polymorphs', 'accuracy': [0.604,
0.648, 0.4578313253012048, 0.7389558232931727, 0.6465863453815262],
'avgAccuracy': 0.6190746987951807, 'f1': [0.6162588945548326,

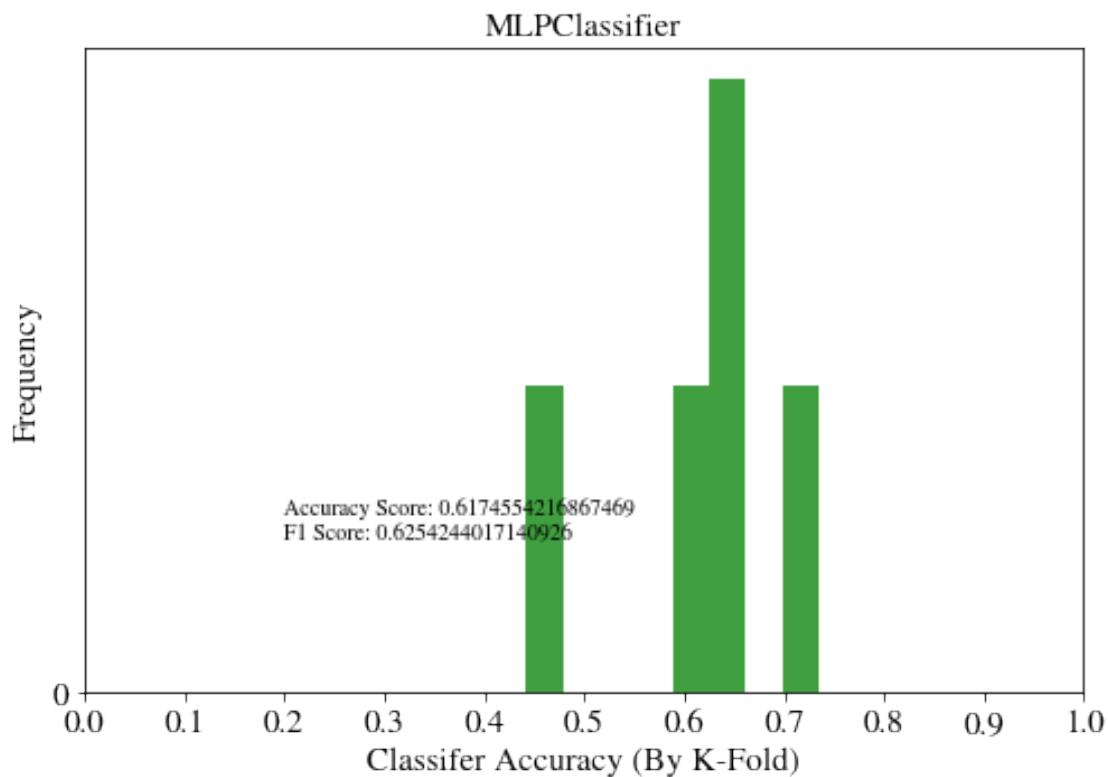
```

```

0.6498739272817095, 0.4721268142923631, 0.7634234416658229, 0.6411749156200647],
'avgF1': 0.6285715986829585, 'precision': [0.604, 0.648, 0.4578313253012048,
0.7389558232931727, 0.6465863453815262], 'avgPrecision': 0.6190746987951807,
'recall': [0.604, 0.648, 0.4578313253012048, 0.7389558232931727,
0.6465863453815262], 'avgRecall': 0.6190746987951807, 'params': [{ 'C': 1.0,
'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0,
'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':
'linear', 'max_iter': -1, 'probability': False, 'random_state': None,
'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```

*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs', 'accuracy':
[0.608, 0.66, 0.44176706827309237, 0.7349397590361446, 0.642570281124498],
'avgAccuracy': 0.6174554216867469, 'f1': [0.6195255377533858,
```

```

0.6614158567774936, 0.4446112100427354, 0.7635685474519565, 0.6380008565448918],  

'avgF1': 0.6254244017140926, 'precision': [0.608, 0.66, 0.44176706827309237,  

0.7349397590361446, 0.642570281124498], 'avgPrecision': 0.6174554216867469,  

'recall': [0.608, 0.66, 0.44176706827309237, 0.7349397590361446,  

0.642570281124498], 'avgRecall': 0.6174554216867469, 'params': [{activation':  

'identity', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':  

0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,),  

'learning_rate': 'constant', 'learning_rate_init': 0.001, 'max_fun': 15000,  

'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum':  

True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam',  

'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start':  

False}]]}  

*****
*****  

* Best Performing Model and Params is:  

* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs',  

'accuracy': [0.612, 0.656, 0.5381526104417671, 0.8353413654618473,  

0.6626506024096386], 'avgAccuracy': 0.6608289156626506, 'f1':  

[0.6121041355970933, 0.6657469445613413, 0.5744890589583157, 0.8397912326481907,  

0.6554602587154591], 'avgF1': 0.66951832609608, 'precision': [0.612, 0.656,  

0.5381526104417671, 0.8353413654618473, 0.6626506024096386], 'avgPrecision':  

0.6608289156626506, 'recall': [0.612, 0.656, 0.5381526104417671,  

0.8353413654618473, 0.6626506024096386], 'avgRecall': 0.6608289156626506,  

'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None,  

'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt',  

'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0,  

'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,  

'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score':  

False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}  

*****  


|   | model                  | features                                          | \ |
|---|------------------------|---------------------------------------------------|---|
| 0 | RandomForestClassifier | Active inflammation?, Severity of Crypt Arch, ... |   |
| 1 | KNeighborsClassifier   | Active inflammation?, Severity of Crypt Arch, ... |   |
| 2 | LogisticRegression     | Active inflammation?, Severity of Crypt Arch, ... |   |
| 3 | GaussianNB             | Active inflammation?, Severity of Crypt Arch, ... |   |
| 4 | AdaBoostClassifier     | Active inflammation?, Severity of Crypt Arch, ... |   |
| 5 | DecisionTreeClassifier | Active inflammation?, Severity of Crypt Arch, ... |   |
| 6 | SVC                    | Active inflammation?, Severity of Crypt Arch, ... |   |
| 7 | MLPClassifier          | Active inflammation?, Severity of Crypt Arch, ... |   |


|   | accuracy | f1       | precision | recall   | \ |
|---|----------|----------|-----------|----------|---|
| 0 | 0.652006 | 0.660246 | 0.652006  | 0.652006 |   |
| 1 | 0.466509 | 0.454747 | 0.466509  | 0.466509 |   |


```

```

2 0.612636 0.619650 0.612636 0.612636
3 0.623929 0.626030 0.623929 0.623929
4 0.568675 0.577539 0.568675 0.568675
5 0.627142 0.637205 0.627142 0.627142
6 0.619075 0.628572 0.619075 0.619075
7 0.612643 0.624516 0.612643 0.612643

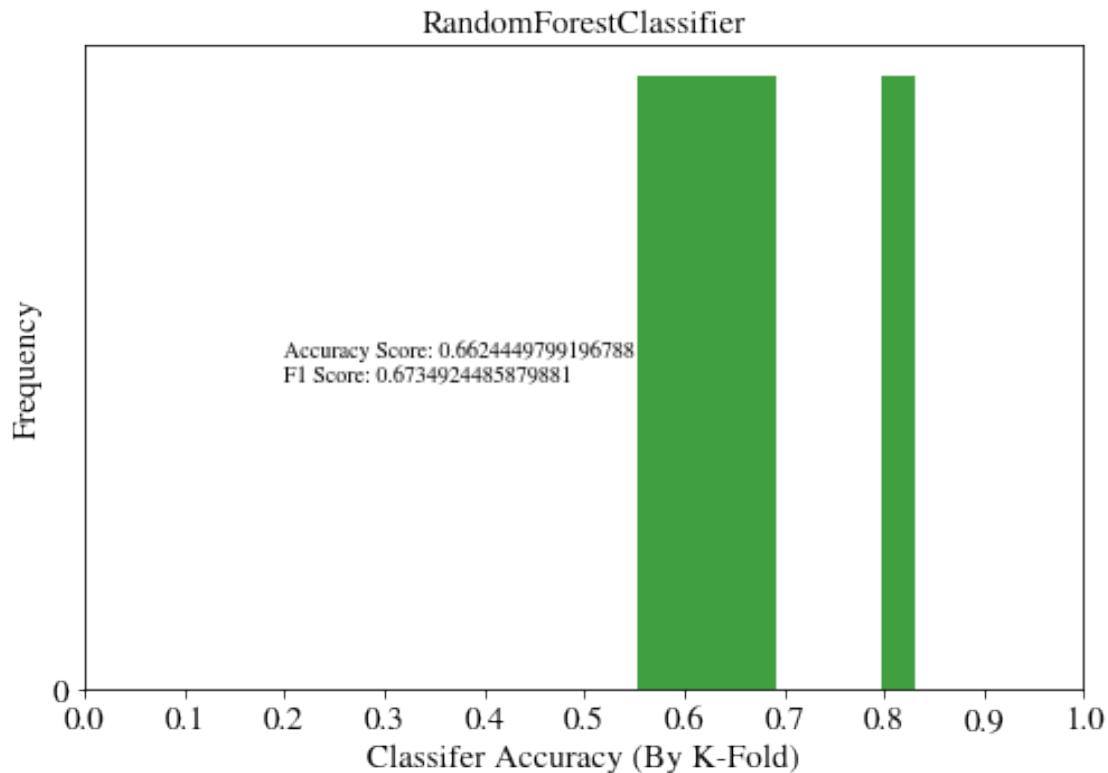
```

```

params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3     {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier

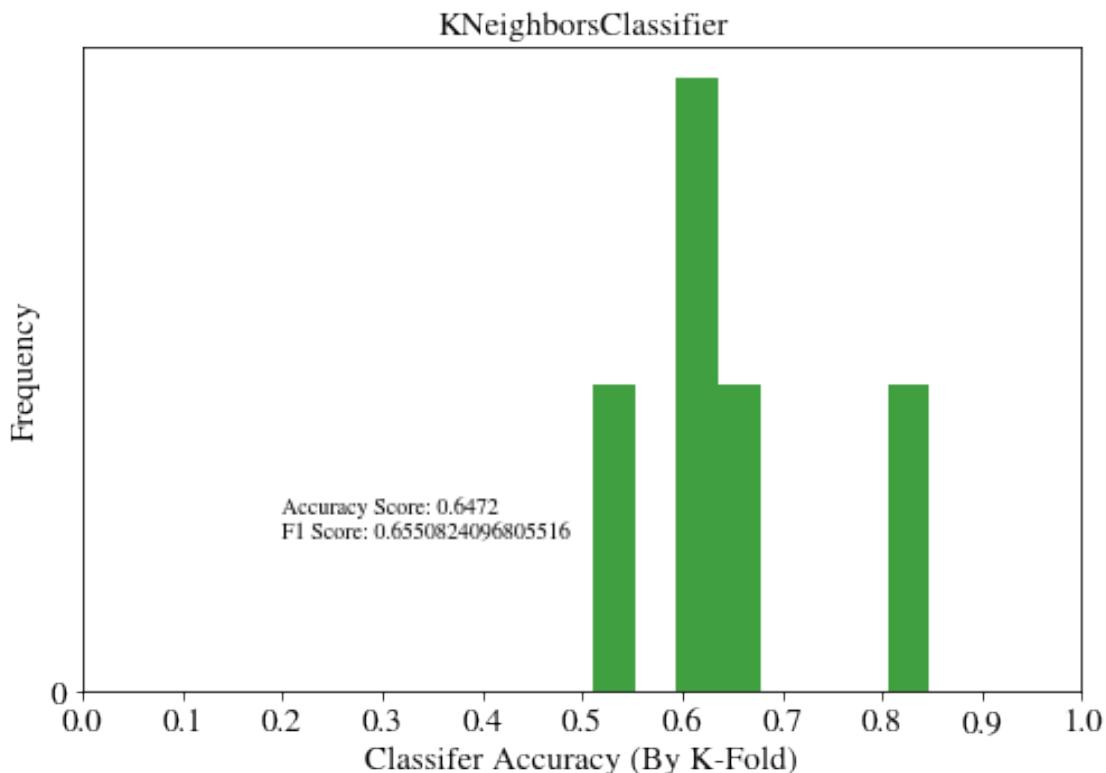


```

*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?',
```

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion', 'accuracy': [0.612, 0.644, 0.5542168674698795, 0.8313253012048193, 0.6706827309236948], 'avgAccuracy': 0.6624449799196788, 'f1': [0.6121041355970933, 0.6513908123061447, 0.597356097285909, 0.8370287874185819, 0.6695824103322116], 'avgF1': 0.6734924485879881, 'precision': [0.612, 0.644, 0.5542168674698795, 0.8313253012048193, 0.6706827309236948], 'avgPrecision': 0.6624449799196788, 'recall': [0.612, 0.644, 0.5542168674698795, 0.8313253012048193, 0.6706827309236948], 'avgRecall': 0.6624449799196788, 'params': [{bootstrap': True, 'ccp\_alpha': 0.0, 'class\_weight': None, 'criterion': 'entropy', 'max\_depth': None, 'max\_features': 'log2', 'max\_leaf\_nodes': None, 'max\_samples': None, 'min\_impurity\_decrease': 0.0, 'min\_impurity\_split': None, 'min\_samples\_leaf': 1, 'min\_samples\_split': 2, 'min\_weight\_fraction\_leaf': 0.0, 'n\_estimators': 700, 'n\_jobs': -1, 'oob\_score': False, 'random\_state': None, 'verbose': 0, 'warm\_start': False}]}  
\*\*\*\*\*

Processing Model: KNeighborsClassifier



\*\*\*\*\*

\* KNeighborsClassifier

```

* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion', 'accuracy': [0.6, 0.636,  

0.5100401606425703, 0.8473895582329317, 0.642570281124498], 'avgAccuracy':  

0.6472, 'f1': [0.606024215023414, 0.6490201990819379, 0.5280082659320139,  

0.8538525995875392, 0.6385067687778532], 'avgF1': 0.6550824096805516,  

'precision': [0.6, 0.636, 0.5100401606425703, 0.8473895582329317,  

0.642570281124498], 'avgPrecision': 0.6472, 'recall': [0.6, 0.636,  

0.5100401606425703, 0.8473895582329317, 0.642570281124498], 'avgRecall': 0.6472,  

'params': [{algorithm': 'ball_tree', 'leaf_size': 30, 'metric': 'minkowski',  

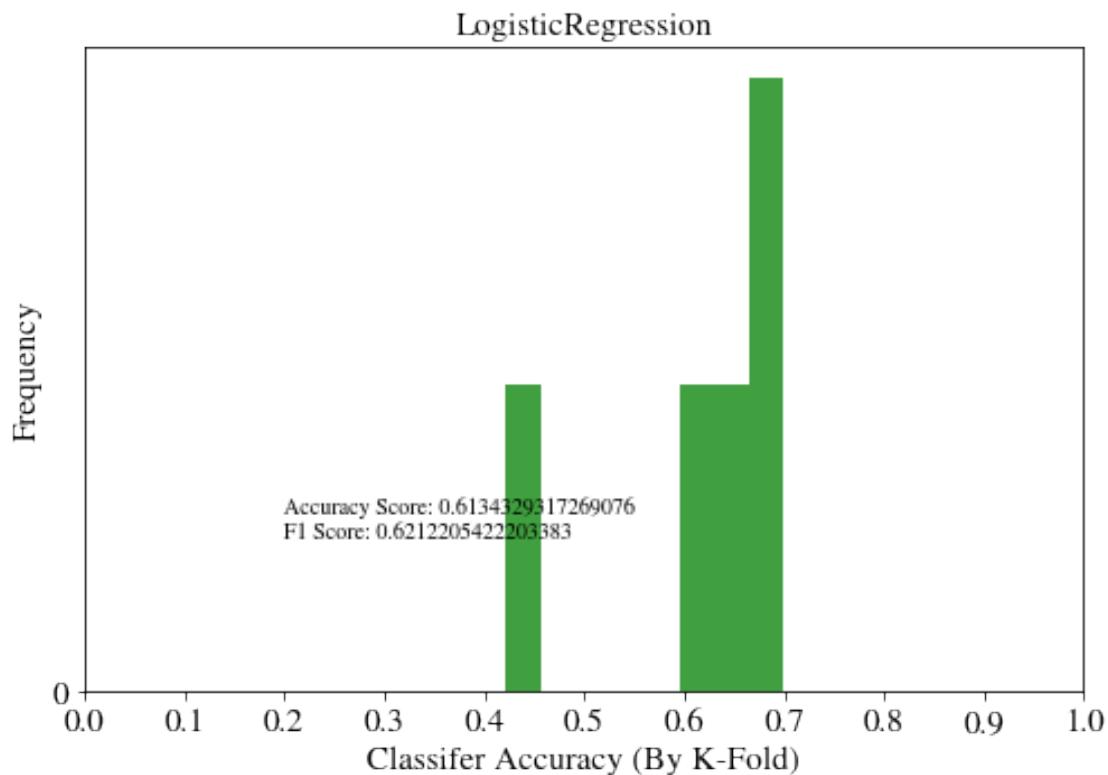
'metric_params': None, 'n_jobs': -1, 'n_neighbors': 13, 'p': 2, 'weights':  

'distance'}]}

*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  

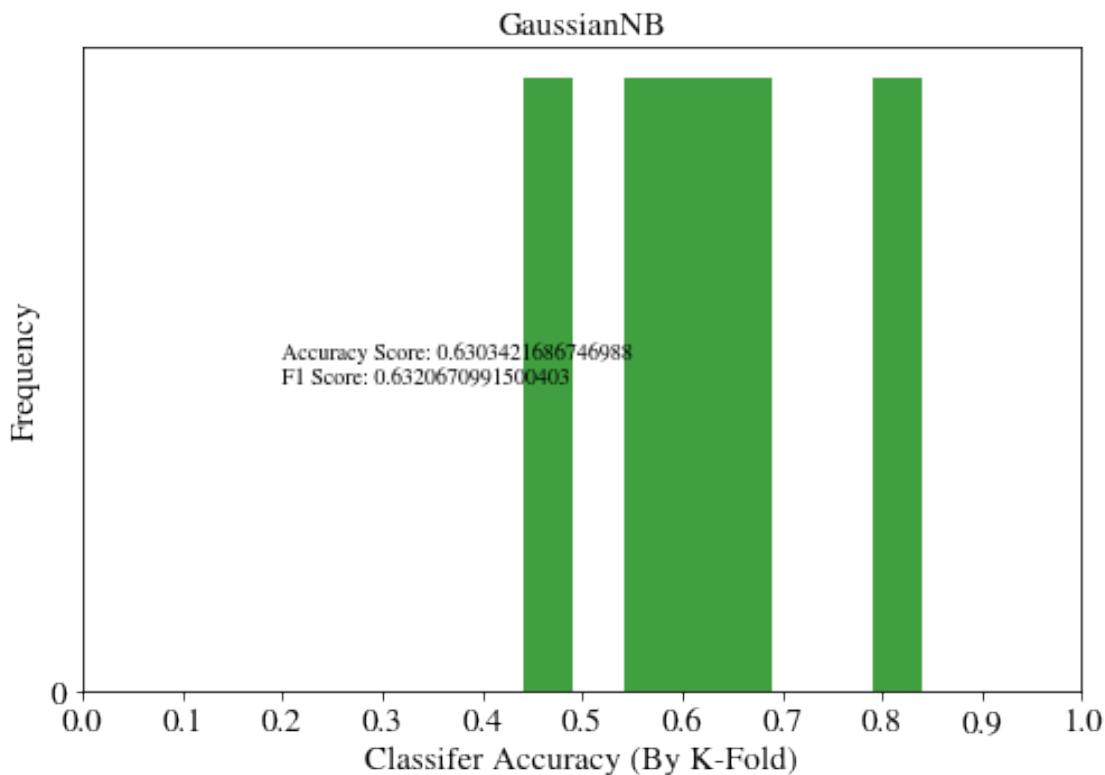

```

```

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion', 'accuracy': [0.616,
0.66, 0.42168674698795183, 0.6987951807228916, 0.6706827309236948],
'avgAccuracy': 0.6134329317269076, 'f1': [0.6267198965210661,
0.6614158567774936, 0.4034062270972491, 0.7419761048068823, 0.6725846258990003],
'avgF1': 0.6212205422203383, 'precision': [0.616, 0.66, 0.42168674698795183,
0.6987951807228916, 0.6706827309236948], 'avgPrecision': 0.6134329317269076,
'recall': [0.616, 0.66, 0.42168674698795183, 0.6987951807228916,
0.6706827309236948], 'avgRecall': 0.6134329317269076, 'params': [{ 'C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'ovr', 'n_jobs': -1,
'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?', Severity of

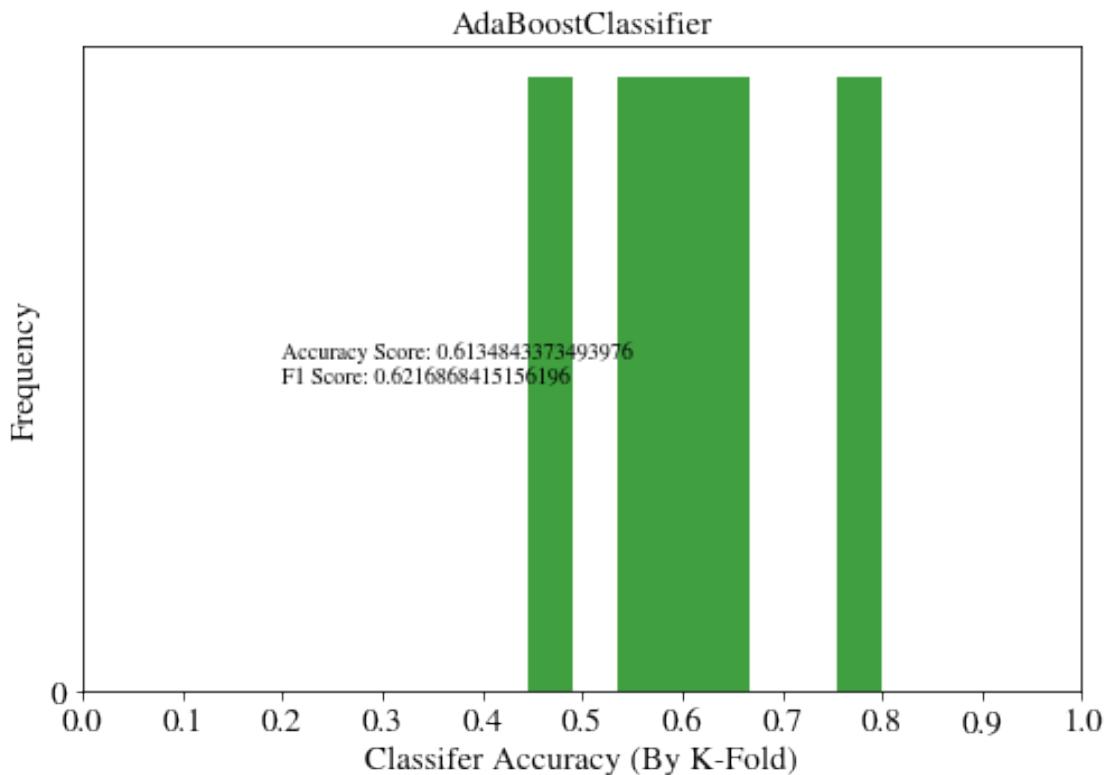
```

```

Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion', 'accuracy': [0.584, 0.64,
0.44176706827309237, 0.8393574297188755, 0.6465863453815262], 'avgAccuracy':
0.6303421686746988, 'f1': [0.5907148328135997, 0.6331520065987755,
0.45881905182646254, 0.8385132438284361, 0.639136360682928], 'avgF1':
0.6320670991500403, 'precision': [0.584, 0.64, 0.44176706827309237,
0.8393574297188755, 0.6465863453815262], 'avgPrecision': 0.6303421686746988,
'recall': [0.584, 0.64, 0.44176706827309237, 0.8393574297188755,
0.6465863453815262], 'avgRecall': 0.6303421686746988, 'params': [{'priors':
None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?',
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,

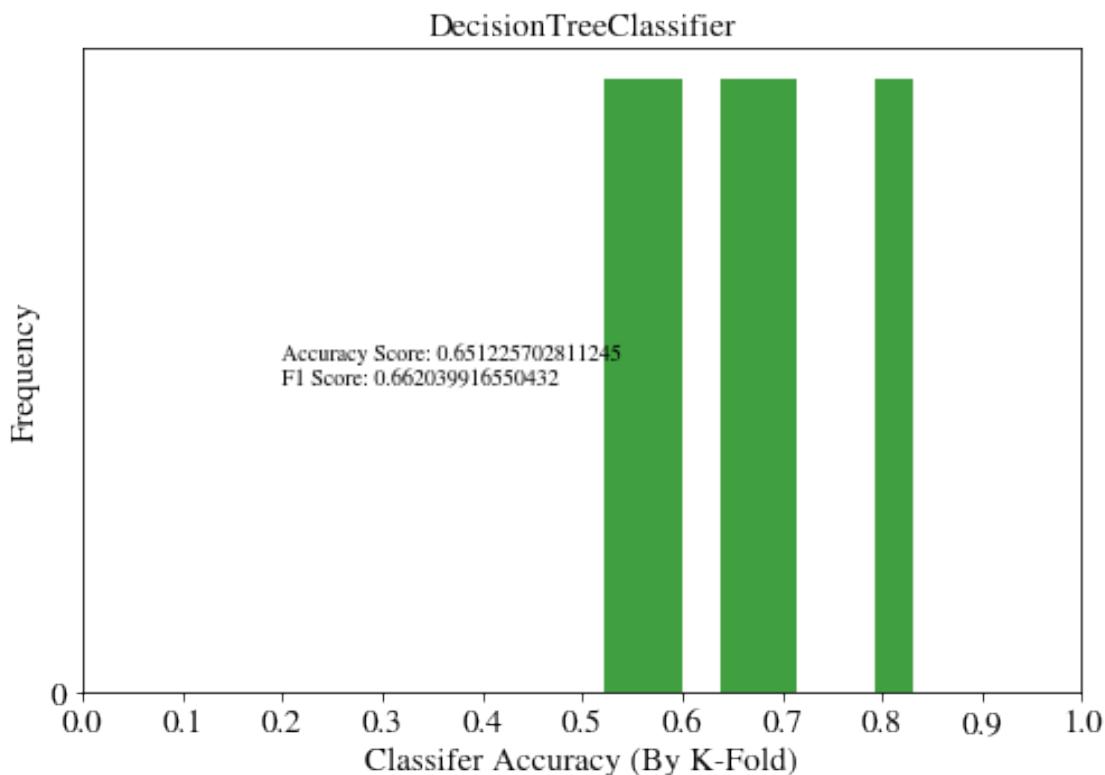
```

```

Epithelial changes, Cryptitis extent, Mucin depletion', 'accuracy': [0.568,
0.644, 0.4457831325301205, 0.7991967871485943, 0.6104417670682731],
'avgAccuracy': 0.6134843373493976, 'f1': [0.569455373148017, 0.6516575431469049,
0.4740473867071771, 0.8086431203320488, 0.6046307842439502], 'avgF1':
0.6216868415156196, 'precision': [0.568, 0.644, 0.4457831325301205,
0.7991967871485943, 0.6104417670682731], 'avgPrecision': 0.6134843373493976,
'recall': [0.568, 0.644, 0.4457831325301205, 0.7991967871485943,
0.6104417670682731], 'avgRecall': 0.6134843373493976, 'params': [{algorithm':
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 300,
'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



```

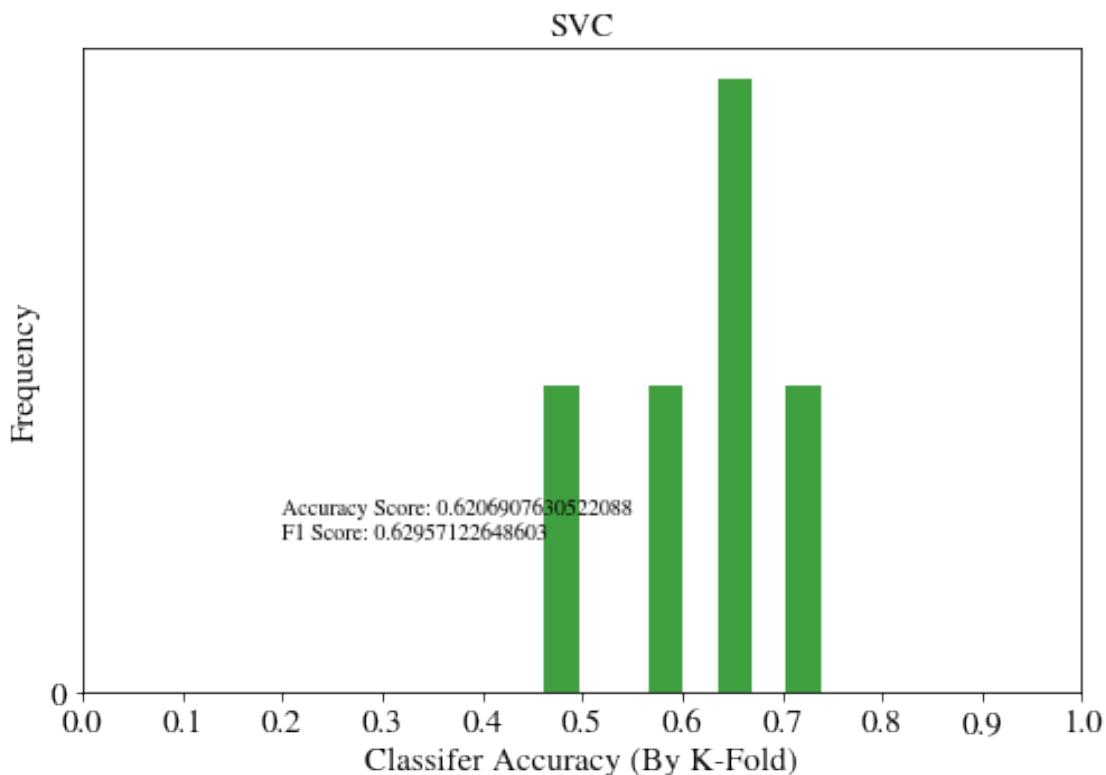
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?',
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion', 'accuracy': [0.584,
0.64, 0.5220883534136547, 0.8313253012048193, 0.678714859437751], 'avgAccuracy':
```

```

0.651225702811245, 'f1': [0.5883440805696325, 0.64964212294124,
0.5581024954518932, 0.8379079084248814, 0.6762029753645132], 'avgF1':
0.662039916550432, 'precision': [0.584, 0.64, 0.5220883534136547,
0.8313253012048193, 0.678714859437751], 'avgPrecision': 0.651225702811245,
'recall': [0.584, 0.64, 0.5220883534136547, 0.8313253012048193,
0.678714859437751], 'avgRecall': 0.651225702811245, 'params': [{'ccp_alpha':
0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None,
'max_features': 'auto', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****

```

Processing Model: SVC



```

*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt
Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in
lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,
Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,
Cryptitis extent, Mucin depletion', 'accuracy': [0.592, 0.648,
0.46184738955823296, 0.7389558232931727, 0.6626506024096386], 'avgAccuracy':

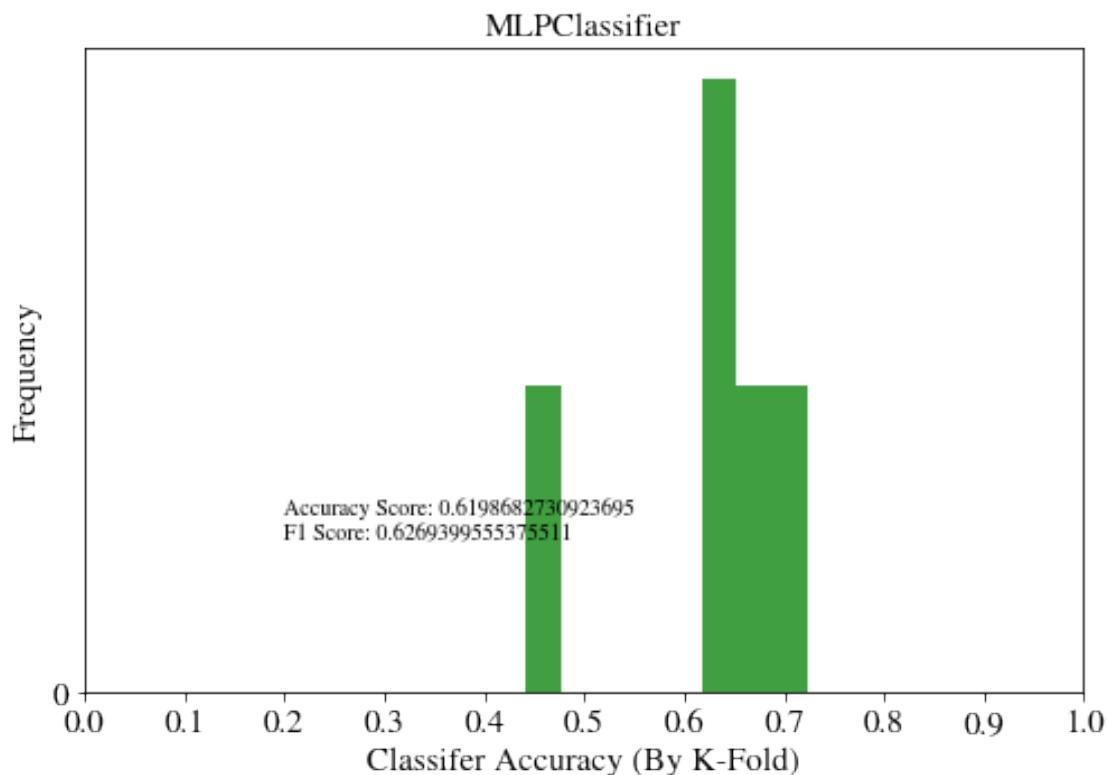
```

```

0.6206907630522088, 'f1': [0.6017632341072021, 0.6498739272817095,
0.4796837665862335, 0.7634234416658229, 0.6531117627891821], 'avgF1':
0.62957122648603, 'precision': [0.592, 0.648, 0.46184738955823296,
0.7389558232931727, 0.6626506024096386], 'avgPrecision': 0.6206907630522088,
'recall': [0.592, 0.648, 0.46184738955823296, 0.7389558232931727,
0.6626506024096386], 'avgRecall': 0.6206907630522088, 'params': [{ 'C': 1.0,
'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0,
'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':
'linear', 'max_iter': -1, 'probability': False, 'random_state': None,
'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```

*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion', 'accuracy': [0.62, 0.644,
0.44176706827309237, 0.7228915662650602, 0.6706827309236948], 'avgAccuracy':

```

```

0.6198682730923695, 'f1': [0.6309104503504619, 0.6462082088655747,
0.4446112100427354, 0.7521219513509532, 0.6608479570780306], 'avgF1':
0.6269399555375511, 'precision': [0.62, 0.644, 0.44176706827309237,
0.7228915662650602, 0.6706827309236948], 'avgPrecision': 0.6198682730923695,
'recall': [0.62, 0.644, 0.44176706827309237, 0.7228915662650602,
0.6706827309236948], 'avgRecall': 0.6198682730923695, 'params': [{activation':
'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion', 'accuracy': [0.612, 0.644, 0.5542168674698795, 0.8313253012048193, 0.6706827309236948], 'avgAccuracy': 0.6624449799196788, 'f1': [0.6121041355970933, 0.6513908123061447, 0.597356097285909, 0.8370287874185819, 0.6695824103322116], 'avgF1': 0.6734924485879881, 'precision': [0.612, 0.644, 0.5542168674698795, 0.8313253012048193, 0.6706827309236948], 'avgPrecision': 0.6624449799196788, 'recall': [0.612, 0.644, 0.5542168674698795, 0.8313253012048193, 0.6706827309236948], 'avgRecall': 0.6624449799196788, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 700, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

	model	features	\		
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...			
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...			
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...			
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...			
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...			
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...			
6	SVC	Active inflammation?, Severity of Crypt Arch, ...			
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...			
	accuracy	f1	precision	recall	\
0	0.662445	0.673492	0.662445	0.662445	

```

1 0.474519 0.464603 0.474519 0.474519
2 0.612636 0.619530 0.612636 0.612636
3 0.630342 0.632067 0.630342 0.630342
4 0.613484 0.621687 0.613484 0.613484
5 0.643197 0.654199 0.643197 0.643197
6 0.620691 0.629571 0.620691 0.620691
7 0.619868 0.626940 0.619868 0.619868

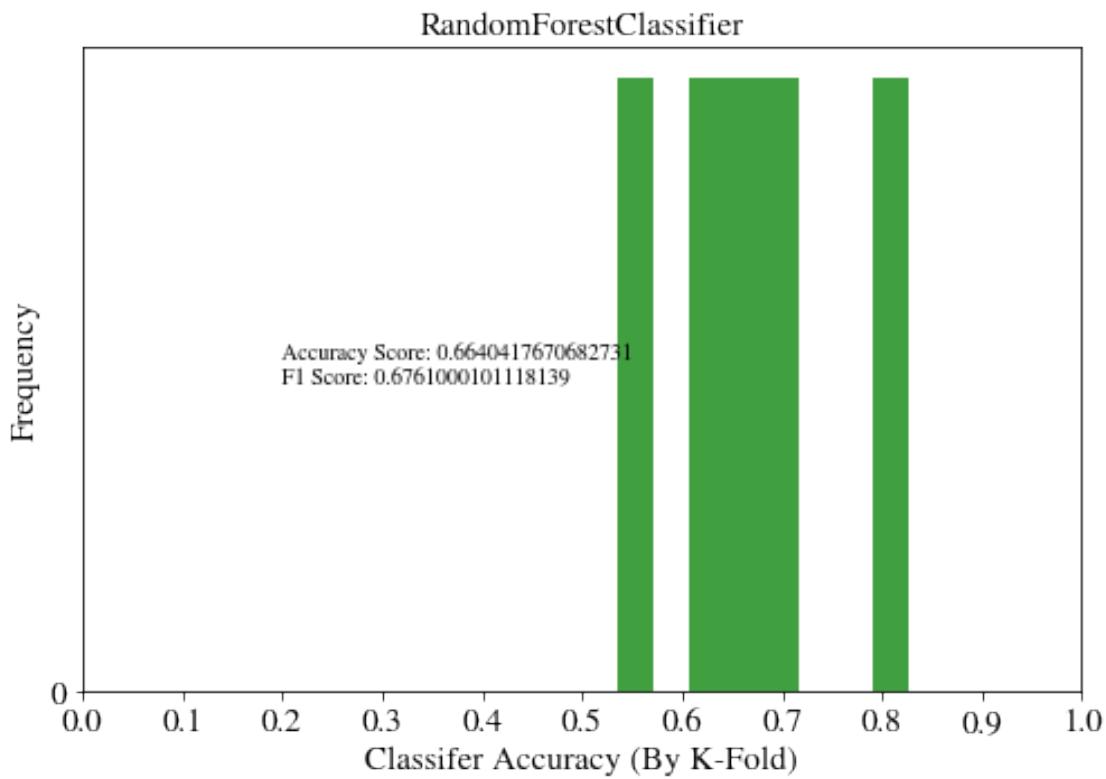
```

```

          params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3         {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier



```

*****
* RandomForestClassifier
* Best Params Result:

```

```

* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent', 'accuracy': [0.608, 0.66,  

0.5341365461847389, 0.8273092369477911, 0.6907630522088354], 'avgAccuracy':  

0.6640417670682731, 'f1': [0.612803420349091, 0.6682190220710633,  

0.5729305190489704, 0.8342254170744602, 0.6923216720154846], 'avgF1':  

0.6761000101118139, 'precision': [0.608, 0.66, 0.5341365461847389,  

0.8273092369477911, 0.6907630522088354], 'avgPrecision': 0.6640417670682731,  

'recall': [0.608, 0.66, 0.5341365461847389, 0.8273092369477911,  

0.6907630522088354], 'avgRecall': 0.6640417670682731, 'params': [{bootstrap':  

True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy',  

'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None,  

'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None,  

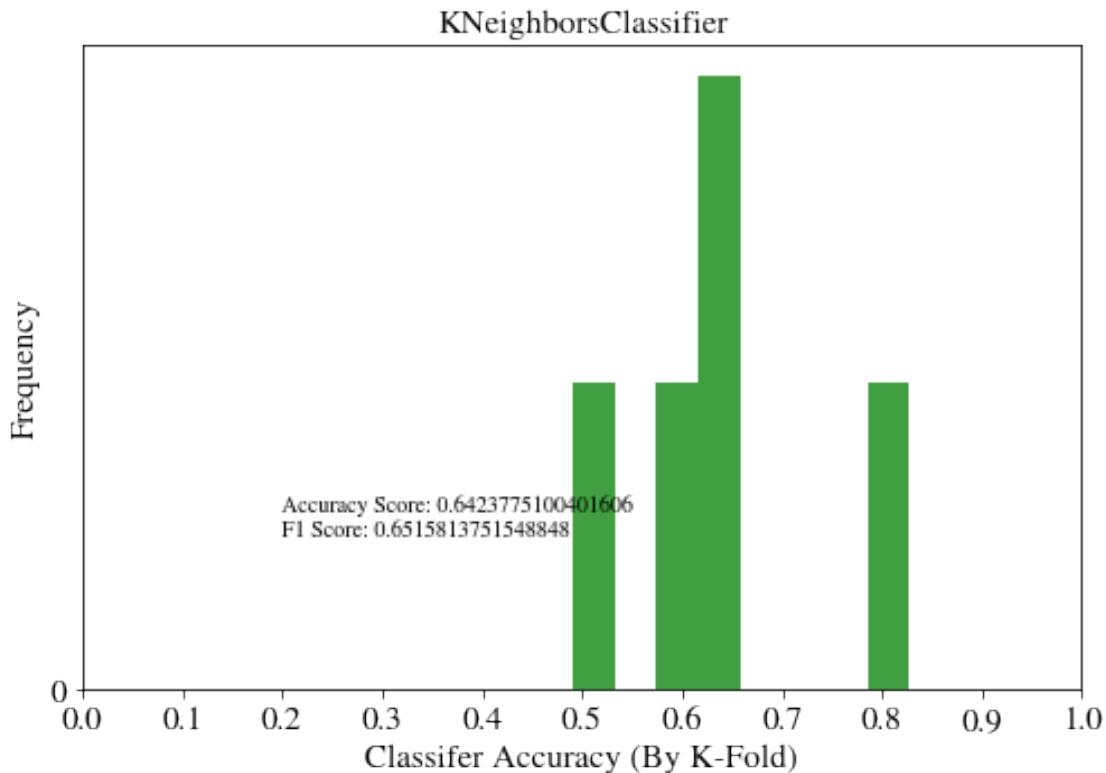
'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0,  

'n_estimators': 700, 'n_jobs': -1, 'oob_score': True, 'random_state': None,  

'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



```
*****

```

```

* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent', 'accuracy': [0.596, 0.644,  

0.4899598393574297, 0.8273092369477911, 0.6546184738955824], 'avgAccuracy':  

0.6423775100401606, 'f1': [0.6037203302695122, 0.656534342915983,  

0.5076579488158941, 0.8380630080475228, 0.6519312457255116], 'avgF1':  

0.6515813751548848, 'precision': [0.596, 0.644, 0.4899598393574297,  

0.8273092369477911, 0.6546184738955824], 'avgPrecision': 0.6423775100401606,  

'recall': [0.596, 0.644, 0.4899598393574297, 0.8273092369477911,  

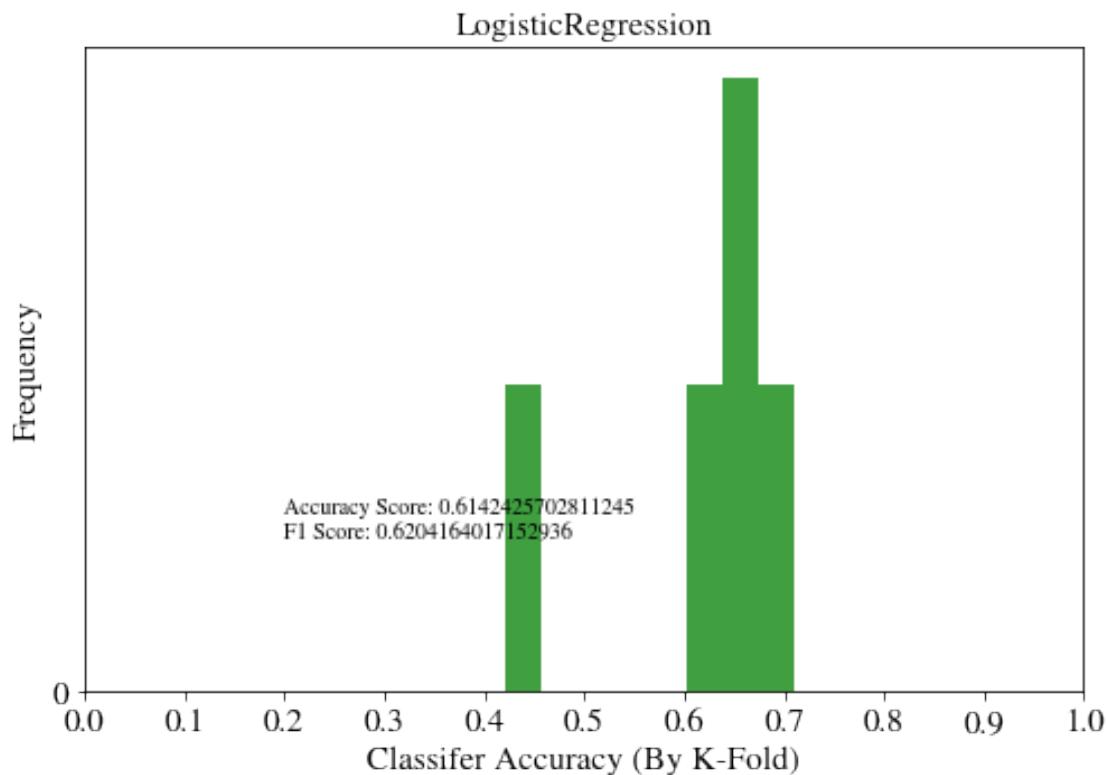
0.6546184738955824], 'avgRecall': 0.6423775100401606, 'params': [{'algorithm':  

'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs':  

-1, 'n_neighbors': 14, 'p': 2, 'weights': 'distance'}]}
*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:

```

```

* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent', 'accuracy': [0.608, 0.66,  

0.42168674698795183, 0.7108433734939759, 0.6706827309236948], 'avgAccuracy':  

0.6142425702811245, 'f1': [0.6183170636774872, 0.6614158567774936,  

0.4034062270972491, 0.7585047883843066, 0.6604380726399312], 'avgF1':  

0.6204164017152936, 'precision': [0.608, 0.66, 0.42168674698795183,  

0.7108433734939759, 0.6706827309236948], 'avgPrecision': 0.6142425702811245,  

'recall': [0.608, 0.66, 0.42168674698795183, 0.7108433734939759,  

0.6706827309236948], 'avgRecall': 0.6142425702811245, 'params': [{C': 1,  

'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':  

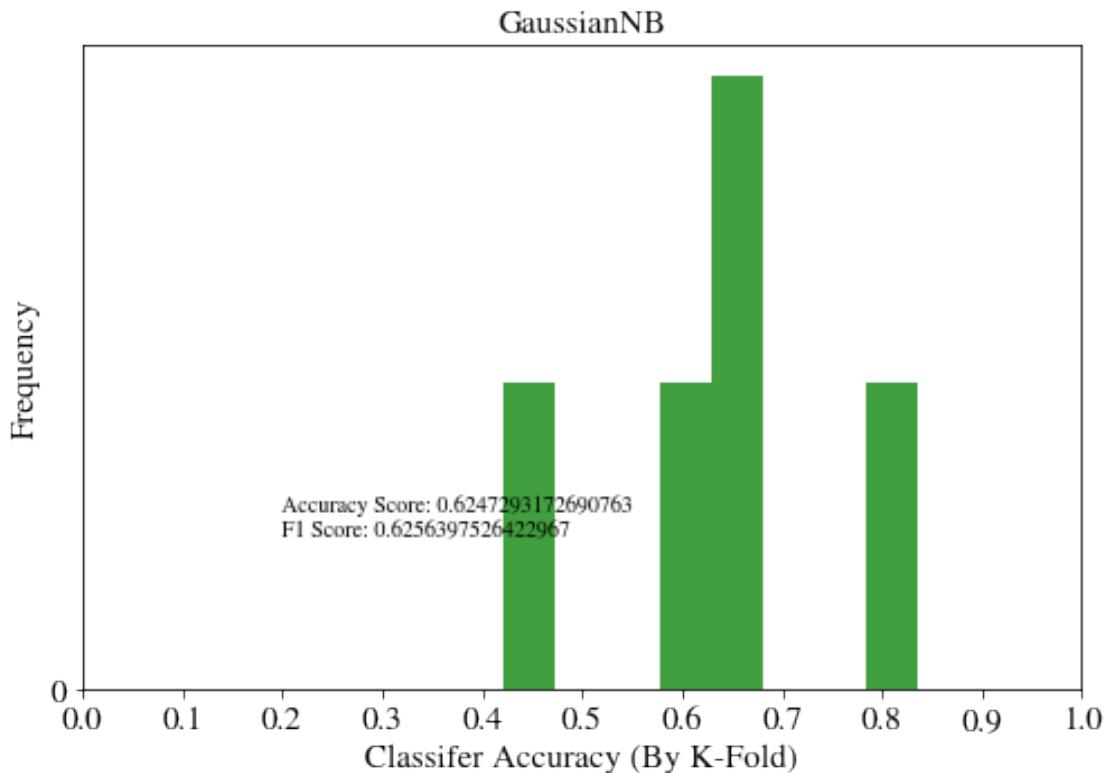
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs':  

-1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,  

'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```
*****

```

\* GaussianNB

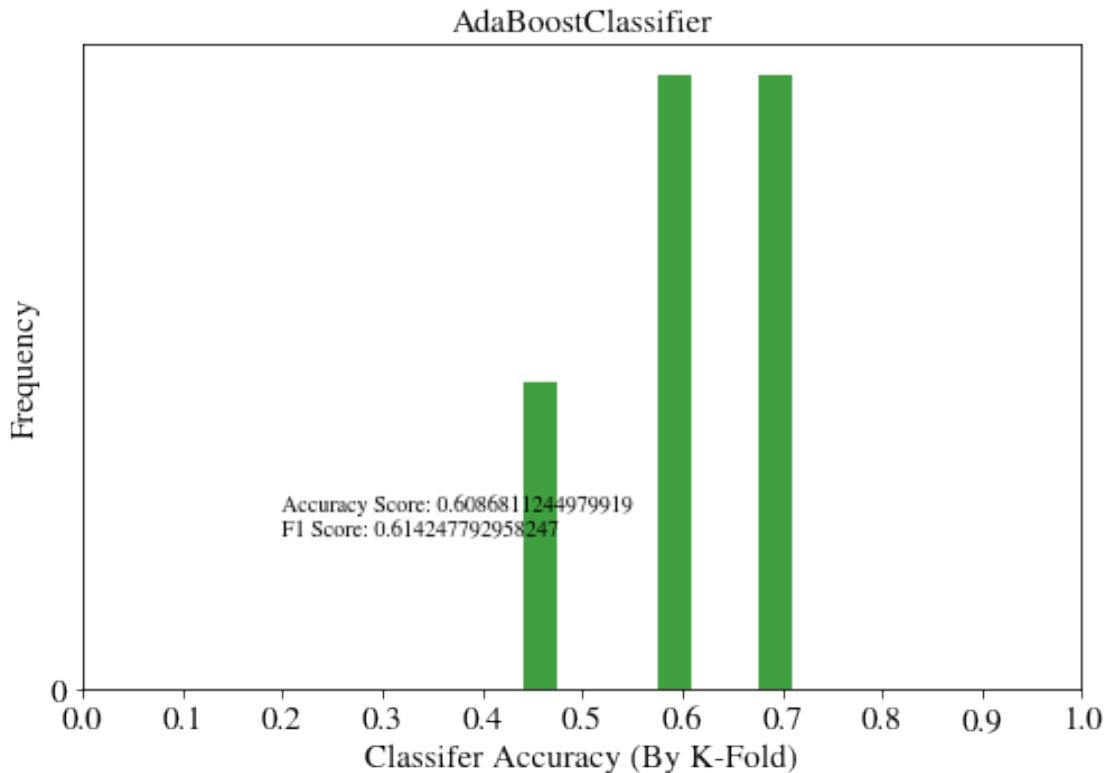
\* Best Params Result:

```

* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent', 'accuracy': [0.58, 0.632, 0.42168674698795183, 0.8353413654618473, 0.6546184738955824], 'avgAccuracy': 0.6247293172690763, 'f1': [0.5865654969364207, 0.6240476761524063, 0.43312578479291847, 0.8365466017757426, 0.6479132035539954], 'avgF1': 0.6256397526422967, 'precision': [0.58, 0.632, 0.42168674698795183, 0.8353413654618473, 0.6546184738955824], 'avgPrecision': 0.6247293172690763, 'recall': [0.58, 0.632, 0.42168674698795183, 0.8353413654618473, 0.6546184738955824], 'avgRecall': 0.6247293172690763, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,

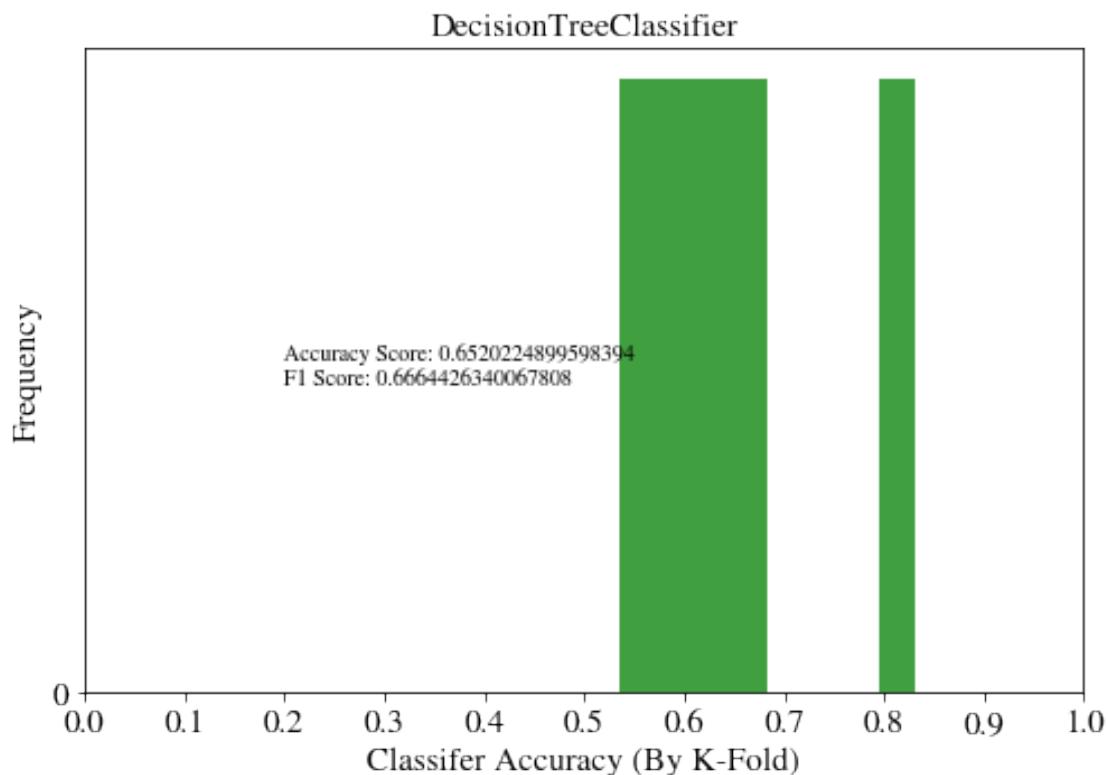
```

```

Epithelial changes, Cryptitis extent', 'accuracy': [0.592, 0.6,
0.44176706827309237, 0.7108433734939759, 0.6987951807228916], 'avgAccuracy':
0.6086811244979919, 'f1': [0.5829662653936627, 0.610520441703825,
0.4651248672852329, 0.7339334871968092, 0.6786939032117055], 'avgF1':
0.614247792958247, 'precision': [0.592, 0.6, 0.44176706827309237,
0.7108433734939759, 0.6987951807228916], 'avgPrecision': 0.6086811244979919,
'recall': [0.592, 0.6, 0.44176706827309237, 0.7108433734939759,
0.6987951807228916], 'avgRecall': 0.6086811244979919, 'params': [{algorithm':
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 20,
'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



```

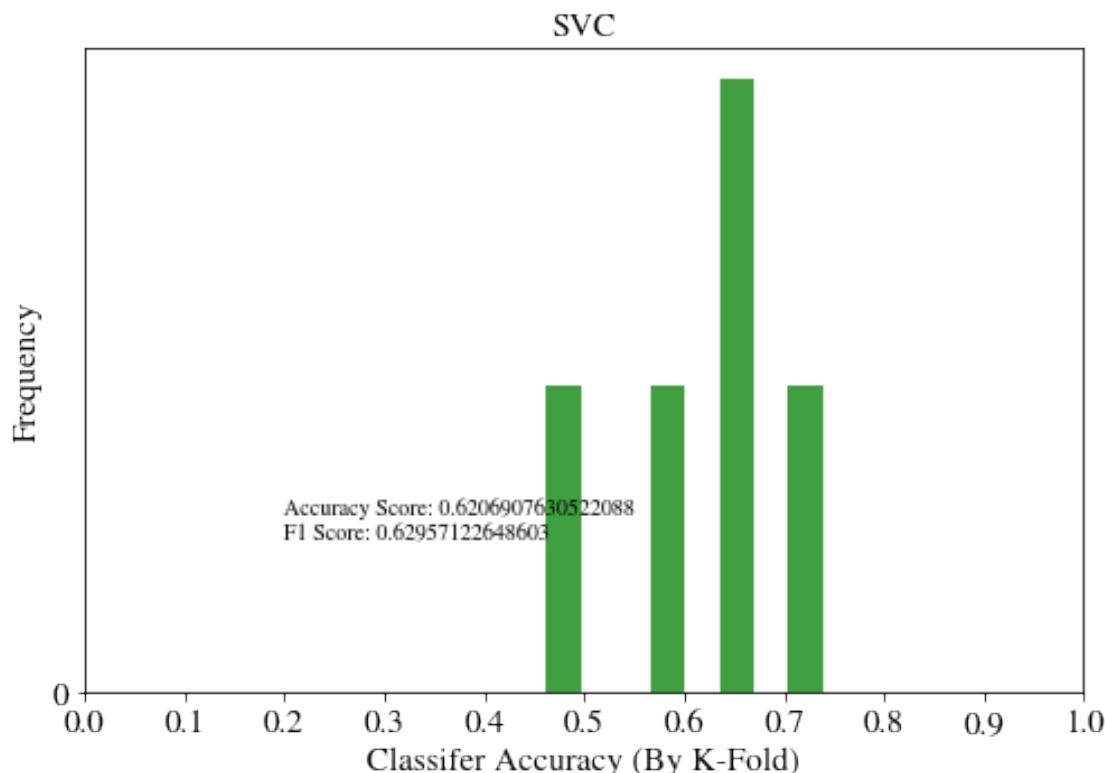
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent', 'accuracy': [0.608, 0.624,
0.5341365461847389, 0.8313253012048193, 0.6626506024096386], 'avgAccuracy':
```

```

0.6520224899598394, 'f1': [0.6116112865635344, 0.6359847031749104,
0.5785479240327648, 0.8388185922805564, 0.6672506639821383], 'avgF1':
0.6664426340067808, 'precision': [0.608, 0.624, 0.5341365461847389,
0.8313253012048193, 0.6626506024096386], 'avgPrecision': 0.6520224899598394,
'recall': [0.608, 0.624, 0.5341365461847389, 0.8313253012048193,
0.6626506024096386], 'avgRecall': 0.6520224899598394, 'params': [{'
ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None,
'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****

```

Processing Model: SVC



```

*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt
Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in
lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,
Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,
Cryptitis extent', 'accuracy': [0.592, 0.648, 0.46184738955823296,
0.7389558232931727, 0.6626506024096386], 'avgAccuracy': 0.6206907630522088,

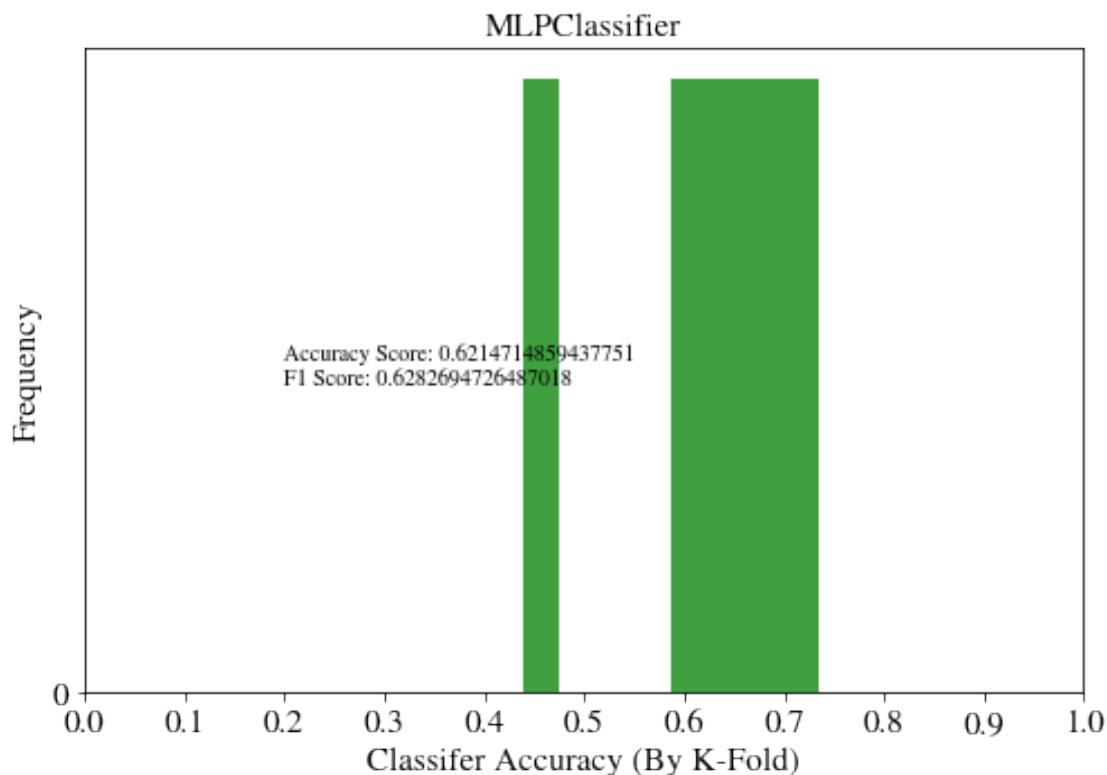
```

```

'f1': [0.6017632341072021, 0.6498739272817095, 0.4796837665862335,
0.7634234416658229, 0.6531117627891821], 'avgF1': 0.62957122648603, 'precision':
[0.592, 0.648, 0.46184738955823296, 0.7389558232931727, 0.6626506024096386],
'avgPrecision': 0.6206907630522088, 'recall': [0.592, 0.648,
0.46184738955823296, 0.7389558232931727, 0.6626506024096386], 'avgRecall':
0.6206907630522088, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size':
4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr',
'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1,
'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001,
'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```

*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent', 'accuracy': [0.608, 0.66, 0.43775100401606426,
0.7349397590361446, 0.6666666666666666], 'avgAccuracy': 0.6214714859437751,
```

```

'f1': [0.6189703710940503, 0.6614158567774936, 0.4386888821345646,
0.7655028647232759, 0.6567693885141245], 'avgF1': 0.6282694726487018,
'precision': [0.608, 0.66, 0.43775100401606426, 0.7349397590361446,
0.6666666666666666], 'avgPrecision': 0.6214714859437751, 'recall': [0.608, 0.66,
0.43775100401606426, 0.7349397590361446, 0.6666666666666666], 'avgRecall':
0.6214714859437751, 'params': [{'activation': 'identity', 'alpha': 0.0001,
'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False,
'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'adaptive',
'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5,
'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'verlow': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent', 'accuracy': [0.608, 0.66, 0.5341365461847389, 0.8273092369477911, 0.6907630522088354], 'avgAccuracy': 0.6640417670682731, 'f1': [0.612803420349091, 0.6682190220710633, 0.5729305190489704, 0.8342254170744602, 0.6923216720154846], 'avgF1': 0.6761000101118139, 'precision': [0.608, 0.66, 0.5341365461847389, 0.8273092369477911, 0.6907630522088354], 'avgPrecision': 0.6640417670682731, 'recall': [0.608, 0.66, 0.5341365461847389, 0.8273092369477911, 0.6907630522088354], 'avgRecall': 0.6640417670682731, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 700, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
*****
```

	model	features
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...
6	SVC	Active inflammation?, Severity of Crypt Arch, ...
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...

	accuracy	f1	precision	recall	\
0	0.660035	0.669980	0.660035	0.660035	
1	0.470503	0.461693	0.470503	0.470503	

```

2 0.614243 0.620416 0.614243 0.614243
3 0.624729 0.625640 0.624729 0.624729
4 0.593497 0.605620 0.593497 0.593497
5 0.635955 0.648851 0.635955 0.635955
6 0.620691 0.629571 0.620691 0.620691
7 0.611839 0.615364 0.611839 0.611839

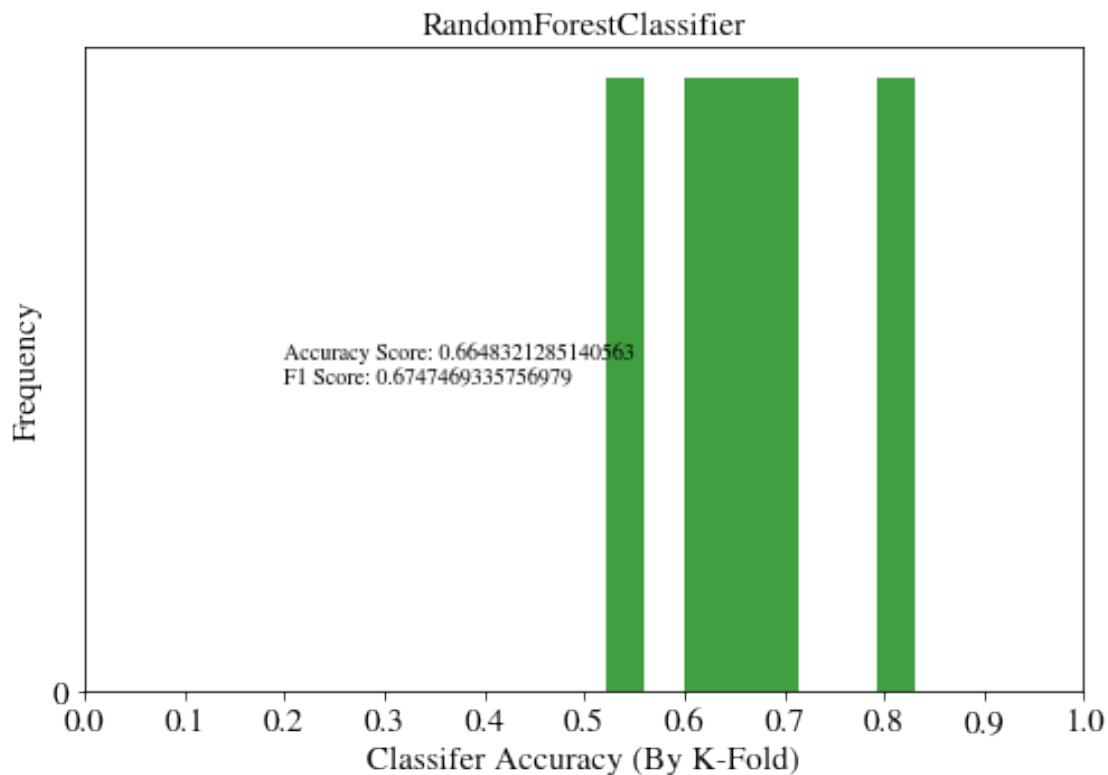
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```

params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3     {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier

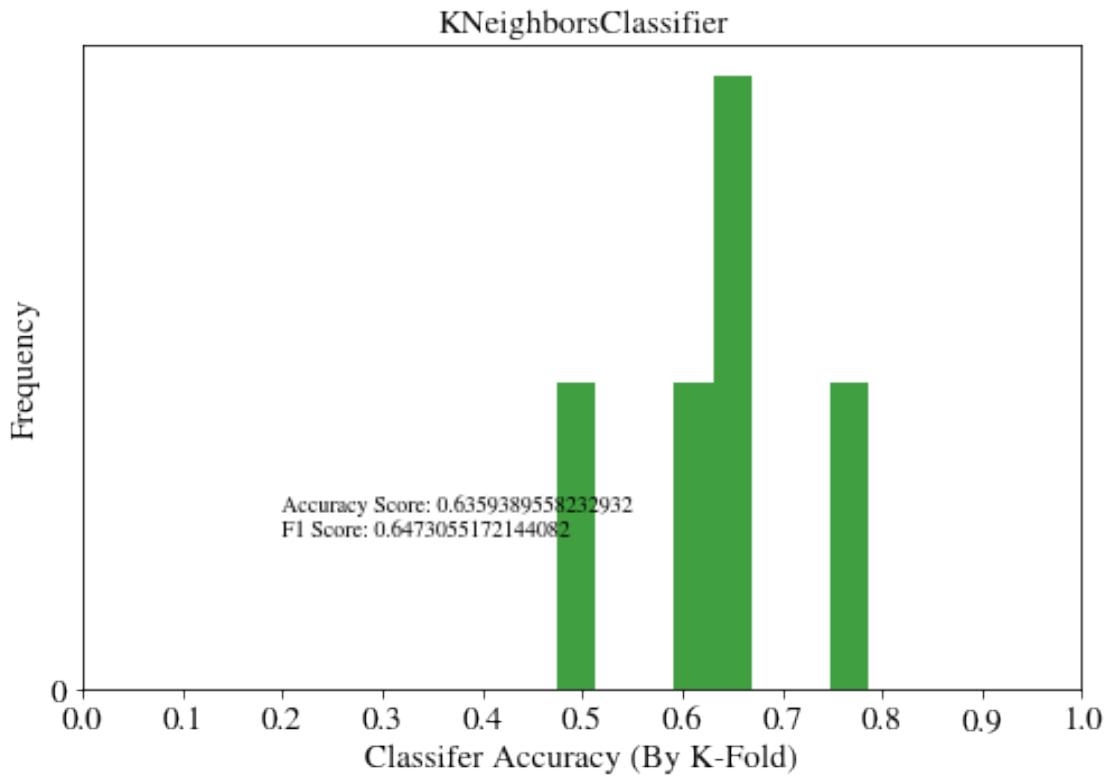


```

*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?',
```

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes', 'accuracy': [0.62, 0.664, 0.5220883534136547, 0.8313253012048193, 0.6867469879518072], 'avgAccuracy': 0.6648321285140563, 'f1': [0.6208806286497008, 0.6669812244897959, 0.5593282219788243, 0.8370287874185819, 0.689515805341587], 'avgF1': 0.6747469335756979, 'precision': [0.62, 0.664, 0.5220883534136547, 0.8313253012048193, 0.6867469879518072], 'avgPrecision': 0.6648321285140563, 'recall': [0.62, 0.664, 0.5220883534136547, 0.8313253012048193, 0.6867469879518072], 'avgRecall': 0.6648321285140563, 'params': [{bootstrap': True, 'ccp\_alpha': 0.0, 'class\_weight': None, 'criterion': 'gini', 'max\_depth': None, 'max\_features': 'auto', 'max\_leaf\_nodes': None, 'max\_samples': None, 'min\_impurity\_decrease': 0.0, 'min\_impurity\_split': None, 'min\_samples\_leaf': 1, 'min\_samples\_split': 2, 'min\_weight\_fraction\_leaf': 0.0, 'n\_estimators': 700, 'n\_jobs': -1, 'oob\_score': True, 'random\_state': None, 'verbose': 0, 'warm\_start': False}]}  
\*\*\*\*\*

Processing Model: KNeighborsClassifier



\*\*\*\*\*

\* KNeighborsClassifier  
\* Best Params Result:

```

* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes', 'accuracy': [0.604, 0.652, 0.4738955823293173,  

0.7871485943775101, 0.6626506024096386], 'avgAccuracy': 0.6359389558232932,  

'f1': [0.6086027452310089, 0.6578927272727274, 0.4859287496058938,  

0.828954451721248, 0.6551489187902864], 'avgF1': 0.6473055172144082,  

'precision': [0.604, 0.652, 0.4738955823293173, 0.7871485943775101,  

0.6626506024096386], 'avgPrecision': 0.6359389558232932, 'recall': [0.604,  

0.652, 0.4738955823293173, 0.7871485943775101, 0.6626506024096386], 'avgRecall':  

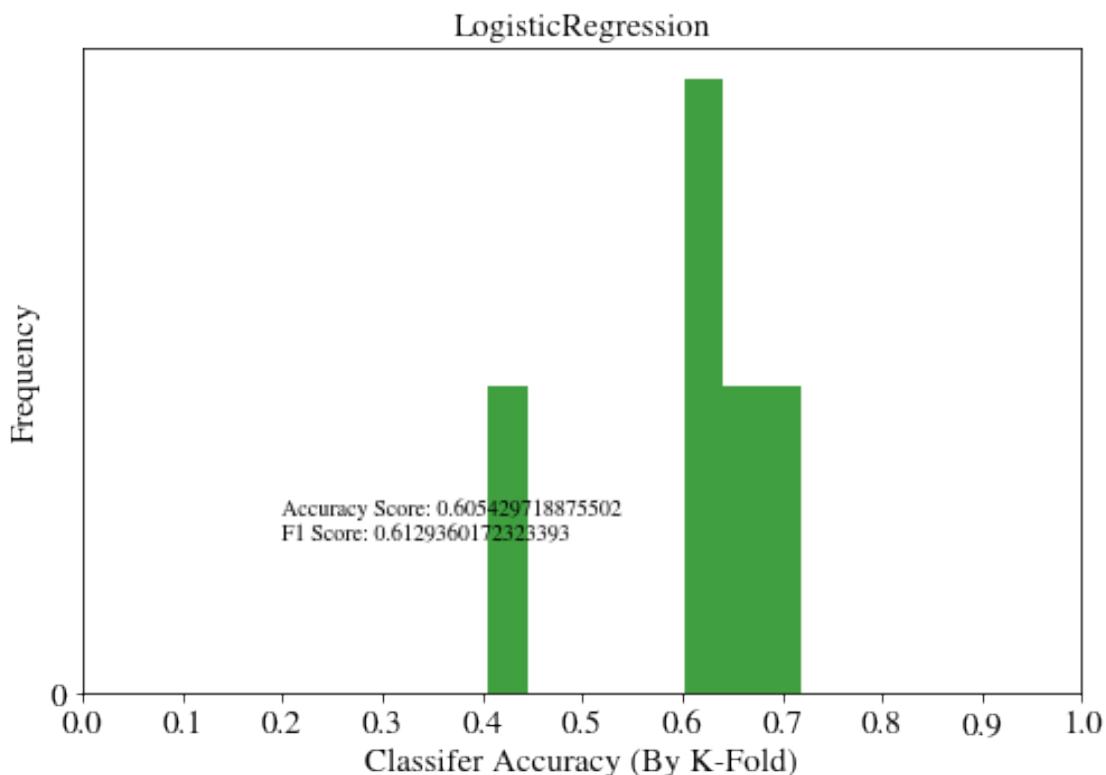
0.6359389558232932, 'params': [{'algorithm': 'ball_tree', 'leaf_size': 30,  

'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 14,  

'p': 2, 'weights': 'distance'}]}
*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &

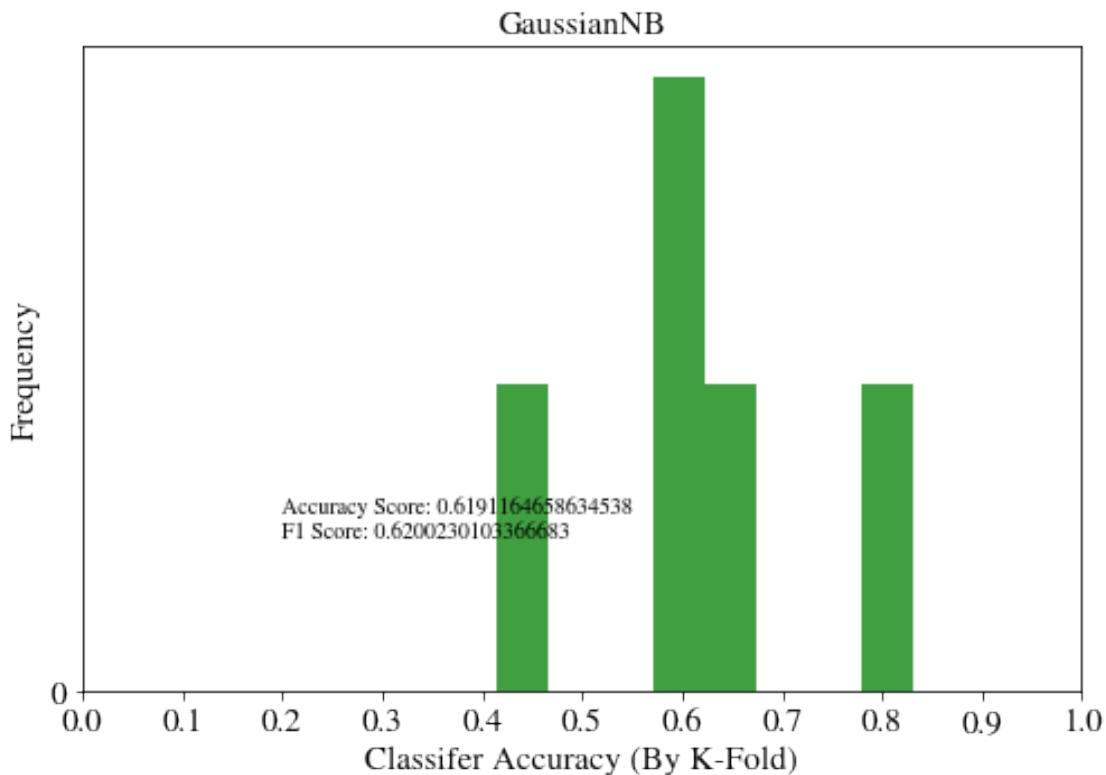
```

```

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes', 'accuracy': [0.604, 0.636, 0.40562248995983935,
0.7188755020080321, 0.6626506024096386], 'avgAccuracy': 0.605429718875502, 'f1':
[0.6116246118197338, 0.6385392658950373, 0.3899578016779831, 0.7671227898017409,
0.6574356169672013], 'avgF1': 0.6129360172323393, 'precision': [0.604, 0.636,
0.40562248995983935, 0.7188755020080321, 0.6626506024096386], 'avgPrecision':
0.605429718875502, 'recall': [0.604, 0.636, 0.40562248995983935,
0.7188755020080321, 0.6626506024096386], 'avgRecall': 0.605429718875502,
'params': [{C': 1, 'class_weight': None, 'dual': False, 'fit_intercept': True,
'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class':
'multinomial', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver':
'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt

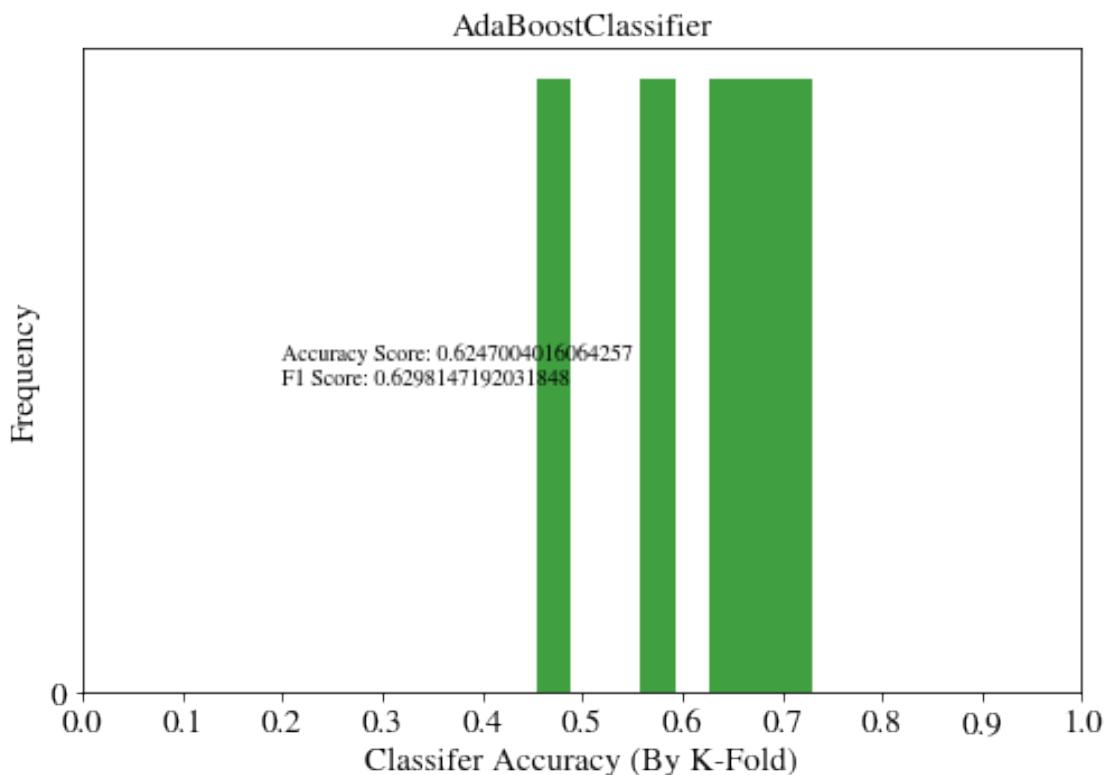
```

```

architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes', 'accuracy': [0.58, 0.62, 0.41365461847389556, 0.8313253012048193,
0.6506024096385542], 'avgAccuracy': 0.6191164658634538, 'f1':
[0.5865654969364207, 0.6126864253393665, 0.42284783291078454,
0.8327734417754876, 0.6452418547212819], 'avgF1': 0.6200230103366683,
'precision': [0.58, 0.62, 0.41365461847389556, 0.8313253012048193,
0.6506024096385542], 'avgPrecision': 0.6191164658634538, 'recall': [0.58, 0.62,
0.41365461847389556, 0.8313253012048193, 0.6506024096385542], 'avgRecall':
0.6191164658634538, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes', 'accuracy': [0.588, 0.66, 0.4538152610441767,
0.7309236947791165, 0.6907630522088354], 'avgAccuracy': 0.6247004016064257,
'f1': [0.5803308431223256, 0.6632430295152123, 0.48230091871676295,

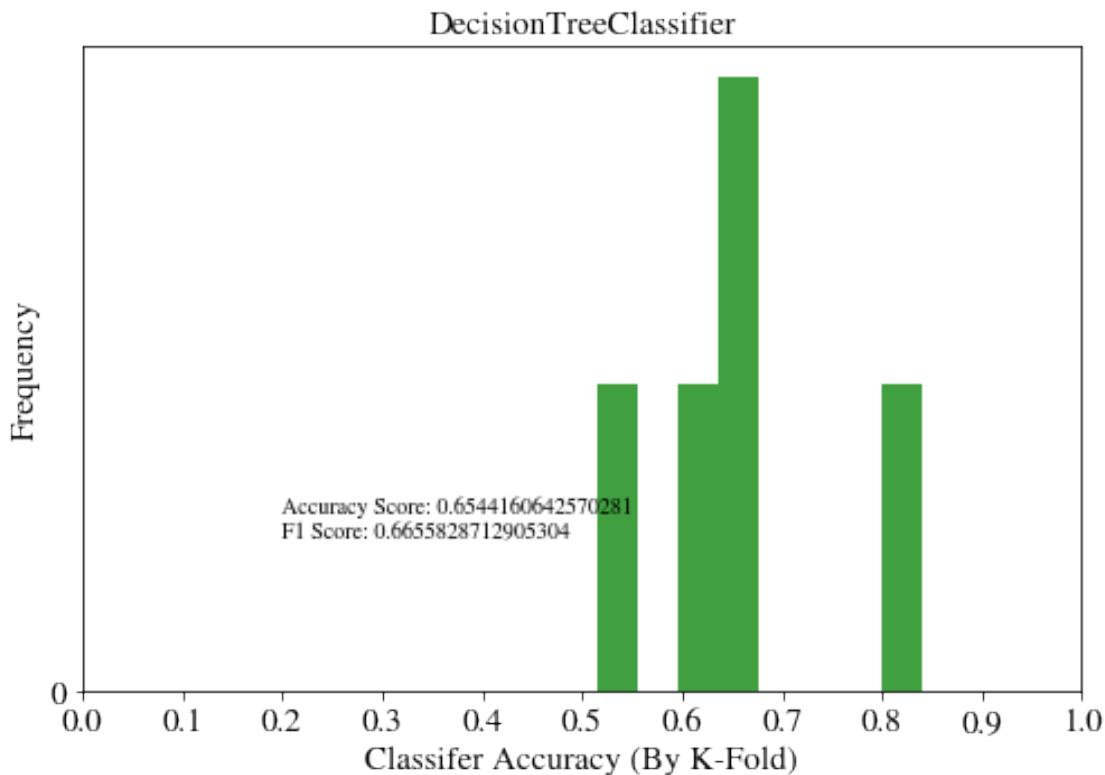
```

```

0.752860180216665, 0.6703386244449581], 'avgF1': 0.6298147192031848,
'precision': [0.588, 0.66, 0.4538152610441767, 0.7309236947791165,
0.6907630522088354], 'avgPrecision': 0.6247004016064257, 'recall': [0.588, 0.66,
0.4538152610441767, 0.7309236947791165, 0.6907630522088354], 'avgRecall':
0.6247004016064257, 'params': [{'algorithm': 'SAMME.R', 'base_estimator': None,
'learning_rate': 1, 'n_estimators': 20, 'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



```

*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes', 'accuracy': [0.612, 0.64, 0.5140562248995983, 0.8393574297188755, 0.6666666666666666], 'avgAccuracy': 0.6544160642570281, 'f1': [0.6149688513037349, 0.6465245761093054, 0.5519843436329912, 0.8443034473016638, 0.6701331381049564], 'avgF1': 0.6655828712905304, 'precision': [0.612, 0.64, 0.5140562248995983, 0.8393574297188755, 0.6666666666666666], 'avgPrecision': 0.6544160642570281, 'recall': [0.612, 0.64,
```

```

0.5140562248995983, 0.8393574297188755, 0.6666666666666666], 'avgRecall':  

0.6544160642570281, 'params': [{'ccp_alpha': 0.0, 'class_weight': None,  

'criterion': 'gini', 'max_depth': None, 'max_features': 'auto',  

'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split':  

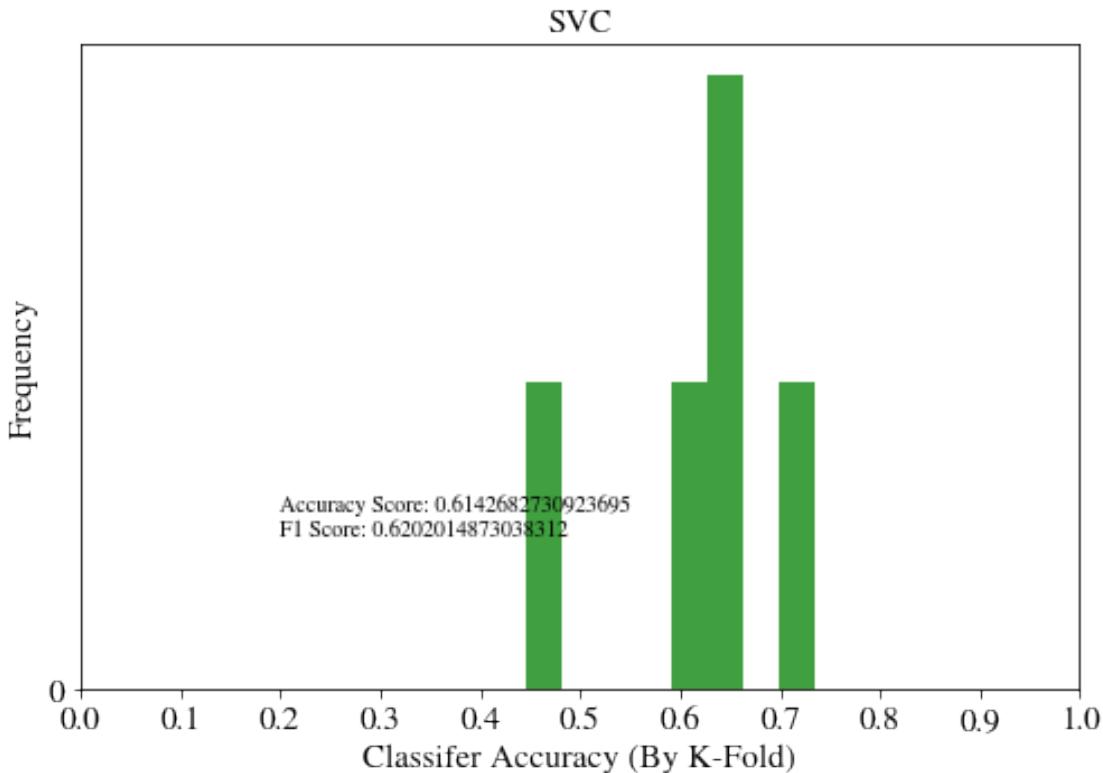
None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf':  

0.0, 'random_state': None, 'splitter': 'best'}]}  

*****

```

Processing Model: SVC



```

*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt  

Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in  

lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,  

Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes',  

'accuracy': [0.608, 0.628, 0.4457831325301205, 0.7349397590361446,  

0.6546184738955824], 'avgAccuracy': 0.6142682730923695, 'f1':  

[0.6176947697111632, 0.6305924557119835, 0.454735101778283, 0.7585636664304276,  

0.6394214428872986], 'avgF1': 0.6202014873038312, 'precision': [0.608, 0.628,  

0.4457831325301205, 0.7349397590361446, 0.6546184738955824], 'avgPrecision':  

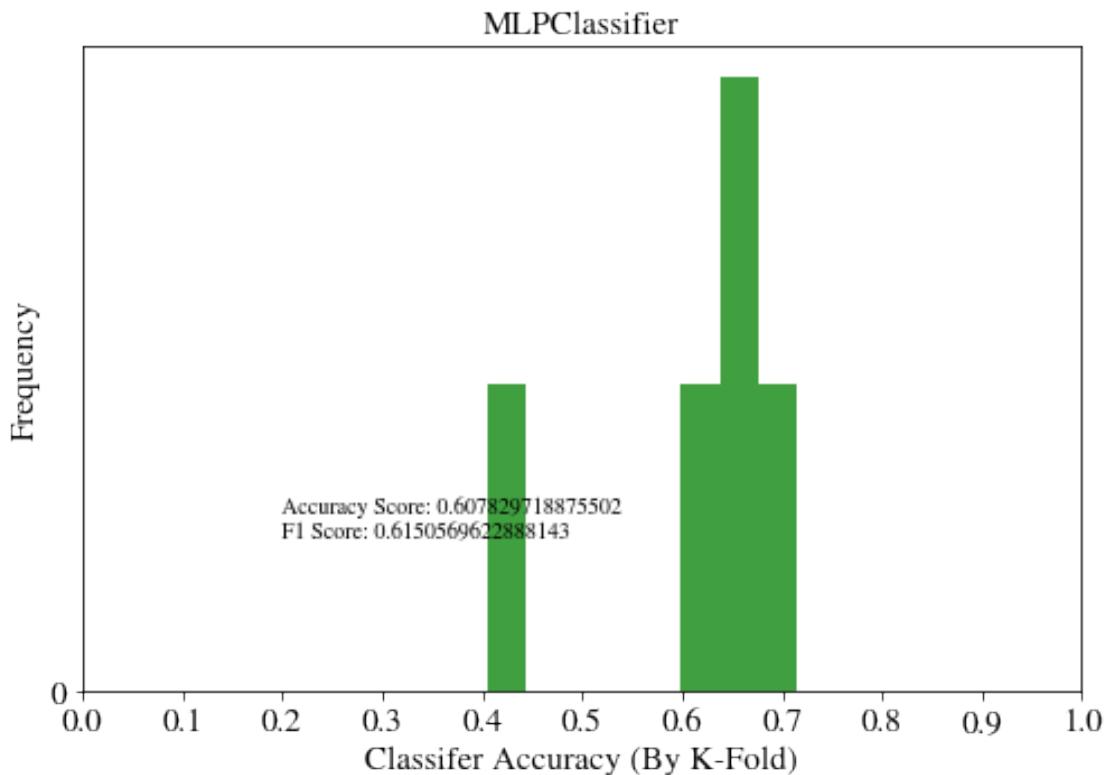
0.6142682730923695, 'recall': [0.608, 0.628, 0.4457831325301205,
```

```

0.7349397590361446, 0.6546184738955824], 'avgRecall': 0.6142682730923695,
'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```

*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes', 'accuracy': [0.608, 0.644, 0.40562248995983935, 0.714859437751004, 0.6666666666666666], 'avgAccuracy': 0.607829718875502, 'f1': [0.6146542721000553, 0.6433845524296675, 0.3899578016779831, 0.764287920914427, 0.6630002643219388], 'avgF1': 0.6150569622888143, 'precision': [0.608, 0.644, 0.40562248995983935, 0.714859437751004, 0.6666666666666666], 'avgPrecision': 0.607829718875502, 'recall': [0.608, 0.644, 0.40562248995983935, 0.714859437751004, 0.6666666666666666], 'avgRecall': 0.607829718875502,
```

```

'params': [{}{'activation': 'identity', 'alpha': 0.0001, 'batch_size': 'auto',
'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08,
'hidden_layer_sizes': (100,), 'learning_rate': 'invscaling',
'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5,
'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'verlow': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes', 'accuracy': [0.62, 0.664, 0.5220883534136547, 0.8313253012048193, 0.6867469879518072], 'avgAccuracy': 0.6648321285140563, 'f1': [0.6208806286497008, 0.6669812244897959, 0.5593282219788243, 0.8370287874185819, 0.689515805341587], 'avgF1': 0.6747469335756979, 'precision': [0.62, 0.664, 0.5220883534136547, 0.8313253012048193, 0.6867469879518072], 'avgPrecision': 0.6648321285140563, 'recall': [0.62, 0.664, 0.5220883534136547, 0.8313253012048193, 0.6867469879518072], 'avgRecall': 0.6648321285140563, 'params': [{}{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 700, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

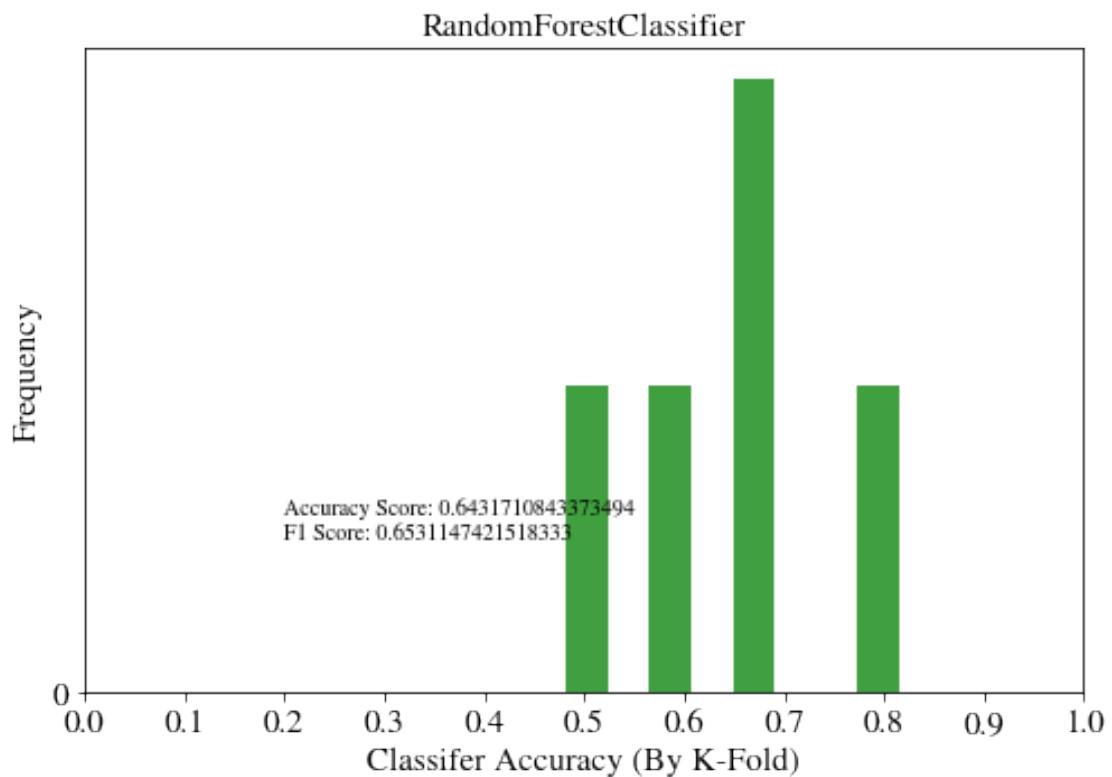
	model	features \			
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...			
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...			
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...			
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...			
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...			
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...			
6	SVC	Active inflammation?, Severity of Crypt Arch, ...			
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...			
	accuracy	f1	precision	recall	\
0	0.660826	0.670647	0.660826	0.660826	
1	0.476903	0.463214	0.476903	0.476903	
2	0.605430	0.612936	0.605430	0.605430	
3	0.619116	0.620023	0.619116	0.619116	
4	0.606316	0.617295	0.606316	0.606316	
5	0.638345	0.650812	0.638345	0.638345	
6	0.614268	0.620201	0.614268	0.614268	
7	0.603014	0.615198	0.603014	0.603014	

```

          params
0  {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1  {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2  {'C': 1, 'class_weight': None, 'dual': False, ...
3      {'priors': None, 'var_smoothing': 1e-09}
4  {'algorithm': 'SAMME.R', 'base_estimator': Non...
5  {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6  {'C': 1.0, 'break_ties': False, 'cache_size': ...
7  {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier



```

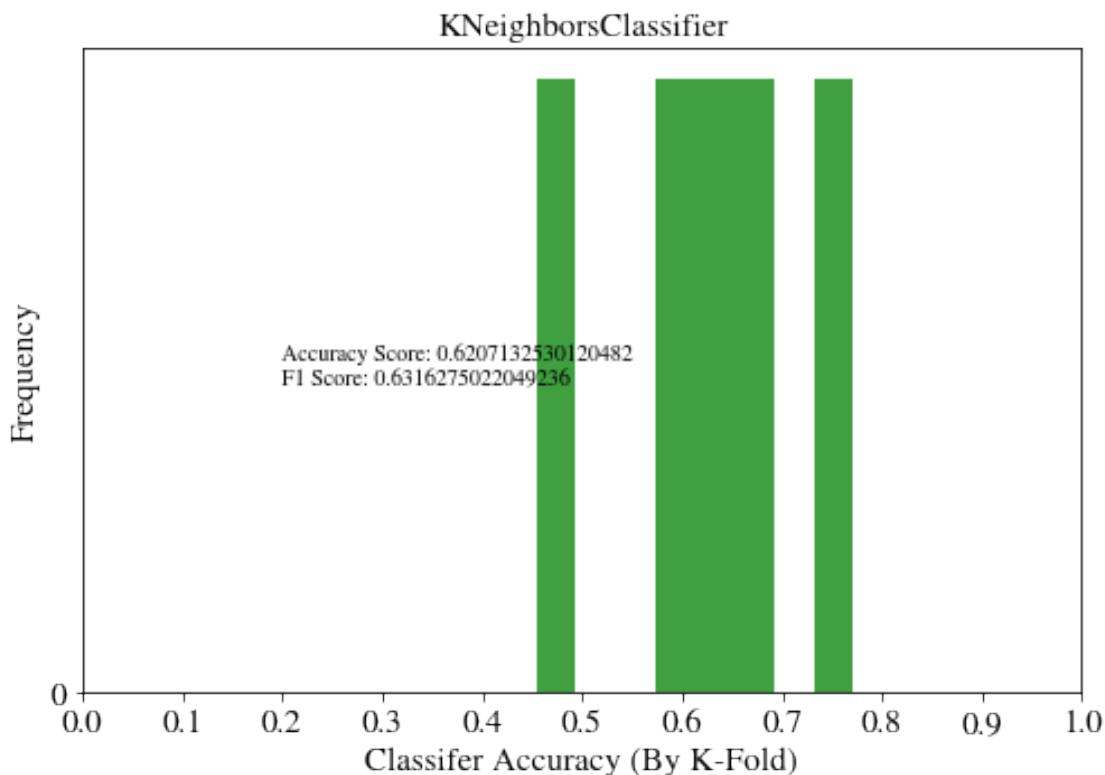
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface',  
'accuracy': [0.596, 0.656, 0.4819277108433735, 0.8152610441767069,  
0.6666666666666666], 'avgAccuracy': 0.6431710843373494, 'f1':  
[0.6032931326372981, 0.6670598013750955, 0.4974433312740977, 0.8255604541926298,
```

```

0.6722169912800455], 'avgF1': 0.6531147421518333, 'precision': [0.596, 0.656,
0.4819277108433735, 0.8152610441767069, 0.6666666666666666], 'avgPrecision':
0.6431710843373494, 'recall': [0.596, 0.656, 0.4819277108433735,
0.8152610441767069, 0.6666666666666666], 'avgRecall': 0.6431710843373494,
'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None,
'criterion': 'gini', 'max_depth': None, 'max_features': 'auto',
'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score':
False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier

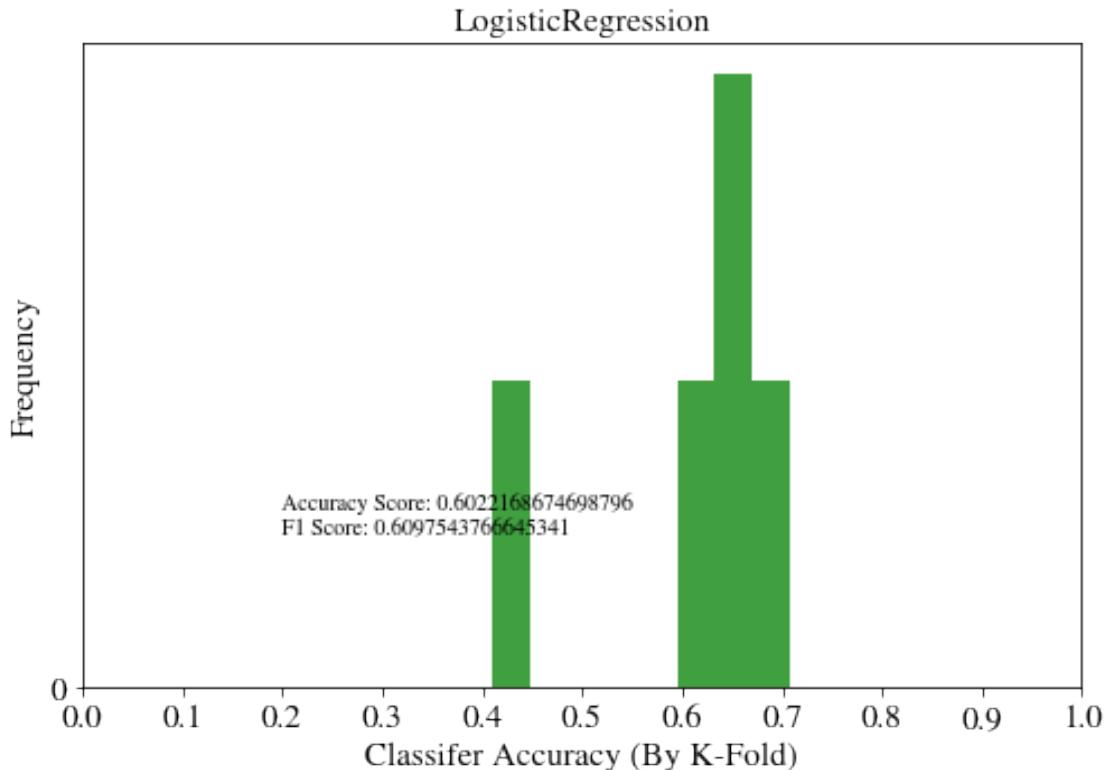


```

*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,',
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface',
'accuracy': [0.592, 0.62, 0.4538152610441767, 0.7710843373493976,
0.6666666666666666], 'avgAccuracy': 0.6207132530120482, 'f1':
```

```
[0.6011913733340857, 0.6341662380300956, 0.4482238368143228, 0.8115882332749802,
0.6629678295711333], 'avgF1': 0.6316275022049236, 'precision': [0.592, 0.62,
0.4538152610441767, 0.7710843373493976, 0.6666666666666666], 'avgPrecision':
0.6207132530120482, 'recall': [0.592, 0.62, 0.4538152610441767,
0.7710843373493976, 0.6666666666666666], 'avgRecall': 0.6207132530120482,
'params': [{algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski',
'metric_params': None, 'n_jobs': -1, 'n_neighbors': 15, 'p': 2, 'weights':
'distance'}]}}
*****
```

Processing Model: LogisticRegression



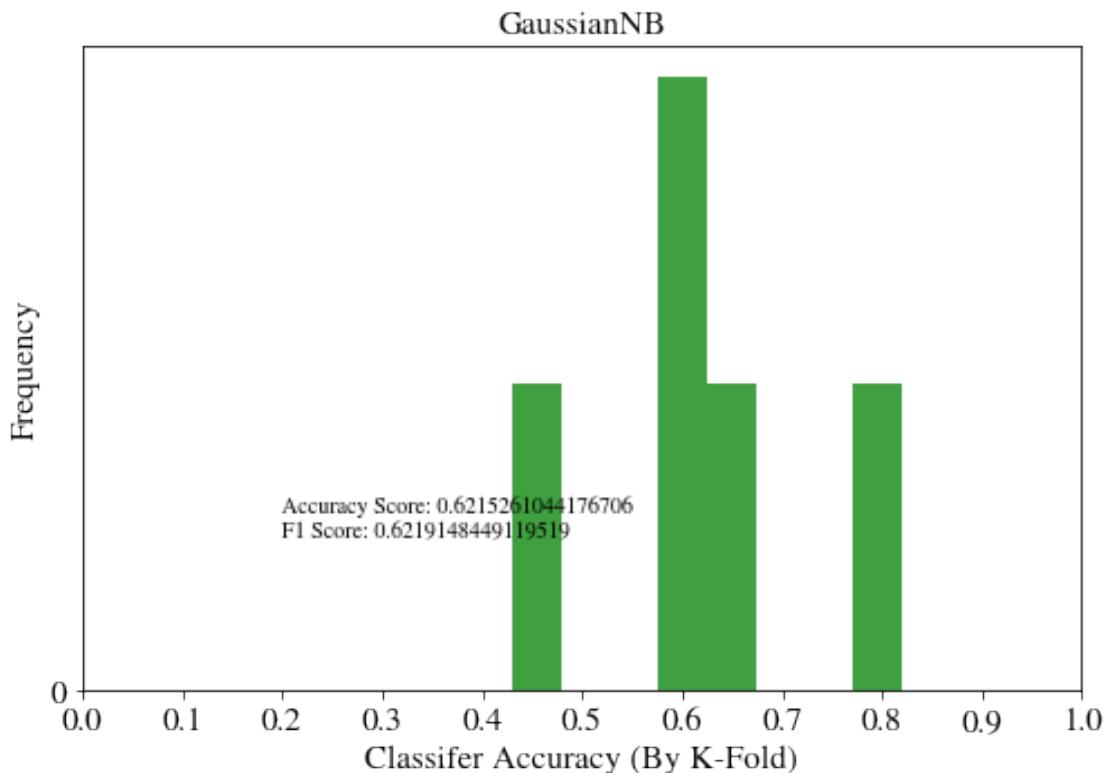
```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface',
'accuracy': [0.604, 0.636, 0.40963855421686746, 0.7068273092369478,
0.6546184738955824], 'avgAccuracy': 0.6022168674698796, 'f1':
[0.6141031857031857, 0.6385392658950373, 0.38408029215270306,
0.7540652118965372, 0.6579839276752074], 'avgF1': 0.6097543766645341,
```

```

'precision': [0.604, 0.636, 0.40963855421686746, 0.7068273092369478,
0.6546184738955824], 'avgPrecision': 0.6022168674698796, 'recall': [0.604,
0.636, 0.40963855421686746, 0.7068273092369478, 0.6546184738955824],
'avgRecall': 0.6022168674698796, 'params': [{C': 1, 'class_weight': None,
'dual': False, 'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None,
'max_iter': 100, 'multi_class': 'ovr', 'n_jobs': -1, 'penalty': 'l2',
'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0,
'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

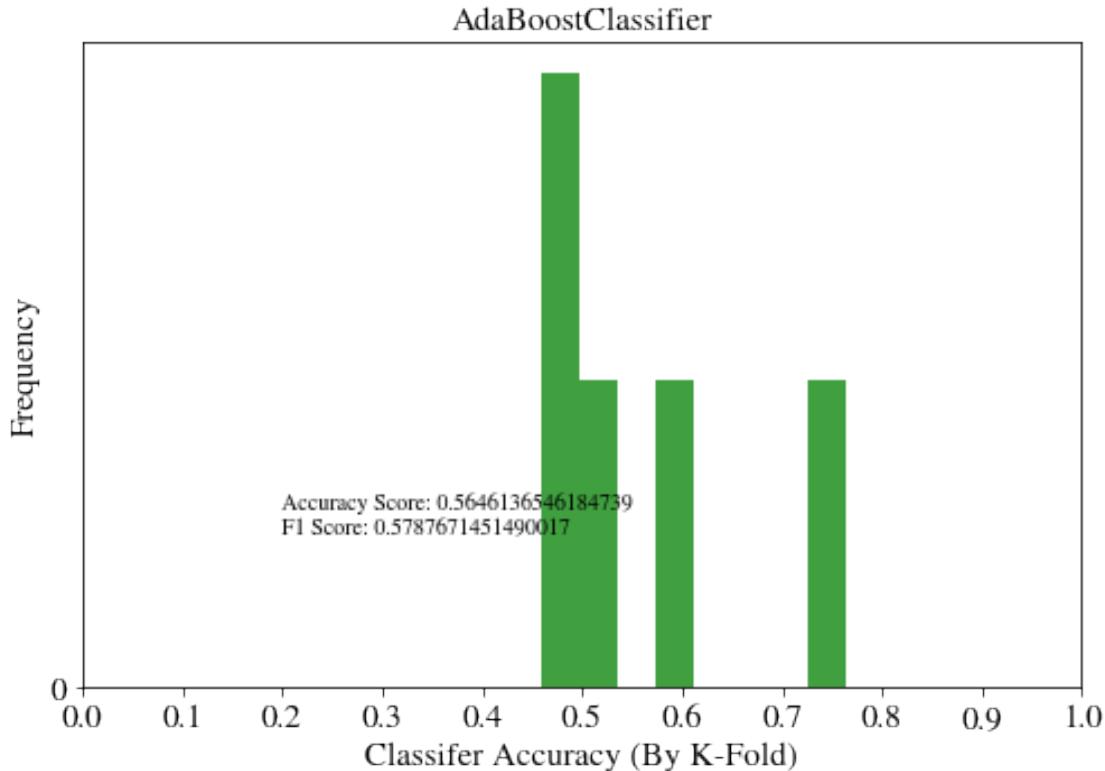
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface', 'accuracy':
[0.576, 0.624, 0.42971887550200805, 0.8192771084337349, 0.6586345381526104],
'avgAccuracy': 0.6215261044176706, 'f1': [0.5816290435452378, 0.618200856286942,
0.4377133893970274, 0.8210143703183825, 0.65101656501217], 'avgF1':
0.6219148449119519, 'precision': [0.576, 0.624, 0.42971887550200805,
```

```

0.8192771084337349, 0.6586345381526104], 'avgPrecision': 0.6215261044176706,
'recall': [0.576, 0.624, 0.42971887550200805, 0.8192771084337349,
0.6586345381526104], 'avgRecall': 0.6215261044176706, 'params': [{'priors':
None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

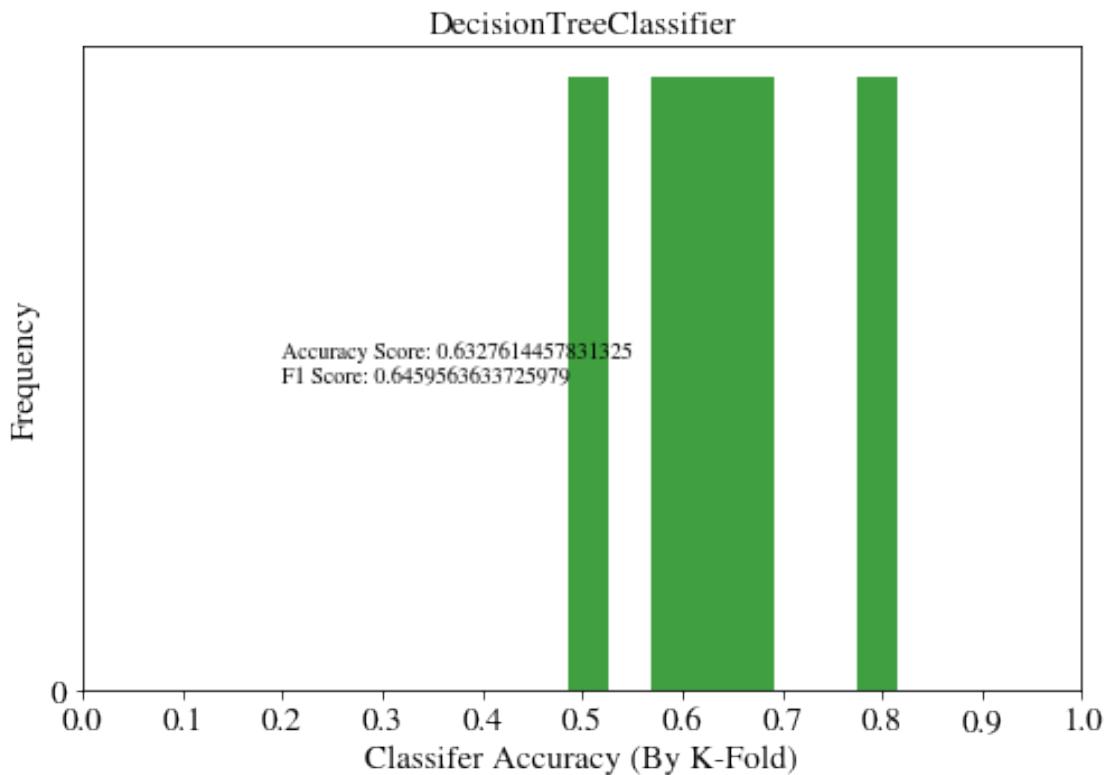
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface',  
'accuracy': [0.596, 0.46, 0.46987951807228917, 0.7630522088353414,  
0.5341365461847389], 'avgAccuracy': 0.5646136546184739, 'f1':  
[0.5973077612701495, 0.46155421776161565, 0.503314748008694, 0.8005179023303244,  
0.5311410963742251], 'avgF1': 0.5787671451490017, 'precision': [0.596, 0.46,  
0.46987951807228917, 0.7630522088353414, 0.5341365461847389], 'avgPrecision':  
0.5646136546184739, 'recall': [0.596, 0.46, 0.46987951807228917,  
0.7630522088353414, 0.5341365461847389], 'avgRecall': 0.5646136546184739,  
'params': [{'algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1,

```

```
'n_estimators': 300, 'random_state': None}]]}
*****

```

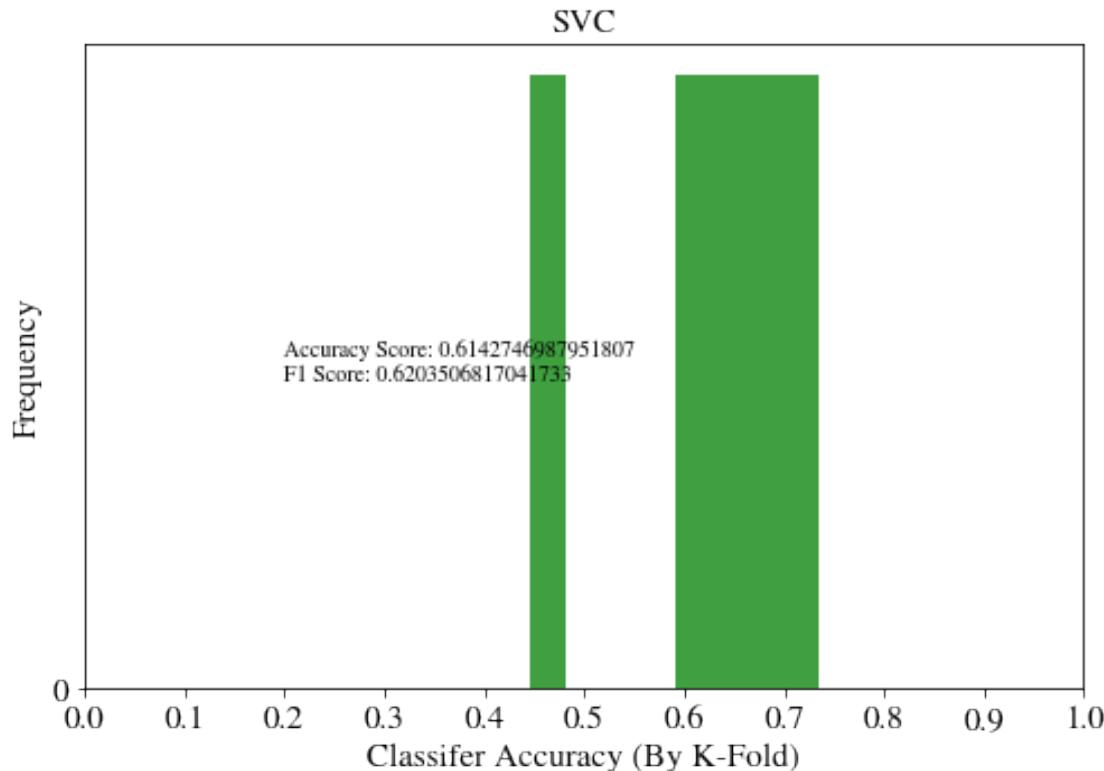
Processing Model: DecisionTreeClassifier



```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface', 'accuracy': [0.592, 0.62, 0.4859437751004016, 0.8152610441767069, 0.6506024096385542], 'avgAccuracy': 0.6327614457831325, 'f1': [0.6011913733340857, 0.6341662380300956, 0.5068982434407437, 0.8273502590546044, 0.6601757030034601], 'avgF1': 0.6459563633725979, 'precision': [0.592, 0.62, 0.4859437751004016, 0.8152610441767069, 0.6506024096385542], 'avgPrecision': 0.6327614457831325, 'recall': [0.592, 0.62, 0.4859437751004016, 0.8152610441767069, 0.6506024096385542], 'avgRecall': 0.6327614457831325, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None},
```

```
'splitter': 'best'}]]}  
*****
```

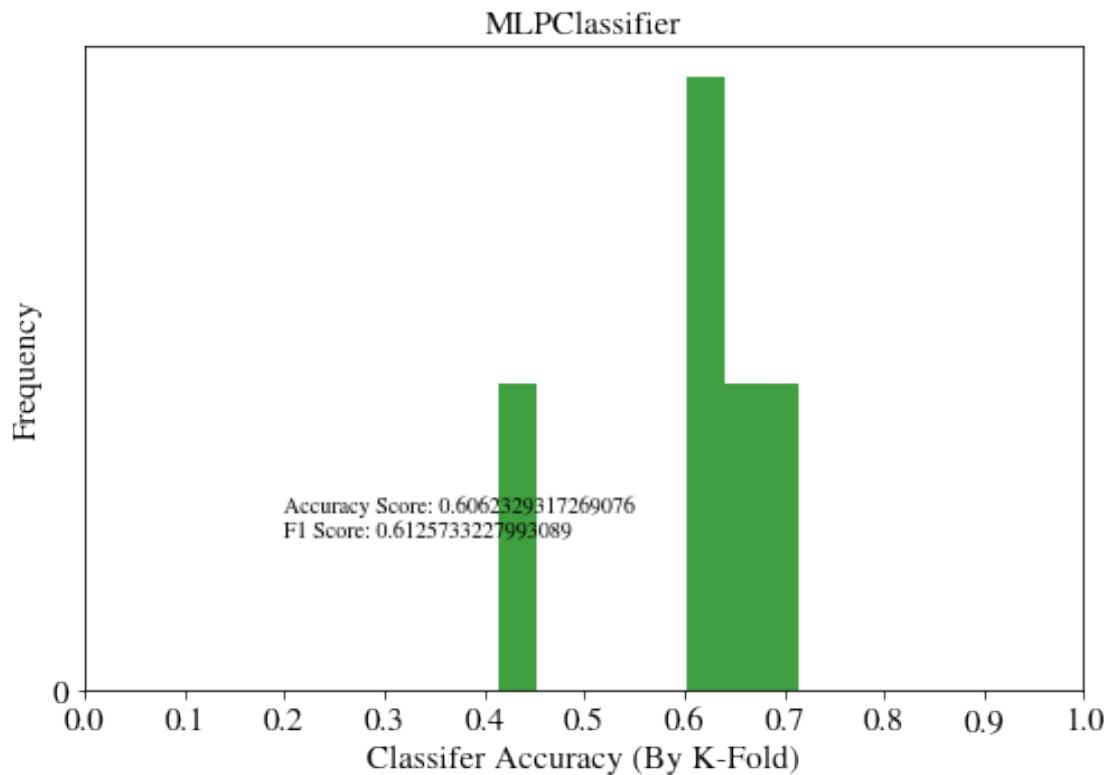
Processing Model: SVC



```
*****  
* SVC  
* Best Params Result:  
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface', 'accuracy': [0.6, 0.628, 0.4457831325301205, 0.7349397590361446, 0.6626506024096386], 'avgAccuracy': 0.6142746987951807, 'f1': [0.6114655367231637, 0.6305924557119835, 0.454735101778283, 0.7585636664304276, 0.6463966478770088], 'avgF1': 0.6203506817041733, 'precision': [0.6, 0.628, 0.4457831325301205, 0.7349397590361446, 0.6626506024096386], 'avgPrecision': 0.6142746987951807, 'recall': [0.6, 0.628, 0.4457831325301205, 0.7349397590361446, 0.6626506024096386], 'avgRecall': 0.6142746987951807, 'params': [{C: 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}}
```

```
*****
```

Processing Model: MLPClassifier



```
*****
```

```
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface', 'accuracy':
[0.604, 0.636, 0.41365461847389556, 0.714859437751004, 0.6626506024096386],
'avgAccuracy': 0.6062329317269076, 'f1': [0.6141031857031857,
0.6385392658950373, 0.3905689047995097, 0.764287920914427, 0.655367336684385],
'avgF1': 0.6125733227993089, 'precision': [0.604, 0.636, 0.41365461847389556,
0.714859437751004, 0.6626506024096386], 'avgPrecision': 0.6062329317269076,
'recall': [0.604, 0.636, 0.41365461847389556, 0.714859437751004,
0.6626506024096386], 'avgRecall': 0.6062329317269076, 'params': [{activation':
'identity', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum':
True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam'}]}
```

```

'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start':
False}]}}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface', 'accuracy': [0.596, 0.656, 0.4819277108433735, 0.8152610441767069, 0.6666666666666666], 'avgAccuracy': 0.6431710843373494, 'f1': [0.6032931326372981, 0.6670598013750955, 0.4974433312740977, 0.8255604541926298, 0.6722169912800455], 'avgF1': 0.6531147421518333, 'precision': [0.596, 0.656, 0.4819277108433735, 0.8152610441767069, 0.6666666666666666], 'avgPrecision': 0.6431710843373494, 'recall': [0.596, 0.656, 0.4819277108433735, 0.8152610441767069, 0.6666666666666666], 'avgRecall': 0.6431710843373494, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

	model	features	\
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...	
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...	
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...	
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...	
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...	
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...	
6	SVC	Active inflammation?, Severity of Crypt Arch, ...	
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...	

	accuracy	f1	precision	recall	\
0	0.639968	0.650503	0.639968	0.639968	
1	0.472919	0.459770	0.472919	0.472919	
2	0.602217	0.607305	0.602217	0.602217	
3	0.621526	0.621915	0.621526	0.621526	
4	0.564614	0.578767	0.564614	0.564614	
5	0.626342	0.636403	0.626342	0.626342	
6	0.614275	0.620351	0.614275	0.614275	
7	0.603017	0.608671	0.603017	0.603017	

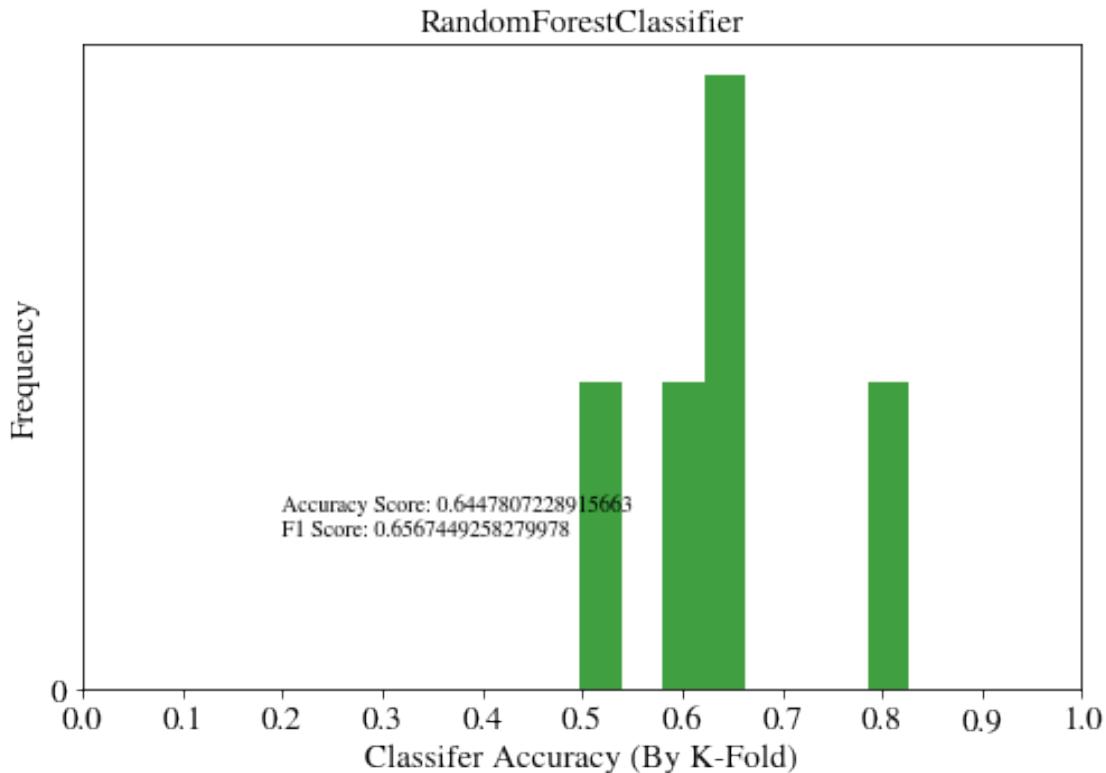
	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	{'C': 1, 'class_weight': None, 'dual': False, ...}

```

3      {'priors': None, 'var_smoothing': 1e-09}
4  {'algorithm': 'SAMME.R', 'base_estimator': Non...
5  {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6  {'C': 1.0, 'break_ties': False, 'cache_size': ...
7  {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier



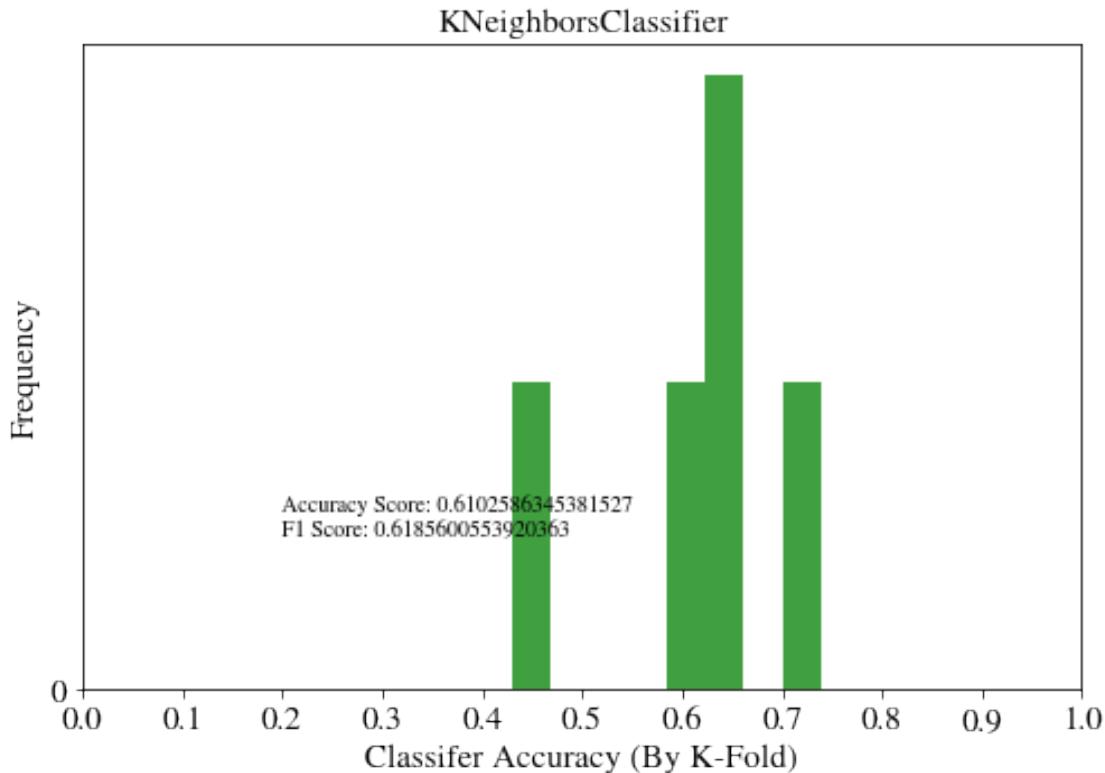
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?', 'accuracy': [0.6, 0.648, 0.4979919678714859, 0.8273092369477911, 0.6506024096385542], 'avgAccuracy': 0.6447807228915663, 'f1': [0.6084049734108214, 0.6596198087264065, 0.5293950019320559, 0.8298189700448412, 0.6564858750258641], 'avgF1': 0.6567449258279978, 'precision': [0.6, 0.648, 0.4979919678714859, 0.8273092369477911, 0.6506024096385542], 'avgPrecision': 0.6447807228915663, 'recall': [0.6, 0.648, 0.4979919678714859, 0.8273092369477911, 0.6506024096385542], 'avgRecall': 0.6447807228915663, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth':
```

```

None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None,
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 700,
'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0,
'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier

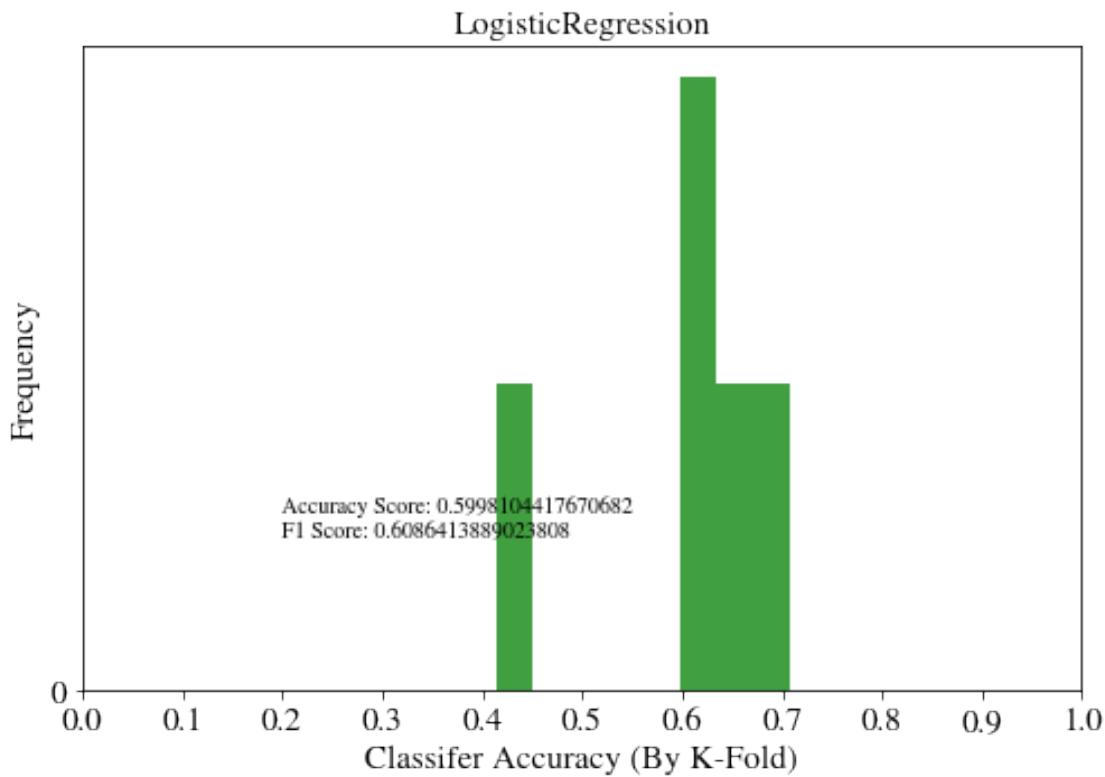


```

*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?', 'accuracy': [0.6,  
0.628, 0.42971887550200805, 0.7389558232931727, 0.6546184738955824],  
'avgAccuracy': 0.6102586345381527, 'f1': [0.6102253571117878,  
0.6418048910702305, 0.4077950992565974, 0.7831244077433329, 0.6498505217782325],  
'avgF1': 0.6185600553920363, 'precision': [0.6, 0.628, 0.42971887550200805,  
0.7389558232931727, 0.6546184738955824], 'avgPrecision': 0.6102586345381527,  
'recall': [0.6, 0.628, 0.42971887550200805, 0.7389558232931727,  
0.6546184738955824], 'avgRecall': 0.6102586345381527, 'params': [{algorithm':
```

```
'ball_tree', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None,
'n_jobs': -1, 'n_neighbors': 15, 'p': 2, 'weights': 'distance'}]}}
*****
```

Processing Model: LogisticRegression

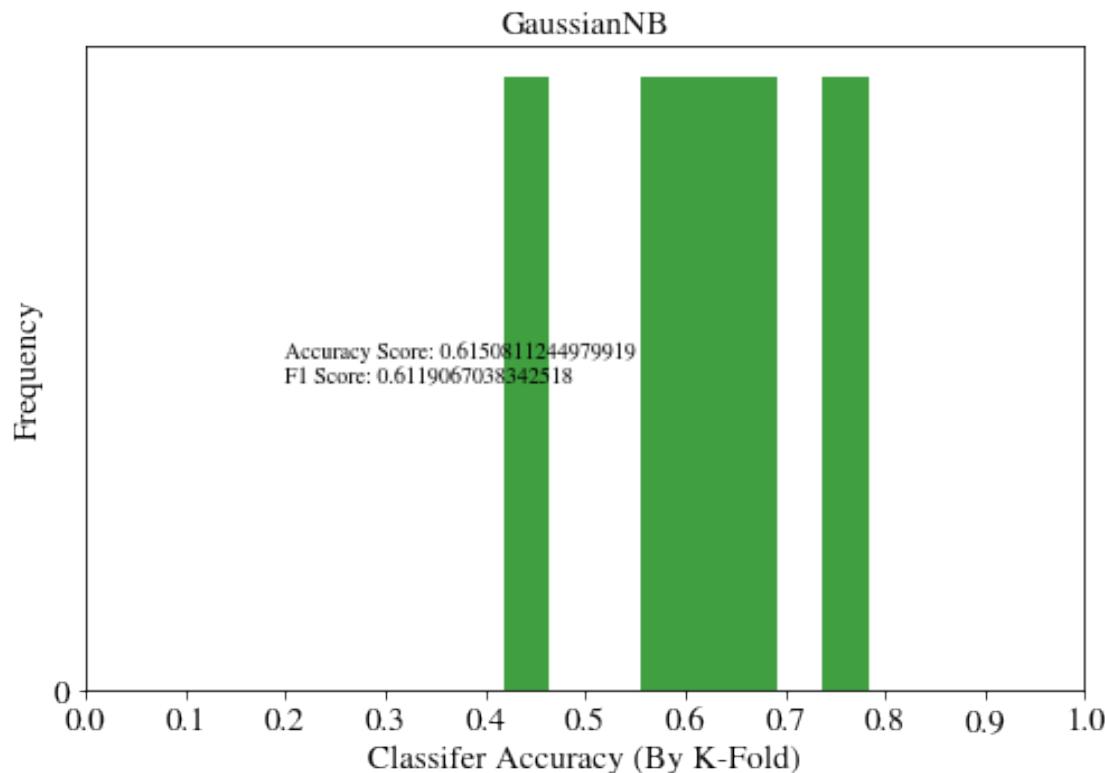


```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?', 'accuracy': [0.604,  
0.632, 0.41365461847389556, 0.7068273092369478, 0.642570281124498],  
'avgAccuracy': 0.5998104417670682, 'f1': [0.6141031857031857,  
0.6346857273868014, 0.3905689047995097, 0.7540652118965372, 0.6497839147258705],  
'avgF1': 0.6086413889023808, 'precision': [0.604, 0.632, 0.41365461847389556,  
0.7068273092369478, 0.642570281124498], 'avgPrecision': 0.5998104417670682,  
'recall': [0.604, 0.632, 0.41365461847389556, 0.7068273092369478,  
0.642570281124498], 'avgRecall': 0.5998104417670682, 'params': [{C': 1,  
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':  
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'ovr', 'n_jobs': -1,  
'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001},
```

```
'verbose': 0, 'warm_start': False}]]}
*****

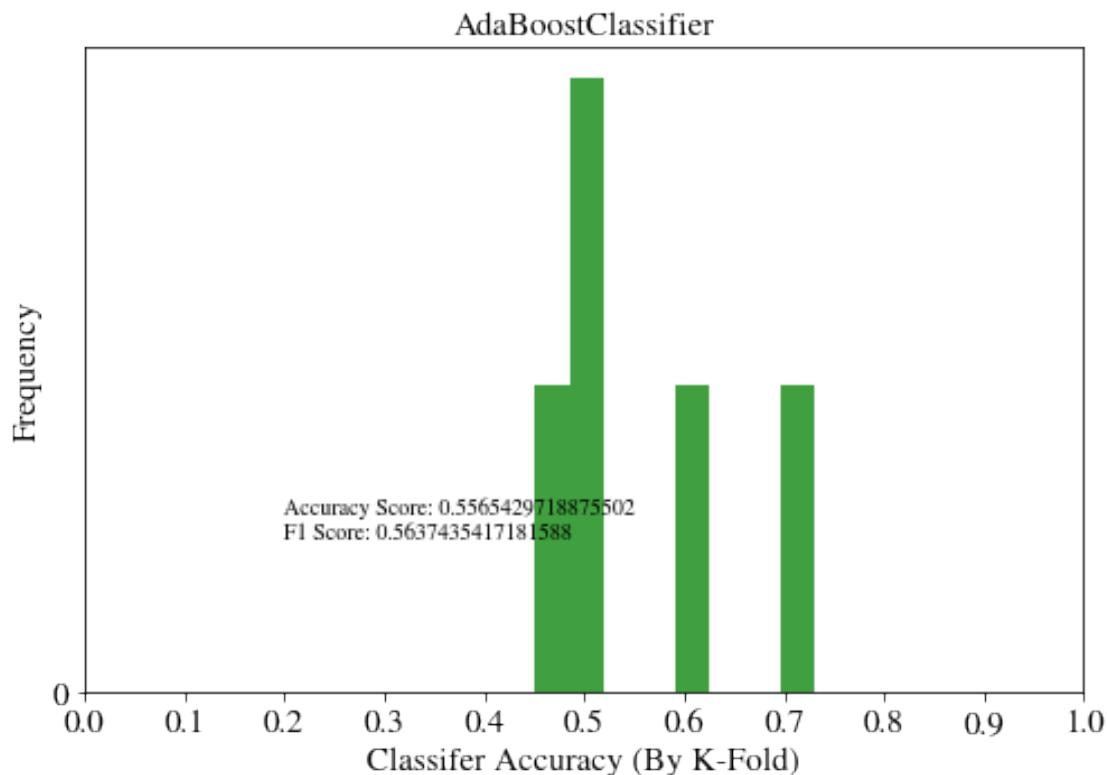
```

Processing Model: GaussianNB



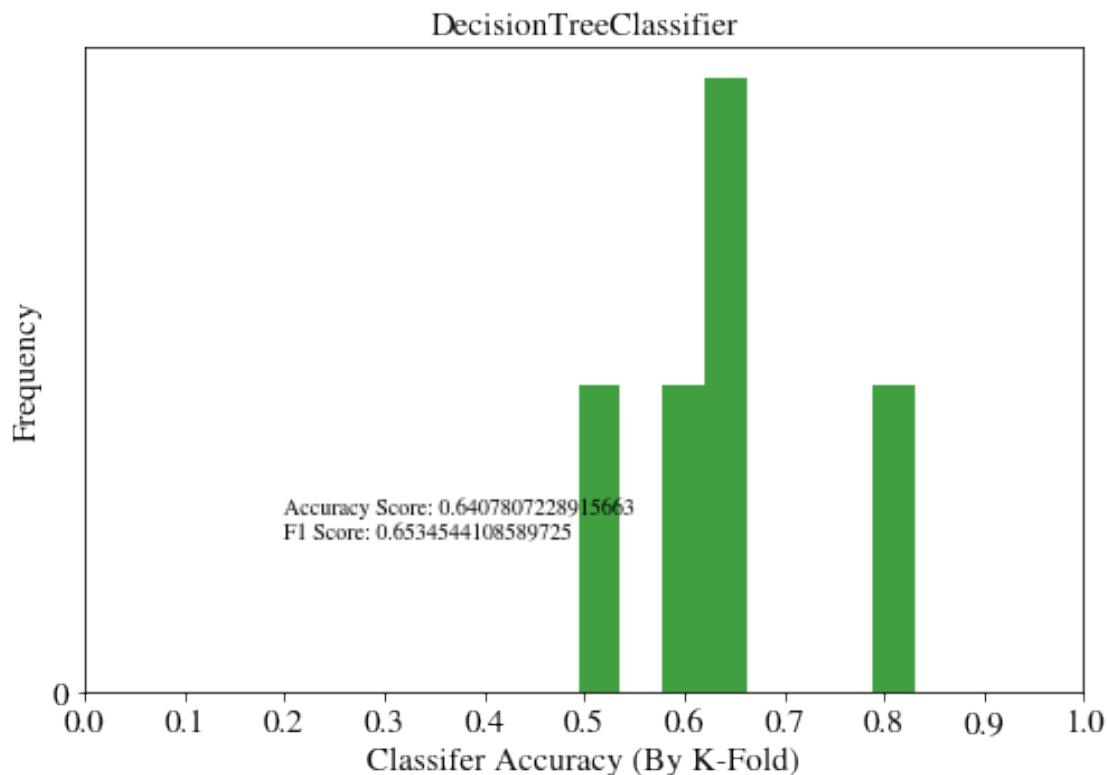
```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?', 'accuracy': [0.588, 0.636, 0.41767068273092367, 0.7831325301204819, 0.6506024096385542], 'avgAccuracy': 0.6150811244979919, 'f1': [0.5948966346627165, 0.6327143850643705, 0.40514105112963505, 0.7809332568368713, 0.6458481914776659], 'avgF1': 0.6119067038342518, 'precision': [0.588, 0.636, 0.41767068273092367, 0.7831325301204819, 0.6506024096385542], 'avgPrecision': 0.6150811244979919, 'recall': [0.588, 0.636, 0.41767068273092367, 0.7831325301204819, 0.6506024096385542], 'avgRecall': 0.6150811244979919, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****
```

Processing Model: AdaBoostClassifier



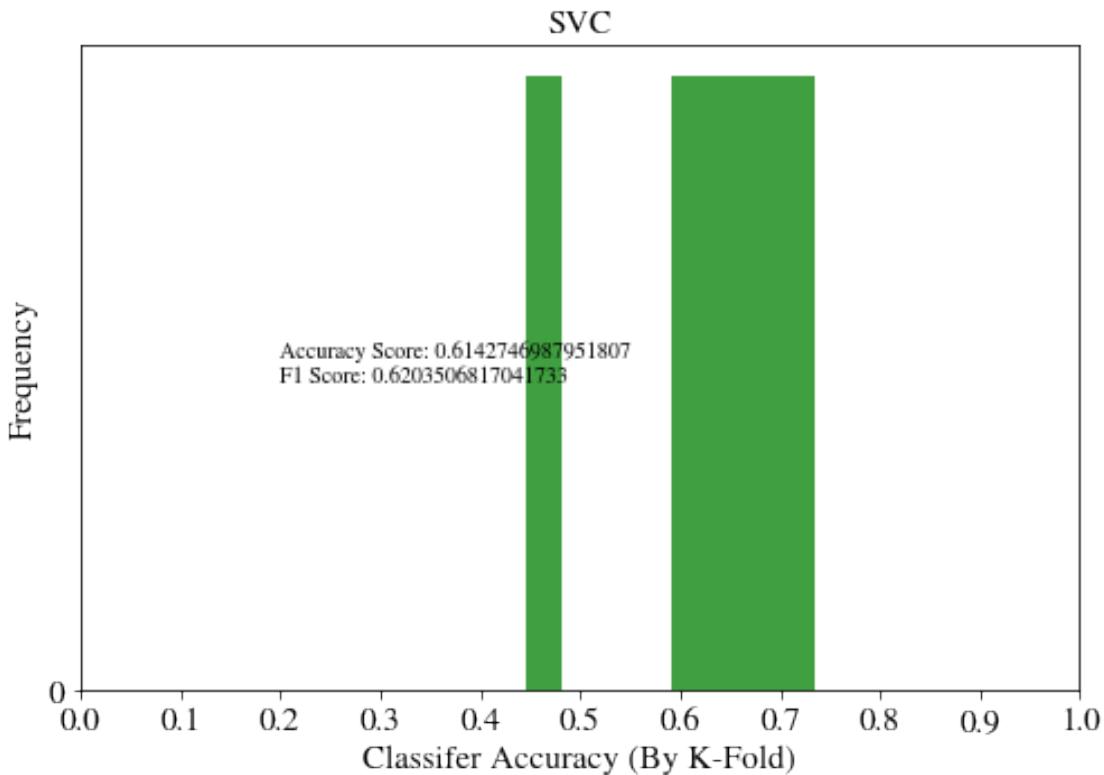
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?', 'accuracy': [0.604,  
0.5, 0.4497991967871486, 0.7309236947791165, 0.4979919678714859], 'avgAccuracy':  
0.5565429718875502, 'f1': [0.5975477855477854, 0.5104181724315953,  
0.4782792415552194, 0.7532984935316382, 0.47917401552455574], 'avgF1':  
0.5637435417181588, 'precision': [0.604, 0.5, 0.4497991967871486,  
0.7309236947791165, 0.4979919678714859], 'avgPrecision': 0.5565429718875502,  
'recall': [0.604, 0.5, 0.4497991967871486, 0.7309236947791165,  
0.4979919678714859], 'avgRecall': 0.5565429718875502, 'params': [{'algorithm':  
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 50,  
'random_state': None}]}
*****
```

Processing Model: DecisionTreeClassifier



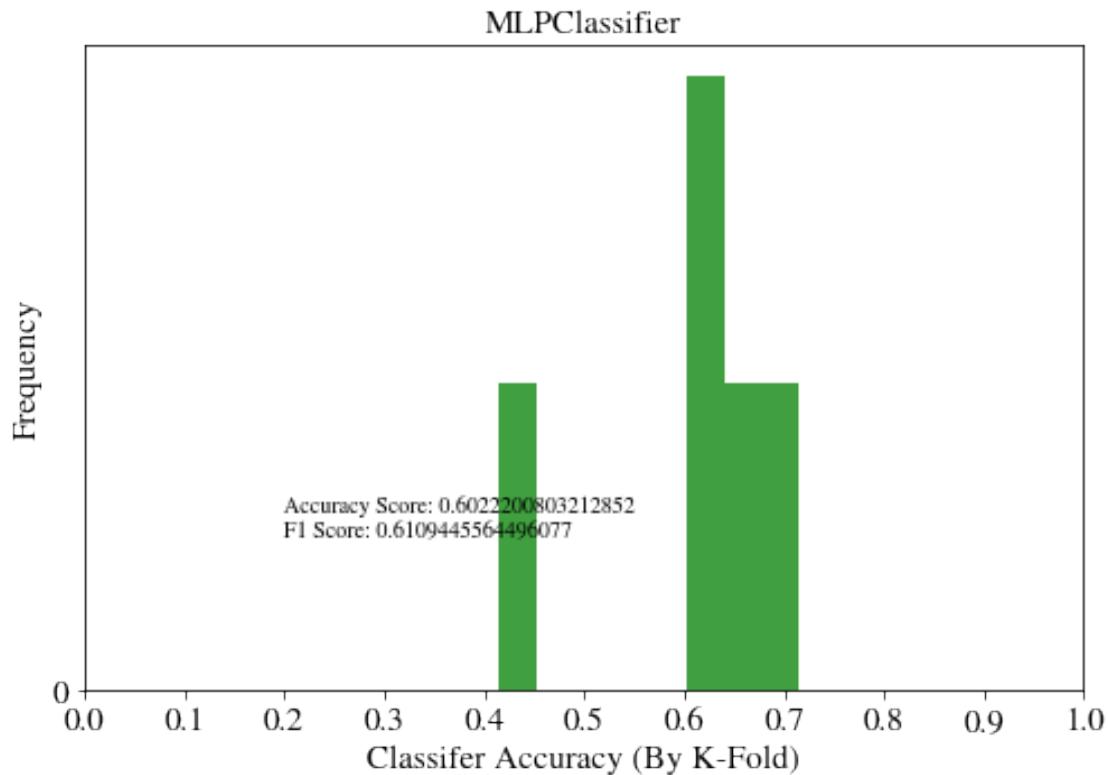
```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?', 'accuracy': [0.6, 0.628, 0.4939759036144578, 0.8313253012048193, 0.6506024096385542], 'avgAccuracy': 0.6407807228915663, 'f1': [0.6102253571117878, 0.6418048910702305, 0.5252768402191668, 0.8334790908678135, 0.6564858750258641], 'avgF1': 0.6534544108589725, 'precision': [0.6, 0.628, 0.4939759036144578, 0.8313253012048193, 0.6506024096385542], 'avgPrecision': 0.6407807228915663, 'recall': [0.6, 0.628, 0.4939759036144578, 0.8313253012048193, 0.6506024096385542], 'avgRecall': 0.6407807228915663, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****
```

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?', 'accuracy': [0.6, 0.628, 0.4457831325301205, 0.7349397590361446, 0.6626506024096386], 'avgAccuracy': 0.6142746987951807, 'f1': [0.6114655367231637, 0.6305924557119835, 0.454735101778283, 0.7585636664304276, 0.6463966478770088], 'avgF1': 0.6203506817041733, 'precision': [0.6, 0.628, 0.4457831325301205, 0.7349397590361446, 0.6626506024096386], 'avgPrecision': 0.6142746987951807, 'recall': [0.6, 0.628, 0.4457831325301205, 0.7349397590361446, 0.6626506024096386], 'avgRecall': 0.6142746987951807, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?', 'accuracy': [0.604, 0.632,
0.41365461847389556, 0.714859437751004, 0.6465863453815262], 'avgAccuracy':
0.6022200803212852, 'f1': [0.6141031857031857, 0.6346857273868014,
0.3996059752104363, 0.7628564524663775, 0.6434714414812377], 'avgF1':
0.6109445564496077, 'precision': [0.604, 0.632, 0.41365461847389556,
0.714859437751004, 0.6465863453815262], 'avgPrecision': 0.6022200803212852,
'recall': [0.604, 0.632, 0.41365461847389556, 0.714859437751004,
0.6465863453815262], 'avgRecall': 0.6022200803212852, 'params': [{activation':
'identity', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'invscaling', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum':
True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam',
'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start':
False}]}
*****
```

```
*****
* Best Performing Model and Params is:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?', 'accuracy': [0.6, 0.628, 0.4939759036144578, 0.8313253012048193, 0.6506024096385542], 'avgAccuracy': 0.6407807228915663, 'f1': [0.6102253571117878, 0.6418048910702305, 0.5252768402191668, 0.8334790908678135, 0.6564858750258641], 'avgF1': 0.6534544108589725, 'precision': [0.6, 0.628, 0.4939759036144578, 0.8313253012048193, 0.6506024096385542], 'avgPrecision': 0.6407807228915663, 'recall': [0.6, 0.628, 0.4939759036144578, 0.8313253012048193, 0.6506024096385542], 'avgRecall': 0.6407807228915663, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****
```

	model	features	\
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...	
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...	
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...	
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...	
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...	
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...	
6	SVC	Active inflammation?, Severity of Crypt Arch, ...	
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...	

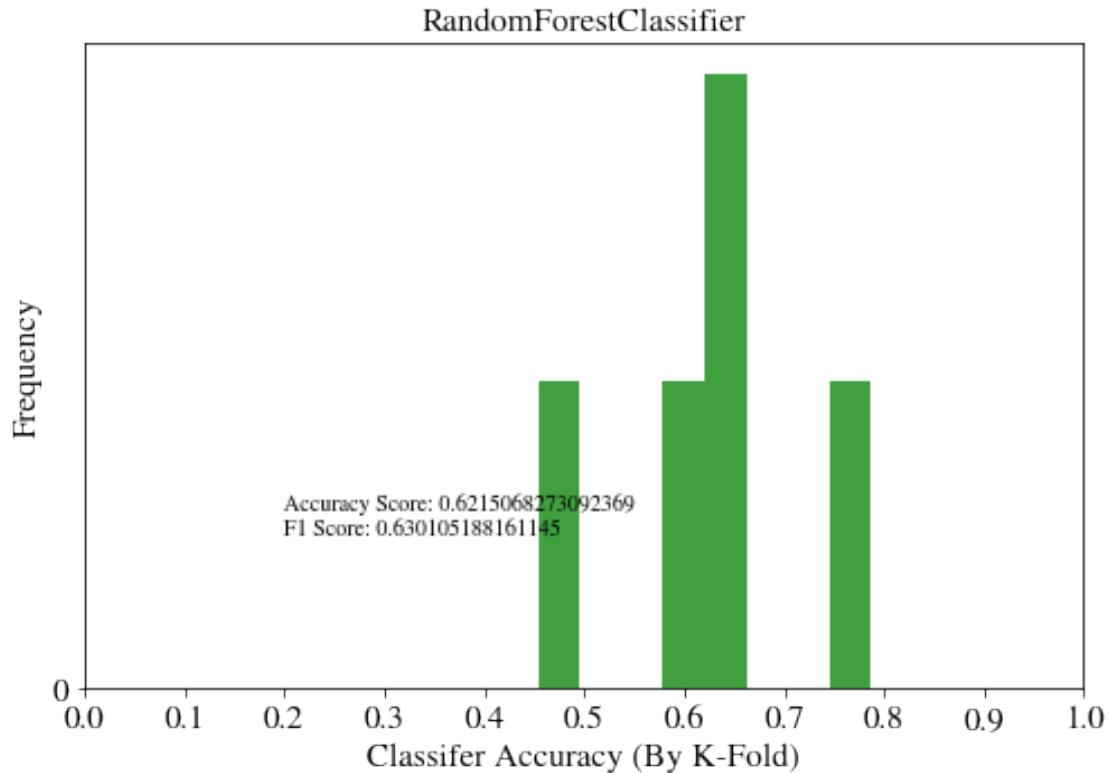
  

	accuracy	f1	precision	recall	\
0	0.624704	0.630677	0.624704	0.624704	
1	0.468090	0.449808	0.468090	0.468090	
2	0.599810	0.606604	0.599810	0.599810	
3	0.615081	0.611907	0.615081	0.615081	
4	0.553343	0.564815	0.553343	0.553343	
5	0.633555	0.647055	0.633555	0.633555	
6	0.614275	0.620351	0.614275	0.614275	
7	0.596598	0.608903	0.596598	0.596598	

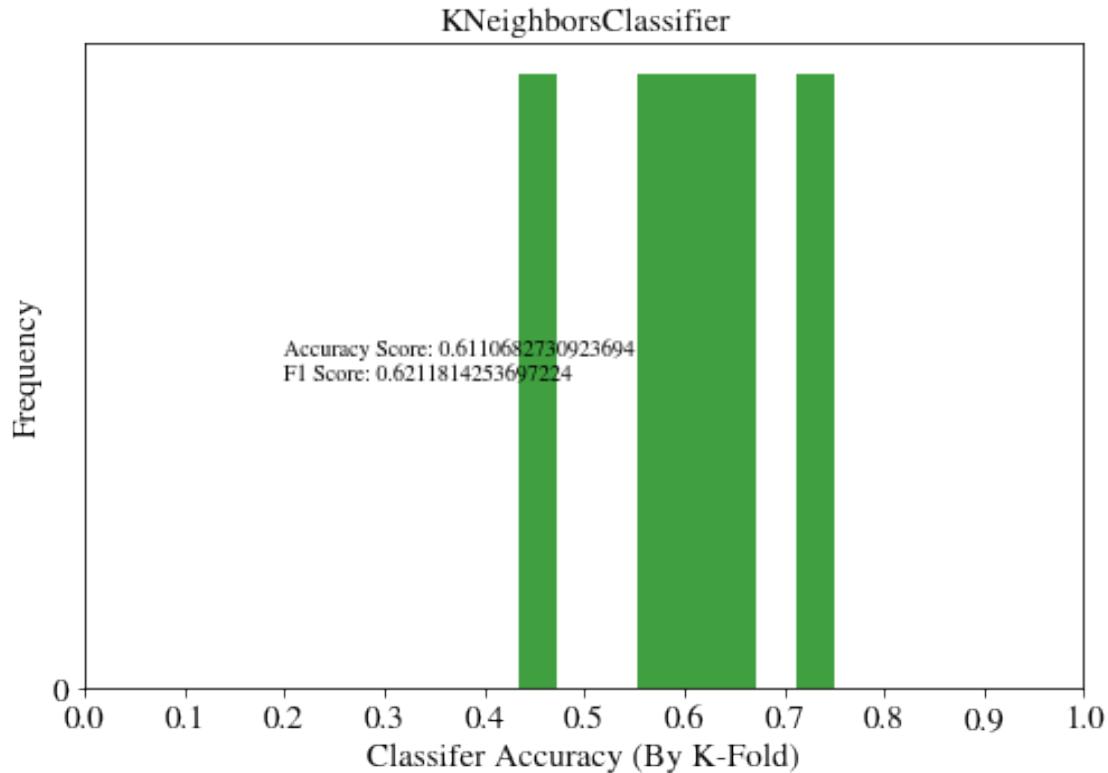
	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	{'C': 1, 'class_weight': None, 'dual': False, ...
3	{'priors': None, 'var_smoothing': 1e-09}
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...

Processing Model: RandomForestClassifier



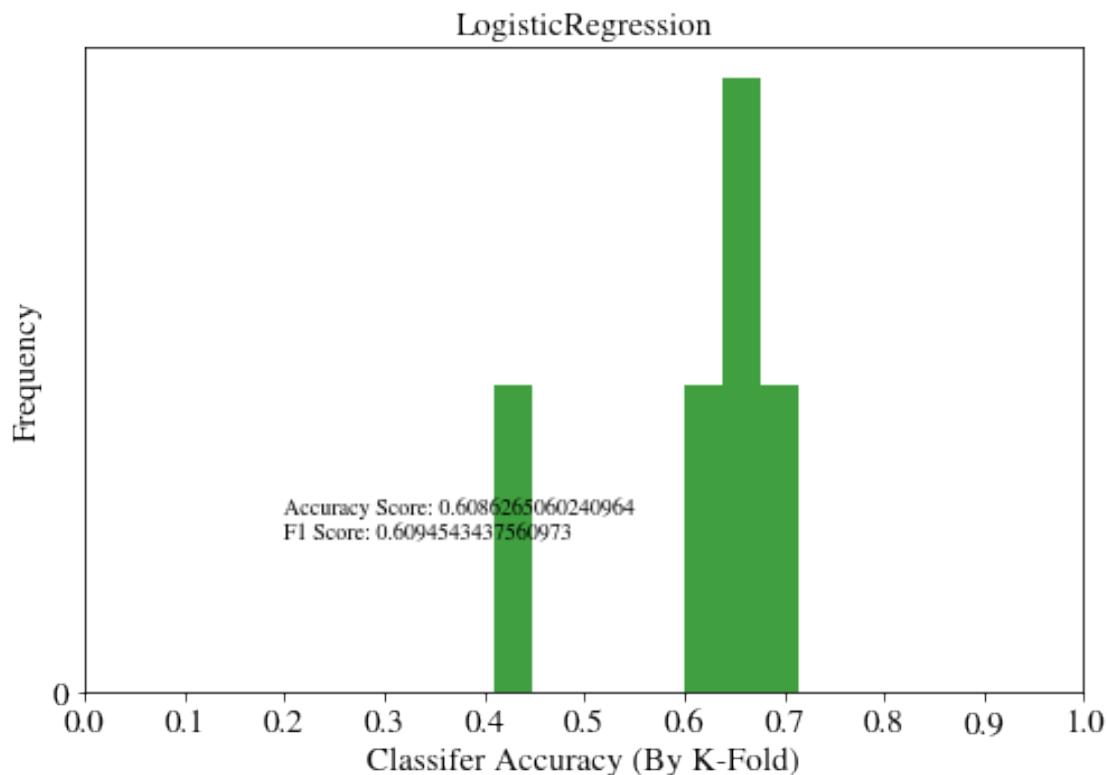
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture', 'accuracy': [0.588, 0.636, 0.4538152610441767, 0.7871485943775101, 0.642570281124498], 'avgAccuracy': 0.6215068273092369, 'f1': [0.5981201219154798, 0.6383418964076859, 0.46192133097649907, 0.799904496356075, 0.6522380951499854], 'avgF1': 0.630105188161145, 'precision': [0.588, 0.636, 0.4538152610441767, 0.7871485943775101, 0.642570281124498], 'avgPrecision': 0.6215068273092369, 'recall': [0.588, 0.636, 0.4538152610441767, 0.7871485943775101, 0.642570281124498], 'avgRecall': 0.6215068273092369, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
```

Processing Model: KNeighborsClassifier



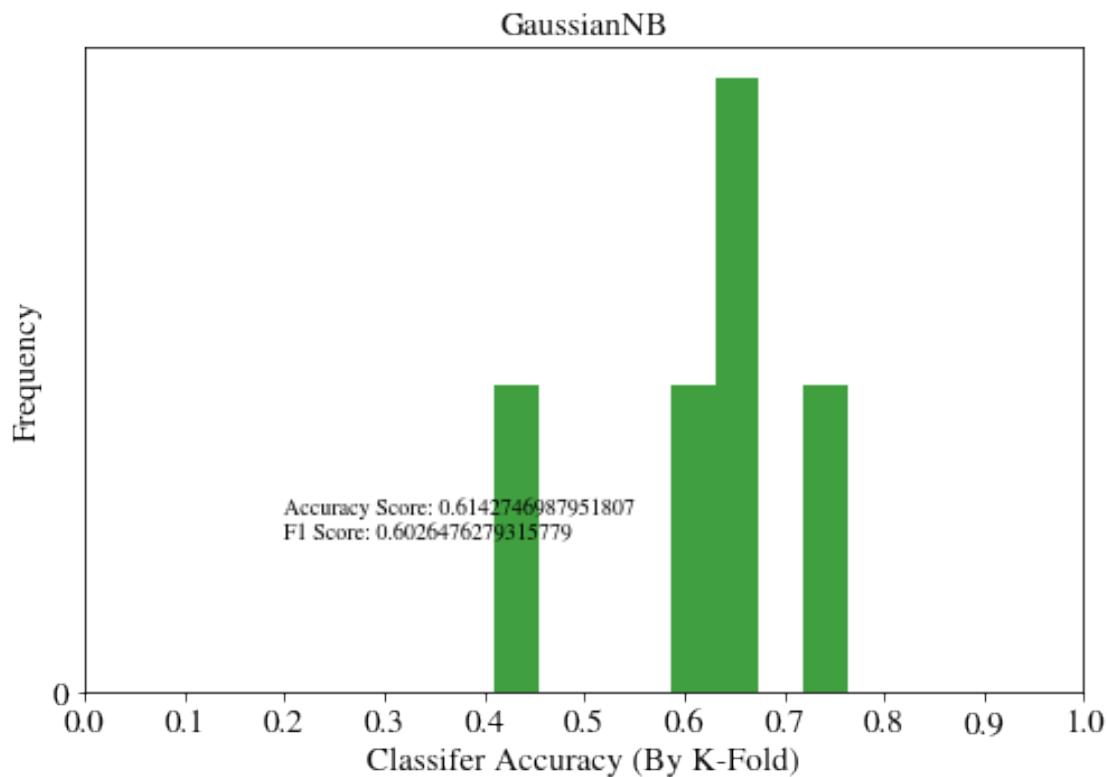
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture', 'accuracy': [0.592, 0.628, 0.43373493975903615,  
0.751004016064257, 0.6506024096385542], 'avgAccuracy': 0.6110682730923694, 'f1':  
[0.6025583455737991, 0.6422275032353206, 0.41843728543344344, 0.79542058273456,  
0.6472634098714892], 'avgF1': 0.6211814253697224, 'precision': [0.592, 0.628,  
0.43373493975903615, 0.751004016064257, 0.6506024096385542], 'avgPrecision':  
0.6110682730923694, 'recall': [0.592, 0.628, 0.43373493975903615,  
0.751004016064257, 0.6506024096385542], 'avgRecall': 0.6110682730923694,  
'params': [{algorithm': 'ball_tree', 'leaf_size': 30, 'metric': 'minkowski',  
'metric_params': None, 'n_jobs': -1, 'n_neighbors': 15, 'p': 2, 'weights':  
'distance'}]}}
*****
```

Processing Model: LogisticRegression



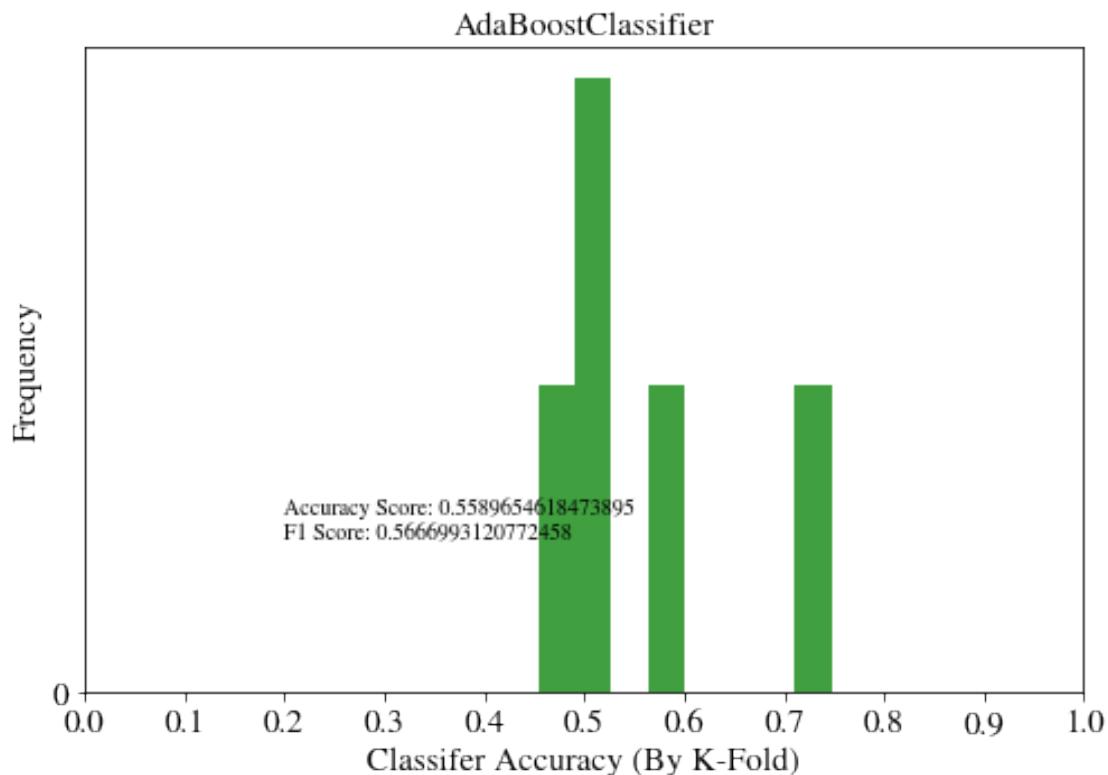
```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture', 'accuracy': [0.604, 0.656, 0.40963855421686746,  
0.714859437751004, 0.6586345381526104], 'avgAccuracy': 0.6086265060240964, 'f1':  
[0.6044305702943835, 0.644156126750986, 0.39419583094281885, 0.7465326894623027,  
0.6579565013299953], 'avgF1': 0.6094543437560973, 'precision': [0.604, 0.656,  
0.40963855421686746, 0.714859437751004, 0.6586345381526104], 'avgPrecision':  
0.6086265060240964, 'recall': [0.604, 0.656, 0.40963855421686746,  
0.714859437751004, 0.6586345381526104], 'avgRecall': 0.6086265060240964,  
'params': [{'C': 1, 'class_weight': None, 'dual': False, 'fit_intercept': True,  
'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class':  
'multinomial', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver':  
'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}
*****
```

Processing Model: GaussianNB



```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture', 'accuracy': [0.588, 0.64, 0.40963855421686746,
0.7630522088353414, 0.6706827309236948], 'avgAccuracy': 0.6142746987951807,
'f1': [0.5819666666666667, 0.6195747780959591, 0.40173365603814315,
0.7599212077874768, 0.6500418310696436], 'avgF1': 0.6026476279315779,
'precision': [0.588, 0.64, 0.40963855421686746, 0.7630522088353414,
0.6706827309236948], 'avgPrecision': 0.6142746987951807, 'recall': [0.588, 0.64,
0.40963855421686746, 0.7630522088353414, 0.6706827309236948], 'avgRecall':
0.6142746987951807, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****
```

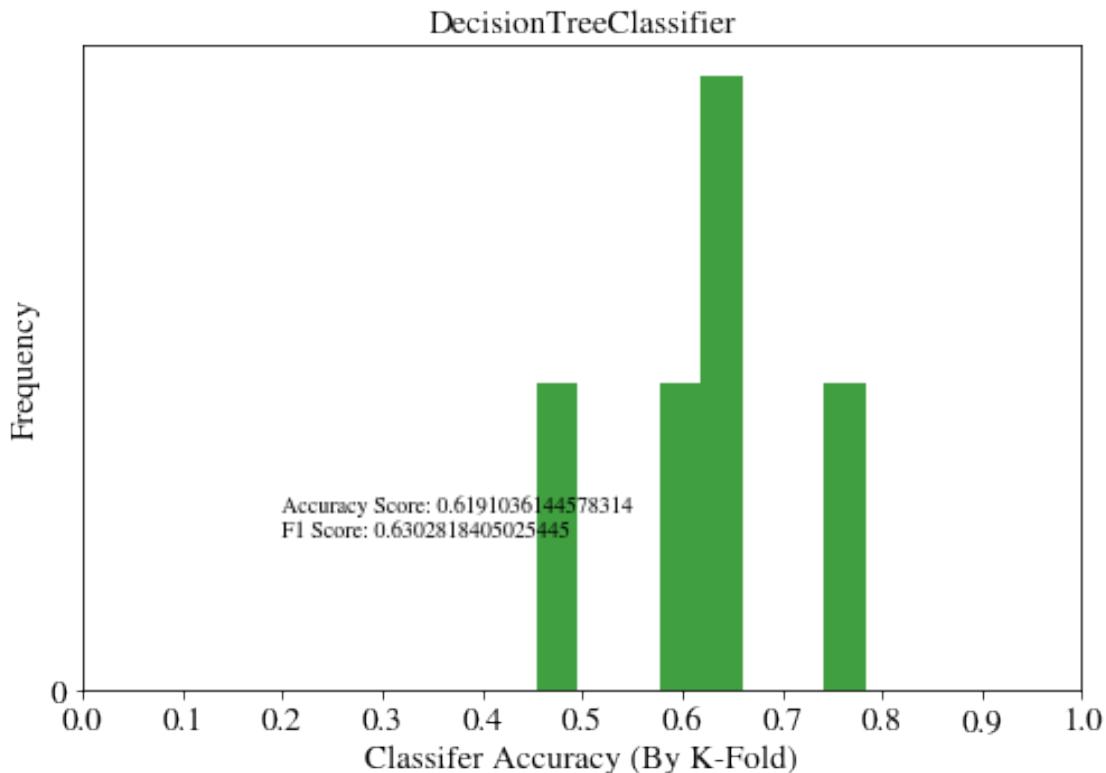
Processing Model: AdaBoostClassifier



```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture', 'accuracy': [0.592, 0.496, 0.4538152610441767,  
0.7469879518072289, 0.5060240963855421], 'avgAccuracy': 0.5589654618473895,  
'f1': [0.5931245869144702, 0.5058552787621287, 0.48476053565420374,  
0.7676750742346156, 0.48208108482081086], 'avgF1': 0.5666993120772458,  
'precision': [0.592, 0.496, 0.4538152610441767, 0.7469879518072289,  
0.5060240963855421], 'avgPrecision': 0.5589654618473895, 'recall': [0.592,  
0.496, 0.4538152610441767, 0.7469879518072289, 0.5060240963855421], 'avgRecall':  
0.5589654618473895, 'params': [{'algorithm': 'SAMME.R', 'base_estimator': None,  
'learning_rate': 1, 'n_estimators': 300, 'random_state': None}]}
```

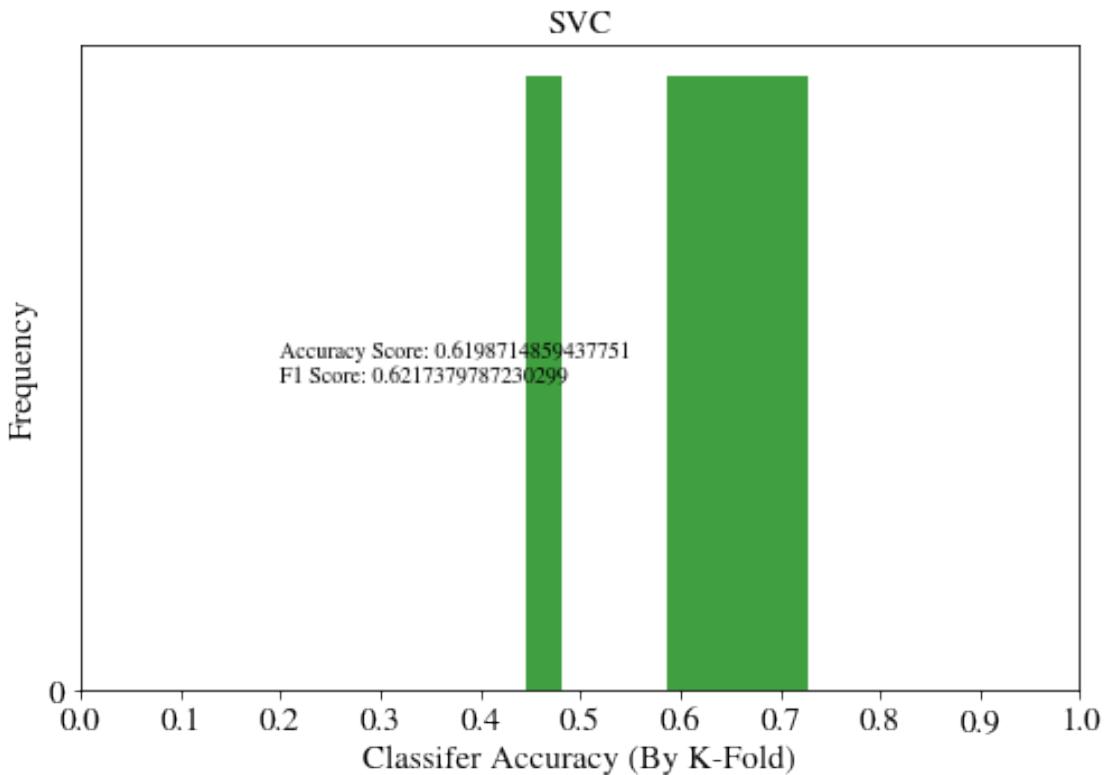
\*\*\*\*\*

Processing Model: DecisionTreeClassifier



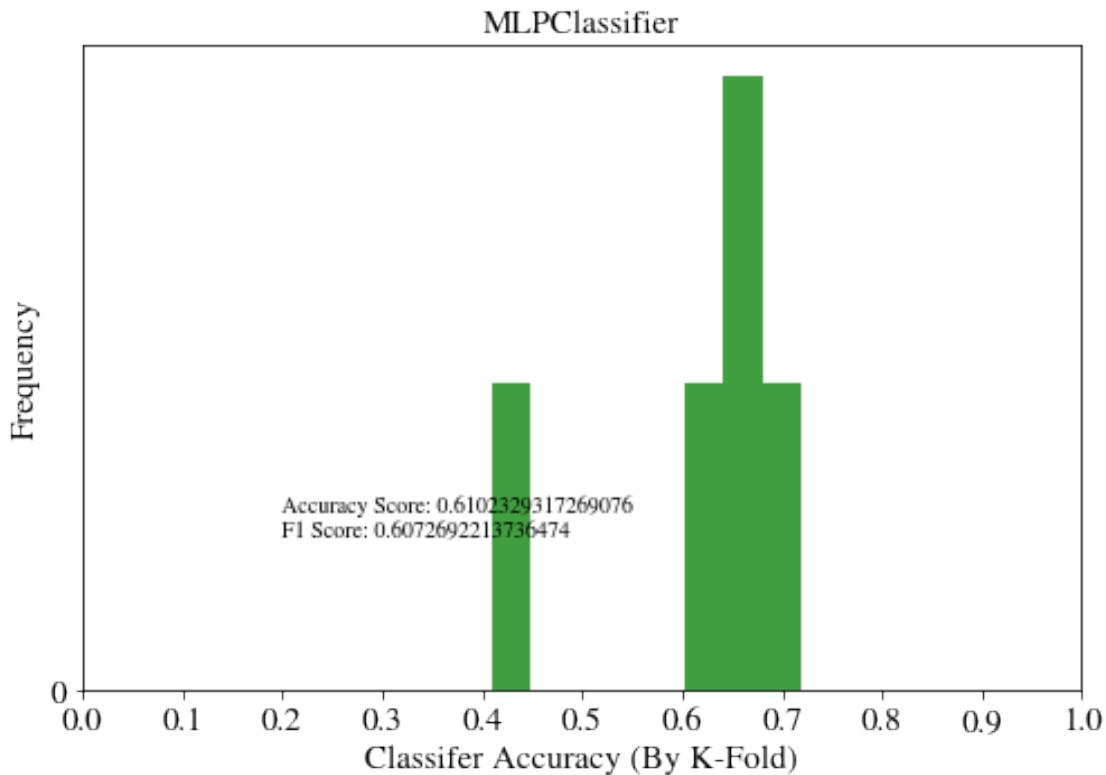
```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture', 'accuracy': [0.588, 0.628, 0.4538152610441767, 0.7831325301204819, 0.642570281124498], 'avgAccuracy': 0.6191036144578314, 'f1': [0.5981201219154798, 0.6422275032353206, 0.4632430552869379, 0.7966518908835662, 0.6511666311914183], 'avgF1': 0.6302818405025445, 'precision': [0.588, 0.628, 0.4538152610441767, 0.7831325301204819, 0.642570281124498], 'avgPrecision': 0.6191036144578314, 'recall': [0.588, 0.628, 0.4538152610441767, 0.7831325301204819, 0.642570281124498], 'avgRecall': 0.6191036144578314, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****
```

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture',
'accuracy': [0.608, 0.652, 0.4457831325301205, 0.7269076305220884,
0.6666666666666666], 'avgAccuracy': 0.6198714859437751, 'f1':
[0.6116425814420257, 0.6406507043708826, 0.454735101778283, 0.751004016064257,
0.6506574899597014], 'avgF1': 0.6217379787230299, 'precision': [0.608, 0.652,
0.4457831325301205, 0.7269076305220884, 0.6666666666666666], 'avgPrecision':
0.6198714859437751, 'recall': [0.608, 0.652, 0.4457831325301205,
0.7269076305220884, 0.6666666666666666], 'avgRecall': 0.6198714859437751,
'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None,
'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale',
'kernel': 'linear', 'max_iter': -1, 'probability': False,
'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture', 'accuracy': [0.604, 0.656, 0.40963855421686746,
0.7188755020080321, 0.6626506024096386], 'avgAccuracy': 0.6102329317269076,
'f1': [0.6044305702943835, 0.644156126750986, 0.39419583094281885,
0.7481713562364477, 0.645392222643601], 'avgF1': 0.6072692213736474,
'precision': [0.604, 0.656, 0.40963855421686746, 0.7188755020080321,
0.6626506024096386], 'avgPrecision': 0.6102329317269076, 'recall': [0.604,
0.656, 0.40963855421686746, 0.7188755020080321, 0.6626506024096386],
'avgRecall': 0.6102329317269076, 'params': [{'activation': 'identity', 'alpha':
0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping':
False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000,
'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t':
0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'verification_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
```

```

* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture', 'accuracy': [0.588, 0.636, 0.4538152610441767, 0.7871485943775101, 0.642570281124498], 'avgAccuracy': 0.6215068273092369, 'f1': [0.5981201219154798, 0.6383418964076859, 0.46192133097649907, 0.799904496356075, 0.6522380951499854], 'avgF1': 0.630105188161145, 'precision': [0.588, 0.636, 0.4538152610441767, 0.7871485943775101, 0.642570281124498], 'avgPrecision': 0.6215068273092369, 'recall': [0.588, 0.636, 0.4538152610441767, 0.7871485943775101, 0.642570281124498], 'avgRecall': 0.6215068273092369, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

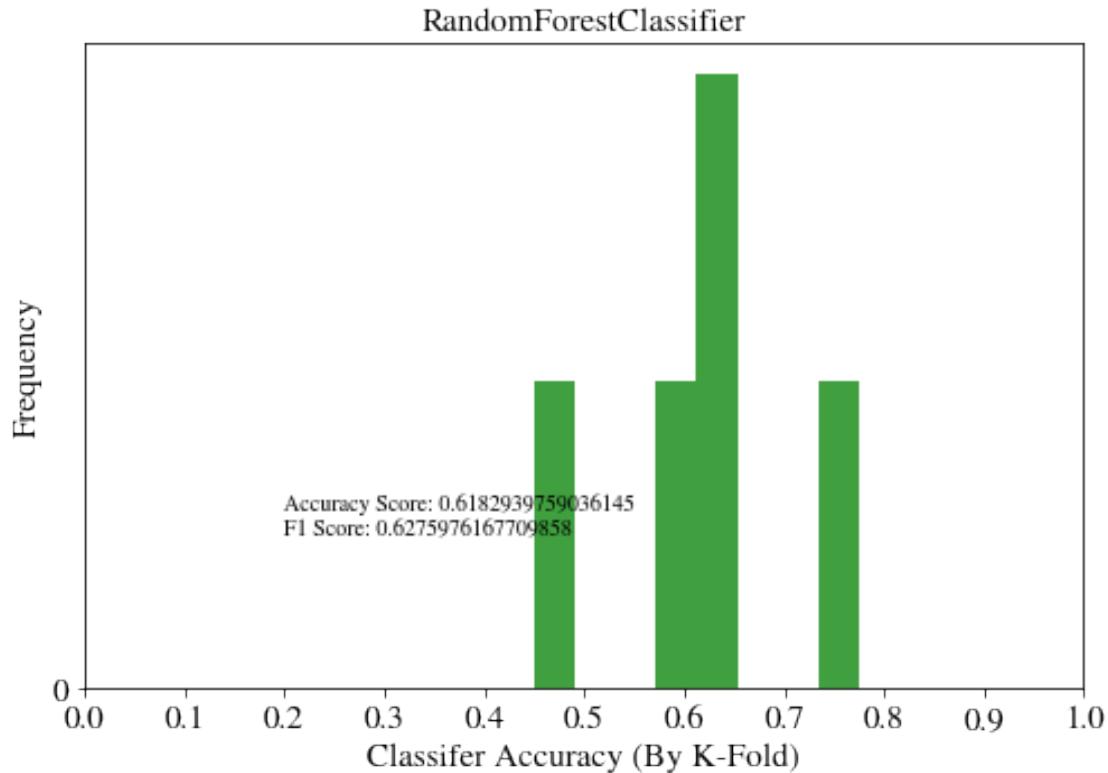
```

	model	features	\
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...	
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...	
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...	
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...	
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...	
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...	
6	SVC	Active inflammation?, Severity of Crypt Arch, ...	
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...	

	accuracy	f1	precision	recall	\
0	0.621507	0.629891	0.621507	0.621507	
1	0.468900	0.457183	0.468900	0.468900	
2	0.608627	0.609454	0.608627	0.608627	
3	0.614275	0.602648	0.614275	0.614275	
4	0.558965	0.566699	0.558965	0.558965	
5	0.611075	0.621001	0.611075	0.611075	
6	0.619871	0.621738	0.619871	0.619871	
7	0.605433	0.611825	0.605433	0.605433	

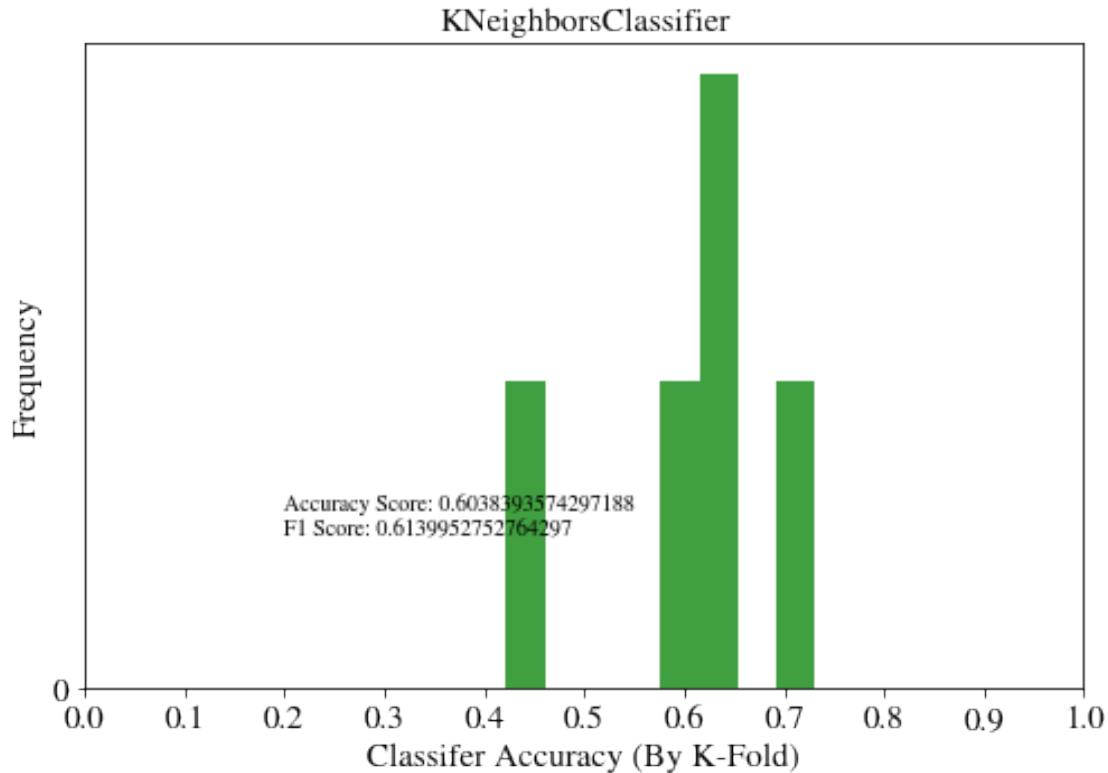
	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	{'C': 1, 'class_weight': None, 'dual': False, ...
3	{'priors': None, 'var_smoothing': 1e-09}
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...

Processing Model: RandomForestClassifier



```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs',  
'accuracy': [0.588, 0.636, 0.4497991967871486, 0.7751004016064257,  
0.642570281124498], 'avgAccuracy': 0.6182939759036145, 'f1':  
[0.5981201219154798, 0.6383418964076859, 0.456825388042795, 0.7935340462975499,  
0.6511666311914183], 'avgF1': 0.6275976167709858, 'precision': [0.588, 0.636,  
0.4497991967871486, 0.7751004016064257, 0.642570281124498], 'avgPrecision':  
0.6182939759036145, 'recall': [0.588, 0.636, 0.4497991967871486,  
0.7751004016064257, 0.642570281124498], 'avgRecall': 0.6182939759036145,  
'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None,  
'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt',  
'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0,  
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,  
'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score':  
True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}  
*****
```

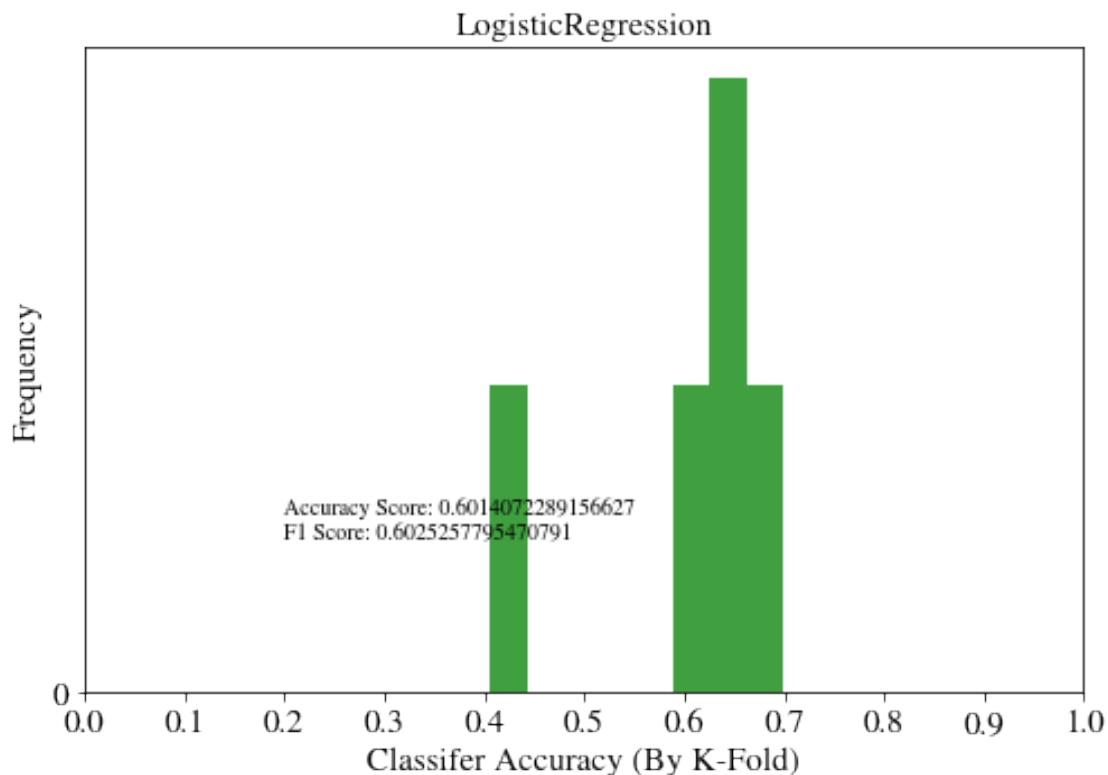
Processing Model: KNeighborsClassifier



```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs',  
'accuracy': [0.592, 0.628, 0.42168674698795183, 0.7309236947791165,  
0.6465863453815262], 'avgAccuracy': 0.6038393574297188, 'f1':  
[0.6025583455737991, 0.6422275032353206, 0.40042746029512305,  
0.7803979658008805, 0.6443651014770254], 'avgF1': 0.6139952752764297,  
'precision': [0.592, 0.628, 0.42168674698795183, 0.7309236947791165,  
0.6465863453815262], 'avgPrecision': 0.6038393574297188, 'recall': [0.592,  
0.628, 0.42168674698795183, 0.7309236947791165, 0.6465863453815262],  
'avgRecall': 0.6038393574297188, 'params': [{'algorithm': 'ball_tree',  
'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1,  
'n_neighbors': 15, 'p': 2, 'weights': 'distance'}]}
```

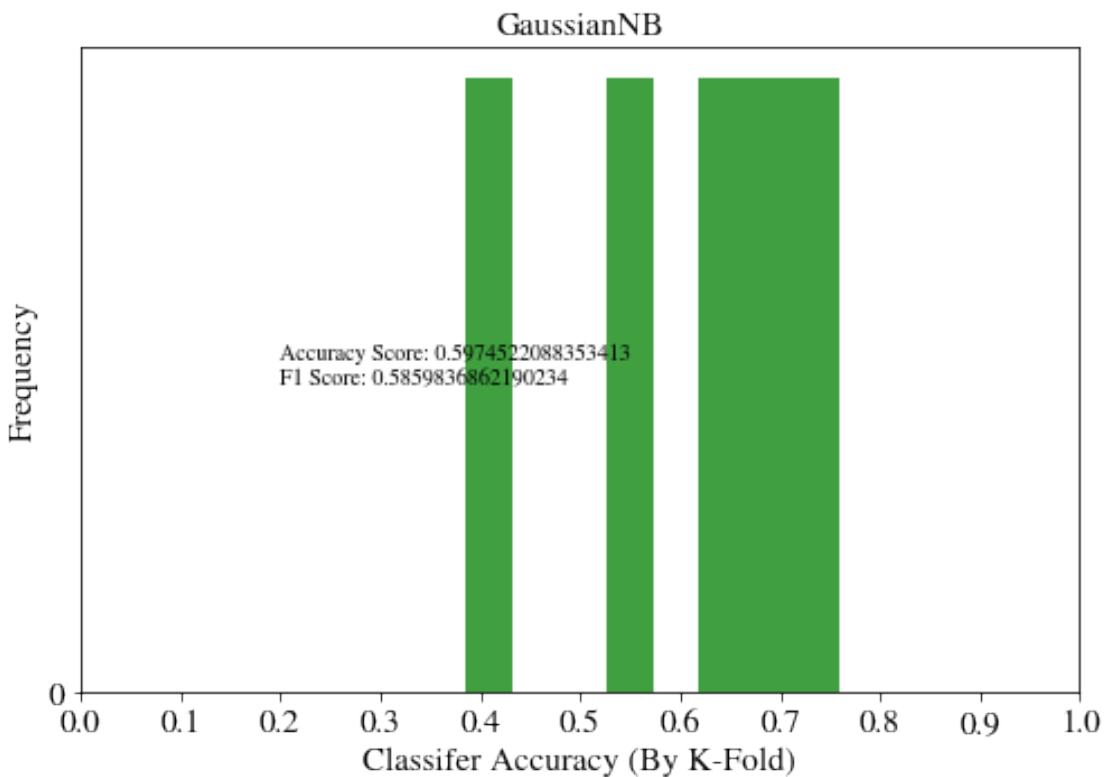
\*\*\*\*\*

Processing Model: LogisticRegression



```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs',  
'accuracy': [0.596, 0.652, 0.40562248995983935, 0.6987951807228916,  
0.6546184738955824], 'avgAccuracy': 0.6014072289156627, 'f1':  
[0.5966284993205202, 0.6406507043708826, 0.3907985526394286, 0.7301148650546242,  
0.6544362763499401], 'avgF1': 0.6025257795470791, 'precision': [0.596, 0.652,  
0.40562248995983935, 0.6987951807228916, 0.6546184738955824], 'avgPrecision':  
0.6014072289156627, 'recall': [0.596, 0.652, 0.40562248995983935,  
0.6987951807228916, 0.6546184738955824], 'avgRecall': 0.6014072289156627,  
'params': [{'C': 1, 'class_weight': None, 'dual': False, 'fit_intercept': True,  
'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class':  
'multinomial', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver':  
'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}  
*****
```

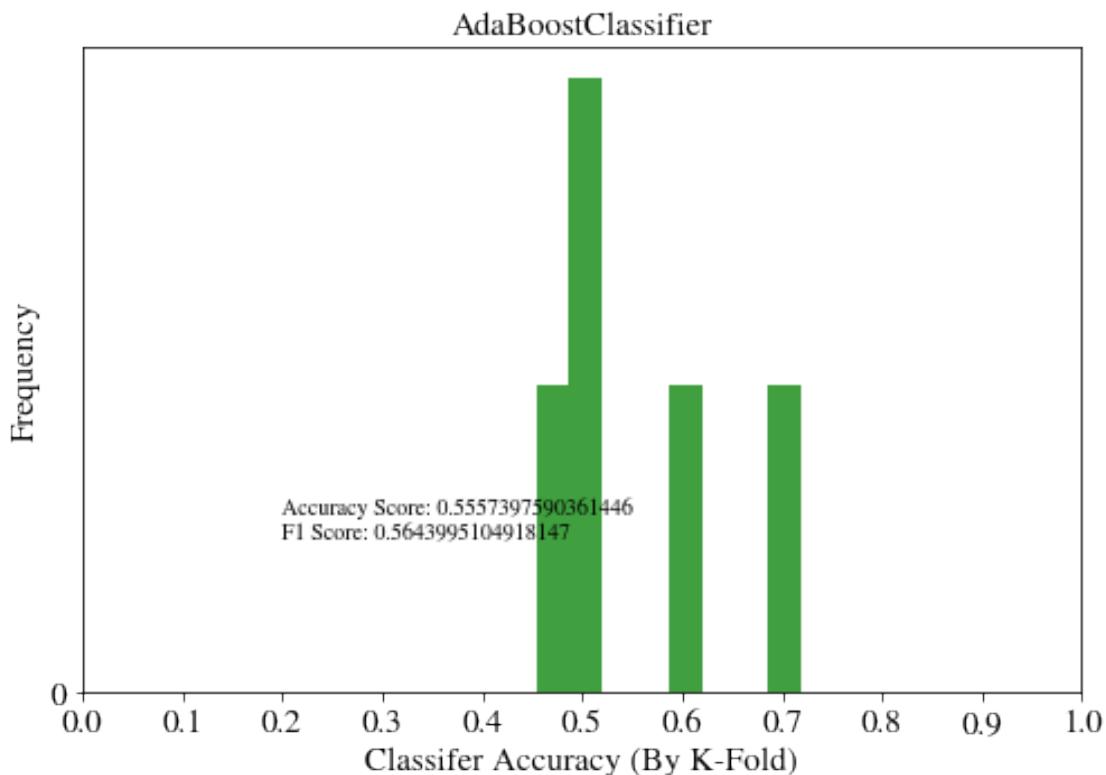
Processing Model: GaussianNB



```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs', 'accuracy':
[0.54, 0.632, 0.3855421686746988, 0.7590361445783133, 0.6706827309236948],
'avgAccuracy': 0.5974522088353413, 'f1': [0.5407923734957228,
0.6125443701717168, 0.3718364915574808, 0.7547033648005528, 0.6500418310696436],
'avgF1': 0.5859836862190234, 'precision': [0.54, 0.632, 0.3855421686746988,
0.7590361445783133, 0.6706827309236948], 'avgPrecision': 0.5974522088353413,
'recall': [0.54, 0.632, 0.3855421686746988, 0.7590361445783133,
0.6706827309236948], 'avgRecall': 0.5974522088353413, 'params': [{'priors':
None, 'var_smoothing': 1e-09}]}
```

\*\*\*\*\*

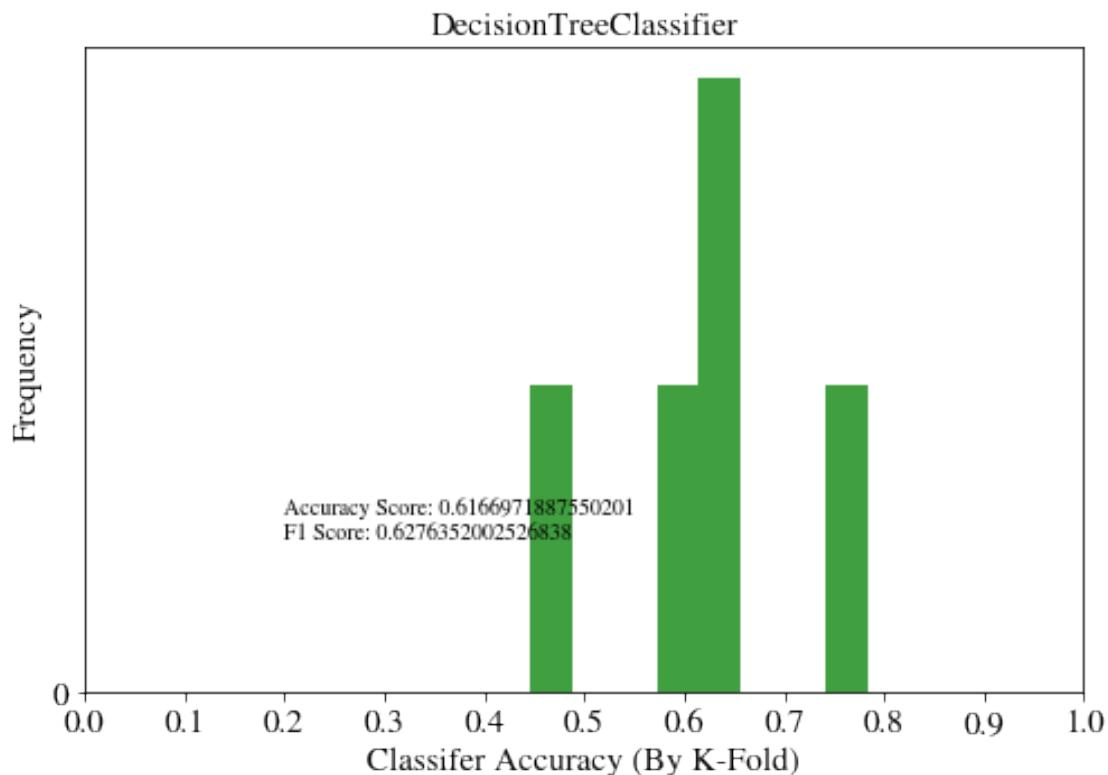
Processing Model: AdaBoostClassifier



```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs',  
'accuracy': [0.6, 0.504, 0.4538152610441767, 0.7188755020080321,  
0.5020080321285141], 'avgAccuracy': 0.5557397590361446, 'f1':  
[0.5924150197628457, 0.5149442877908903, 0.4856172262658005, 0.7460637637816944,  
0.4829572548578424], 'avgF1': 0.5643995104918147, 'precision': [0.6, 0.504,  
0.4538152610441767, 0.7188755020080321, 0.5020080321285141], 'avgPrecision':  
0.5557397590361446, 'recall': [0.6, 0.504, 0.4538152610441767,  
0.7188755020080321, 0.5020080321285141], 'avgRecall': 0.5557397590361446,  
'params': [{'algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1,  
'n_estimators': 100, 'random_state': None}]}
```

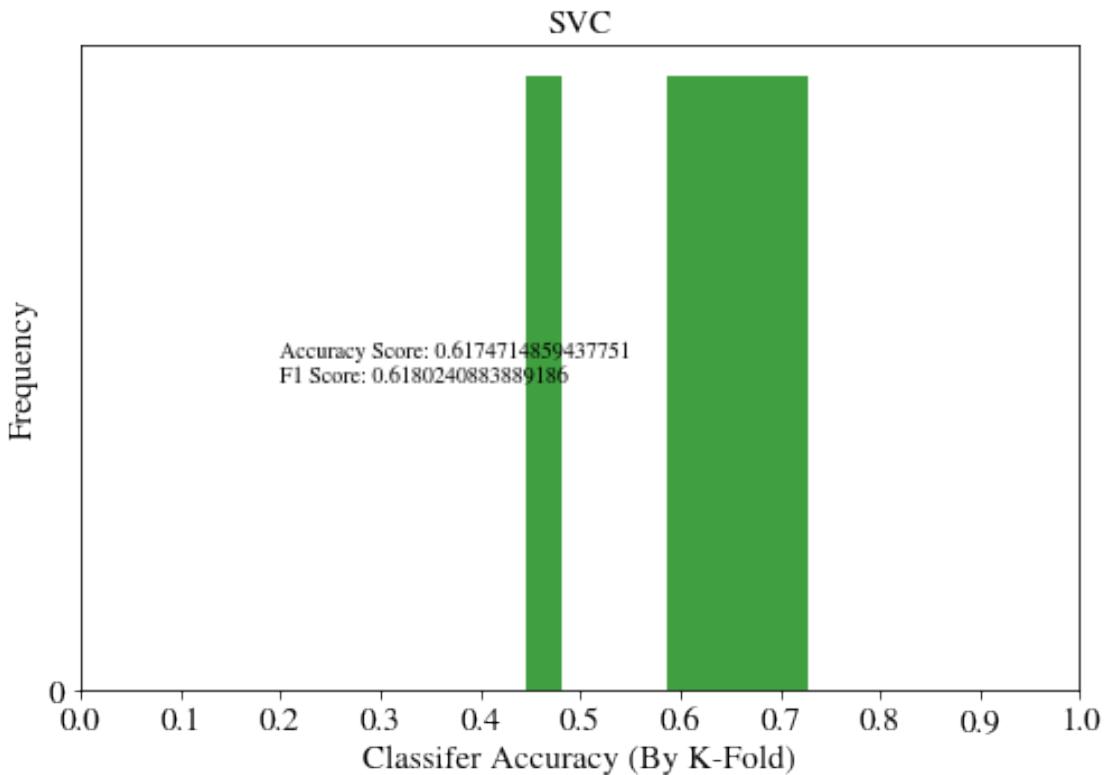
\*\*\*\*\*

Processing Model: DecisionTreeClassifier



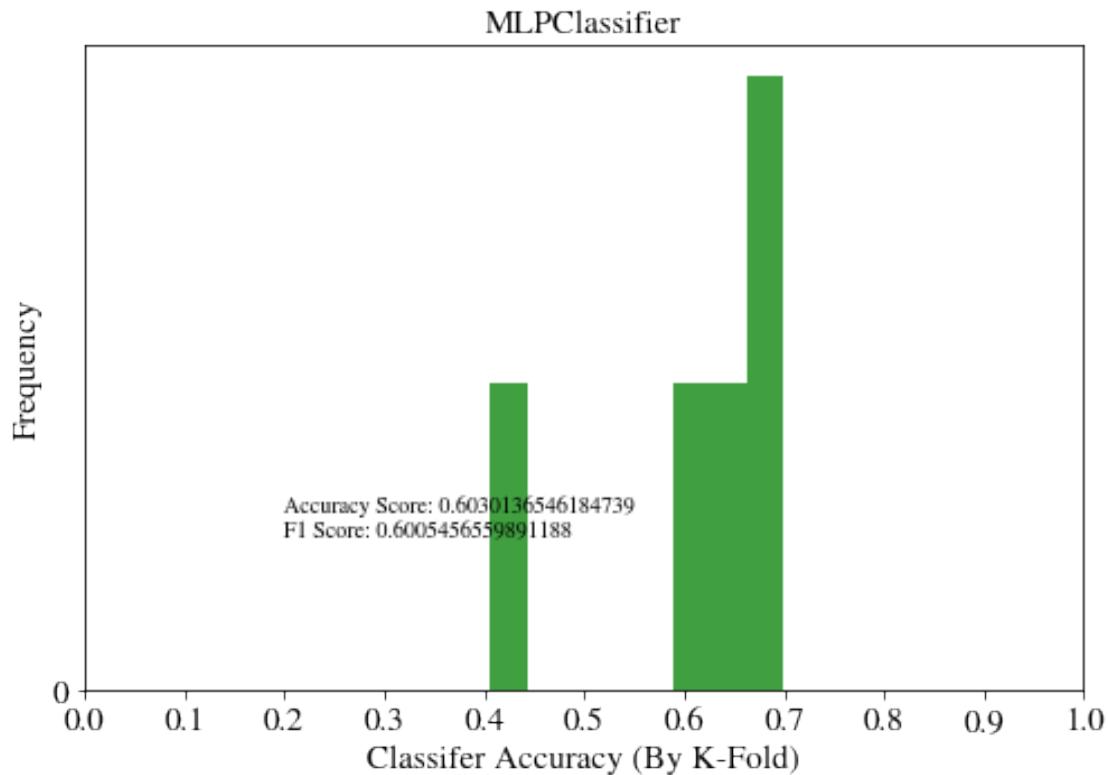
```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs', 'accuracy': [0.588, 0.624, 0.4457831325301205, 0.7831325301204819, 0.642570281124498], 'avgAccuracy': 0.6166971887550201, 'f1': [0.5981201219154798, 0.6377872128400056, 0.45312828556892154, 0.7979737497475938, 0.6511666311914183], 'avgF1': 0.6276352002526838, 'precision': [0.588, 0.624, 0.4457831325301205, 0.7831325301204819, 0.642570281124498], 'avgPrecision': 0.6166971887550201, 'recall': [0.588, 0.624, 0.4457831325301205, 0.7831325301204819, 0.642570281124498], 'avgRecall': 0.6166971887550201, 'params': [{ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****
```

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs', 'accuracy': [0.596, 0.652, 0.4457831325301205, 0.7269076305220884, 0.6666666666666666], 'avgAccuracy': 0.6174714859437751, 'f1': [0.5966284993205202, 0.6406507043708826, 0.45368038939634603, 0.751004016064257, 0.6481568327925875], 'avgF1': 0.6180240883889186, 'precision': [0.596, 0.652, 0.4457831325301205, 0.7269076305220884, 0.6666666666666666], 'avgPrecision': 0.6174714859437751, 'recall': [0.596, 0.652, 0.4457831325301205, 0.7269076305220884, 0.6666666666666666], 'avgRecall': 0.6174714859437751, 'params': [{C: 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs', 'accuracy':
[0.596, 0.652, 0.40562248995983935, 0.6987951807228916, 0.6626506024096386],
'avgAccuracy': 0.6030136546184739, 'f1': [0.5966284993205202,
0.6406507043708826, 0.3907985526394286, 0.7301148650546242, 0.6445356585601383],
'avgF1': 0.6005456559891188, 'precision': [0.596, 0.652, 0.40562248995983935,
0.6987951807228916, 0.6626506024096386], 'avgPrecision': 0.6030136546184739,
'recall': [0.596, 0.652, 0.40562248995983935, 0.6987951807228916,
0.6626506024096386], 'avgRecall': 0.6030136546184739, 'params': [{activation':
'identity', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state':
None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose':
False}]}
*****
```

```

* Best Performing Model and Params is:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs', 'accuracy': [0.596, 0.652, 0.4457831325301205, 0.7269076305220884, 0.6666666666666666], 'avgAccuracy': 0.6174714859437751, 'f1': [0.5966284993205202, 0.6406507043708826, 0.45368038939634603, 0.751004016064257, 0.6481568327925875], 'avgF1': 0.6180240883889186, 'precision': [0.596, 0.652, 0.4457831325301205, 0.7269076305220884, 0.6666666666666666], 'avgPrecision': 0.6174714859437751, 'recall': [0.596, 0.652, 0.4457831325301205, 0.7269076305220884, 0.6666666666666666], 'avgRecall': 0.6174714859437751, 'params': [{ 'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

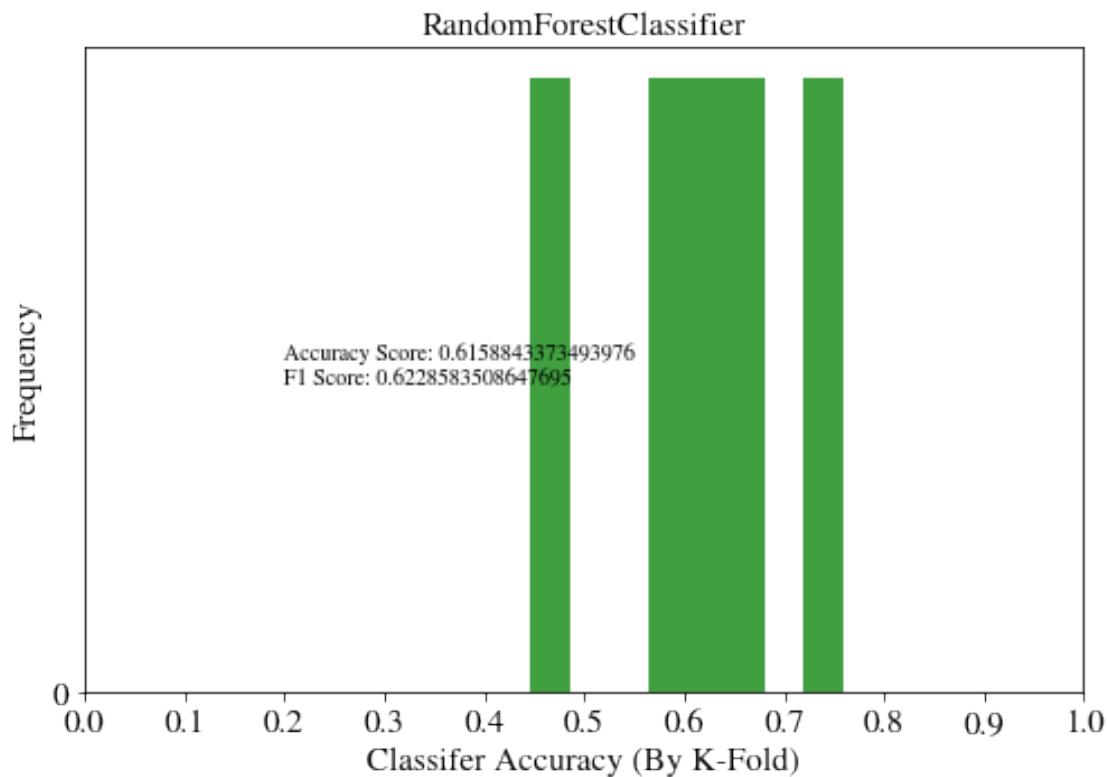
```

	model	features \		
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...		
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...		
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...		
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...		
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...		
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...		
6	SVC	Active inflammation?, Severity of Crypt Arch, ...		
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...		

	accuracy	f1	precision	recall	\
0	0.616694	0.628375	0.616694	0.616694	
1	0.464884	0.453067	0.464884	0.464884	
2	0.601407	0.602526	0.601407	0.601407	
3	0.597452	0.585984	0.597452	0.597452	
4	0.554130	0.566673	0.554130	0.554130	
5	0.616697	0.627539	0.616697	0.616697	
6	0.617471	0.618024	0.617471	0.617471	
7	0.601410	0.605284	0.601410	0.601410	

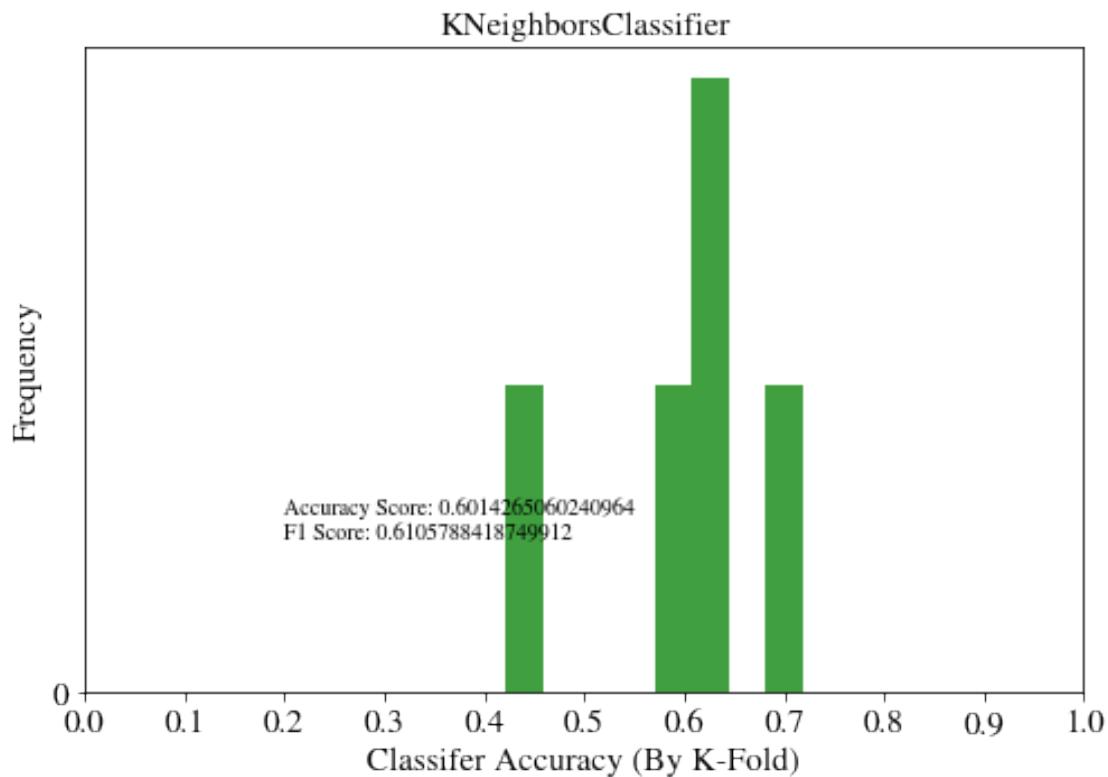
	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	{'C': 1, 'class_weight': None, 'dual': False, ...
3	{'priors': None, 'var_smoothing': 1e-09}
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...

Processing Model: RandomForestClassifier



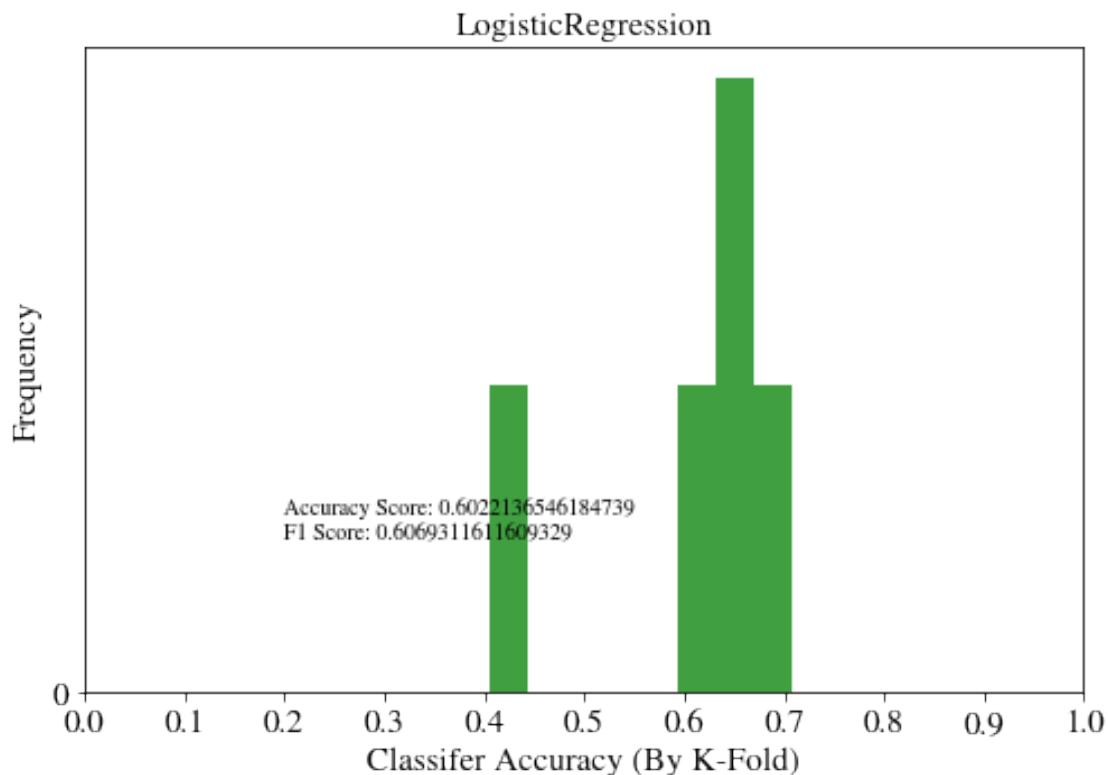
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity', 'accuracy': [0.592, 0.632,  
0.4457831325301205, 0.7590361445783133, 0.6506024096385542], 'avgAccuracy':  
0.6158843373493976, 'f1': [0.6033218390804598, 0.6344738479868622,  
0.4508677369896693, 0.7781013731466874, 0.6475269571201686], 'avgF1':  
0.6228583508647695, 'precision': [0.592, 0.632, 0.4457831325301205,  
0.7590361445783133, 0.6506024096385542], 'avgPrecision': 0.6158843373493976,  
'recall': [0.592, 0.632, 0.4457831325301205, 0.7590361445783133,  
0.6506024096385542], 'avgRecall': 0.6158843373493976, 'params': [{bootstrap':  
True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth':  
None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None,  
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,  
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200,  
'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0,  
'warm_start': False}]}
*****
```

Processing Model: KNeighborsClassifier



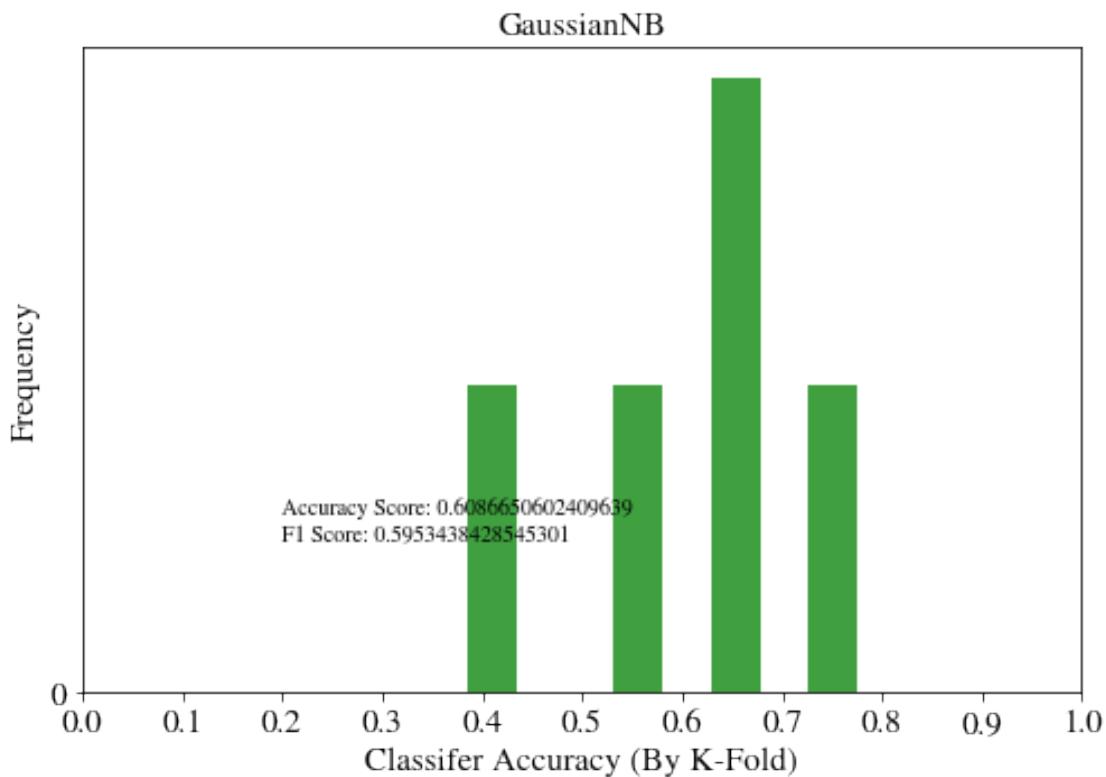
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity', 'accuracy': [0.596, 0.628,  
0.42168674698795183, 0.7188755020080321, 0.642570281124498], 'avgAccuracy':  
0.6014265060240964, 'f1': [0.607280840862991, 0.6422275032353206,  
0.3991324881317011, 0.7626871120847024, 0.641566265060241], 'avgF1':  
0.6105788418749912, 'precision': [0.596, 0.628, 0.42168674698795183,  
0.7188755020080321, 0.642570281124498], 'avgPrecision': 0.6014265060240964,  
'recall': [0.596, 0.628, 0.42168674698795183, 0.7188755020080321,  
0.642570281124498], 'avgRecall': 0.6014265060240964, 'params': [{  
'algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None,  
'n_jobs': -1, 'n_neighbors': 14, 'p': 2, 'weights': 'distance'}]}
*****
```

Processing Model: LogisticRegression



```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity', 'accuracy': [0.6, 0.644,  
0.40562248995983935, 0.7068273092369478, 0.6546184738955824], 'avgAccuracy':  
0.6022136546184739, 'f1': [0.6036935286935288, 0.6494525687406804,  
0.3907985526394286, 0.7349397590361446, 0.6557713966948822], 'avgF1':  
0.6069311611609329, 'precision': [0.6, 0.644, 0.40562248995983935,  
0.7068273092369478, 0.6546184738955824], 'avgPrecision': 0.6022136546184739,  
'recall': [0.6, 0.644, 0.40562248995983935, 0.7068273092369478,  
0.6546184738955824], 'avgRecall': 0.6022136546184739, 'params': [{C': 1,  
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':  
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs':  
-1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,  
'verbose': 0, 'warm_start': False}]}
*****
```

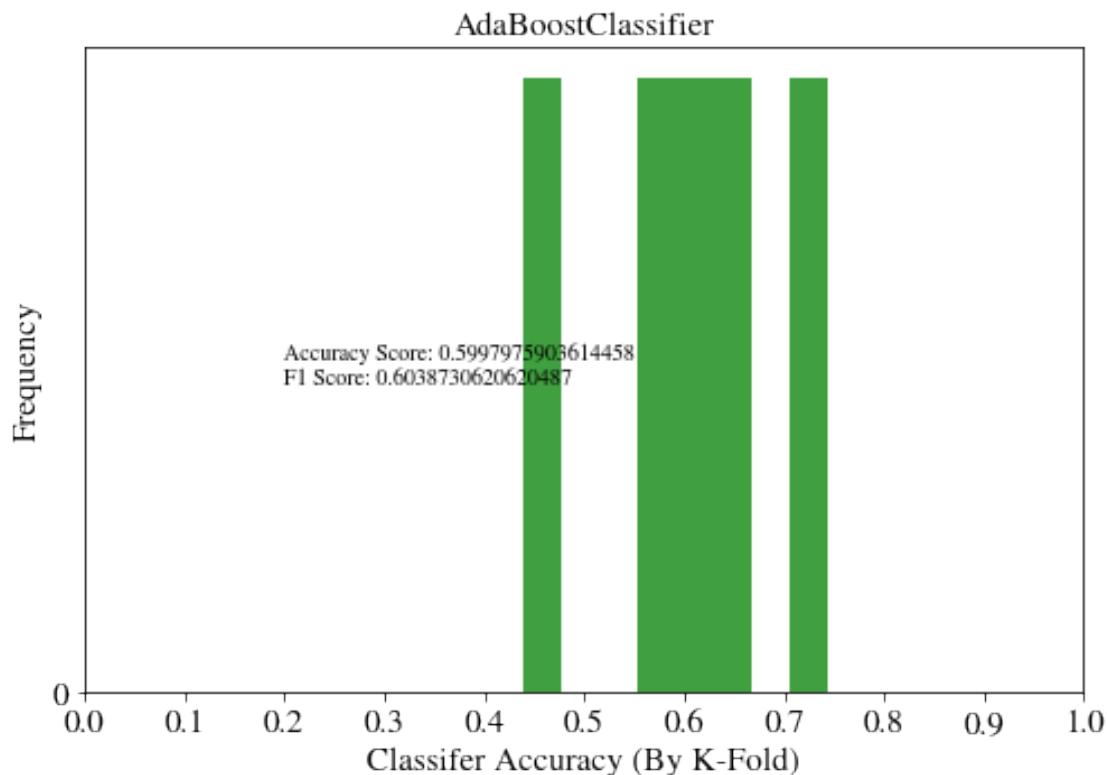
Processing Model: GaussianNB



```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity', 'accuracy': [0.58, 0.632,
0.3855421686746988, 0.7751004016064257, 0.6706827309236948], 'avgAccuracy':
0.6086650602409639, 'f1': [0.5744997626957759, 0.6129490392648288,
0.37085733257428016, 0.7694397643343823, 0.6489733154033833], 'avgF1':
0.5953438428545301, 'precision': [0.58, 0.632, 0.3855421686746988,
0.7751004016064257, 0.6706827309236948], 'avgPrecision': 0.6086650602409639,
'recall': [0.58, 0.632, 0.3855421686746988, 0.7751004016064257,
0.6706827309236948], 'avgRecall': 0.6086650602409639, 'params': [{'priors':
None, 'var_smoothing': 1e-09}]}
```

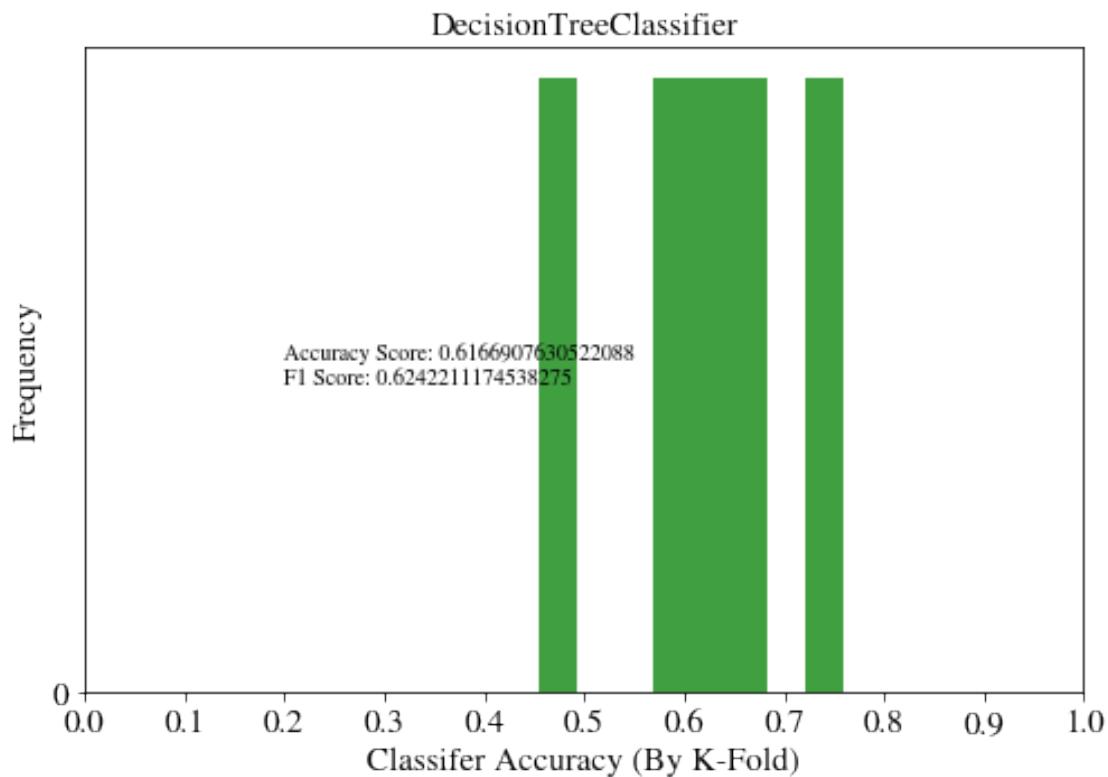
\*\*\*\*\*

Processing Model: AdaBoostClassifier



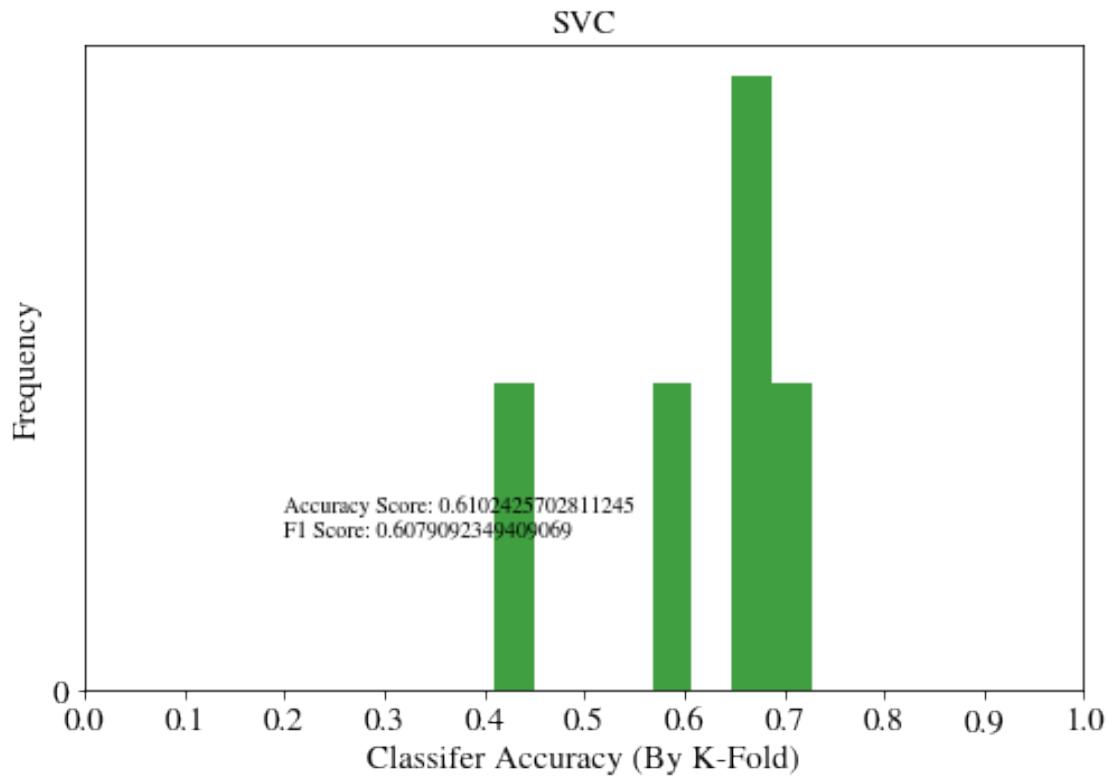
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity', 'accuracy': [0.612, 0.64,  
0.43775100401606426, 0.7429718875502008, 0.5662650602409639], 'avgAccuracy':  
0.5997975903614458, 'f1': [0.6184414395672976, 0.6383344466042418,  
0.44225235845596444, 0.7624044565358207, 0.5579326091469192], 'avgF1':  
0.6038730620620487, 'precision': [0.612, 0.64, 0.43775100401606426,  
0.7429718875502008, 0.5662650602409639], 'avgPrecision': 0.5997975903614458,  
'recall': [0.612, 0.64, 0.43775100401606426, 0.7429718875502008,  
0.5662650602409639], 'avgRecall': 0.5997975903614458, 'params': [{  
'algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 300,  
'random_state': None}]}
*****
```

Processing Model: DecisionTreeClassifier



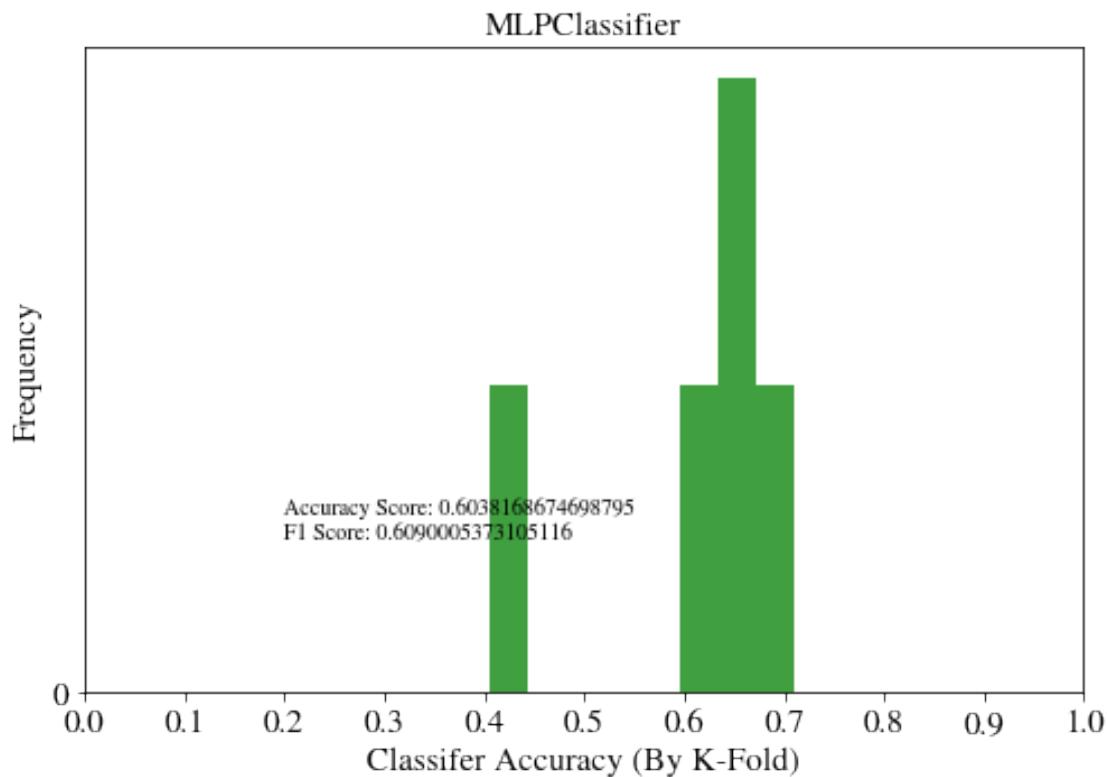
```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity', 'accuracy': [0.592, 0.628,  
0.4538152610441767, 0.7590361445783133, 0.6506024096385542], 'avgAccuracy':  
0.6166907630522088, 'f1': [0.6033218390804598, 0.6294061821219716,  
0.46274923579984995, 0.7781013731466874, 0.6475269571201686], 'avgF1':  
0.6242211174538275, 'precision': [0.592, 0.628, 0.4538152610441767,  
0.7590361445783133, 0.6506024096385542], 'avgPrecision': 0.6166907630522088,  
'recall': [0.592, 0.628, 0.4538152610441767, 0.7590361445783133,  
0.6506024096385542], 'avgRecall': 0.6166907630522088, 'params': [{  
'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None,  
'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0,  
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,  
'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}  
*****
```

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity', 'accuracy': [0.6, 0.648, 0.40963855421686746, 0.7269076305220884, 0.6666666666666666], 'avgAccuracy': 0.6102425702811245, 'f1': [0.6036935286935288, 0.6371394795299579, 0.39705166045708934, 0.751004016064257, 0.6506574899597014], 'avgF1': 0.6079092349409069, 'precision': [0.6, 0.648, 0.40963855421686746, 0.7269076305220884, 0.6666666666666666], 'avgPrecision': 0.6102425702811245, 'recall': [0.6, 0.648, 0.40963855421686746, 0.7269076305220884, 0.6666666666666666], 'avgRecall': 0.6102425702811245, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity', 'accuracy': [0.604, 0.644,
0.40562248995983935, 0.7108433734939759, 0.6546184738955824], 'avgAccuracy':
0.6038168674698795, 'f1': [0.6097664328009156, 0.6494525687406804,
0.3907985526394286, 0.7392137356766516, 0.6557713966948822], 'avgF1':
0.6090005373105116, 'precision': [0.604, 0.644, 0.40562248995983935,
0.7108433734939759, 0.6546184738955824], 'avgPrecision': 0.6038168674698795,
'recall': [0.604, 0.644, 0.40562248995983935, 0.7108433734939759,
0.6546184738955824], 'avgRecall': 0.6038168674698795, 'params': [{activation':
'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
```

```

* Best Performing Model and Params is:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity', 'accuracy': [0.592, 0.628, 0.4538152610441767, 0.7590361445783133, 0.6506024096385542], 'avgAccuracy': 0.6166907630522088, 'f1': [0.6033218390804598, 0.6294061821219716, 0.46274923579984995, 0.7781013731466874, 0.6475269571201686], 'avgF1': 0.6242211174538275, 'precision': [0.592, 0.628, 0.4538152610441767, 0.7590361445783133, 0.6506024096385542], 'avgPrecision': 0.6166907630522088, 'recall': [0.592, 0.628, 0.4538152610441767, 0.7590361445783133, 0.6506024096385542], 'avgRecall': 0.6166907630522088, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****

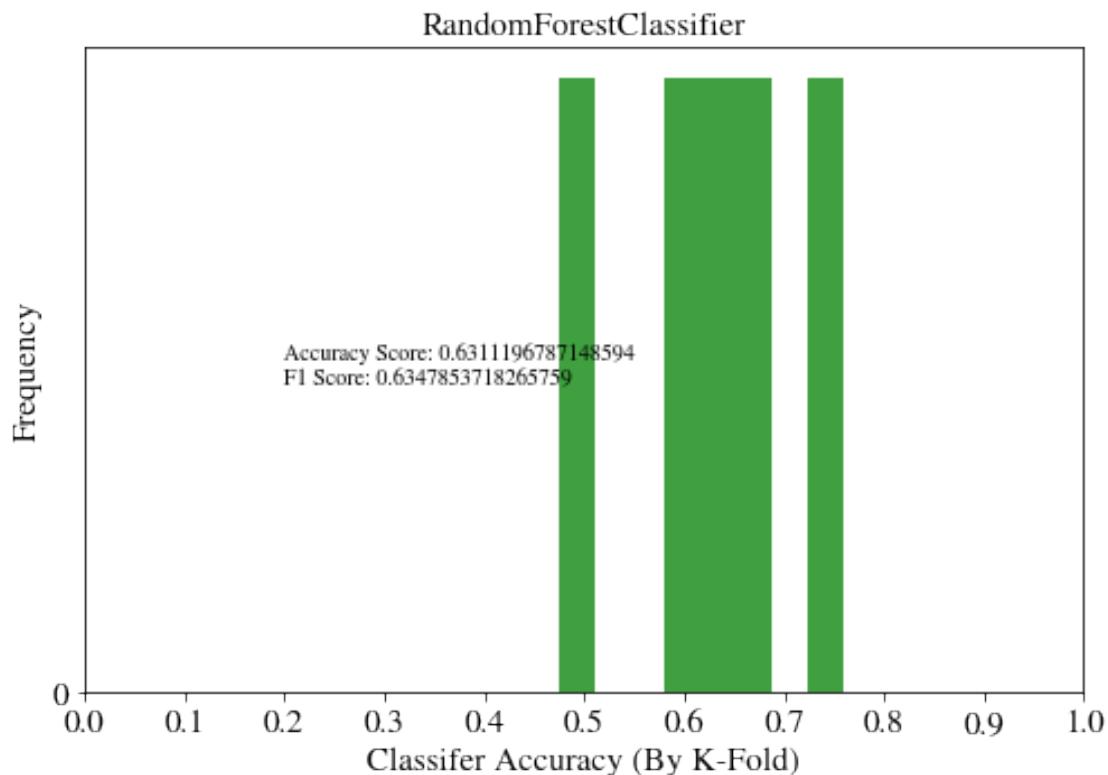
```

	model	features	\
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...	
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...	
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...	
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...	
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...	
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...	
6	SVC	Active inflammation?, Severity of Crypt Arch, ...	
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...	

	accuracy	f1	precision	recall	\
0	0.615081	0.621660	0.615081	0.615081	
1	0.460864	0.440906	0.460864	0.460864	
2	0.602214	0.606931	0.602214	0.602214	
3	0.608665	0.595344	0.608665	0.608665	
4	0.599798	0.603873	0.599798	0.599798	
5	0.613475	0.621126	0.613475	0.613475	
6	0.610243	0.607909	0.610243	0.610243	
7	0.603817	0.608985	0.603817	0.603817	

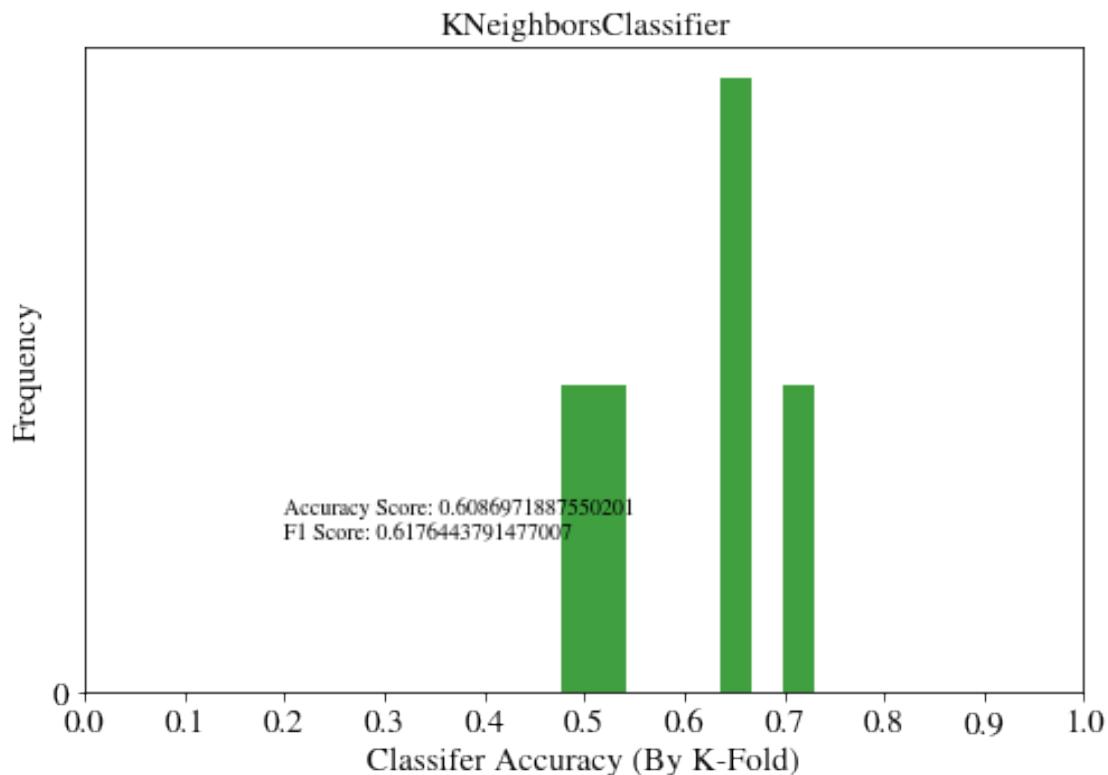
	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	{'C': 1, 'class_weight': None, 'dual': False, ...
3	{'priors': None, 'var_smoothing': 1e-09}
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...

Processing Model: RandomForestClassifier



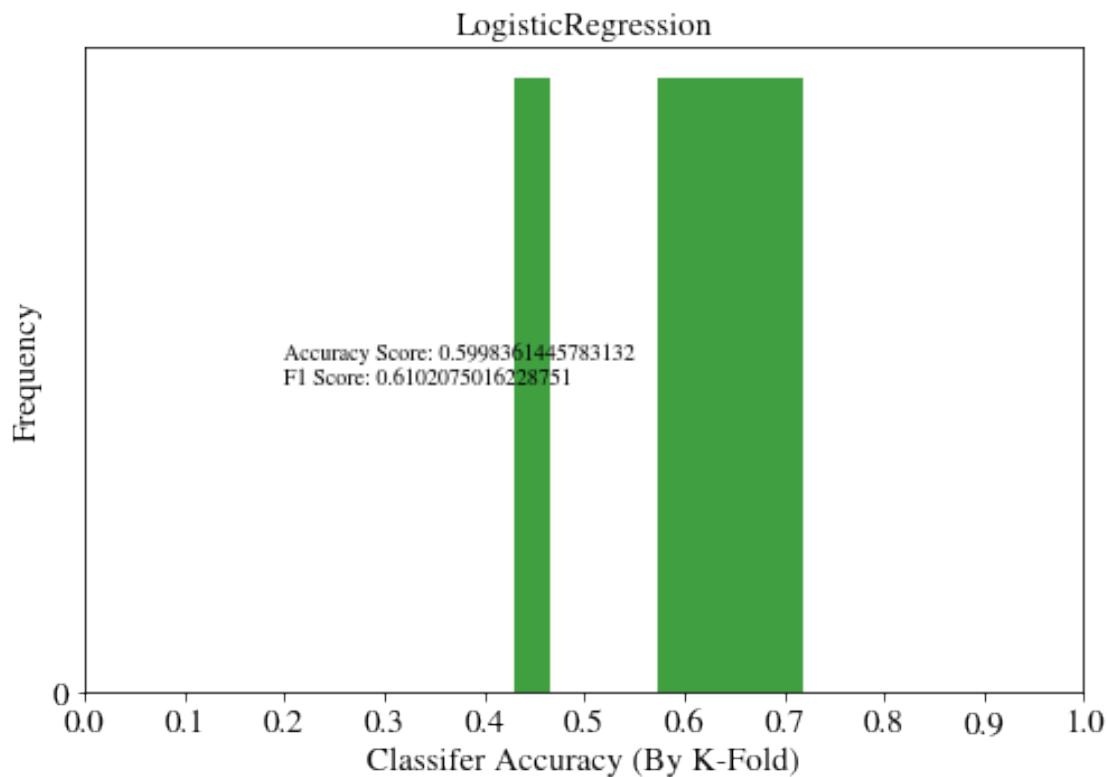
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?', 'accuracy':  
[0.608, 0.648, 0.4738955823293173, 0.7590361445783133, 0.6666666666666666],  
'avgAccuracy': 0.6311196787148594, 'f1': [0.6116425814420257, 0.634688426492588,  
0.4983797187736231, 0.7781013731466874, 0.6511147592779555], 'avgF1':  
0.6347853718265759, 'precision': [0.608, 0.648, 0.4738955823293173,  
0.7590361445783133, 0.6666666666666666], 'avgPrecision': 0.6311196787148594,  
'recall': [0.608, 0.648, 0.4738955823293173, 0.7590361445783133,  
0.6666666666666666], 'avgRecall': 0.6311196787148594, 'params': [{bootstrap':  
True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth':  
None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None,  
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,  
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200,  
'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0,  
'warm_start': False}]}
*****
```

Processing Model: KNeighborsClassifier



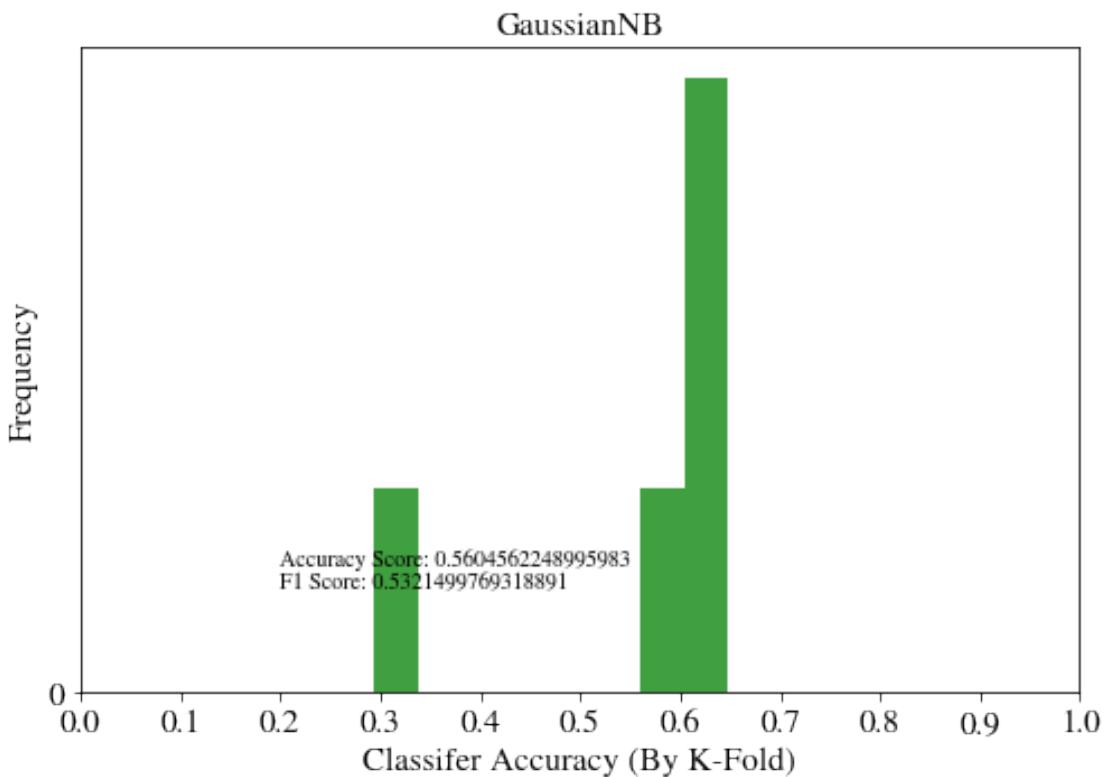
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?', 'accuracy':  
[0.524, 0.648, 0.4779116465863454, 0.7309236947791165, 0.6626506024096386],  
'avgAccuracy': 0.6086971887550201, 'f1': [0.5269224611866121, 0.652914821737252,  
0.48534002805850224, 0.7755728797543114, 0.6474717050018256], 'avgF1':  
0.6176443791477007, 'precision': [0.524, 0.648, 0.4779116465863454,  
0.7309236947791165, 0.6626506024096386], 'avgPrecision': 0.6086971887550201,  
'recall': [0.524, 0.648, 0.4779116465863454, 0.7309236947791165,  
0.6626506024096386], 'avgRecall': 0.6086971887550201, 'params': [{  
'algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1,  
'n_neighbors': 12, 'p': 2, 'weights': 'distance'}]}}
*****
```

Processing Model: LogisticRegression



```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?', 'accuracy':  
[0.592, 0.612, 0.42971887550200805, 0.7188755020080321, 0.6465863453815262],  
'avgAccuracy': 0.5998361445783132, 'f1': [0.5982050258684406,  
0.6213139091237966, 0.4333705168394917, 0.7475306631933137, 0.6506173930893329],  
'avgF1': 0.6102075016228751, 'precision': [0.592, 0.612, 0.42971887550200805,  
0.7188755020080321, 0.6465863453815262], 'avgPrecision': 0.5998361445783132,  
'recall': [0.592, 0.612, 0.42971887550200805, 0.7188755020080321,  
0.6465863453815262], 'avgRecall': 0.5998361445783132, 'params': [{C': 1,  
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':  
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs':  
-1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,  
'verbose': 0, 'warm_start': False}]}
*****
```

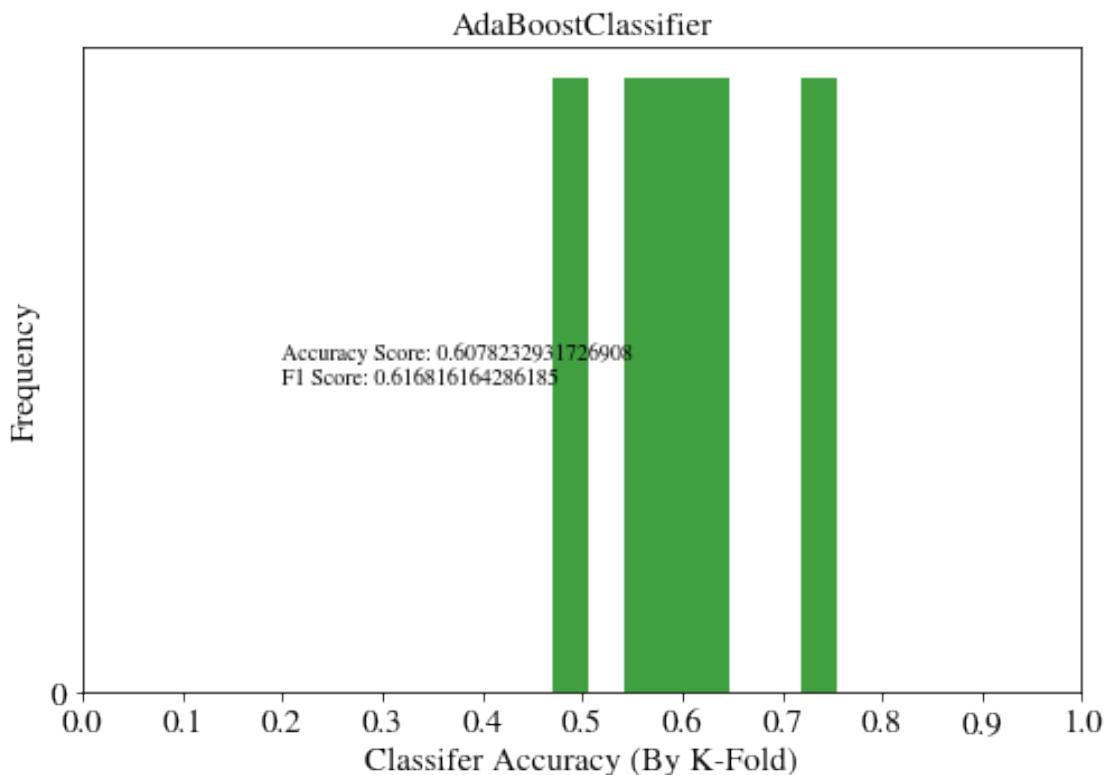
Processing Model: GaussianNB



```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?', 'accuracy': [0.584, 0.648,
0.2931726907630522, 0.6385542168674698, 0.6385542168674698], 'avgAccuracy':
0.5604562248995983, 'f1': [0.588440874592975, 0.6371394795299579,
0.16311156969709023, 0.6463379290357306, 0.6257200318036917], 'avgF1':
0.5321499769318891, 'precision': [0.584, 0.648, 0.2931726907630522,
0.6385542168674698, 0.6385542168674698], 'avgPrecision': 0.5604562248995983,
'recall': [0.584, 0.648, 0.2931726907630522, 0.6385542168674698,
0.6385542168674698], 'avgRecall': 0.5604562248995983, 'params': [{'priors':
None, 'var_smoothing': 1e-09}]}
```

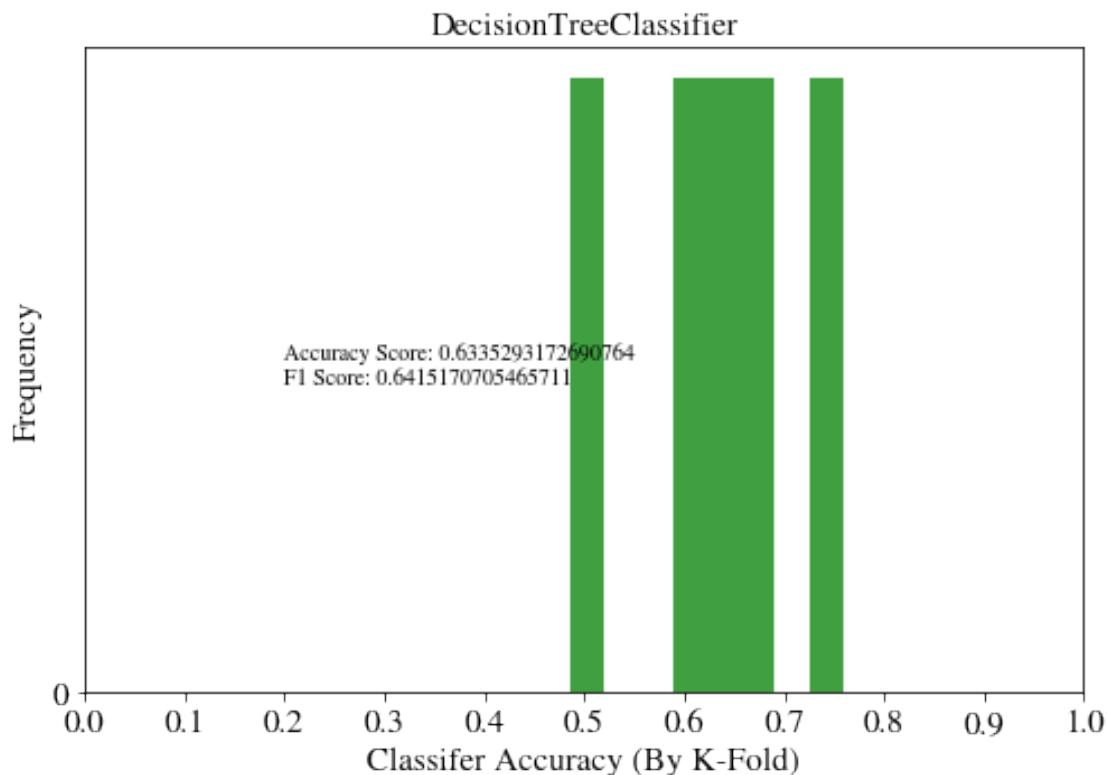
\*\*\*\*\*

Processing Model: AdaBoostClassifier



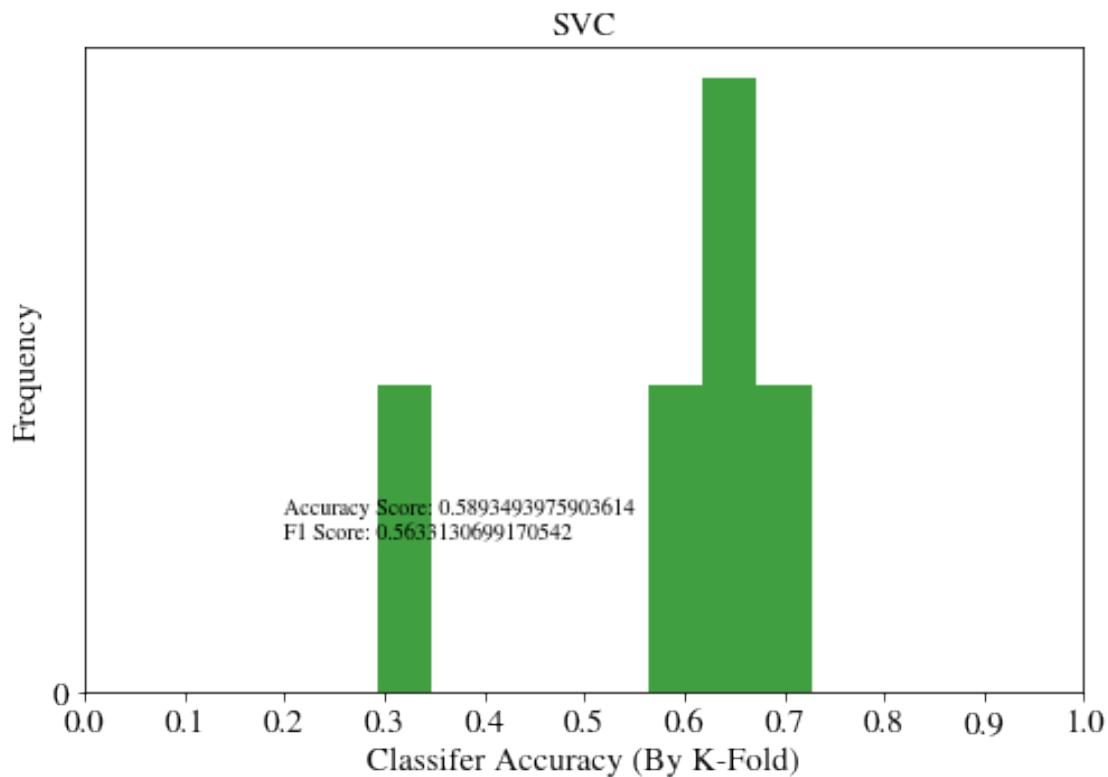
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?', 'accuracy':  
[0.612, 0.648, 0.46987951807228917, 0.7550200803212851, 0.5542168674698795],  
'avgAccuracy': 0.6078232931726908, 'f1': [0.6175520476208417, 0.652914821737252,  
0.49275029982726315, 0.7727603326692597, 0.5481033195763083], 'avgF1':  
0.616816164286185, 'precision': [0.612, 0.648, 0.46987951807228917,  
0.7550200803212851, 0.5542168674698795], 'avgPrecision': 0.6078232931726908,  
'recall': [0.612, 0.648, 0.46987951807228917, 0.7550200803212851,  
0.5542168674698795], 'avgRecall': 0.6078232931726908, 'params': [{  
'algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 300,  
'random_state': None}]}
*****
```

Processing Model: DecisionTreeClassifier



```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?', 'accuracy':  
[0.608, 0.648, 0.4859437751004016, 0.7590361445783133, 0.6666666666666666],  
'avgAccuracy': 0.6335293172690764, 'f1': [0.6116425814420257, 0.634688426492588,  
0.5151214959298356, 0.7959763708573908, 0.6501564780110155], 'avgF1':  
0.6415170705465711, 'precision': [0.608, 0.648, 0.4859437751004016,  
0.7590361445783133, 0.6666666666666666], 'avgPrecision': 0.6335293172690764,  
'recall': [0.608, 0.648, 0.4859437751004016, 0.7590361445783133,  
0.6666666666666666], 'avgRecall': 0.6335293172690764, 'params': [{'ccp_alpha':  
0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None,  
'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0,  
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,  
'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'random'}]}
*****
```

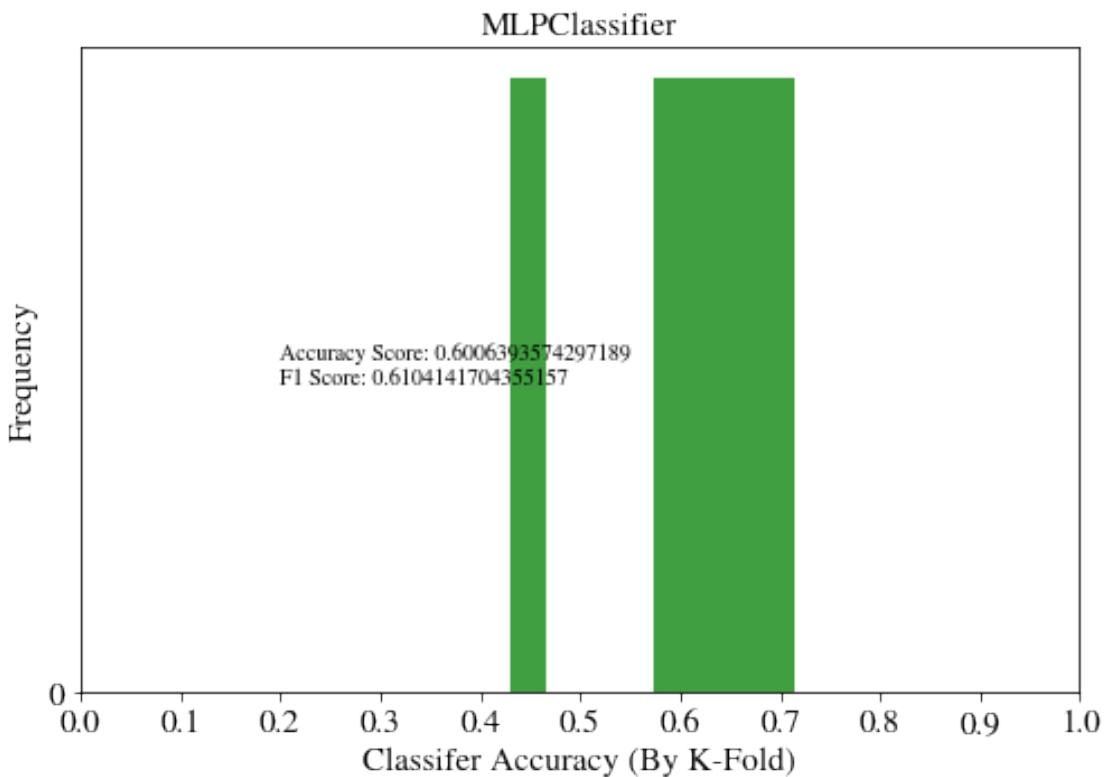
Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?', 'accuracy': [0.608, 0.652, 0.2931726907630522, 0.7269076305220884, 0.6666666666666666], 'avgAccuracy': 0.5893493975903614, 'f1': [0.6116425814420257, 0.6406507043708826, 0.16311156969709023, 0.751004016064257, 0.6501564780110155], 'avgF1': 0.5633130699170542, 'precision': [0.608, 0.652, 0.2931726907630522, 0.7269076305220884, 0.6666666666666666], 'avgPrecision': 0.5893493975903614, 'recall': [0.608, 0.652, 0.2931726907630522, 0.7269076305220884, 0.6666666666666666], 'avgRecall': 0.5893493975903614, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
```

\*\*\*\*\*

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?', 'accuracy': [0.592, 0.612,
0.42971887550200805, 0.714859437751004, 0.6546184738955824], 'avgAccuracy':
0.6006393574297189, 'f1': [0.5982050258684406, 0.6213139091237966,
0.4333705168394917, 0.7434100036509674, 0.6557713966948822], 'avgF1':
0.6104141704355157, 'precision': [0.592, 0.612, 0.42971887550200805,
0.714859437751004, 0.6546184738955824], 'avgPrecision': 0.6006393574297189,
'recall': [0.592, 0.612, 0.42971887550200805, 0.714859437751004,
0.6546184738955824], 'avgRecall': 0.6006393574297189, 'params': [{activation':
'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state':
None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose':
False}]}
*****
*****
* Best Performing Model and Params is:
```

```

* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?', 'accuracy':  

[0.608, 0.648, 0.4859437751004016, 0.7590361445783133, 0.6666666666666666],  

'avgAccuracy': 0.6335293172690764, 'f1': [0.6116425814420257, 0.634688426492588,  

0.5151214959298356, 0.7959763708573908, 0.6501564780110155], 'avgF1':  

0.6415170705465711, 'precision': [0.608, 0.648, 0.4859437751004016,  

0.7590361445783133, 0.6666666666666666], 'avgPrecision': 0.6335293172690764,  

'recall': [0.608, 0.648, 0.4859437751004016, 0.7590361445783133,  

0.6666666666666666], 'avgRecall': 0.6335293172690764, 'params': [{ 'ccp_alpha':  

0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None,  

'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0,  

'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,  

'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'random'}]}  

*****

```

	model	features
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...
6	SVC	Active inflammation?, Severity of Crypt Arch, ...
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...

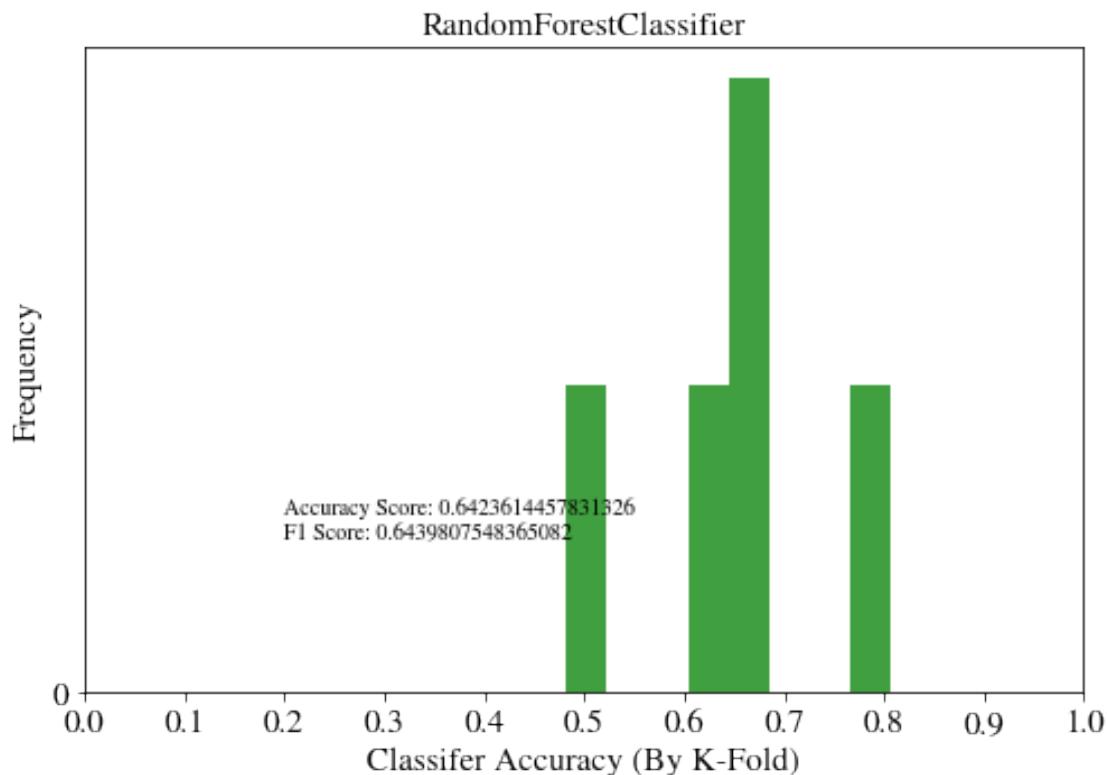
  

	accuracy	f1	precision	recall
0	0.629513	0.637162	0.629513	0.629513
1	0.452803	0.442016	0.452803	0.452803
2	0.599836	0.610208	0.599836	0.599836
3	0.560456	0.532150	0.560456	0.560456
4	0.607823	0.616816	0.607823	0.607823
5	0.631920	0.639618	0.631920	0.631920
6	0.589349	0.563313	0.589349	0.589349
7	0.599833	0.610504	0.599833	0.599833

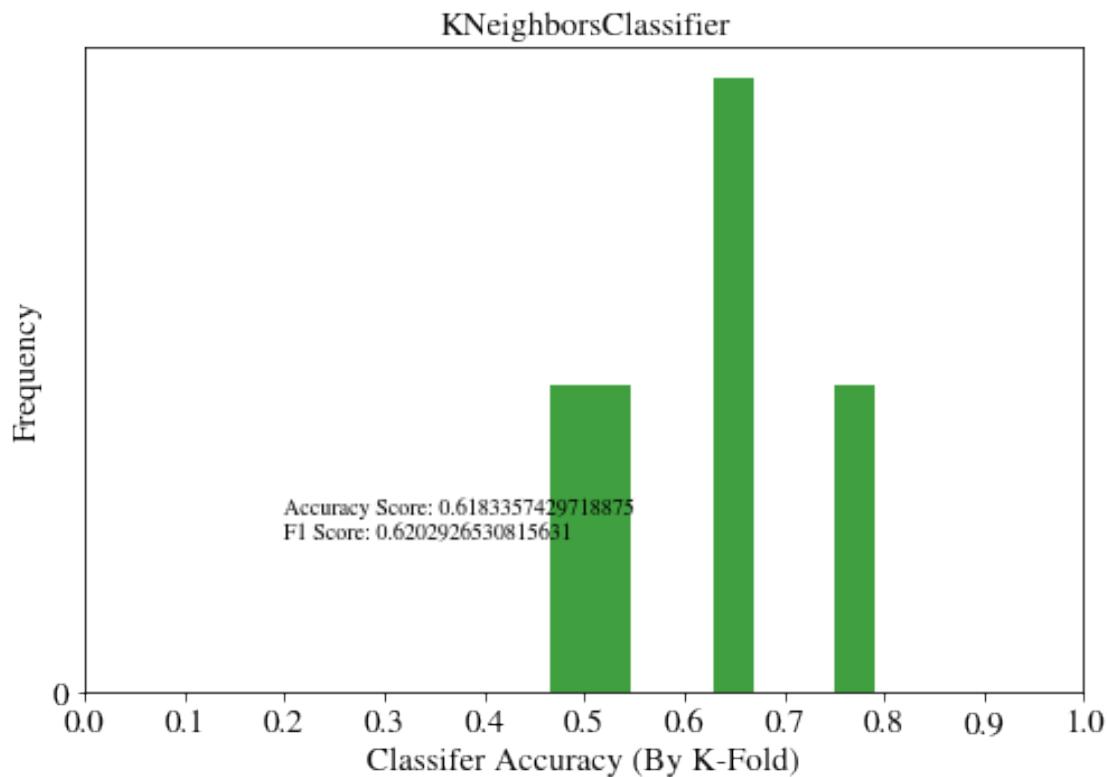
	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...}
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...}
2	{'C': 1, 'class_weight': None, 'dual': False, ...}
3	{'priors': None, 'var_smoothing': 1e-09}
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...}
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...}
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...}
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...}

Processing Model: RandomForestClassifier



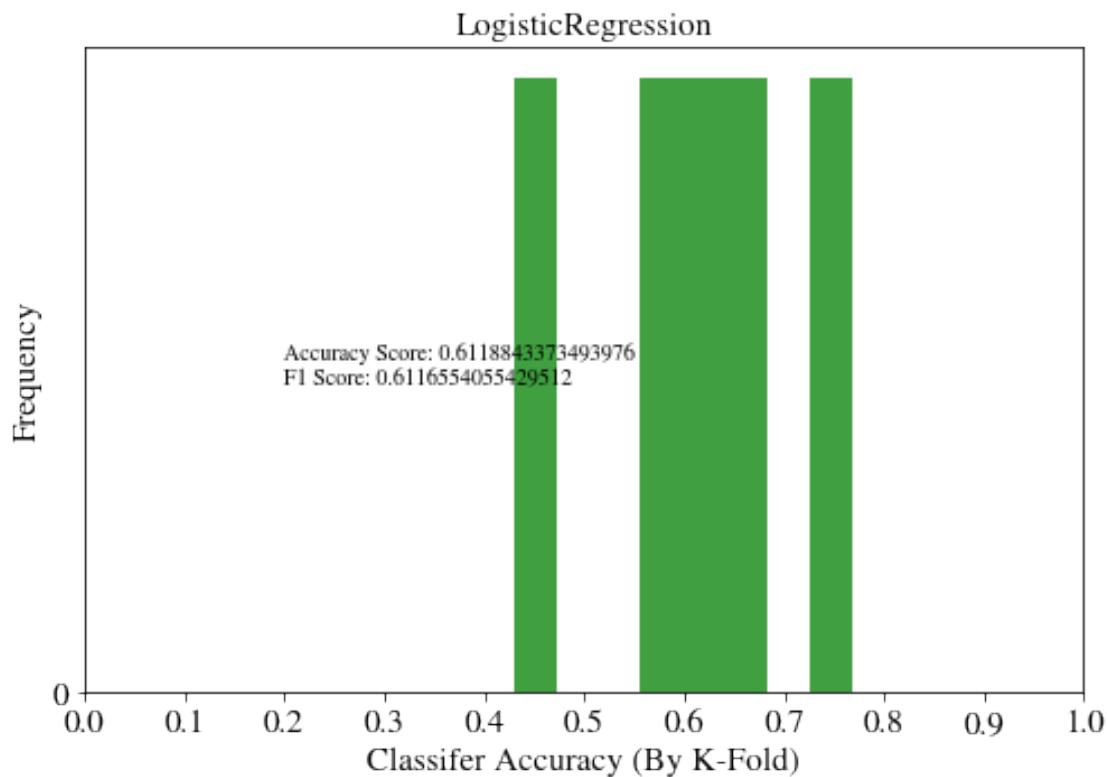
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch', 'accuracy': [0.608, 0.652, 0.4819277108433735, 0.8072289156626506, 0.6626506024096386], 'avgAccuracy': 0.6423614457831326, 'f1': [0.6116425814420257, 0.6406507043708826, 0.5095644272281226, 0.8105718110537388, 0.6474742500877714], 'avgF1': 0.6439807548365082, 'precision': [0.608, 0.652, 0.4819277108433735, 0.8072289156626506, 0.6626506024096386], 'avgPrecision': 0.6423614457831326, 'recall': [0.608, 0.652, 0.4819277108433735, 0.8072289156626506, 0.6626506024096386], 'avgRecall': 0.6423614457831326, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
```

Processing Model: KNeighborsClassifier



```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch', 'accuracy': [0.52, 0.652, 0.46586345381526106,  
0.7911646586345381, 0.6626506024096386], 'avgAccuracy': 0.6183357429718875,  
'f1': [0.5219916142557651, 0.6406507043708826, 0.48709498356712916,  
0.8051952846127631, 0.6465306786012759], 'avgF1': 0.6202926530815631,  
'precision': [0.52, 0.652, 0.46586345381526106, 0.7911646586345381,  
0.6626506024096386], 'avgPrecision': 0.6183357429718875, 'recall': [0.52, 0.652,  
0.46586345381526106, 0.7911646586345381, 0.6626506024096386], 'avgRecall':  
0.6183357429718875, 'params': [{'algorithm': 'auto', 'leaf_size': 30, 'metric':  
'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 12, 'p': 2,  
'weights': 'distance'}]}
*****
```

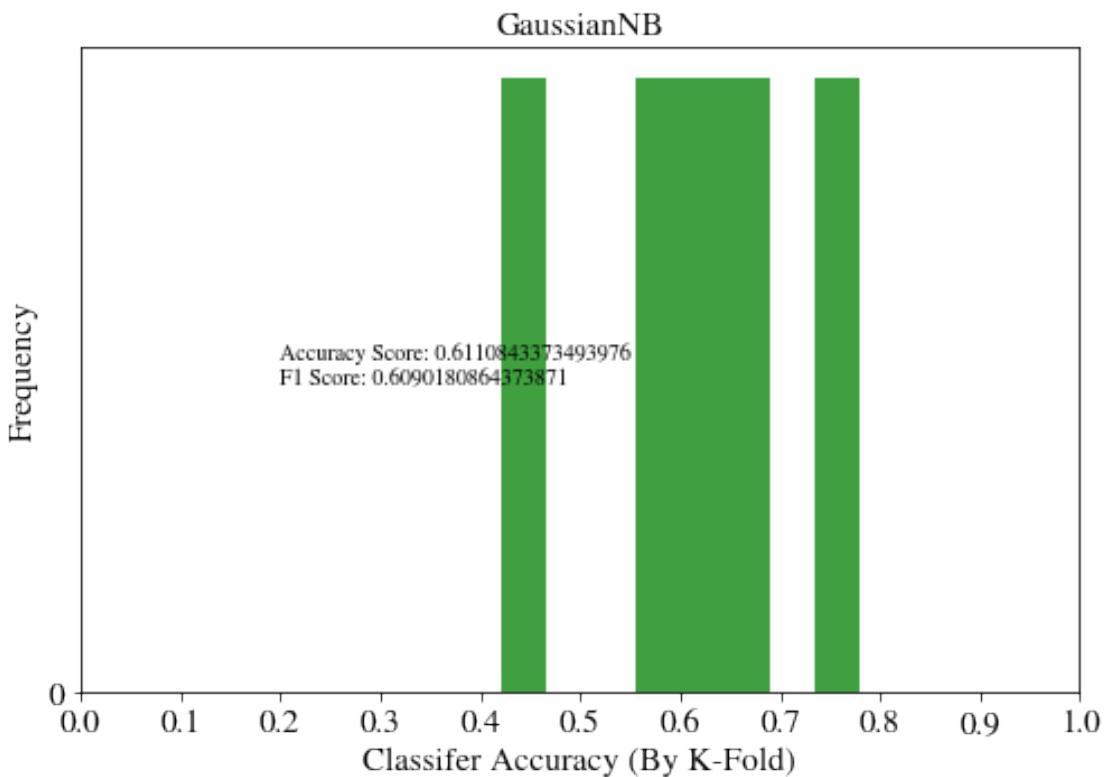
Processing Model: LogisticRegression



```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch', 'accuracy': [0.588, 0.616, 0.42971887550200805,  
0.7670682730923695, 0.6586345381526104], 'avgAccuracy': 0.6118843373493976,  
'f1': [0.5944057833791824, 0.6087414978791758, 0.4333705168394917,  
0.7757428224873455, 0.6460164071295604], 'avgF1': 0.6116554055429512,  
'precision': [0.588, 0.616, 0.42971887550200805, 0.7670682730923695,  
0.6586345381526104], 'avgPrecision': 0.6118843373493976, 'recall': [0.588,  
0.616, 0.42971887550200805, 0.7670682730923695, 0.6586345381526104],  
'avgRecall': 0.6118843373493976, 'params': [{'C': 1, 'class_weight': None,  
'dual': False, 'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None,  
'max_iter': 100, 'multi_class': 'ovr', 'n_jobs': -1, 'penalty': 'l2',  
'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0,  
'warm_start': False}]}
```

\*\*\*\*\*

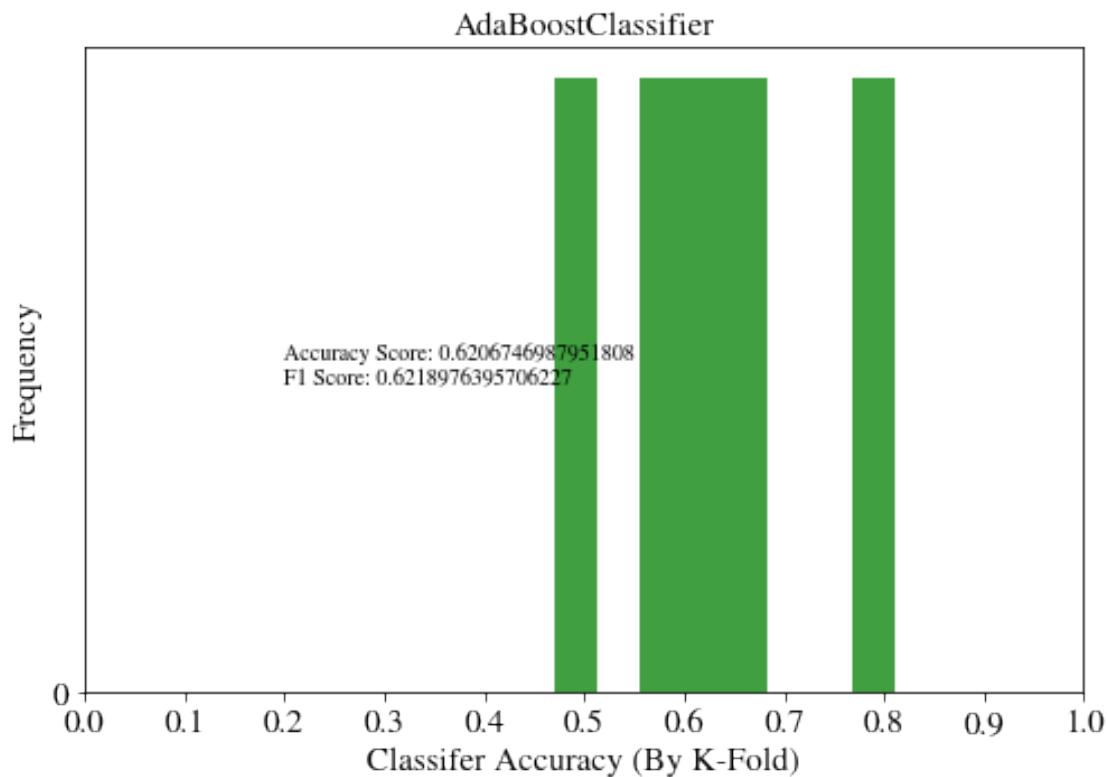
Processing Model: GaussianNB



```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch', 'accuracy': [0.588, 0.612, 0.42168674698795183, 0.7791164658634538,
0.6546184738955824], 'avgAccuracy': 0.6110843373493976, 'f1':
[0.5941312373598087, 0.6051415129837867, 0.42145574605162966,
0.7801475051344093, 0.6442144306573013], 'avgF1': 0.6090180864373871,
'precision': [0.588, 0.612, 0.42168674698795183, 0.7791164658634538,
0.6546184738955824], 'avgPrecision': 0.6110843373493976, 'recall': [0.588,
0.612, 0.42168674698795183, 0.7791164658634538, 0.6546184738955824],
'avgRecall': 0.6110843373493976, 'params': [{'priors': None, 'var_smoothing':
1e-09}]}
```

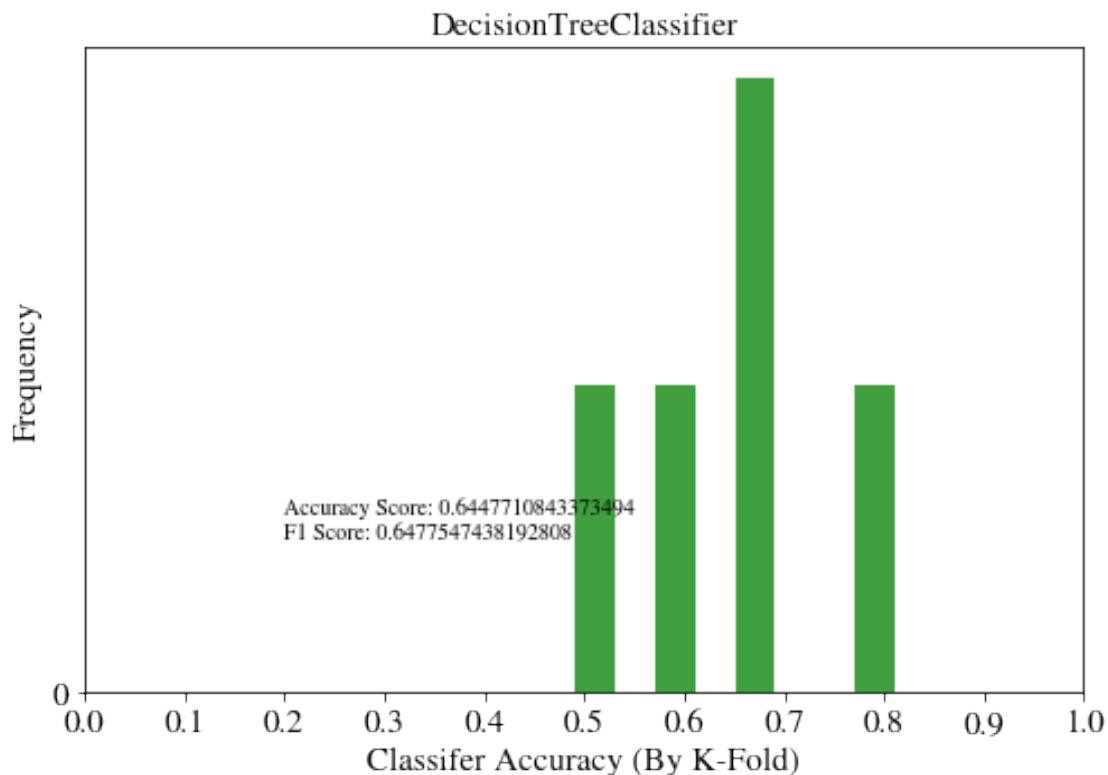
\*\*\*\*\*

Processing Model: AdaBoostClassifier



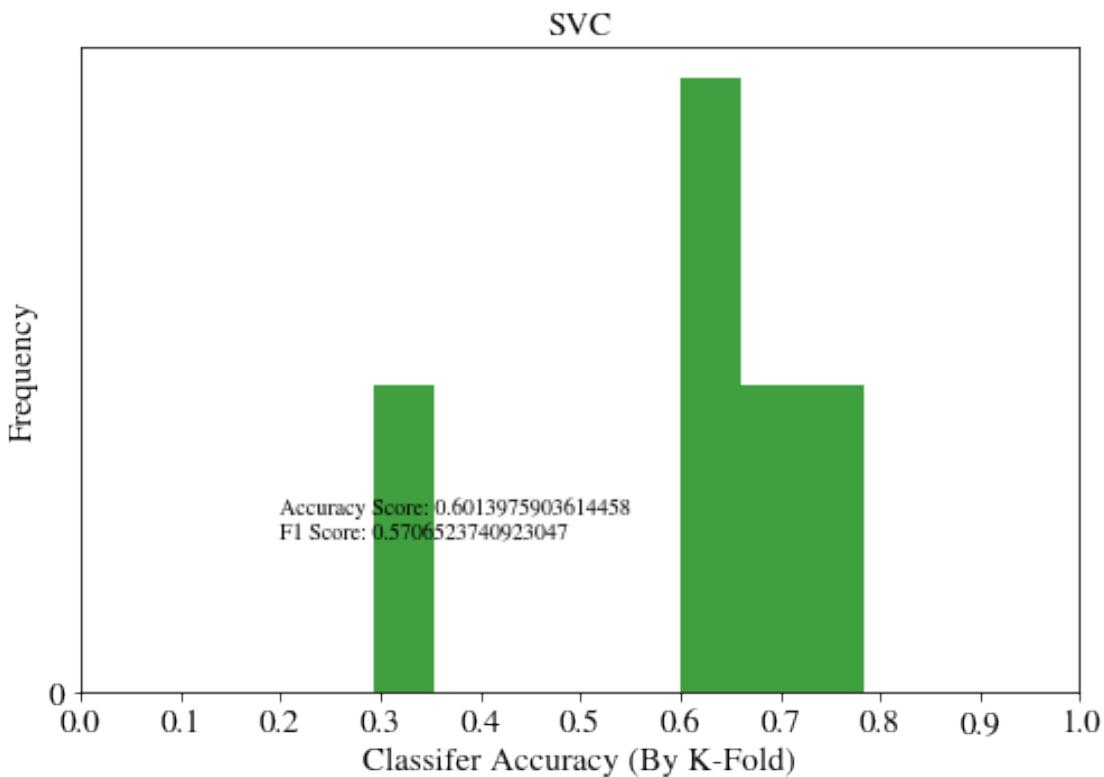
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch', 'accuracy': [0.608, 0.652, 0.46987951807228917,  
0.8112449799196787, 0.5622489959839357], 'avgAccuracy': 0.6206746987951808,  
'f1': [0.6116425814420257, 0.6406507043708826, 0.49275029982726315,  
0.8116386024913339, 0.5528060097216084], 'avgF1': 0.6218976395706227,  
'precision': [0.608, 0.652, 0.46987951807228917, 0.8112449799196787,  
0.5622489959839357], 'avgPrecision': 0.6206746987951808, 'recall': [0.608,  
0.652, 0.46987951807228917, 0.8112449799196787, 0.5622489959839357],  
'avgRecall': 0.6206746987951808, 'params': [{algorithm': 'SAMME.R',  
'base_estimator': None, 'learning_rate': 1, 'n_estimators': 300, 'random_state':  
None}]}}
*****
```

Processing Model: DecisionTreeClassifier



```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch', 'accuracy': [0.608, 0.652, 0.4899598393574297, 0.8112449799196787, 0.6626506024096386], 'avgAccuracy': 0.6447710843373494, 'f1': [0.6116425814420257, 0.6406507043708826, 0.520656226824397, 0.8163549435838593, 0.6494692628752395], 'avgF1': 0.6477547438192808, 'precision': [0.608, 0.652, 0.4899598393574297, 0.8112449799196787, 0.6626506024096386], 'avgPrecision': 0.6447710843373494, 'recall': [0.608, 0.652, 0.4899598393574297, 0.8112449799196787, 0.6626506024096386], 'avgRecall': 0.6447710843373494, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'random'}]}
*****
```

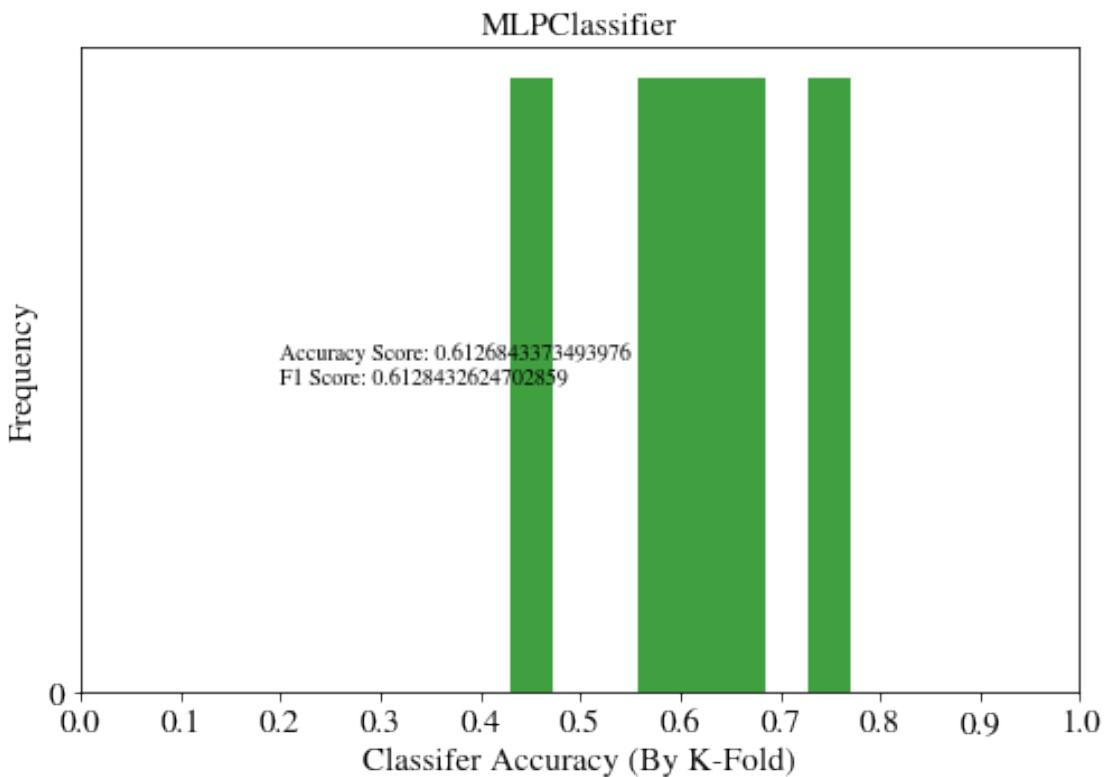
Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch', 'accuracy': [0.608, 0.652, 0.2931726907630522, 0.7831325301204819, 0.6706827309236948], 'avgAccuracy': 0.6013975903614458, 'f1': [0.6116425814420257, 0.6406507043708826, 0.16311156969709023, 0.7850140963238514, 0.6528429186276736], 'avgF1': 0.5706523740923047, 'precision': [0.608, 0.652, 0.2931726907630522, 0.7831325301204819, 0.6706827309236948], 'avgPrecision': 0.6013975903614458, 'recall': [0.608, 0.652, 0.2931726907630522, 0.7831325301204819, 0.6706827309236948], 'avgRecall': 0.6013975903614458, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
```

\*\*\*\*\*

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch', 'accuracy': [0.592, 0.616, 0.42971887550200805, 0.7710843373493976,
0.6546184738955824], 'avgAccuracy': 0.6126843373493976, 'f1':
[0.5982050258684406, 0.6087414978791758, 0.4333705168394917, 0.7806094136767876,
0.6432898580875335], 'avgF1': 0.6128432624702859, 'precision': [0.592, 0.616,
0.42971887550200805, 0.7710843373493976, 0.6546184738955824], 'avgPrecision':
0.6126843373493976, 'recall': [0.592, 0.616, 0.42971887550200805,
0.7710843373493976, 0.6546184738955824], 'avgRecall': 0.6126843373493976,
'params': [{activation': 'identity', 'alpha': 0.0001, 'batch_size': 'auto',
'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08,
'hidden_layer_sizes': (100,), 'learning_rate': 'constant', 'learning_rate_init':
0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change':
10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle':
True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose':
False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,
```

```

Severity of Crypt Arch', 'accuracy': [0.608, 0.652, 0.4899598393574297,
0.8112449799196787, 0.6626506024096386], 'avgAccuracy': 0.6447710843373494,
'f1': [0.6116425814420257, 0.6406507043708826, 0.520656226824397,
0.8163549435838593, 0.6494692628752395], 'avgF1': 0.6477547438192808,
'precision': [0.608, 0.652, 0.4899598393574297, 0.8112449799196787,
0.6626506024096386], 'avgPrecision': 0.6447710843373494, 'recall': [0.608,
0.652, 0.4899598393574297, 0.8112449799196787, 0.6626506024096386], 'avgRecall':
0.6447710843373494, 'params': [{'ccp_alpha': 0.0, 'class_weight': None,
'criterion': 'gini', 'max_depth': None, 'max_features': 'log2',
'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split':
None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf':
0.0, 'random_state': None, 'splitter': 'random'}]}
*****

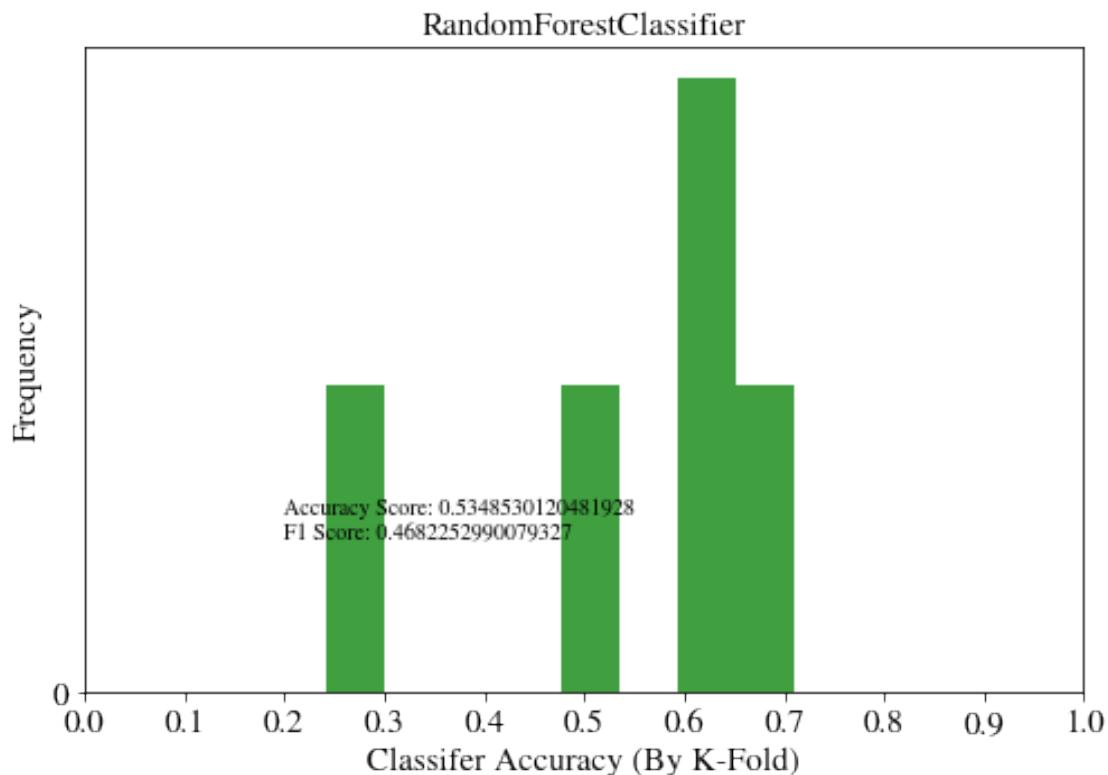
```

	model	features \
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch
3	GaussianNB	Active inflammation?, Severity of Crypt Arch
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch
6	SVC	Active inflammation?, Severity of Crypt Arch
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch

	accuracy	f1	precision	recall	\
0	0.640755	0.641744	0.640755	0.640755	
1	0.586137	0.583885	0.586137	0.586137	
2	0.611884	0.611906	0.611884	0.611884	
3	0.611084	0.609018	0.611084	0.611084	
4	0.620675	0.621898	0.620675	0.620675	
5	0.642361	0.643921	0.642361	0.642361	
6	0.601398	0.570652	0.601398	0.601398	
7	0.612684	0.613028	0.612684	0.612684	

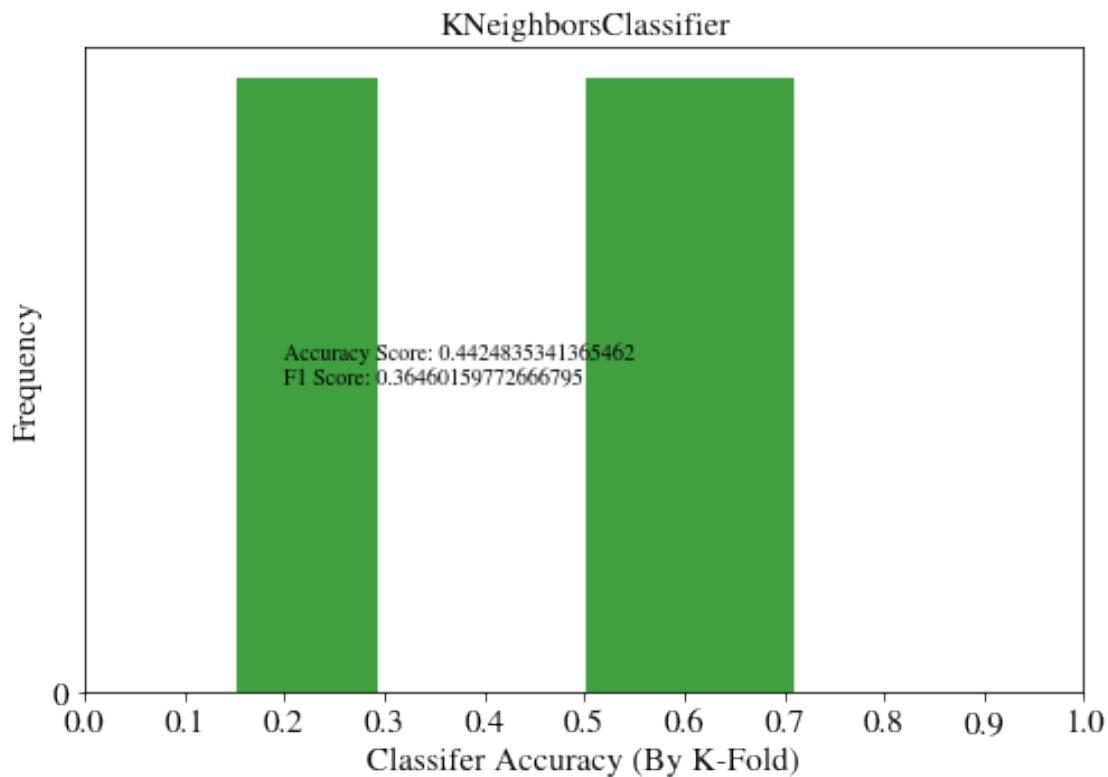
	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	{'C': 1, 'class_weight': None, 'dual': False, ... {'priors': None, 'var_smoothing': 1e-09}
3	{'algorithm': 'SAMME.R', 'base_estimator': Non...
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6	{'C': 1.0, 'break_ties': False, 'cache_size': ... {'activation': 'logistic', 'alpha': 0.0001, 'b...

Processing Model: RandomForestClassifier



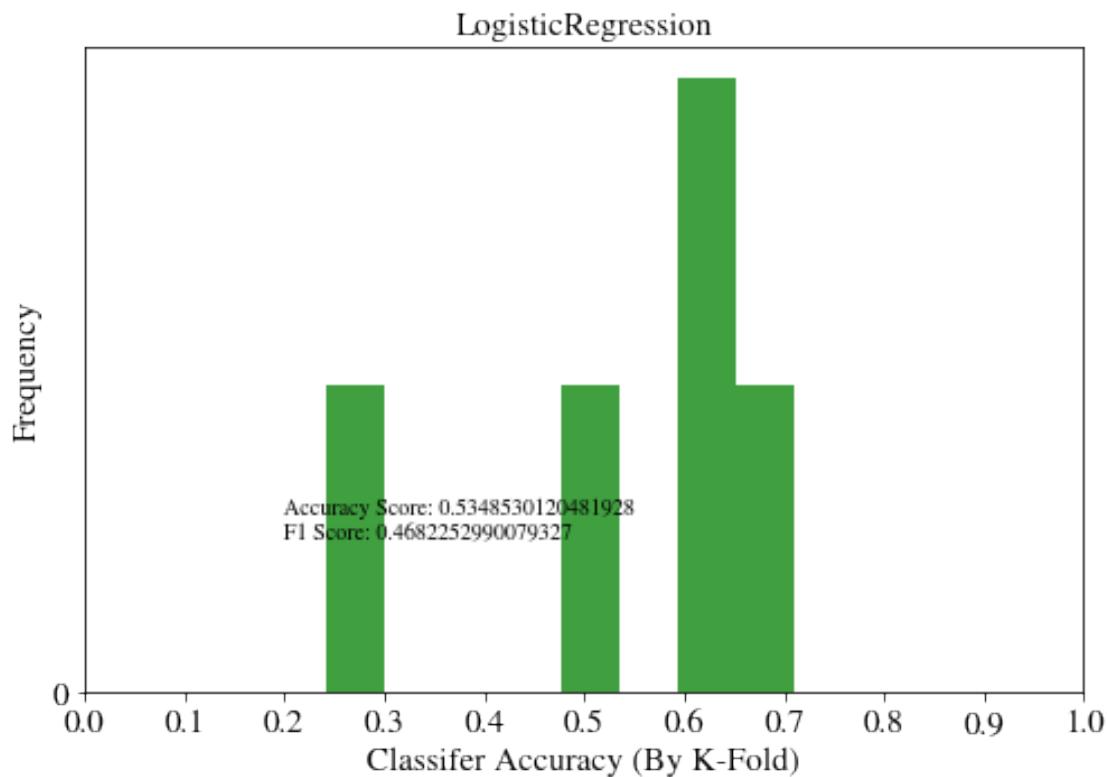
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?', 'accuracy': [0.508, 0.6, 0.24096385542168675, 0.7108433734939759, 0.6144578313253012], 'avgAccuracy': 0.5348530120481928, 'f1': [0.4562137637692224, 0.5376398451739745, 0.13682850563190535, 0.651913352893439, 0.5585310275711224], 'avgF1': 0.4682252990079327, 'precision': [0.508, 0.6, 0.24096385542168675, 0.7108433734939759, 0.6144578313253012], 'avgPrecision': 0.5348530120481928, 'recall': [0.508, 0.6, 0.24096385542168675, 0.7108433734939759, 0.6144578313253012], 'avgRecall': 0.5348530120481928, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
```

Processing Model: KNeighborsClassifier



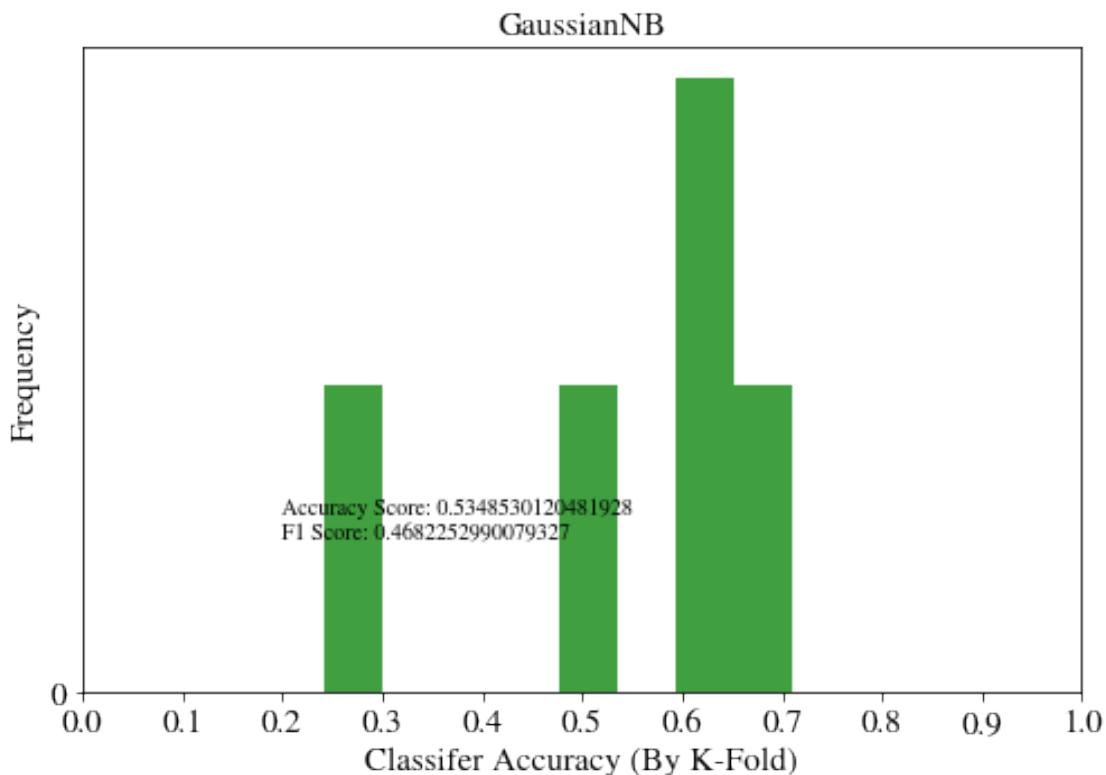
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?',
'accuracy': [0.508, 0.6, 0.24096385542168675, 0.7108433734939759,
0.15261044176706828], 'avgAccuracy': 0.4424835341365462, 'f1':
[0.4562137637692224, 0.5376398451739745, 0.13682850563190535, 0.651913352893439,
0.040412521164798564], 'avgF1': 0.36460159772666795, 'precision': [0.508, 0.6,
0.24096385542168675, 0.7108433734939759, 0.15261044176706828], 'avgPrecision':
0.4424835341365462, 'recall': [0.508, 0.6, 0.24096385542168675,
0.7108433734939759, 0.15261044176706828], 'avgRecall': 0.4424835341365462,
'params': [{('algorithm': 'brute', 'leaf_size': 30, 'metric': 'minkowski',
'metric_params': None, 'n_jobs': -1, 'n_neighbors': 12, 'p': 2, 'weights':
'uniform')}]}
*****
```

Processing Model: LogisticRegression



```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?',
'accuracy': [0.508, 0.6, 0.24096385542168675, 0.7108433734939759,
0.6144578313253012], 'avgAccuracy': 0.5348530120481928, 'f1':
[0.4562137637692224, 0.5376398451739745, 0.13682850563190535, 0.651913352893439,
0.5585310275711224], 'avgF1': 0.4682252990079327, 'precision': [0.508, 0.6,
0.24096385542168675, 0.7108433734939759, 0.6144578313253012], 'avgPrecision':
0.5348530120481928, 'recall': [0.508, 0.6, 0.24096385542168675,
0.7108433734939759, 0.6144578313253012], 'avgRecall': 0.5348530120481928,
'params': [{C': 1, 'class_weight': None, 'dual': False, 'fit_intercept': True,
'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'ovr',
'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg',
'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}
*****
```

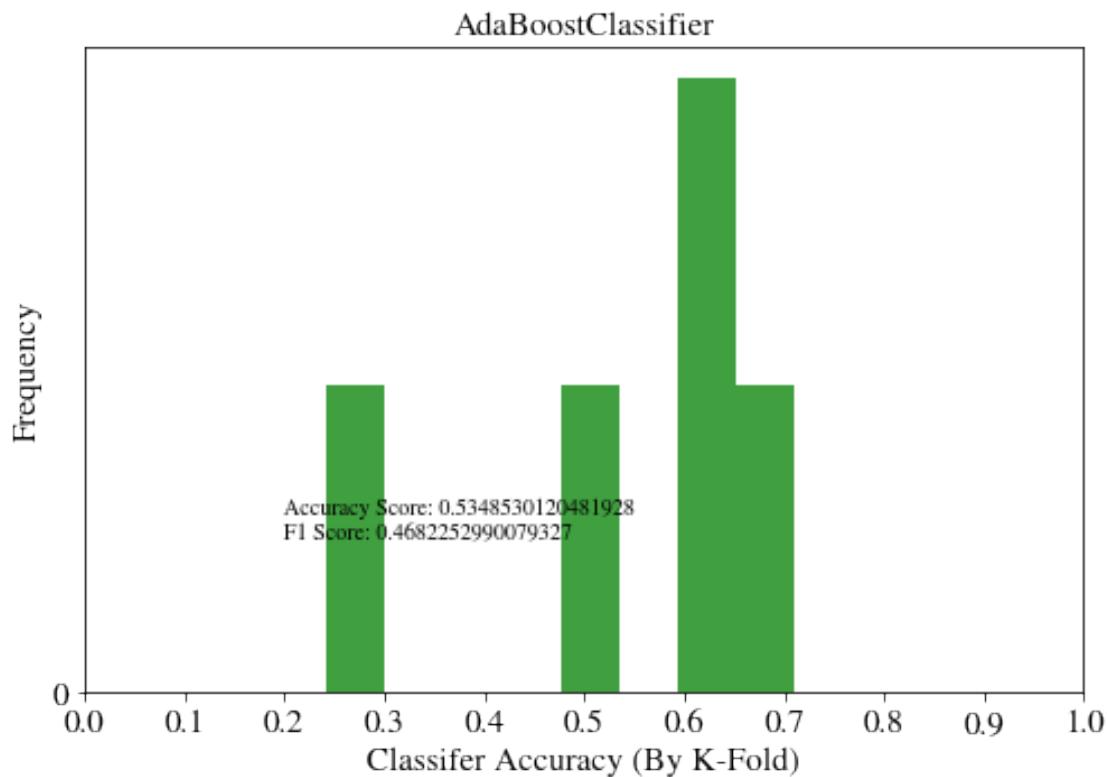
Processing Model: GaussianNB



```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?', 'accuracy':
[0.508, 0.6, 0.24096385542168675, 0.7108433734939759, 0.6144578313253012],
'avgAccuracy': 0.5348530120481928, 'f1': [0.4562137637692224,
0.5376398451739745, 0.13682850563190535, 0.651913352893439, 0.5585310275711224],
'avgF1': 0.4682252990079327, 'precision': [0.508, 0.6, 0.24096385542168675,
0.7108433734939759, 0.6144578313253012], 'avgPrecision': 0.5348530120481928,
'recall': [0.508, 0.6, 0.24096385542168675, 0.7108433734939759,
0.6144578313253012], 'avgRecall': 0.5348530120481928, 'params': [{'priors':
None, 'var_smoothing': 1e-09}]}
```

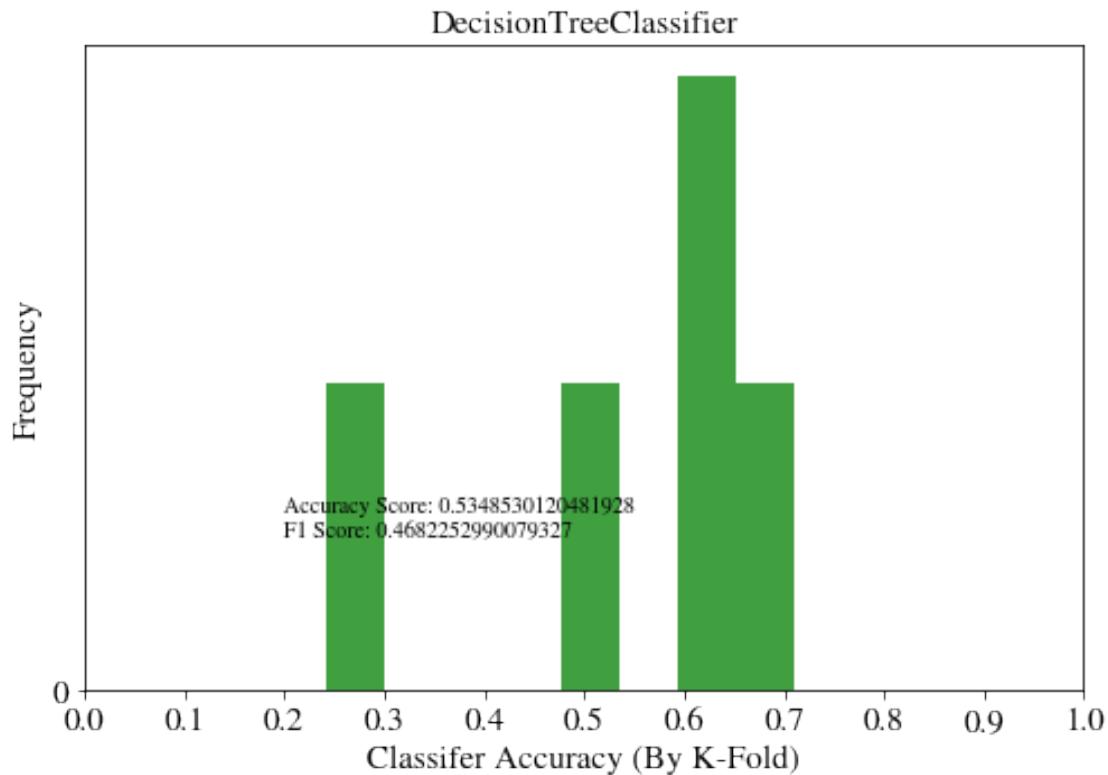
\*\*\*\*\*

Processing Model: AdaBoostClassifier



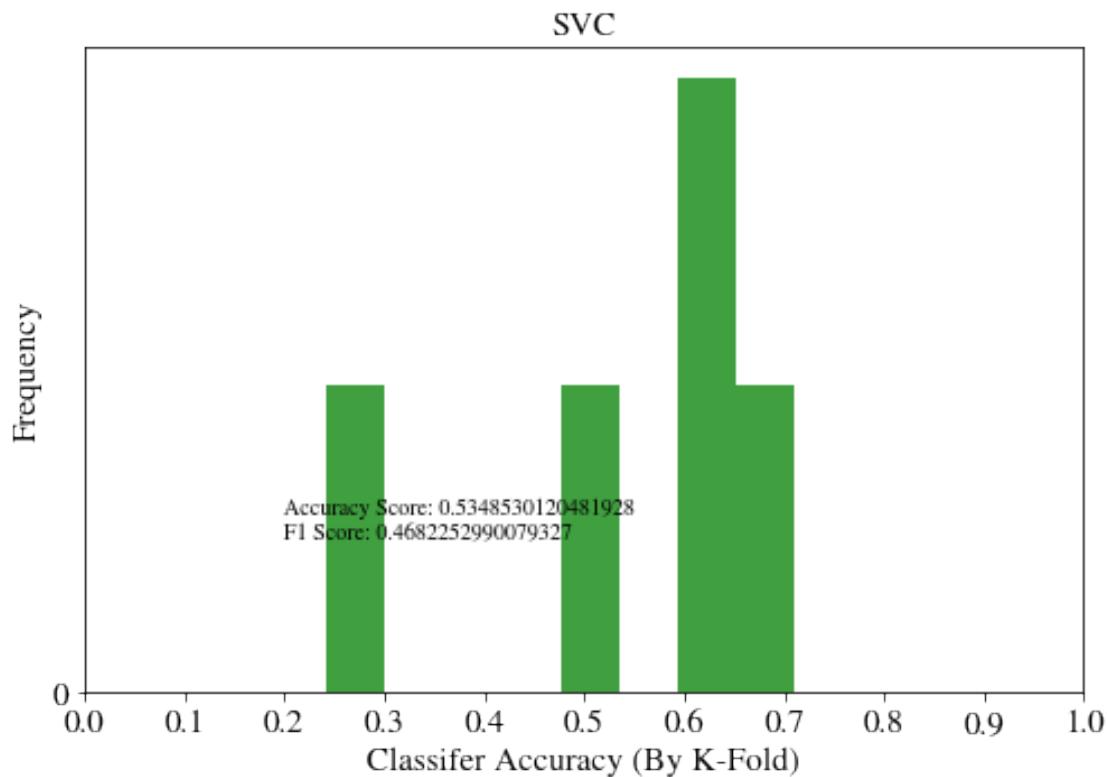
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?',
'accuracy': [0.508, 0.6, 0.24096385542168675, 0.7108433734939759,
0.6144578313253012], 'avgAccuracy': 0.5348530120481928, 'f1':
[0.4562137637692224, 0.5376398451739745, 0.13682850563190535, 0.651913352893439,
0.5585310275711224], 'avgF1': 0.4682252990079327, 'precision': [0.508, 0.6,
0.24096385542168675, 0.7108433734939759, 0.6144578313253012], 'avgPrecision':
0.5348530120481928, 'recall': [0.508, 0.6, 0.24096385542168675,
0.7108433734939759, 0.6144578313253012], 'avgRecall': 0.5348530120481928,
'params': [{('algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1,
'n_estimators': 20, 'random_state': None)}]}
*****
```

Processing Model: DecisionTreeClassifier



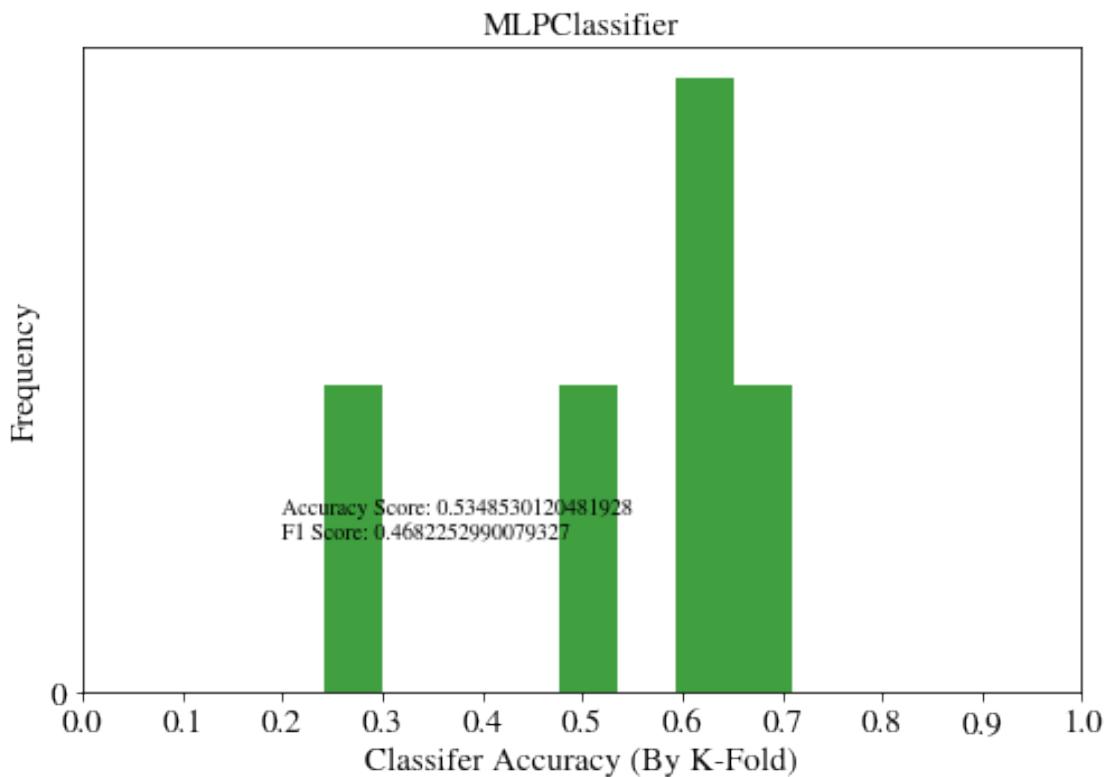
```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?', 'accuracy': [0.508, 0.6, 0.24096385542168675, 0.7108433734939759, 0.6144578313253012], 'avgAccuracy': 0.5348530120481928, 'f1': [0.4562137637692224, 0.5376398451739745, 0.13682850563190535, 0.651913352893439, 0.5585310275711224], 'avgF1': 0.4682252990079327, 'precision': [0.508, 0.6, 0.24096385542168675, 0.7108433734939759, 0.6144578313253012], 'avgPrecision': 0.5348530120481928, 'recall': [0.508, 0.6, 0.24096385542168675, 0.7108433734939759, 0.6144578313253012], 'avgRecall': 0.5348530120481928, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****
```

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?', 'accuracy': [0.508,
0.6, 0.24096385542168675, 0.7108433734939759, 0.6144578313253012],
'avgAccuracy': 0.5348530120481928, 'f1': [0.4562137637692224,
0.5376398451739745, 0.13682850563190535, 0.651913352893439, 0.5585310275711224],
'avgF1': 0.4682252990079327, 'precision': [0.508, 0.6, 0.24096385542168675,
0.7108433734939759, 0.6144578313253012], 'avgPrecision': 0.5348530120481928,
'recall': [0.508, 0.6, 0.24096385542168675, 0.7108433734939759,
0.6144578313253012], 'avgRecall': 0.5348530120481928, 'params': [{'
C': 1.0,
'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0,
'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':
'linear', 'max_iter': -1, 'probability': False, 'random_state': None,
'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?',
'accuracy': [0.508, 0.6, 0.24096385542168675, 0.7108433734939759,
0.6144578313253012], 'avgAccuracy': 0.5348530120481928, 'f1':
[0.4562137637692224, 0.5376398451739745, 0.13682850563190535, 0.651913352893439,
0.5585310275711224], 'avgF1': 0.4682252990079327, 'precision': [0.508, 0.6,
0.24096385542168675, 0.7108433734939759, 0.6144578313253012], 'avgPrecision':
0.5348530120481928, 'recall': [0.508, 0.6, 0.24096385542168675,
0.7108433734939759, 0.6144578313253012], 'avgRecall': 0.5348530120481928,
'params': [{activation': 'identity', 'alpha': 0.0001, 'batch_size': 'auto',
'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08,
'hidden_layer_sizes': (100,), 'learning_rate': 'constant', 'learning_rate_init':
0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change':
10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle':
True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose':
False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?',
```

```

'accuracy': [0.508, 0.6, 0.24096385542168675, 0.7108433734939759,
0.6144578313253012], 'avgAccuracy': 0.5348530120481928, 'f1':
[0.4562137637692224, 0.5376398451739745, 0.13682850563190535, 0.651913352893439,
0.5585310275711224], 'avgF1': 0.4682252990079327, 'precision': [0.508, 0.6,
0.24096385542168675, 0.7108433734939759, 0.6144578313253012], 'avgPrecision':
0.5348530120481928, 'recall': [0.508, 0.6, 0.24096385542168675,
0.7108433734939759, 0.6144578313253012], 'avgRecall': 0.5348530120481928,
'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None,
criterion': 'gini', 'max_depth': None, 'max_features': 'auto',
'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': True,
'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

	model	features	accuracy	f1	\
0	RandomForestClassifier	Active inflammation?	0.534853	0.468225	
1	KNeighborsClassifier	Active inflammation?	0.300315	0.234219	
2	LogisticRegression	Active inflammation?	0.534853	0.468225	
3	GaussianNB	Active inflammation?	0.534853	0.468225	
4	AdaBoostClassifier	Active inflammation?	0.534853	0.468225	
5	DecisionTreeClassifier	Active inflammation?	0.534853	0.468225	
6	SVC	Active inflammation?	0.534853	0.468225	
7	MLPClassifier	Active inflammation?	0.534853	0.468225	

	precision	recall	params
0	0.534853	0.534853	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	0.300315	0.300315	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	0.534853	0.534853	{'C': 1, 'class_weight': None, 'dual': False, ...
3	0.534853	0.534853	{'priors': None, 'var_smoothing': 1e-09}
4	0.534853	0.534853	{'algorithm': 'SAMME.R', 'base_estimator': Non...
5	0.534853	0.534853	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6	0.534853	0.534853	{'C': 1.0, 'break_ties': False, 'cache_size': ...
7	0.534853	0.534853	{'activation': 'logistic', 'alpha': 0.0001, 'b...

```

[93]: # Original Dataset
X2 = pd.concat([X_train_ord, X_test_ord])#.to_numpy()
y2 = pd.concat([y_train_ord, y_test_ord]).to_numpy()
#data2 = (X2, y2, n_folds)

print('*****')
print('Starting Original data set....')
print('*****')

for i in range(1, 0, -1):
    col = []
    col = df[:i]

```

```

nX2 = X2.loc[:, col]
nX2 = nX2.to_numpy()
data2 = (nX2, y2, n_folds)
hyper_search(modelDictionary, modelParamsDictionary, data2, col)

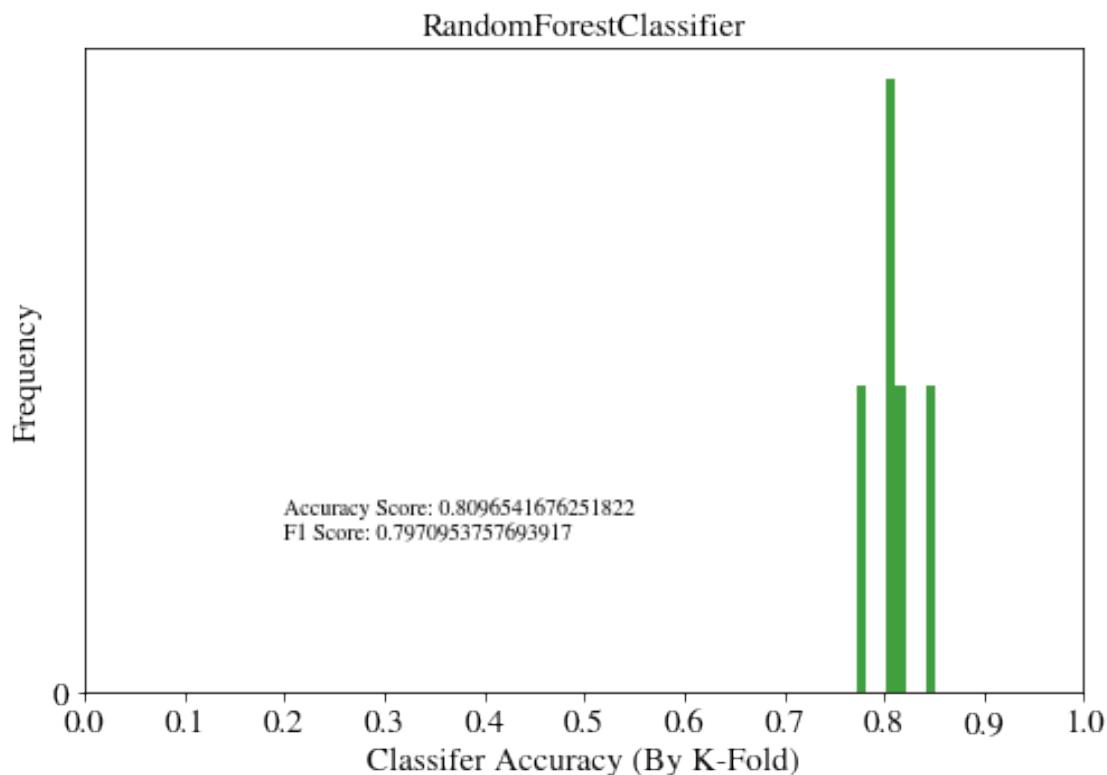
```

\*\*\*\*\*

Starting Original data set...

\*\*\*\*\*

Processing Model: RandomForestClassifier



\*\*\*\*\*

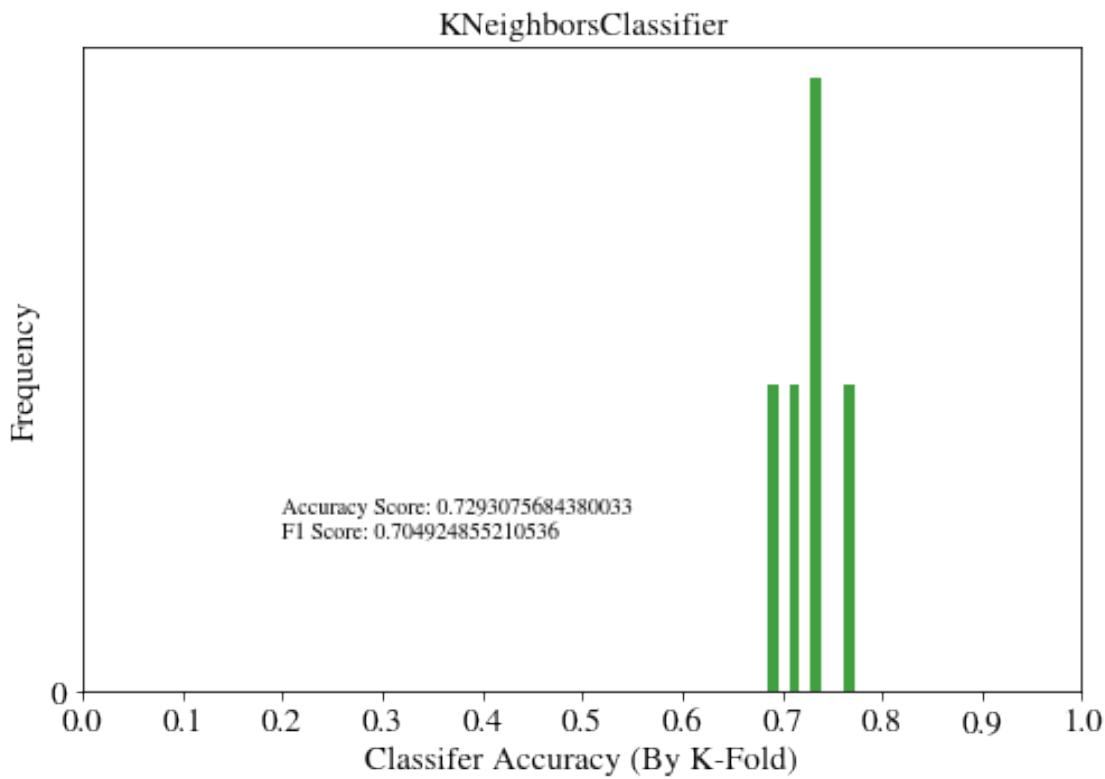
- \* RandomForestClassifier
- \* Best Params Result:
- \* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in

```

lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,
Lab No, Year, Subepithelial collagen', 'accuracy': [0.8024691358024691,
0.7716049382716049, 0.8024691358024691, 0.8518518518518519, 0.8198757763975155],
'avgAccuracy': 0.8096541676251822, 'f1': [0.7925585561610762,
0.7492156623069715, 0.7892421500929311, 0.8431364129944399, 0.8113240972915401],
'avgF1': 0.7970953757693917, 'precision': [0.8024691358024691,
0.7716049382716049, 0.8024691358024691, 0.8518518518518519, 0.8198757763975155],
'avgPrecision': 0.8096541676251822, 'recall': [0.8024691358024691,
0.7716049382716049, 0.8024691358024691, 0.8518518518518519, 0.8198757763975155],
'avgRecall': 0.8096541676251822, 'params': [{bootstrap': True, 'ccp_alpha':
0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None,
'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None,
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200,
'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0,
'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



```
*****

```

- \* KNeighborsClassifier
- \* Best Params Result:

```

* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  

Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  

Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  

lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,  

Lab No, Year, Subepithelial collagen', 'accuracy': [0.7160493827160493,  

0.6851851851852, 0.7345679012345679, 0.7716049382716049, 0.7391304347826086],  

'avgAccuracy': 0.7293075684380033, 'f1': [0.6761890996305074,  

0.6616916947214572, 0.7107772995058727, 0.7556209913298924, 0.7203451908649506],  

'avgF1': 0.704924855210536, 'precision': [0.7160493827160493,  

0.6851851851852, 0.7345679012345679, 0.7716049382716049, 0.7391304347826086],  

'avgPrecision': 0.7293075684380033, 'recall': [0.7160493827160493,  

0.6851851851852, 0.7345679012345679, 0.7716049382716049, 0.7391304347826086],  

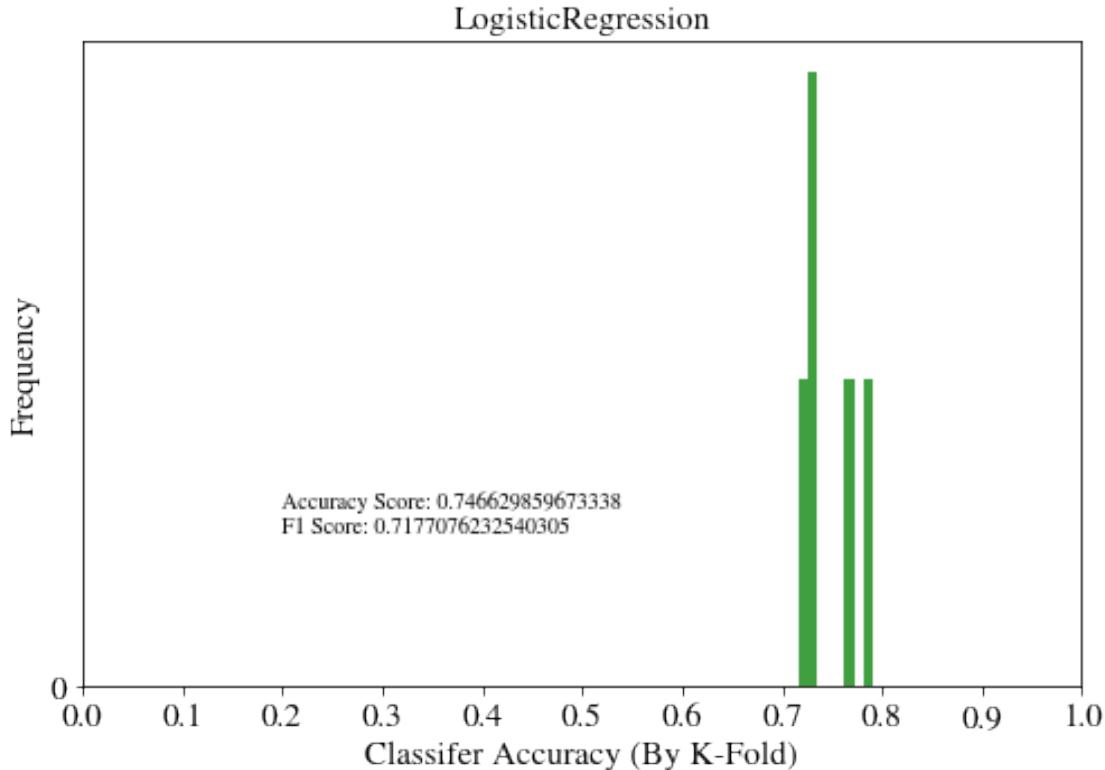
'avgRecall': 0.7293075684380033, 'params': [{"algorithm": "auto", "leaf_size":  

30, "metric": "minkowski", "metric_params": None, "n_jobs": -1, "n_neighbors":  

12, "p": 2, "weights": "distance"}]}
*****

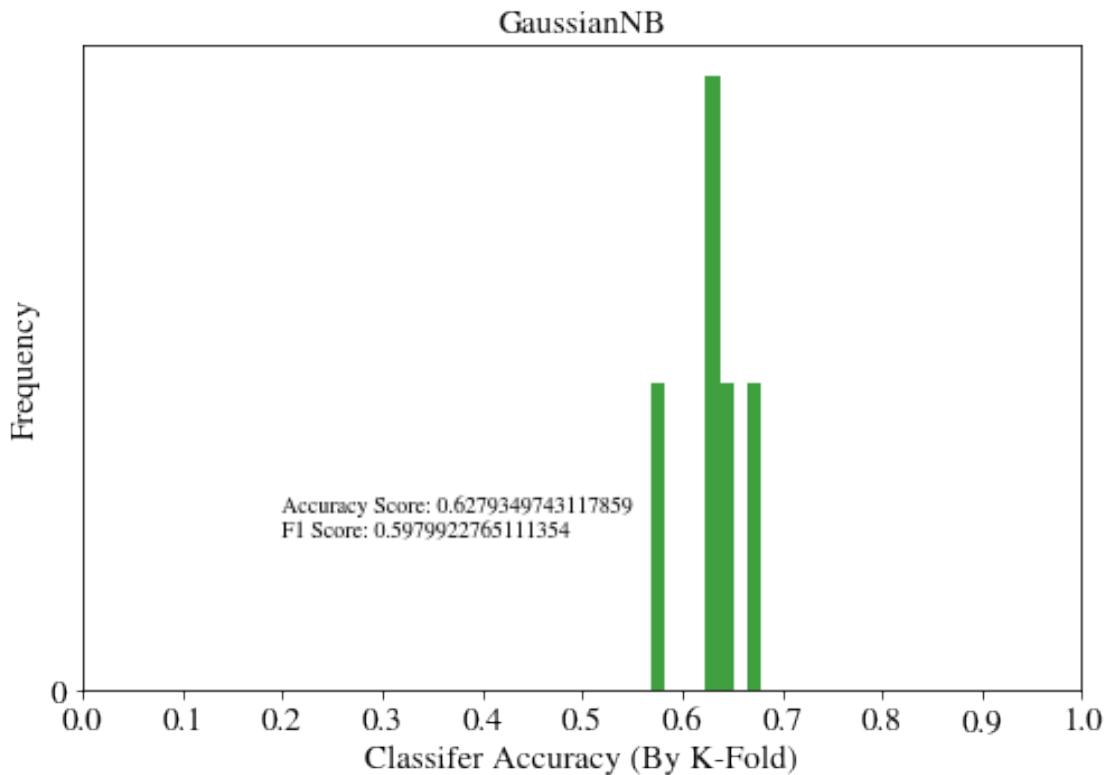
```

Processing Model: LogisticRegression



```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year, Subepithelial collagen', 'accuracy': [0.7283950617283951, 0.7160493827160493, 0.7283950617283951, 0.7901234567901234, 0.7701863354037267], 'avgAccuracy': 0.746629859673338, 'f1': [0.699833174459488, 0.6810868739794413, 0.7008875978374889, 0.7560217746582957, 0.7507086953354385], 'avgF1': 0.7177076232540305, 'precision': [0.7283950617283951, 0.7160493827160493, 0.7283950617283951, 0.7901234567901234, 0.7701863354037267], 'avgPrecision': 0.746629859673338, 'recall': [0.7283950617283951, 0.7160493827160493, 0.7283950617283951, 0.7901234567901234, 0.7701863354037267], 'avgRecall': 0.746629859673338, 'params': [{'C': 1, 'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}
*****
```

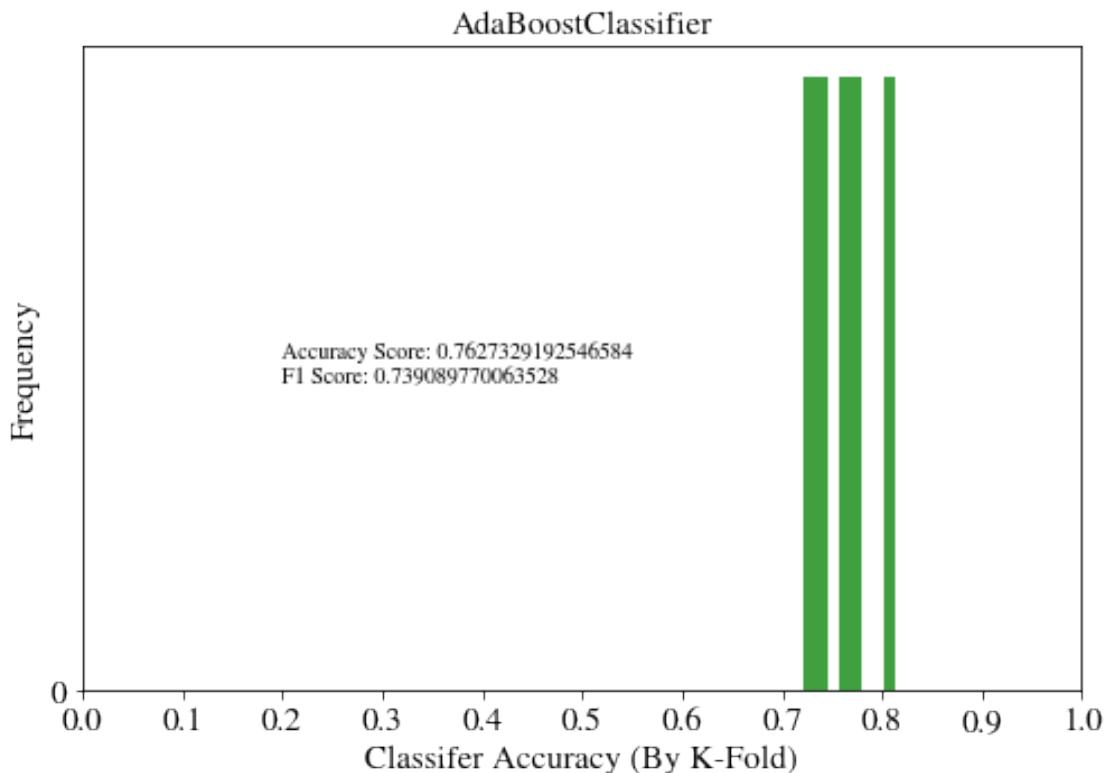
Processing Model: GaussianNB



```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year, Subepithelial collagen', 'accuracy': [0.5679012345679012, 0.6234567901234568, 0.6419753086419753, 0.6790123456790124, 0.6273291925465838], 'avgAccuracy': 0.6279349743117859, 'f1': [0.5366536949203194, 0.5779291112946431, 0.6045764195869905, 0.6616356136219576, 0.6091665431317664], 'avgF1': 0.5979922765111354, 'precision': [0.5679012345679012, 0.6234567901234568, 0.6419753086419753, 0.6790123456790124, 0.6273291925465838], 'avgPrecision': 0.6279349743117859, 'recall': [0.5679012345679012, 0.6234567901234568, 0.6419753086419753, 0.6790123456790124, 0.6273291925465838], 'avgRecall': 0.6279349743117859, 'params': [{'priors': None, 'var_smoothing':
```

```
1e-09}]}  
*****
```

Processing Model: AdaBoostClassifier



```
*****  
* AdaBoostClassifier  
* Best Params Result:  
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,  
Lab No, Year, Subepithelial collagen', 'accuracy': [0.7777777777777778,  
0.7345679012345679, 0.7222222222222222, 0.7654320987654321, 0.8136645962732919],  
'avgAccuracy': 0.7627329192546584, 'f1': [0.756874065884569, 0.6934539656660759,  
0.7033772092448399, 0.7501131004431336, 0.7916305090790217], 'avgF1':  
0.739089770063528, 'precision': [0.7777777777777778, 0.7345679012345679,
```

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0.7222222222222222, 0.7654320987654321, 0.8136645962732919], 'avgPrecision':  

0.7627329192546584, 'recall': [0.7777777777777778, 0.7345679012345679,  

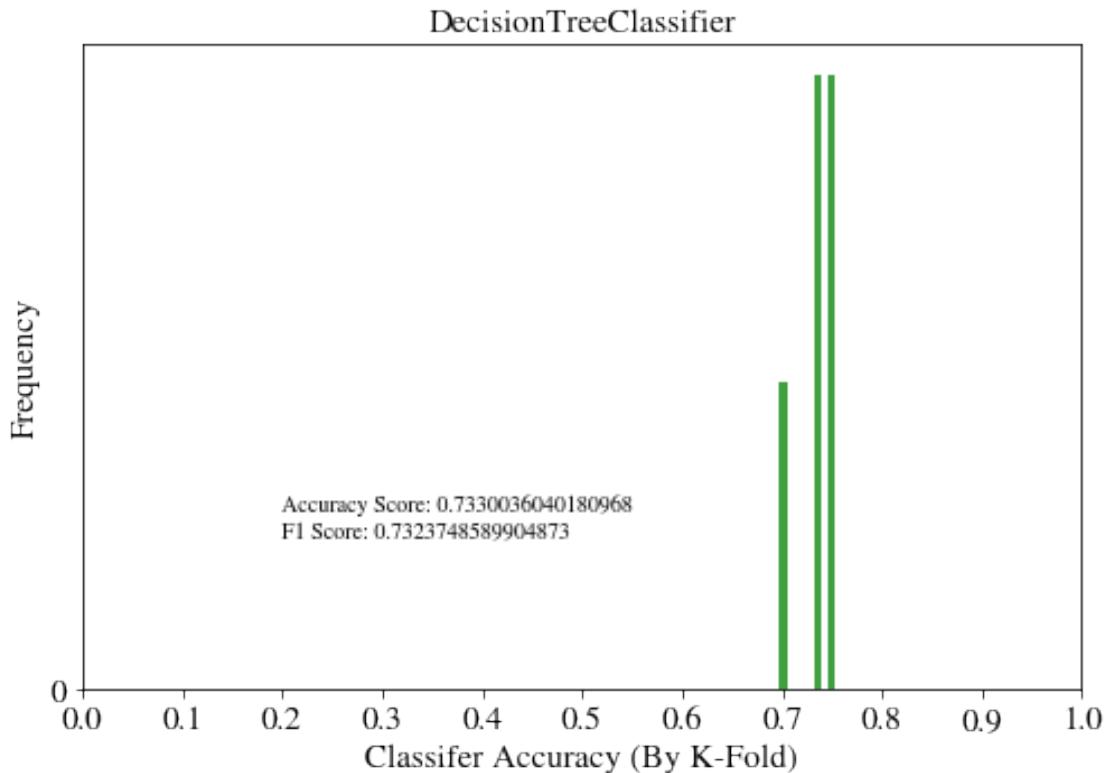
0.7222222222222222, 0.7654320987654321, 0.8136645962732919], 'avgRecall':  

0.7627329192546584, 'params': [{'algorithm': 'SAMME.R', 'base_estimator': None,  

'learning_rate': 1, 'n_estimators': 20, 'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



```

*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  

Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  

Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  

lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,  

Lab No, Year, Subepithelial collagen', 'accuracy': [0.7469135802469136,

```

```

0.6975308641975309, 0.7530864197530864, 0.7345679012345679, 0.7329192546583851],  

'avgAccuracy': 0.7330036040180968, 'f1': [0.740944611718911, 0.6973110976040459,  

0.7528308228818723, 0.7307201663793479, 0.7400675963682595], 'avgF1':  

0.7323748589904873, 'precision': [0.7469135802469136, 0.6975308641975309,  

0.7530864197530864, 0.7345679012345679, 0.7329192546583851], 'avgPrecision':  

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0.7530864197530864, 0.7345679012345679, 0.7329192546583851], 'avgRecall':  

0.7330036040180968, 'params': [{'ccp_alpha': 0.0, 'class_weight': None,  

'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto',  

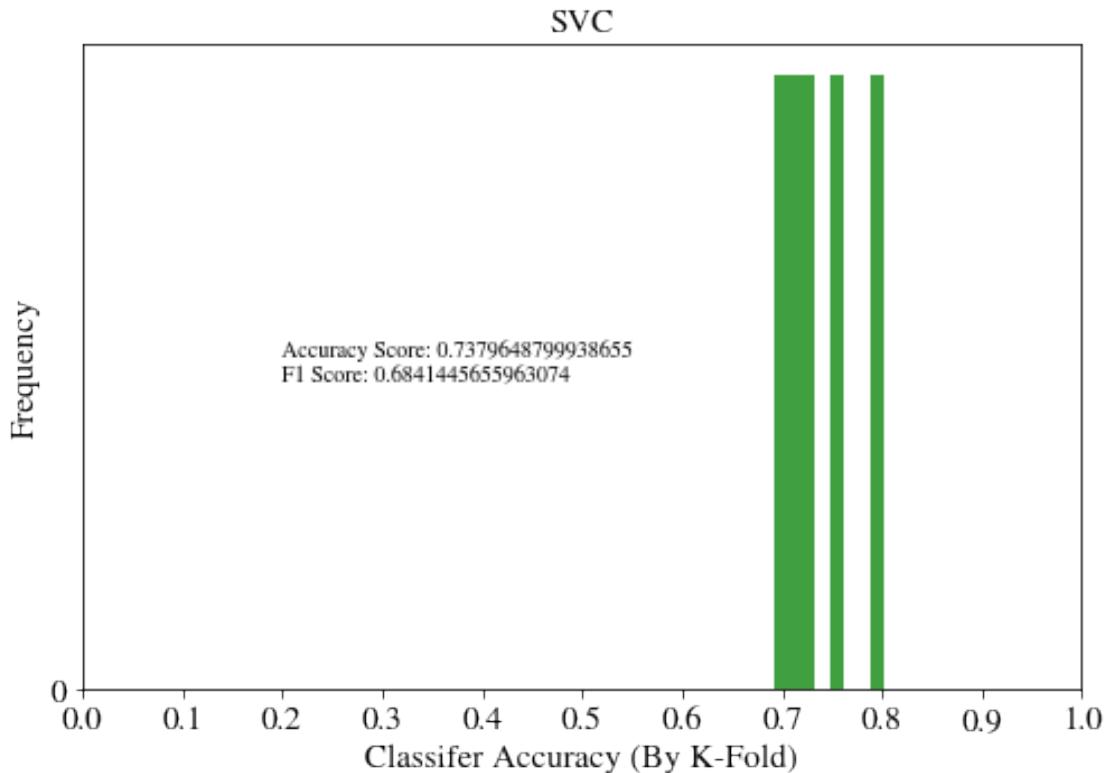
'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split':  

None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf':  

0.0, 'random_state': None, 'splitter': 'best'}]}
*****

```

Processing Model: SVC



```

*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt  

Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in  

lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,  

Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,

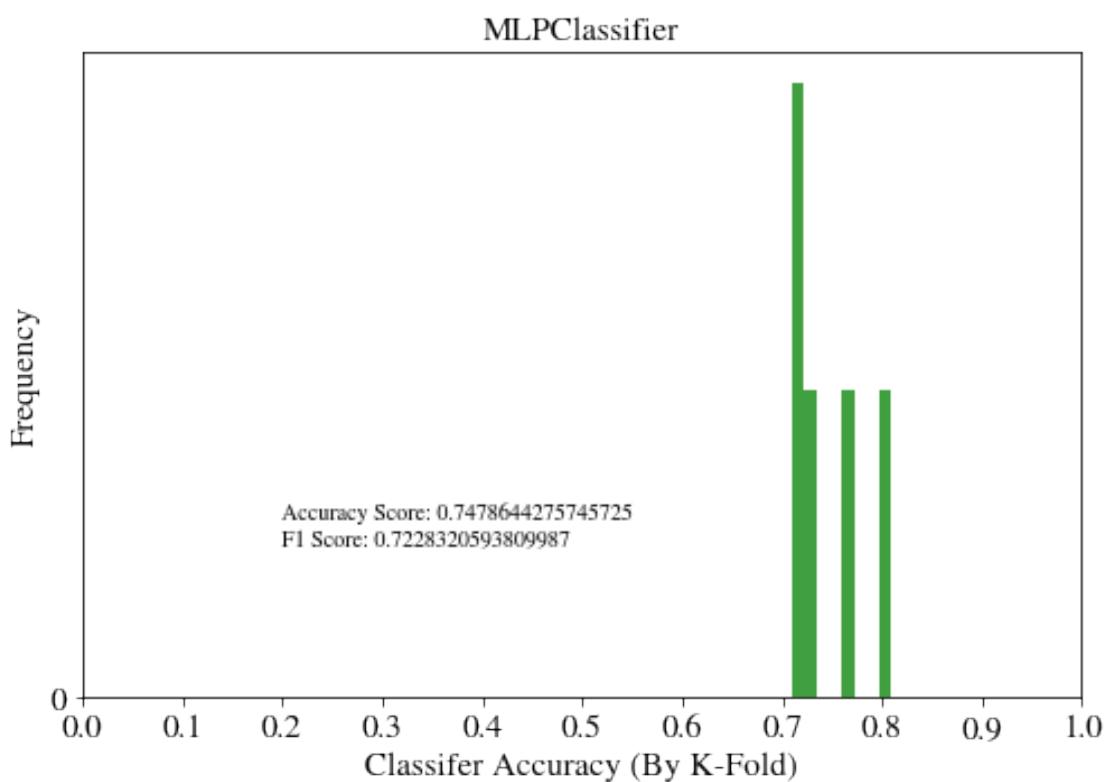
```

```

Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists
diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina
propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal
histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in
lamina propria?, Mild & superficial increase in lamina propria cellularity?,
Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year, Subepithelial
collagen', 'accuracy': [0.691358024691358, 0.7283950617283951,
0.7160493827160493, 0.8024691358024691, 0.7515527950310559], 'avgAccuracy':
0.7379648799938655, 'f1': [0.6299816852700939, 0.6569959308513009,
0.6590775208372501, 0.7615781646724789, 0.7130895263504133], 'avgF1':
0.6841445655963074, 'precision': [0.691358024691358, 0.7283950617283951,
0.7160493827160493, 0.8024691358024691, 0.7515527950310559], 'avgPrecision':
0.7379648799938655, 'recall': [0.691358024691358, 0.7283950617283951,
0.7160493827160493, 0.8024691358024691, 0.7515527950310559], 'avgRecall':
0.7379648799938655, 'params': [{C': 1.0, 'break_ties': False, 'cache_size':
4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr',
'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1,
'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001,
'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year, Subepithelial collagen', 'accuracy': [0.7283950617283951, 0.7222222222222222, 0.7098765432098766, 0.808641975308642, 0.7701863354037267], 'avgAccuracy': 0.7478644275745725, 'f1': [0.7000456342253106, 0.6944224857268335, 0.6881572930955648, 0.7858978241150171, 0.7456370597422673], 'avgF1': 0.7228320593809987, 'precision': [0.7283950617283951, 0.7222222222222222, 0.7098765432098766, 0.808641975308642, 0.7701863354037267], 'avgPrecision': 0.7478644275745725, 'recall': [0.7283950617283951, 0.7222222222222222, 0.7098765432098766, 0.808641975308642, 0.7701863354037267], 'avgRecall': 0.7478644275745725, 'params': [{'activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year, Subepithelial collagen', 'accuracy': [0.8024691358024691, 0.7716049382716049, 0.8024691358024691, 0.8518518518518519, 0.8198757763975155], 'avgAccuracy': 0.8096541676251822, 'f1': [0.7925585561610762, 0.7492156623069715, 0.7892421500929311, 0.8431364129944399, 0.8113240972915401], 'avgF1': 0.7970953757693917, 'precision': [0.8024691358024691, 0.7716049382716049, 0.8024691358024691, 0.8518518518518519, 0.8198757763975155], 'avgPrecision': 0.8096541676251822, 'recall': [0.8024691358024691,
```

```

0.7716049382716049, 0.8024691358024691, 0.8518518518518519, 0.8198757763975155] ,
'avgRecall': 0.8096541676251822, 'params': [ {'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

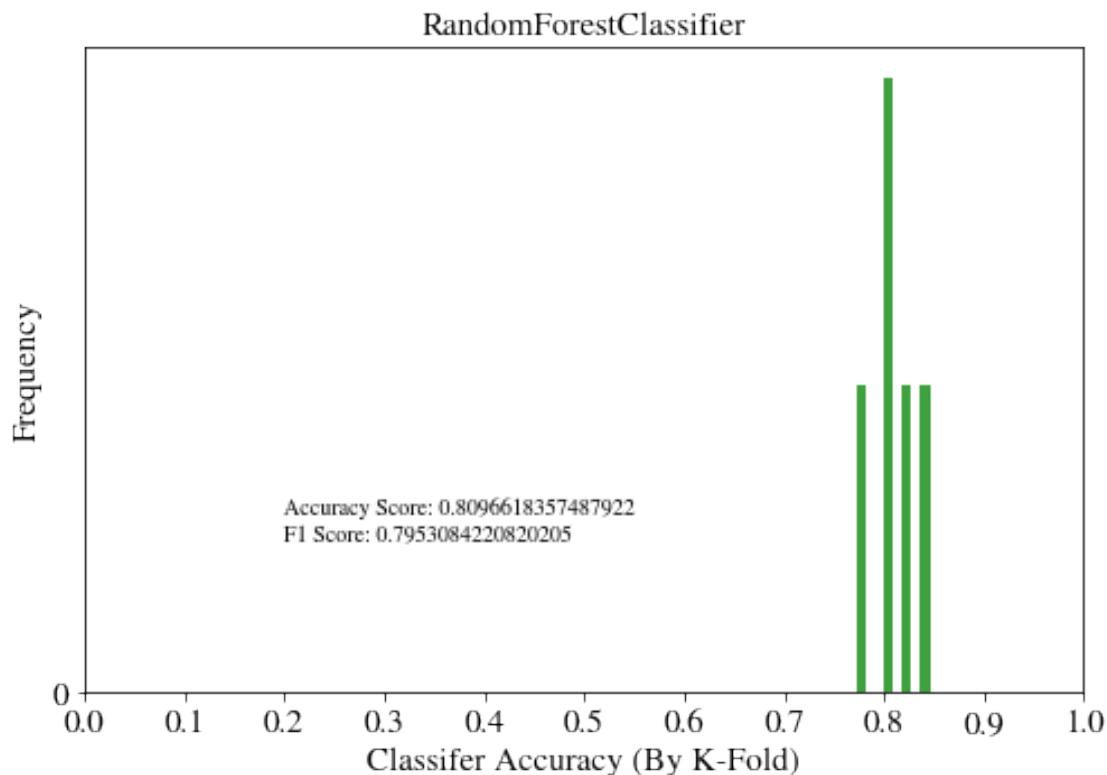
```

	model	features \		
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...		
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...		
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...		
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...		
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...		
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...		
6	SVC	Active inflammation?, Severity of Crypt Arch, ...		
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...		

	accuracy	f1	precision	recall	\
0	0.792363	0.775248	0.792363	0.792363	
1	0.724362	0.690340	0.724362	0.724362	
2	0.746630	0.717708	0.746630	0.746630	
3	0.627935	0.597992	0.627935	0.627935	
4	0.704563	0.708784	0.704563	0.704563	
5	0.660087	0.660704	0.660087	0.660087	
6	0.737965	0.684145	0.737965	0.737965	
7	0.736715	0.704336	0.736715	0.736715	

	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	{'C': 1, 'class_weight': None, 'dual': False, ...
3	{'priors': None, 'var_smoothing': 1e-09}
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...

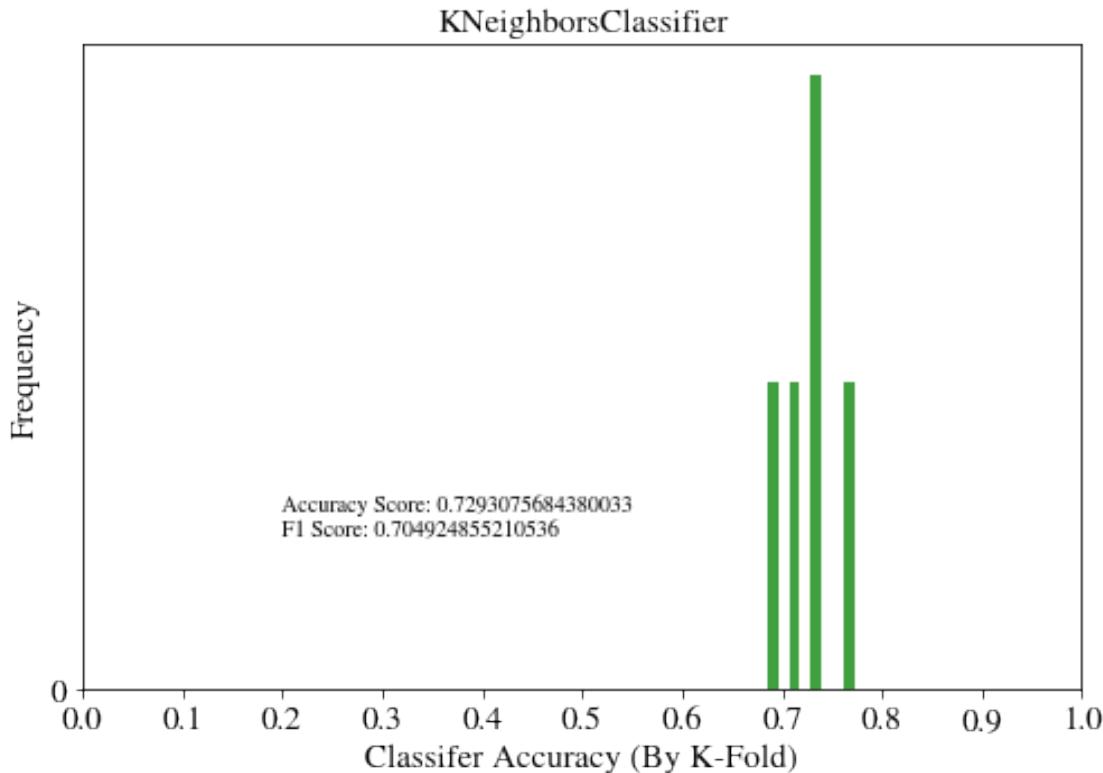
Processing Model: RandomForestClassifier



```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year', 'accuracy': [0.8024691358024691, 0.7716049382716049, 0.8024691358024691, 0.845679012345679, 0.8260869565217391], 'avgAccuracy': 0.8096618357487922, 'f1': [0.7930015953044162, 0.7461158814294129, 0.7853188209102707, 0.8353409533432268, 0.8167648594227758], 'avgF1': 0.7953084220820205, 'precision': [0.8024691358024691, 0.7716049382716049, 0.8024691358024691, 0.845679012345679, 0.8260869565217391], 'avgPrecision': 0.8096618357487922, 'recall': [0.8024691358024691, 0.7716049382716049, 0.8024691358024691, 0.845679012345679, 0.8260869565217391], 'avgRecall': 0.8096618357487922, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0,
```

```
'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 500, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}}
*****
```

Processing Model: KNeighborsClassifier



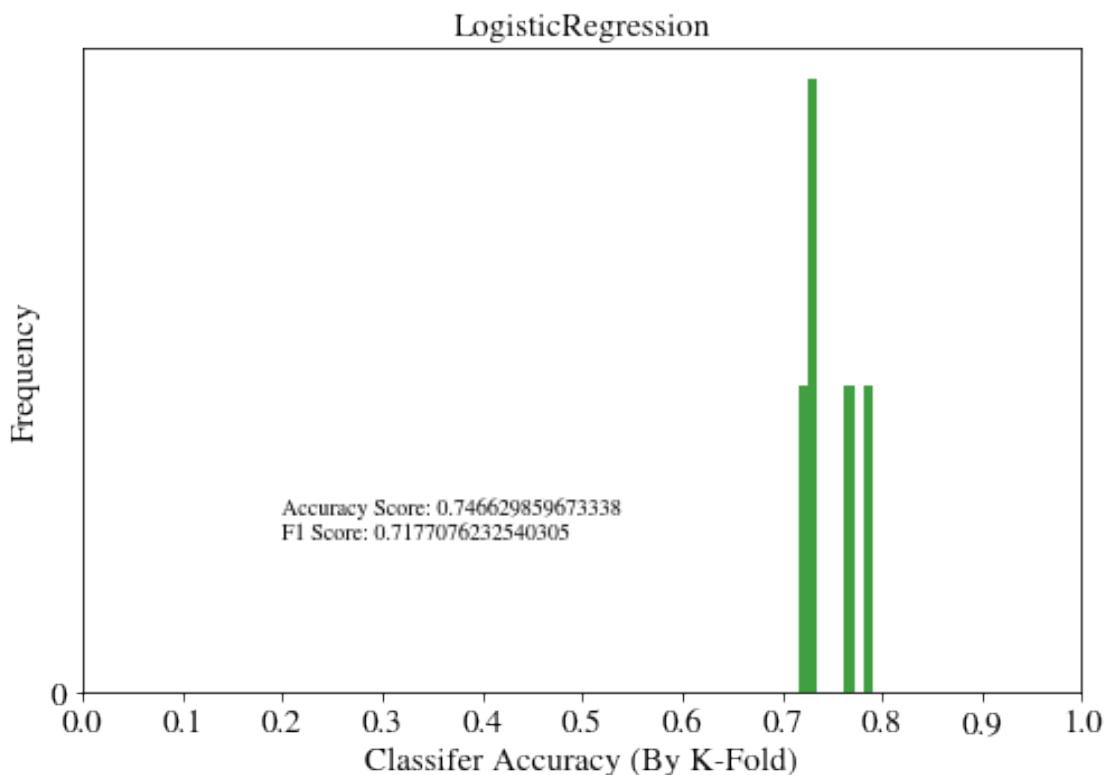
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,  
Lab No, Year', 'accuracy': [0.7160493827160493, 0.6851851851851852,
```

```

0.7345679012345679, 0.7716049382716049, 0.7391304347826086], 'avgAccuracy':
0.7293075684380033, 'f1': [0.6761890996305074, 0.6616916947214572,
0.7107772995058727, 0.7556209913298924, 0.7203451908649506], 'avgF1':
0.704924855210536, 'precision': [0.7160493827160493, 0.6851851851851852,
0.7345679012345679, 0.7716049382716049, 0.7391304347826086], 'avgPrecision':
0.7293075684380033, 'recall': [0.7160493827160493, 0.6851851851851852,
0.7345679012345679, 0.7716049382716049, 0.7391304347826086], 'avgRecall':
0.7293075684380033, 'params': [{'algorithm': 'auto', 'leaf_size': 30, 'metric':
'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 12, 'p': 2,
'weights': 'distance'}]}
*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt

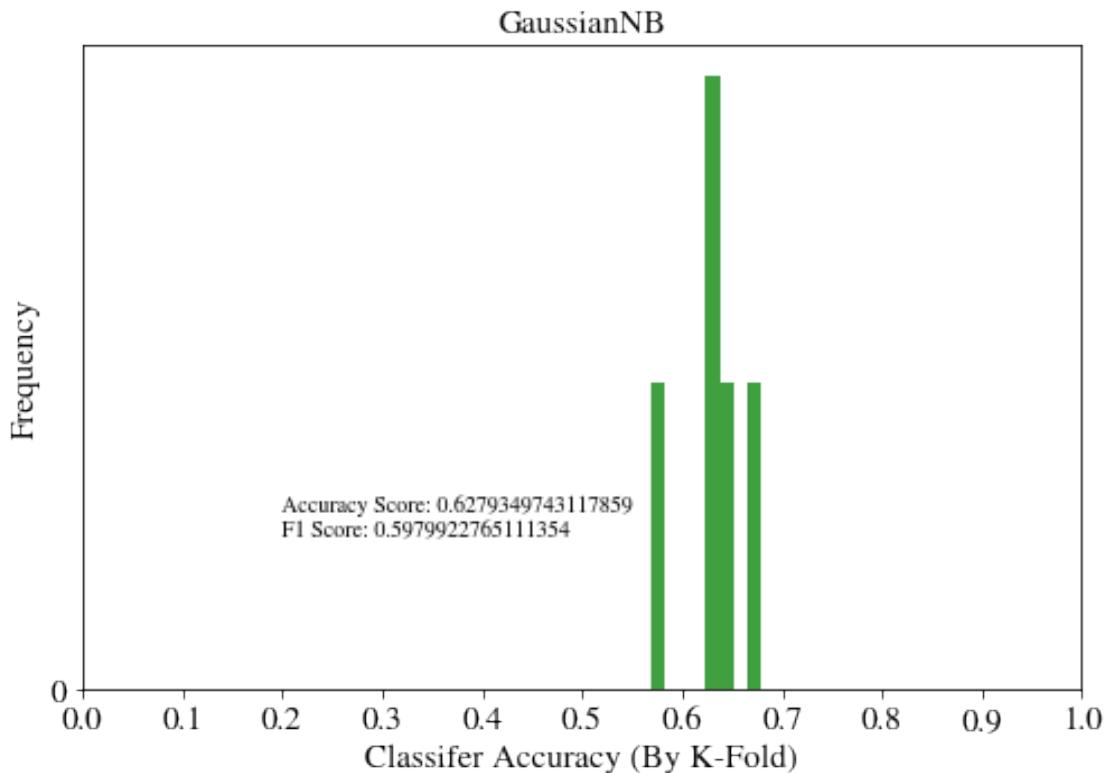
```

```

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,
Lab No, Year', 'accuracy': [0.7283950617283951, 0.7160493827160493,
0.7283950617283951, 0.7901234567901234, 0.7701863354037267], 'avgAccuracy':
0.746629859673338, 'f1': [0.699833174459488, 0.6810868739794413,
0.7008875978374889, 0.7560217746582957, 0.7507086953354385], 'avgF1':
0.7177076232540305, 'precision': [0.7283950617283951, 0.7160493827160493,
0.7283950617283951, 0.7901234567901234, 0.7701863354037267], 'avgPrecision':
0.746629859673338, 'recall': [0.7283950617283951, 0.7160493827160493,
0.7283950617283951, 0.7901234567901234, 0.7701863354037267], 'avgRecall':
0.746629859673338, 'params': [{C: 1, 'class_weight': None, 'dual': False,
'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100,
'multi_class': 'multinomial', 'n_jobs': -1, 'penalty': 'l2',
'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0,
'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```
*****

```

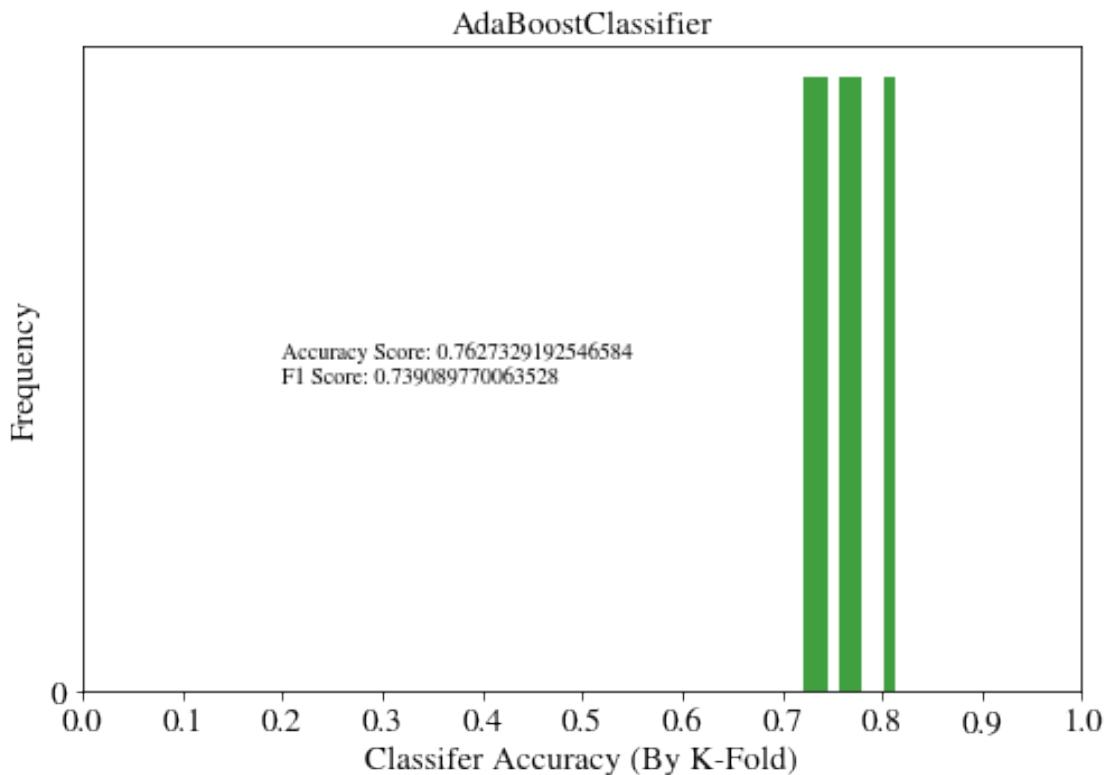
\* GaussianNB

```

* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina
propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No,
Year', 'accuracy': [0.5679012345679012, 0.6234567901234568, 0.6419753086419753,
0.6790123456790124, 0.6273291925465838], 'avgAccuracy': 0.6279349743117859,
'f1': [0.5366536949203194, 0.5779291112946431, 0.6045764195869905,
0.6616356136219576, 0.6091665431317664], 'avgF1': 0.5979922765111354,
'precision': [0.5679012345679012, 0.6234567901234568, 0.6419753086419753,
0.6790123456790124, 0.6273291925465838], 'avgPrecision': 0.6279349743117859,
'recall': [0.5679012345679012, 0.6234567901234568, 0.6419753086419753,
0.6790123456790124, 0.6273291925465838], 'avgRecall': 0.6279349743117859,
'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  

Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  

Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  

lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,  

Lab No, Year', 'accuracy': [0.7777777777777778, 0.7345679012345679,  

0.7222222222222222, 0.7654320987654321, 0.8136645962732919], 'avgAccuracy':  

0.7627329192546584, 'f1': [0.756874065884569, 0.6934539656660759,  

0.7033772092448399, 0.7501131004431336, 0.7916305090790217], 'avgF1':  

0.739089770063528, 'precision': [0.7777777777777778, 0.7345679012345679,  

0.7222222222222222, 0.7654320987654321, 0.8136645962732919], 'avgPrecision':  

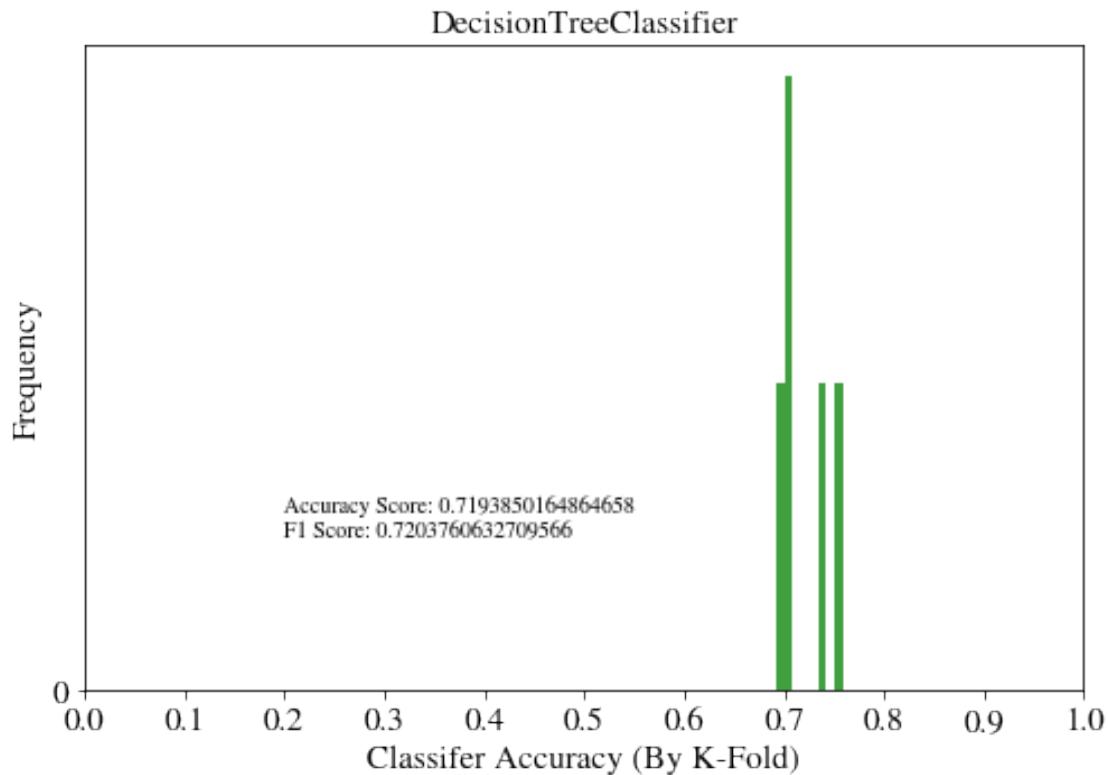
0.7627329192546584, 'recall': [0.7777777777777778, 0.7345679012345679,  

0.7222222222222222, 0.7654320987654321, 0.8136645962732919], 'avgRecall':  

0.7627329192546584, 'params': [{'algorithm': 'SAMME.R', 'base_estimator': None,  

'learning_rate': 1, 'n_estimators': 20, 'random_state': None}]}
*****
```

Processing Model: DecisionTreeClassifier

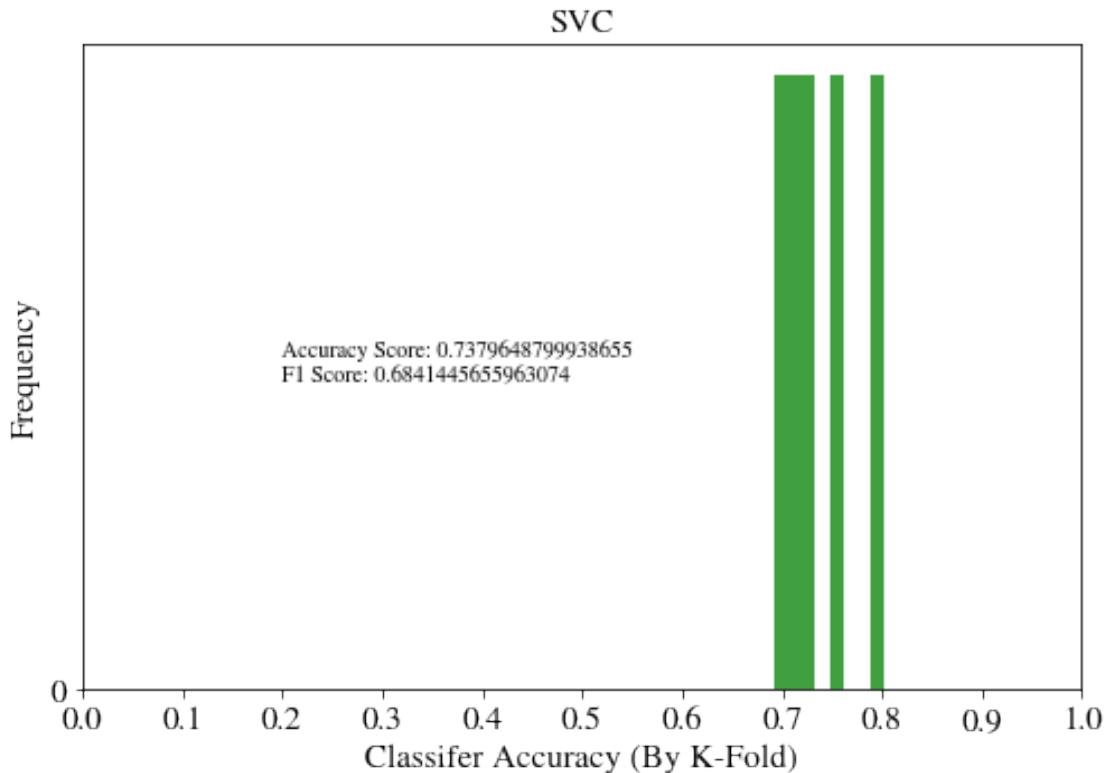


```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year', 'accuracy': [0.691358024691358, 0.7407407407407, 0.7592592592593, 0.7037037037037, 0.7018633540372671], 'avgAccuracy': 0.7193850164864658, 'f1': [0.6922722606625714, 0.7349820865406766, 0.7555820170996322, 0.7090943002544247, 0.7099496517974779], 'avgF1': 0.7203760632709566, 'precision': [0.691358024691358, 0.7407407407407407, 0.7592592592593, 0.7037037037037, 0.7018633540372671], 'avgPrecision': 0.7193850164864658, 'recall': [0.691358024691358, 0.7407407407407407, 0.7592592592593, 0.7037037037037, 0.7018633540372671], 'avgRecall': 0.7193850164864658, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'max_depth': 2, 'max_features': 'sqrt', 'min_samples_leaf': 1, 'min_samples_split': 2, 'random_state': 42, 'splitter': 'best'}]}
```

```
'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2',
'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split':
None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf':
0.0, 'random_state': None, 'splitter': 'best'}]}
*****

```

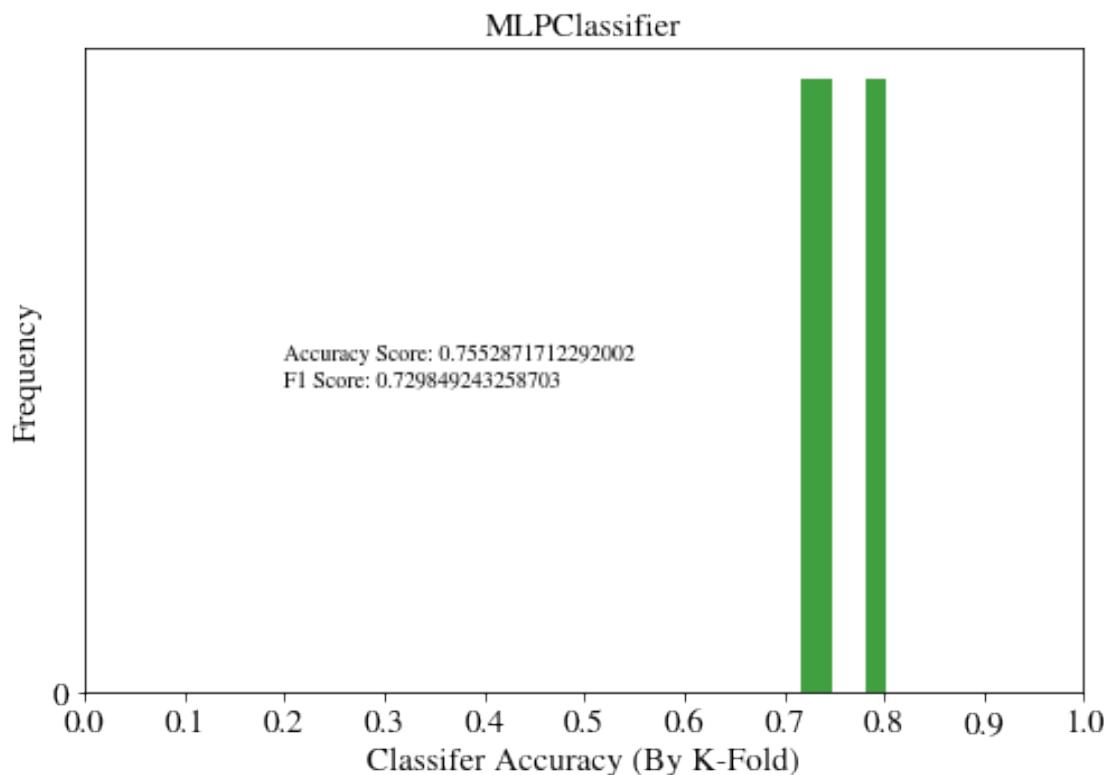
Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year', 'accuracy': [0.691358024691358, 0.7283950617283951, 0.7160493827160493, 0.8024691358024691, 0.7515527950310559], 'avgAccuracy': 0.7379648799938655, 'f1':
```

```
[0.6299816852700939, 0.6569959308513009, 0.6590775208372501, 0.7615781646724789,
0.7130895263504133], 'avgF1': 0.6841445655963074, 'precision':
[0.691358024691358, 0.7283950617283951, 0.7160493827160493, 0.8024691358024691,
0.7515527950310559], 'avgPrecision': 0.7379648799938655, 'recall':
[0.691358024691358, 0.7283950617283951, 0.7160493827160493, 0.8024691358024691,
0.7515527950310559], 'avgRecall': 0.7379648799938655, 'params': [{'C': 1.0,
'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0,
'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':
'linear', 'max_iter': -1, 'probability': False, 'random_state': None,
'shrinking': True, 'tol': 0.001, 'verbose': False}]}}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
```

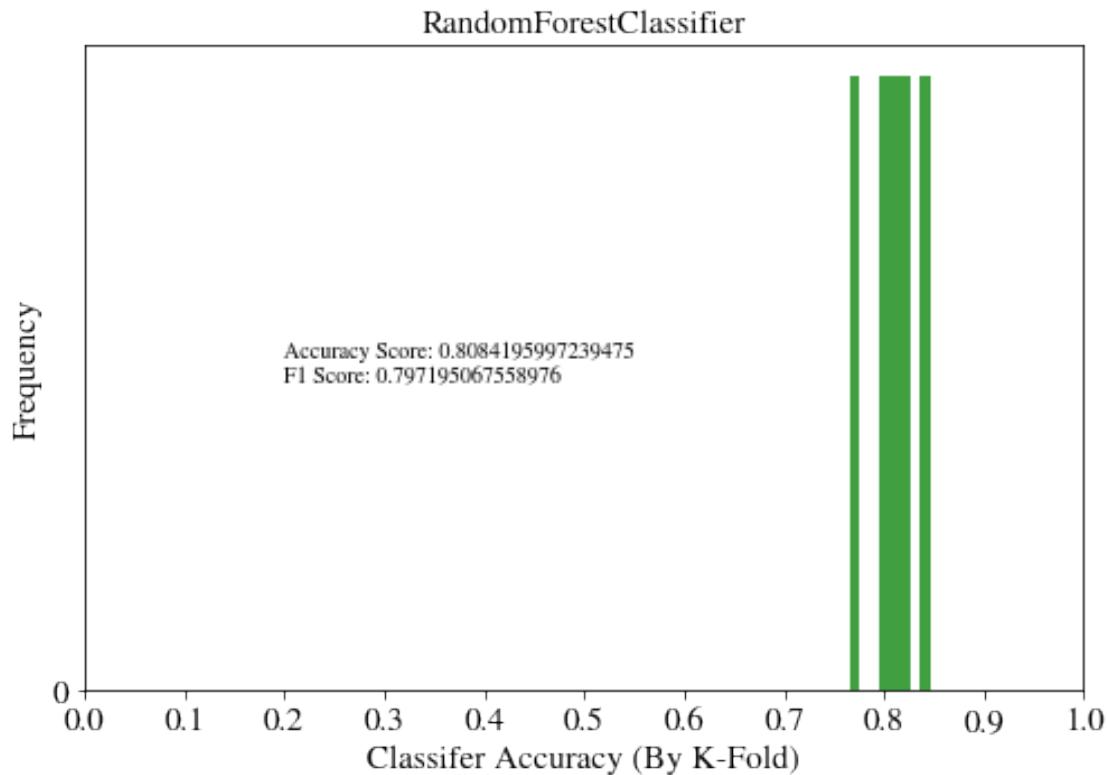
```

polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina
propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No,
Year', 'accuracy': [0.7283950617283951, 0.7160493827160493, 0.7469135802469136,
0.8024691358024691, 0.782608695652174], 'avgAccuracy': 0.7552871712292002, 'f1':
[0.7000456342253106, 0.6850049270555436, 0.7222442287801766, 0.7801126508580241,
0.7618387753744603], 'avgF1': 0.729849243258703, 'precision':
[0.7283950617283951, 0.7160493827160493, 0.7469135802469136, 0.8024691358024691,
0.782608695652174], 'avgPrecision': 0.7552871712292002, 'recall':
[0.7283950617283951, 0.7160493827160493, 0.7469135802469136, 0.8024691358024691,
0.782608695652174], 'avgRecall': 0.7552871712292002, 'params': [{activation':
'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'invscaling', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No, Year', 'accuracy': [0.8024691358024691, 0.7716049382716049, 0.8024691358024691, 0.845679012345679, 0.8260869565217391], 'avgAccuracy': 0.8096618357487922, 'f1': [0.7930015953044162, 0.7461158814294129, 0.7853188209102707, 0.8353409533432268, 0.8167648594227758], 'avgF1': 0.7953084220820205, 'precision': [0.8024691358024691, 0.7716049382716049, 0.8024691358024691, 0.845679012345679, 0.8260869565217391], 'avgPrecision': 0.8096618357487922, 'recall': [0.8024691358024691, 0.7716049382716049, 0.8024691358024691, 0.845679012345679, 0.8260869565217391], 'avgRecall': 0.8096618357487922, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 500, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

	model	features \		
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...		
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...		
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...		
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...		
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...		
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...		
6	SVC	Active inflammation?, Severity of Crypt Arch, ...		
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...		
		accuracy	f1	precision
		recall	\	
0	0.798535	0.784459	0.798535	0.798535
1	0.724362	0.690340	0.724362	0.724362
2	0.746630	0.717708	0.746630	0.746630
3	0.627935	0.597992	0.627935	0.627935
4	0.704563	0.708784	0.704563	0.704563
5	0.684802	0.686611	0.684802	0.684802
6	0.737965	0.684145	0.737965	0.737965
7	0.746615	0.723976	0.746615	0.746615
		params		
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...			
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...			
2	{'C': 1, 'class_weight': None, 'dual': False, ...			
3	{'priors': None, 'var_smoothing': 1e-09}			
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...			
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...			
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...			
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...			

Processing Model: RandomForestClassifier

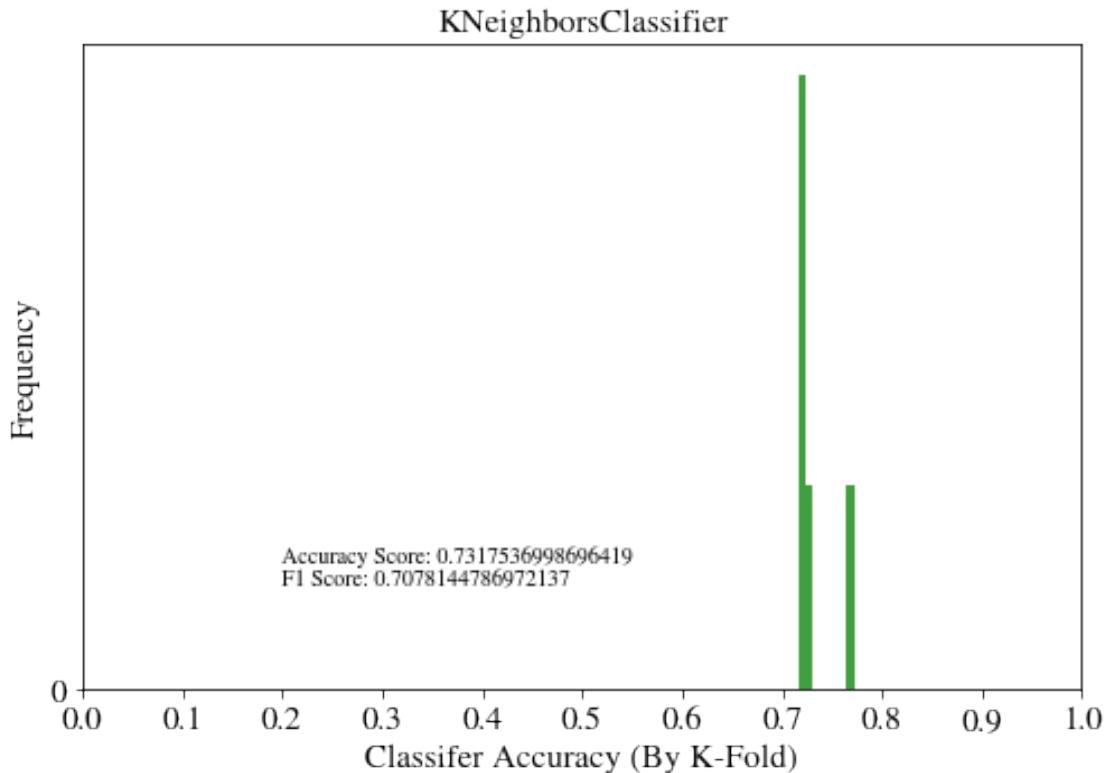


```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No', 'accuracy': [0.808641975308642, 0.7654320987654321, 0.8024691358024691, 0.845679012345679, 0.8198757763975155], 'avgAccuracy': 0.8084195997239475, 'f1': [0.7962789483846832, 0.7446224668823539, 0.7964207217679439, 0.8302317840716533, 0.8184214166882456], 'avgF1': 0.797195067558976, 'precision': [0.808641975308642, 0.7654320987654321, 0.8024691358024691, 0.845679012345679, 0.8198757763975155], 'avgPrecision': 0.8084195997239475, 'recall': [0.808641975308642, 0.7654320987654321, 0.8024691358024691, 0.845679012345679, 0.8198757763975155], 'avgRecall': 0.8084195997239475, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy',
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```
'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None,
'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None,
'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0,
'n_estimators': 500, 'n_jobs': -1, 'oob_score': False, 'random_state': None,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,  
Lab No', 'accuracy': [0.7222222222222222, 0.7160493827160493,
```

```

0.7283950617283951, 0.7716049382716049, 0.7204968944099379], 'avgAccuracy':  

0.7317536998696419, 'f1': [0.6898445358939187, 0.6915087066368815,  

0.7003901073648613, 0.7489204985984375, 0.7084085449919695], 'avgF1':  

0.7078144786972137, 'precision': [0.7222222222222222, 0.7160493827160493,  

0.7283950617283951, 0.7716049382716049, 0.7204968944099379], 'avgPrecision':  

0.7317536998696419, 'recall': [0.7222222222222222, 0.7160493827160493,  

0.7283950617283951, 0.7716049382716049, 0.7204968944099379], 'avgRecall':  

0.7317536998696419, 'params': [{'algorithm': 'auto', 'leaf_size': 30, 'metric':  

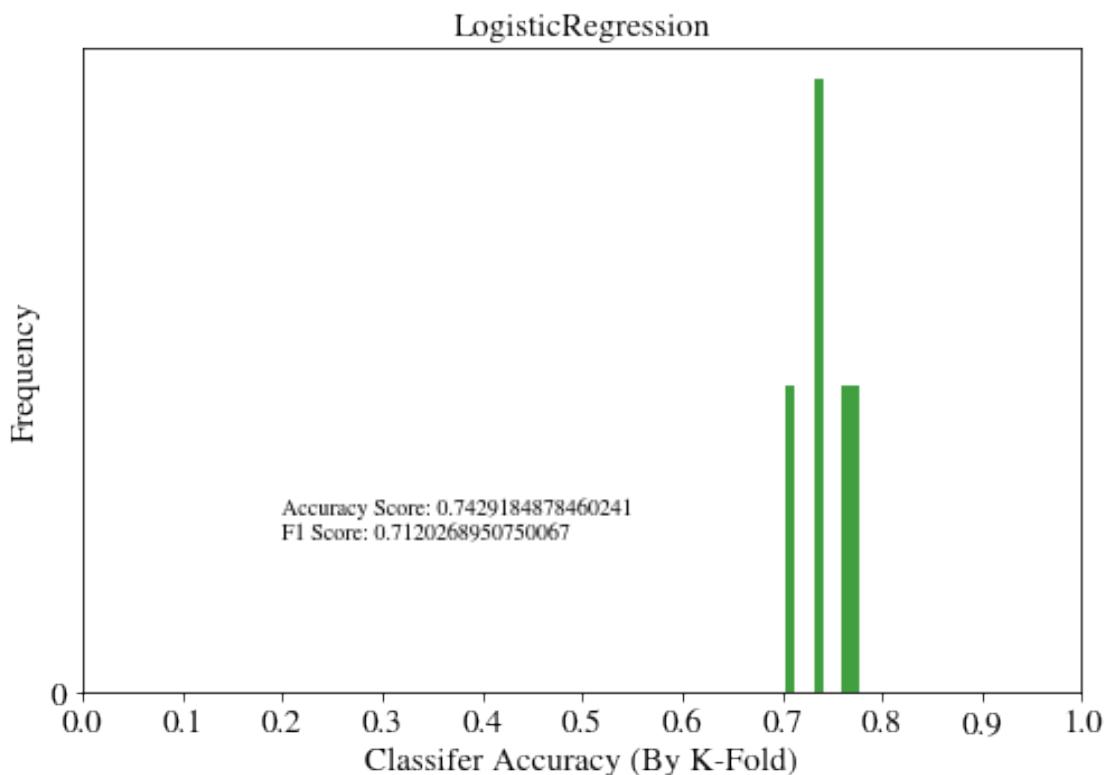
'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 12, 'p': 2,  

'weights': 'distance'}]}]  

*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

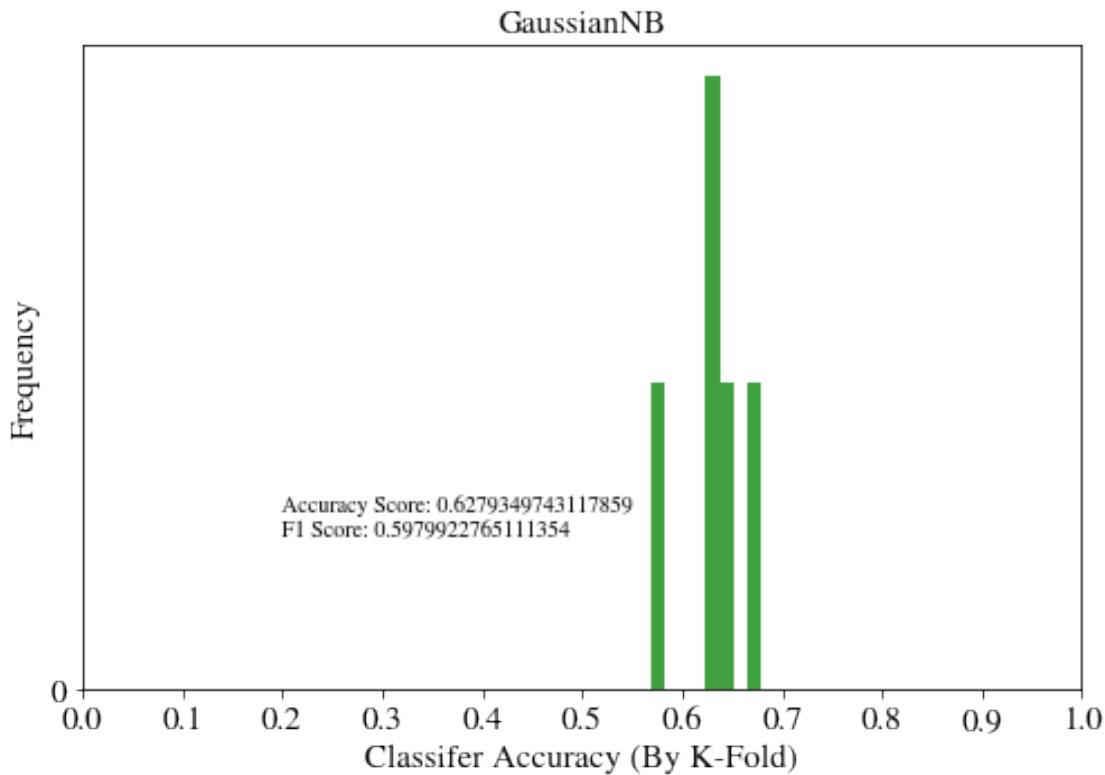
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt

```

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No', 'accuracy': [0.7345679012345679, 0.7037037037037037, 0.7345679012345679, 0.7777777777777778, 0.7639751552795031], 'avgAccuracy': 0.7429184878460241, 'f1': [0.7051953635701563, 0.6655425274520752, 0.6994138588405728, 0.7453680182231989, 0.7446147072890306], 'avgF1': 0.7120268950750067, 'precision': [0.7345679012345679, 0.7037037037037037, 0.7345679012345679, 0.7777777777777778, 0.7639751552795031], 'avgPrecision': 0.7429184878460241, 'recall': [0.7345679012345679, 0.7037037037037037, 0.7345679012345679, 0.7777777777777778, 0.7639751552795031], 'avgRecall': 0.7429184878460241, 'params': [{C': 1, 'class\_weight': None, 'dual': False, 'fit\_intercept': True, 'intercept\_scaling': 1, 'l1\_ratio': None, 'max\_iter': 100, 'multi\_class': 'ovr', 'n\_jobs': -1, 'penalty': 'l2', 'random\_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm\_start': False}]}  
\*\*\*\*\*

Processing Model: GaussianNB



\*\*\*\*\*

\* GaussianNB

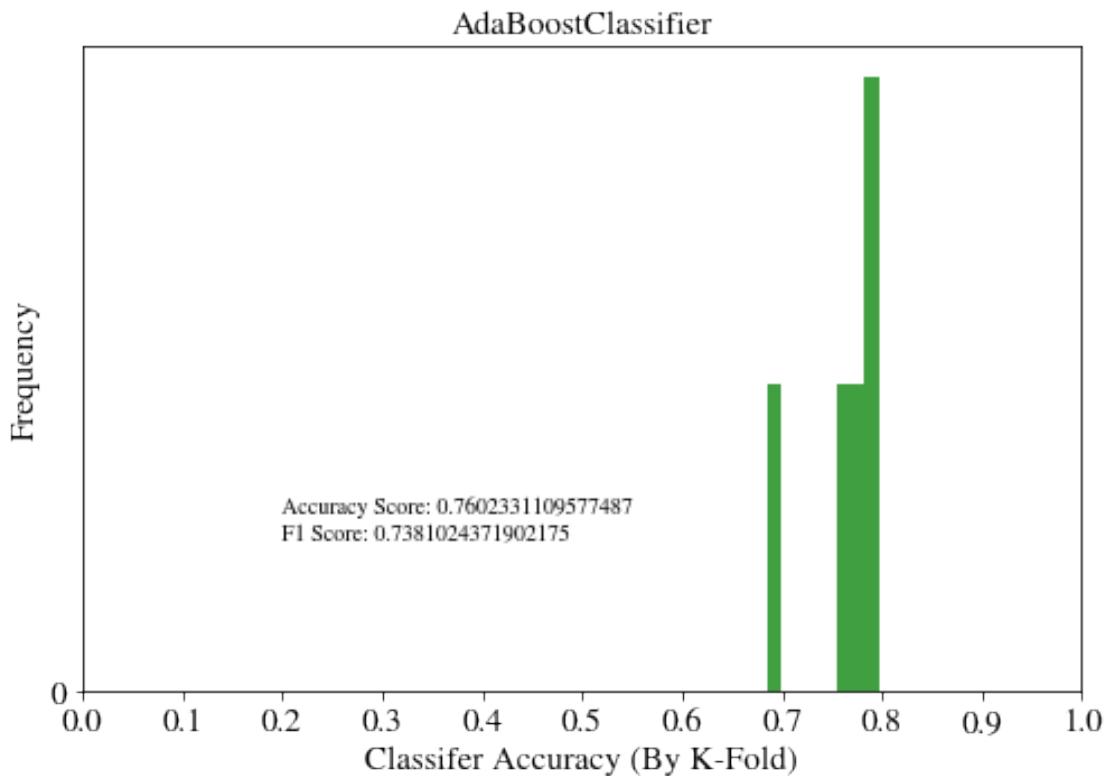
\* Best Params Result:

```

* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina
propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No',
'accuracy': [0.5679012345679012, 0.6234567901234568, 0.6419753086419753,
0.6790123456790124, 0.6273291925465838], 'avgAccuracy': 0.6279349743117859,
'f1': [0.5366536949203194, 0.5779291112946431, 0.6045764195869905,
0.6616356136219576, 0.6091665431317664], 'avgF1': 0.5979922765111354,
'precision': [0.5679012345679012, 0.6234567901234568, 0.6419753086419753,
0.6790123456790124, 0.6273291925465838], 'avgPrecision': 0.6279349743117859,
'recall': [0.5679012345679012, 0.6234567901234568, 0.6419753086419753,
0.6790123456790124, 0.6273291925465838], 'avgRecall': 0.6279349743117859,
'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****

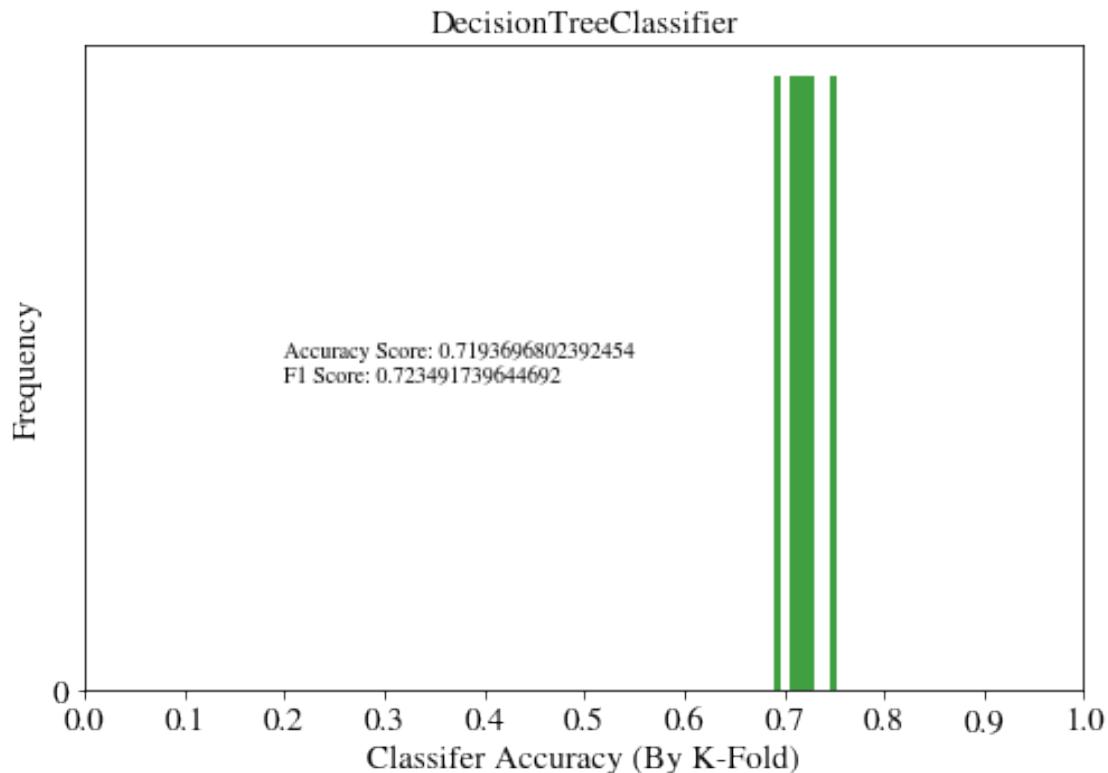
```

Processing Model: AdaBoostClassifier



```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,  
Lab No', 'accuracy': [0.7716049382716049, 0.7592592592593,  
0.6851851851852, 0.7962962962962963, 0.7888198757763976], 'avgAccuracy':  
0.7602331109577487, 'f1': [0.7519021354567755, 0.7433883968275503,  
0.6638359326670793, 0.7637656532293443, 0.7676200677703383], 'avgF1':  
0.7381024371902175, 'precision': [0.7716049382716049, 0.7592592592593,  
0.6851851851852, 0.7962962962962963, 0.7888198757763976], 'avgPrecision':  
0.7602331109577487, 'recall': [0.7716049382716049, 0.7592592592593,  
0.6851851851852, 0.7962962962962963, 0.7888198757763976], 'avgRecall':  
0.7602331109577487, 'params': [{'algorithm': 'SAMME.R', 'base_estimator': None,  
'learning_rate': 1, 'n_estimators': 20, 'random_state': None}]}}
*****
```

Processing Model: DecisionTreeClassifier

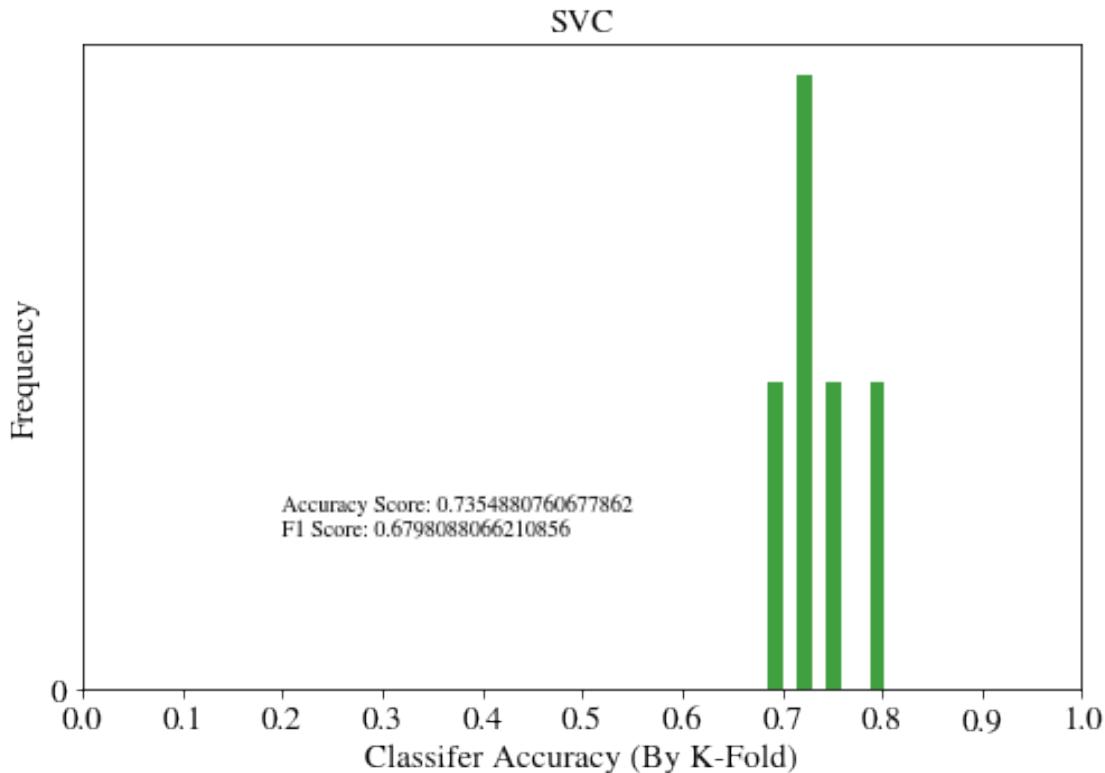


```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No', 'accuracy': [0.7098765432098766, 0.7160493827160493, 0.7283950617283951, 0.7530864197530864, 0.6894409937888198], 'avgAccuracy': 0.7193696802392454, 'f1': [0.706706101140463, 0.723823997374373, 0.7287349776828081, 0.7544786356284421, 0.703714986397374], 'avgF1': 0.723491739644692, 'precision': [0.7098765432098766, 0.7160493827160493, 0.7283950617283951, 0.7530864197530864, 0.6894409937888198], 'avgPrecision': 0.7193696802392454, 'recall': [0.7098765432098766, 0.7160493827160493, 0.7283950617283951, 0.7530864197530864, 0.6894409937888198], 'avgRecall': 0.7193696802392454, 'params': [{'ccp_alpha': 0.0, 'class_weight': None},
```

```
'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt',
'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split':
None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf':
0.0, 'random_state': None, 'splitter': 'best'}]}
*****

```

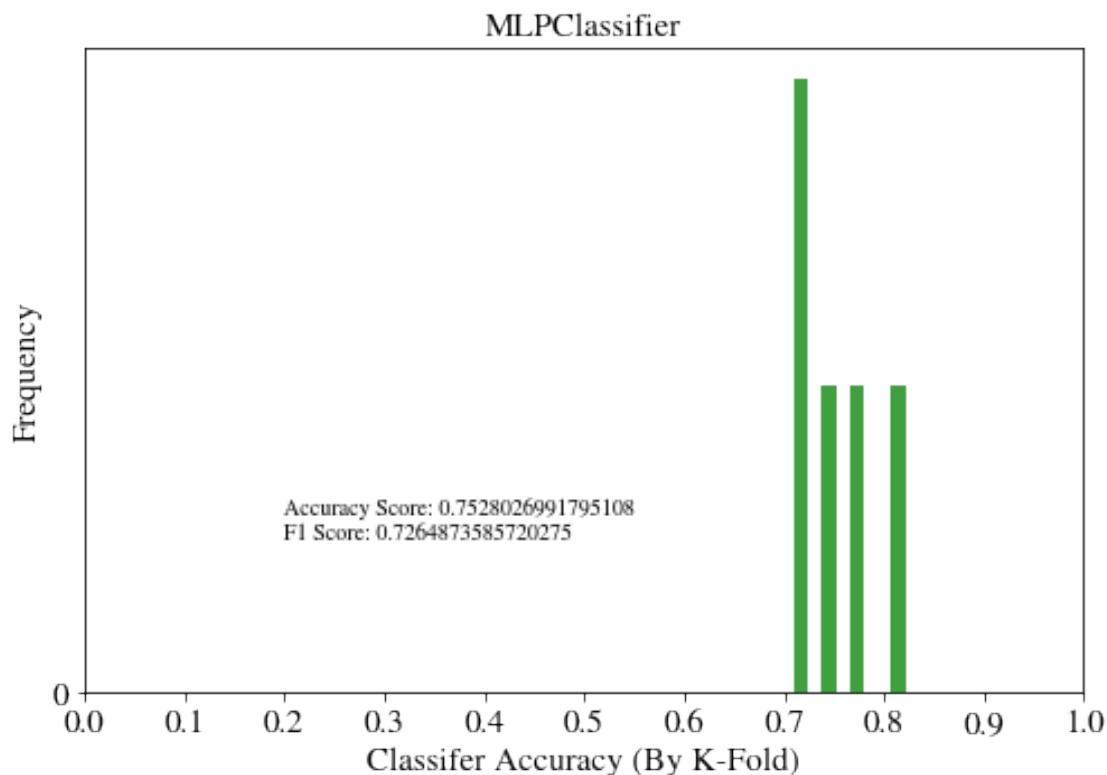
Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No', 'accuracy': [0.6851851851852, 0.7283950617283951, 0.7160493827160493, 0.8024691358024691, 0.7453416149068323], 'avgAccuracy': 0.7354880760677862, 'f1':
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```
[0.6247762365811498, 0.6567102977690645, 0.6587090548281654, 0.7615457491672244,
0.6973026947598235], 'avgF1': 0.6798088066210856, 'precision':
[0.6851851851851852, 0.7283950617283951, 0.7160493827160493, 0.8024691358024691,
0.7453416149068323], 'avgPrecision': 0.7354880760677862, 'recall':
[0.6851851851851852, 0.7283950617283951, 0.7160493827160493, 0.8024691358024691,
0.7453416149068323], 'avgRecall': 0.7354880760677862, 'params': [{ 'C': 1.0,
'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0,
'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':
'linear', 'max_iter': -1, 'probability': False, 'random_state': None,
'shrinking': True, 'tol': 0.001, 'verbose': False}]}}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
```

```

polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina
propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles, Lab No',
'accuracy': [0.7098765432098766, 0.7222222222222222, 0.7407407407407407,
0.8209876543209876, 0.7701863354037267], 'avgAccuracy': 0.7528026991795108,
'f1': [0.6794688245668639, 0.686596415973897, 0.7173384499533737,
0.8041358310206599, 0.744897271345343], 'avgF1': 0.7264873585720275,
'precision': [0.7098765432098766, 0.7222222222222222, 0.7407407407407407,
0.8209876543209876, 0.7701863354037267], 'avgPrecision': 0.7528026991795108,
'recall': [0.7098765432098766, 0.7222222222222222, 0.7407407407407407,
0.8209876543209876, 0.7701863354037267], 'avgRecall': 0.7528026991795108,
'params': [{activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto',
'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08,
'hidden_layer_sizes': (100,), 'learning_rate': 'constant', 'learning_rate_init':
0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change':
10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle':
True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose':
False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles,
Lab No', 'accuracy': [0.808641975308642, 0.7654320987654321, 0.8024691358024691,
0.845679012345679, 0.8198757763975155], 'avgAccuracy': 0.8084195997239475, 'f1':
[0.7962789483846832, 0.7446224668823539, 0.7964207217679439, 0.8302317840716533,
0.8184214166882456], 'avgF1': 0.797195067558976, 'precision':
[0.808641975308642, 0.7654320987654321, 0.8024691358024691, 0.845679012345679,
0.8198757763975155], 'avgPrecision': 0.8084195997239475, 'recall':
[0.808641975308642, 0.7654320987654321, 0.8024691358024691, 0.845679012345679,
0.8198757763975155], 'avgRecall': 0.8084195997239475, 'params': [{bootstrap':
True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy',
'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None,
'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None,
'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0,
'n_estimators': 500, 'n_jobs': -1, 'oob_score': False, 'random_state': None,
'verbose': 0, 'warm_start': False}]}
*****

```

	model	features	\
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...	
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...	
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...	
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...	
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...	
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...	
6	SVC	Active inflammation?, Severity of Crypt Arch, ...	
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...	

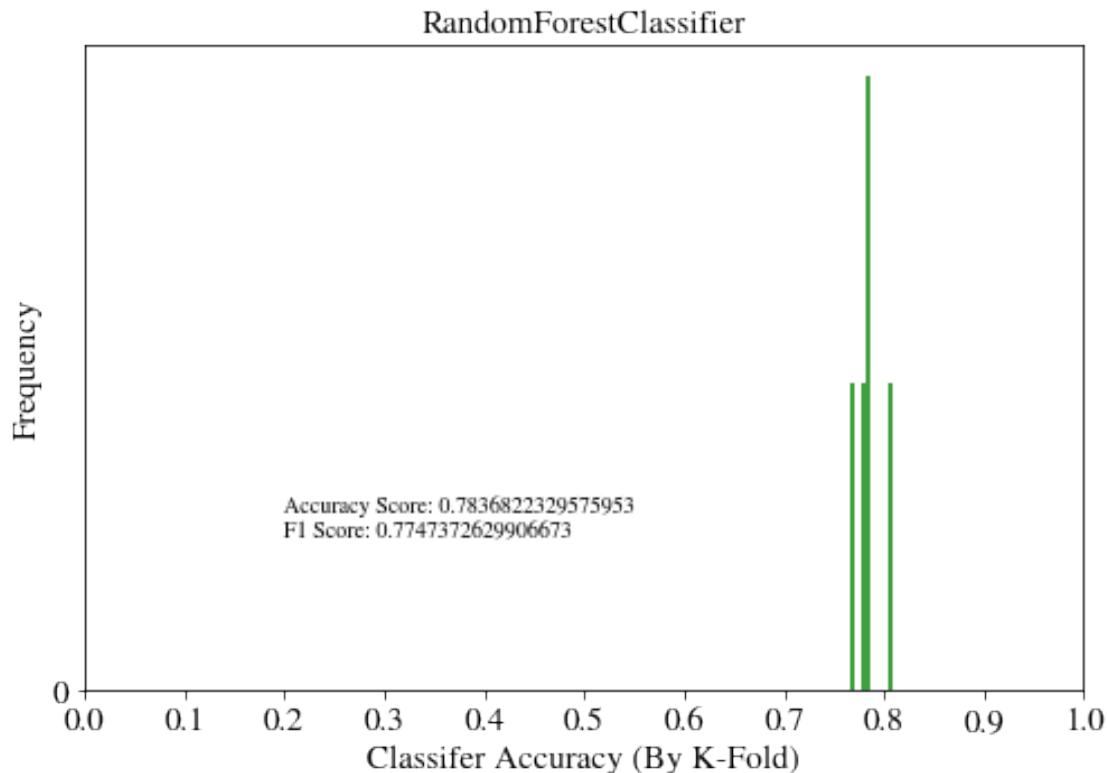
  

	accuracy	f1	precision	recall	\
0	0.793559	0.779351	0.793559	0.793559	
1	0.726823	0.691400	0.726823	0.726823	
2	0.740457	0.709019	0.740457	0.740457	
3	0.627935	0.597992	0.627935	0.627935	
4	0.713220	0.718220	0.713220	0.713220	
5	0.690952	0.690456	0.690952	0.690952	
6	0.735488	0.679809	0.735488	0.735488	
7	0.742903	0.714579	0.742903	0.742903	

	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	{'C': 1, 'class_weight': None, 'dual': False, ...
3	{'priors': None, 'var_smoothing': 1e-09}
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...

Processing Model: RandomForestClassifier

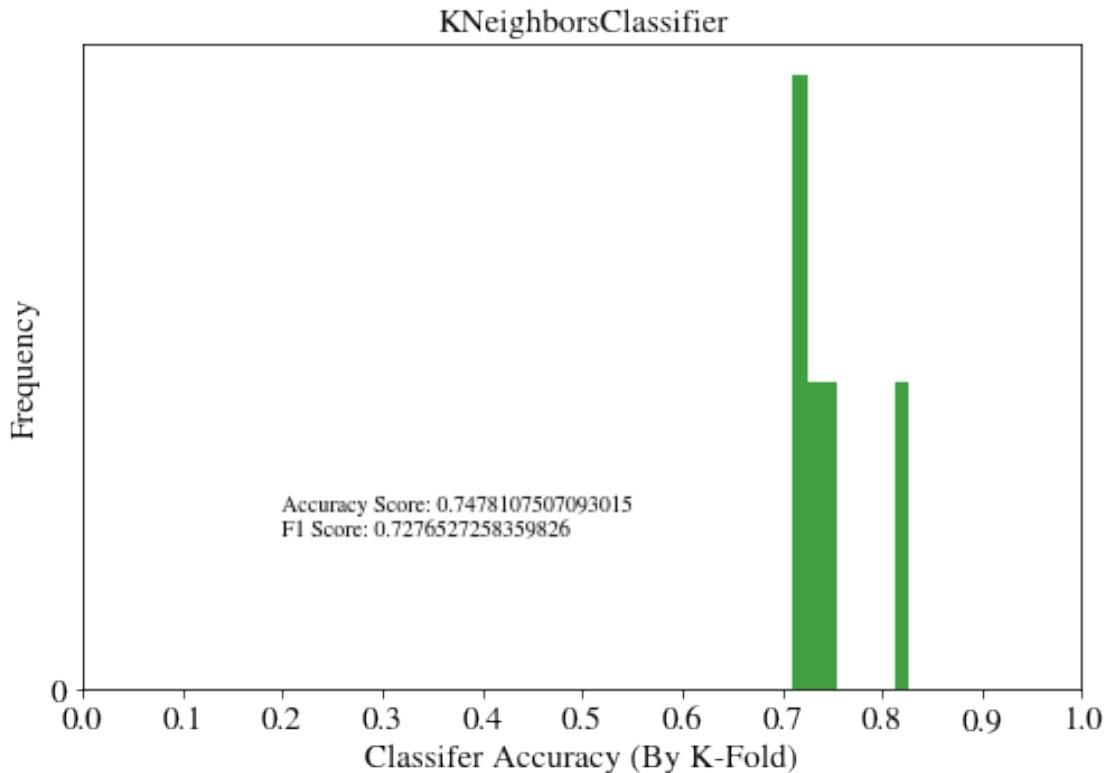


```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles', 'accuracy': [0.7777777777777778, 0.7654320987654321, 0.7839506172839507, 0.808641975308642, 0.782608695652174], 'avgAccuracy': 0.7836822329575953, 'f1': [0.7649507429518596, 0.7489167991388527, 0.7811684126791516, 0.7980946596423862, 0.780555700541086], 'avgF1': 0.7747372629906673, 'precision': [0.7777777777777778, 0.7654320987654321, 0.7839506172839507, 0.808641975308642, 0.782608695652174], 'avgPrecision': 0.7836822329575953, 'recall': [0.7777777777777778, 0.7654320987654321, 0.7839506172839507, 0.808641975308642, 0.782608695652174], 'avgRecall': 0.7836822329575953, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy',
```

```
'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None,
'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None,
'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0,
'n_estimators': 700, 'n_jobs': -1, 'oob_score': False, 'random_state': None,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



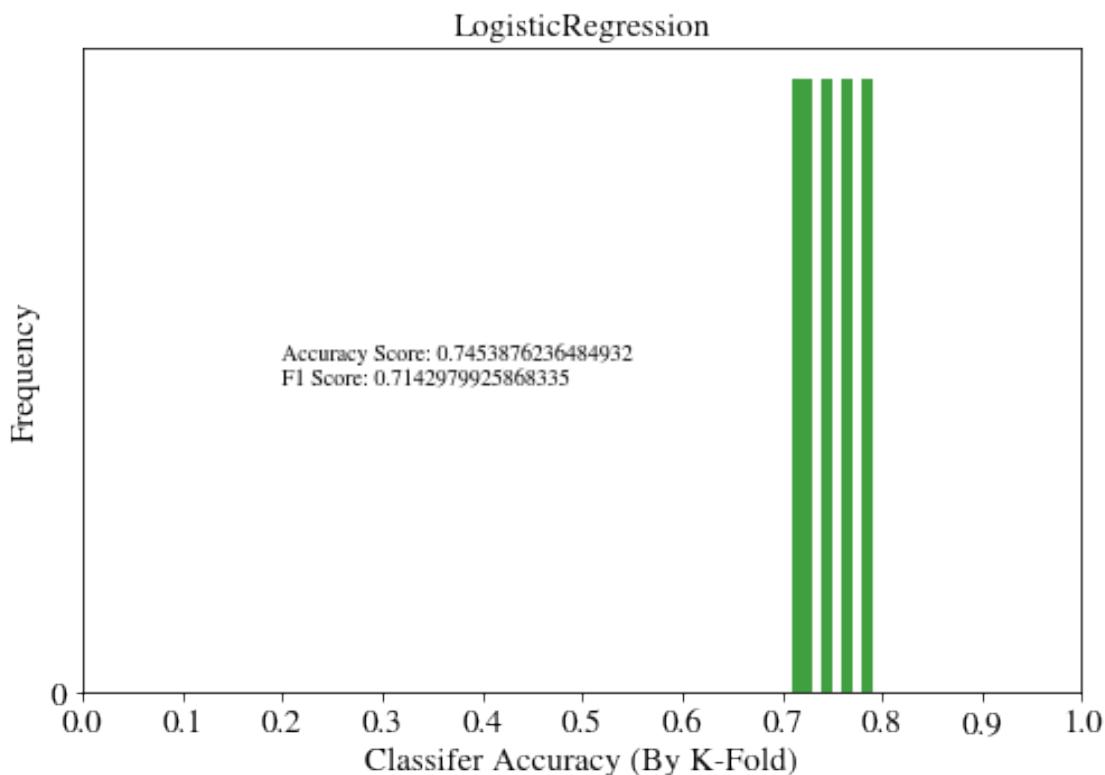
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles',  
'accuracy': [0.7222222222222222, 0.7098765432098766, 0.7530864197530864,
```

```

0.8271604938271605, 0.7267080745341615], 'avgAccuracy': 0.7478107507093015,
'f1': [0.6944367300481468, 0.6873991112668157, 0.7321643933933605,
0.8088803361845122, 0.715383058287078], 'avgF1': 0.7276527258359826,
'precision': [0.7222222222222222, 0.7098765432098766, 0.7530864197530864,
0.8271604938271605, 0.7267080745341615], 'avgPrecision': 0.7478107507093015,
'recall': [0.7222222222222222, 0.7098765432098766, 0.7530864197530864,
0.8271604938271605, 0.7267080745341615], 'avgRecall': 0.7478107507093015,
'params': [{algorithm': 'ball_tree', 'leaf_size': 30, 'metric': 'minkowski',
'metric_params': None, 'n_jobs': -1, 'n_neighbors': 16, 'p': 2, 'weights':
'distance'}]}
*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt

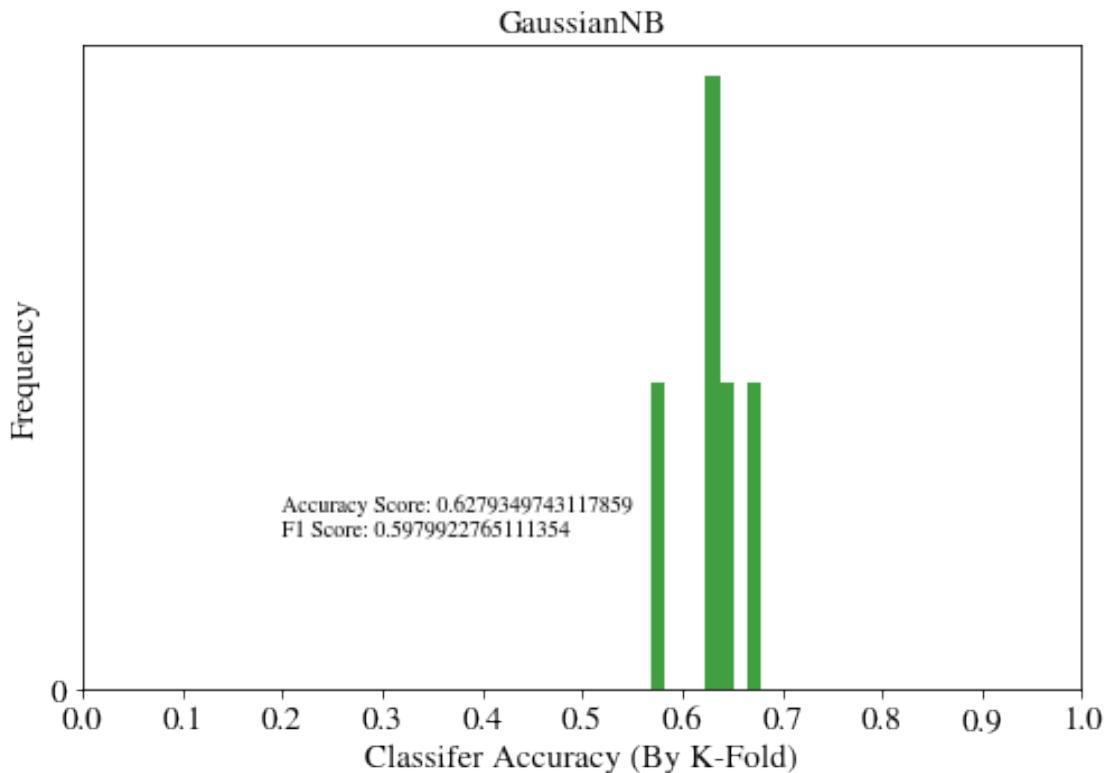
```

```

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in
lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles',
'accuracy': [0.7222222222222222, 0.7098765432098766, 0.7407407407407407,
0.7901234567901234, 0.7639751552795031], 'avgAccuracy': 0.7453876236484932,
'f1': [0.6908352445550514, 0.6752552467072781, 0.7036521859071018,
0.7577002366315833, 0.744047049133153], 'avgF1': 0.7142979925868335,
'precision': [0.7222222222222222, 0.7098765432098766, 0.7407407407407407,
0.7901234567901234, 0.7639751552795031], 'avgPrecision': 0.7453876236484932,
'recall': [0.7222222222222222, 0.7098765432098766, 0.7407407407407407,
0.7901234567901234, 0.7639751552795031], 'avgRecall': 0.7453876236484932,
'params': [{C': 1, 'class_weight': None, 'dual': False, 'fit_intercept': True,
'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class':
'multinomial', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver':
'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```
*****

```

\* GaussianNB

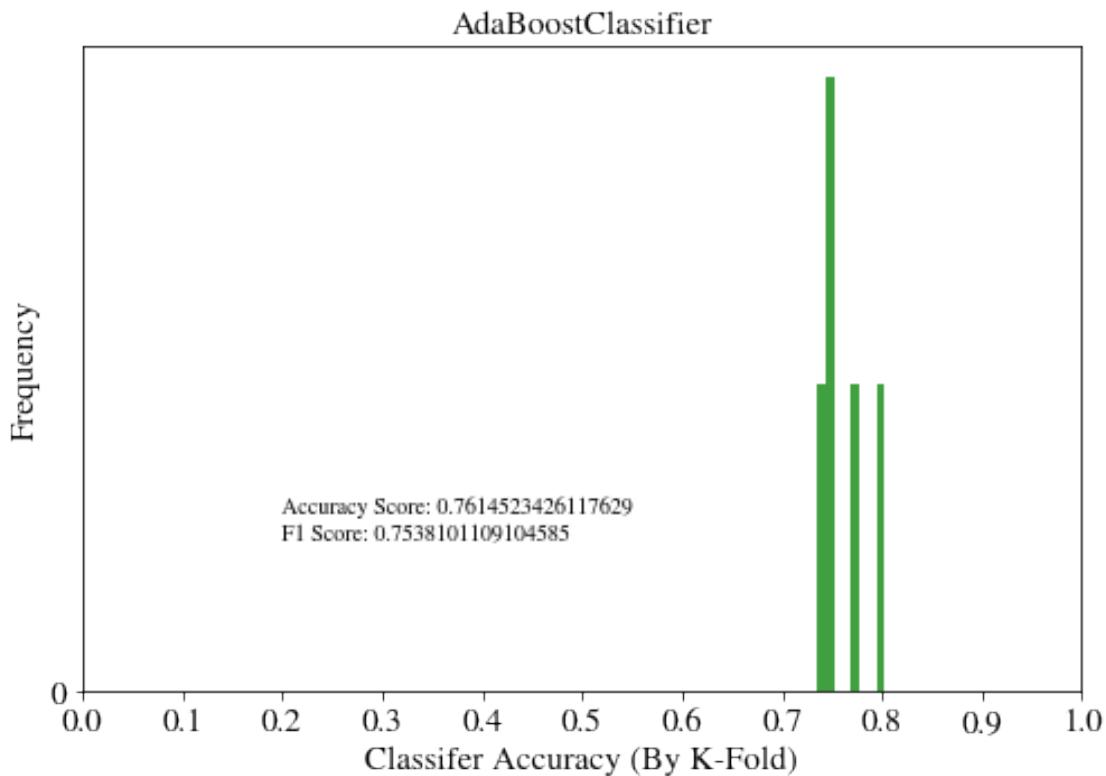
\* Best Params Result:

```

* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina
propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles',
'accuracy': [0.5679012345679012, 0.6234567901234568, 0.6419753086419753,
0.6790123456790124, 0.6273291925465838], 'avgAccuracy': 0.6279349743117859,
'f1': [0.5366536949203194, 0.5779291112946431, 0.6045764195869905,
0.6616356136219576, 0.6091665431317664], 'avgF1': 0.5979922765111354,
'precision': [0.5679012345679012, 0.6234567901234568, 0.6419753086419753,
0.6790123456790124, 0.6273291925465838], 'avgPrecision': 0.6279349743117859,
'recall': [0.5679012345679012, 0.6234567901234568, 0.6419753086419753,
0.6790123456790124, 0.6273291925465838], 'avgRecall': 0.6279349743117859,
'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****

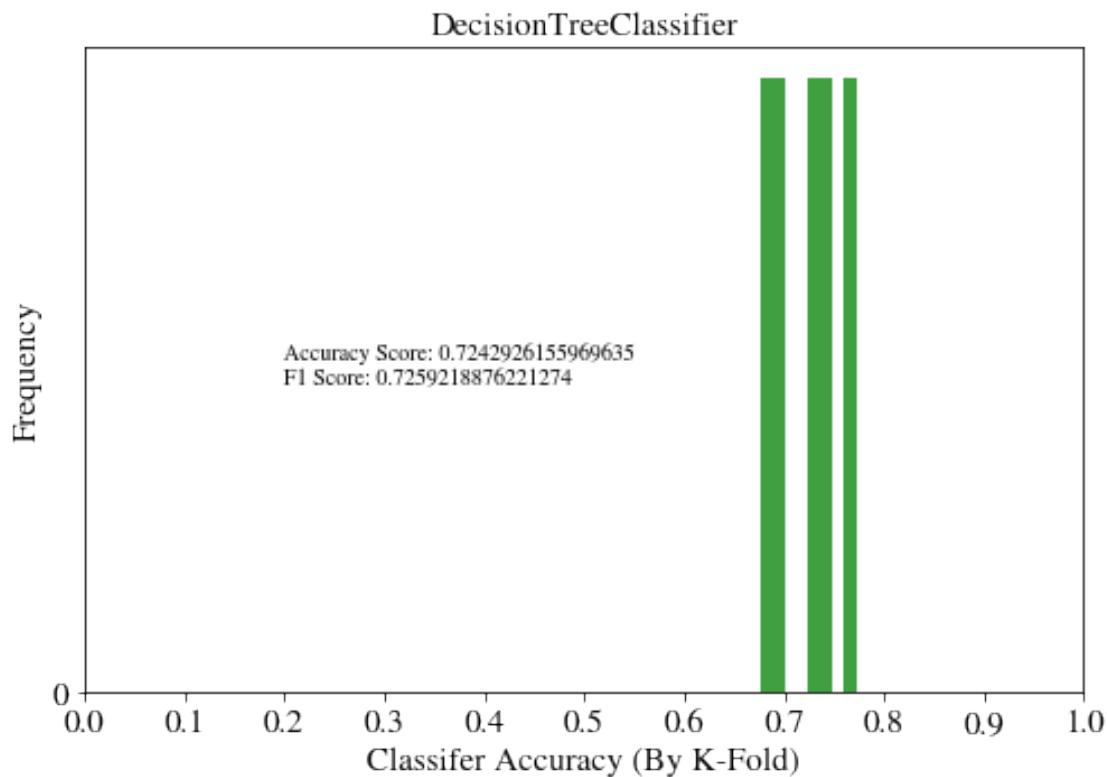
```

Processing Model: AdaBoostClassifier



```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles', 'accuracy': [0.8024691358024691, 0.7469135802469136, 0.7345679012345679, 0.7469135802469136, 0.7763975155279503], 'avgAccuracy': 0.7614523426117629, 'f1': [0.7965684474202145, 0.7216735759670174, 0.7363265766468338, 0.737310405643739, 0.7771715488744876], 'avgF1': 0.7538101109104585, 'precision': [0.8024691358024691, 0.7469135802469136, 0.7345679012345679, 0.7469135802469136, 0.7763975155279503], 'avgPrecision': 0.7614523426117629, 'recall': [0.8024691358024691, 0.7469135802469136, 0.7345679012345679, 0.7469135802469136, 0.7763975155279503], 'avgRecall': 0.7614523426117629, 'params': [{('algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 50, 'random_state': None})]}
*****
```

Processing Model: DecisionTreeClassifier

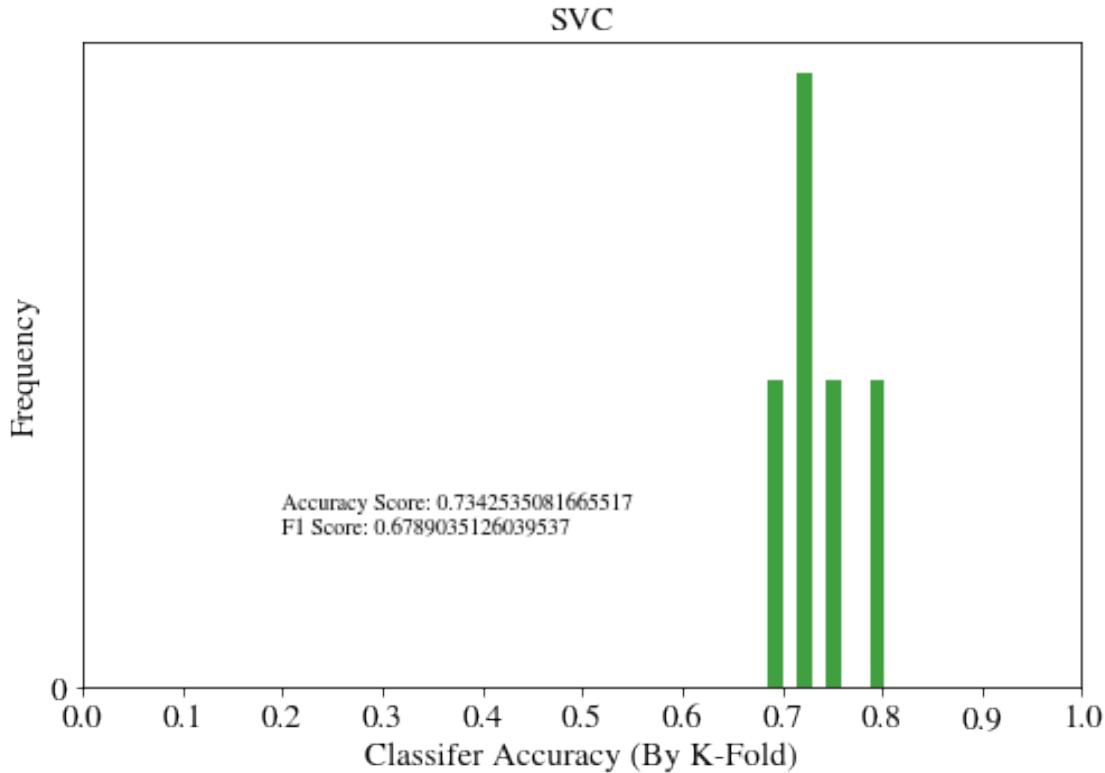


```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles', 'accuracy': [0.6975308641975309, 0.7469135802469136, 0.7283950617283951, 0.7716049382716049, 0.6770186335403726], 'avgAccuracy': 0.7242926155969635, 'f1': [0.6916120799161735, 0.7398052194345642, 0.7374189541376809, 0.7709273383876558, 0.6898458462345624], 'avgF1': 0.7259218876221274, 'precision': [0.6975308641975309, 0.7469135802469136, 0.7283950617283951, 0.7716049382716049, 0.6770186335403726], 'avgPrecision': 0.7242926155969635, 'recall': [0.6975308641975309, 0.7469135802469136, 0.7283950617283951, 0.7716049382716049, 0.6770186335403726], 'avgRecall': 0.7242926155969635, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini',
```

```
'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None,
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None,
'splitter': 'best'}]}}
*****

```

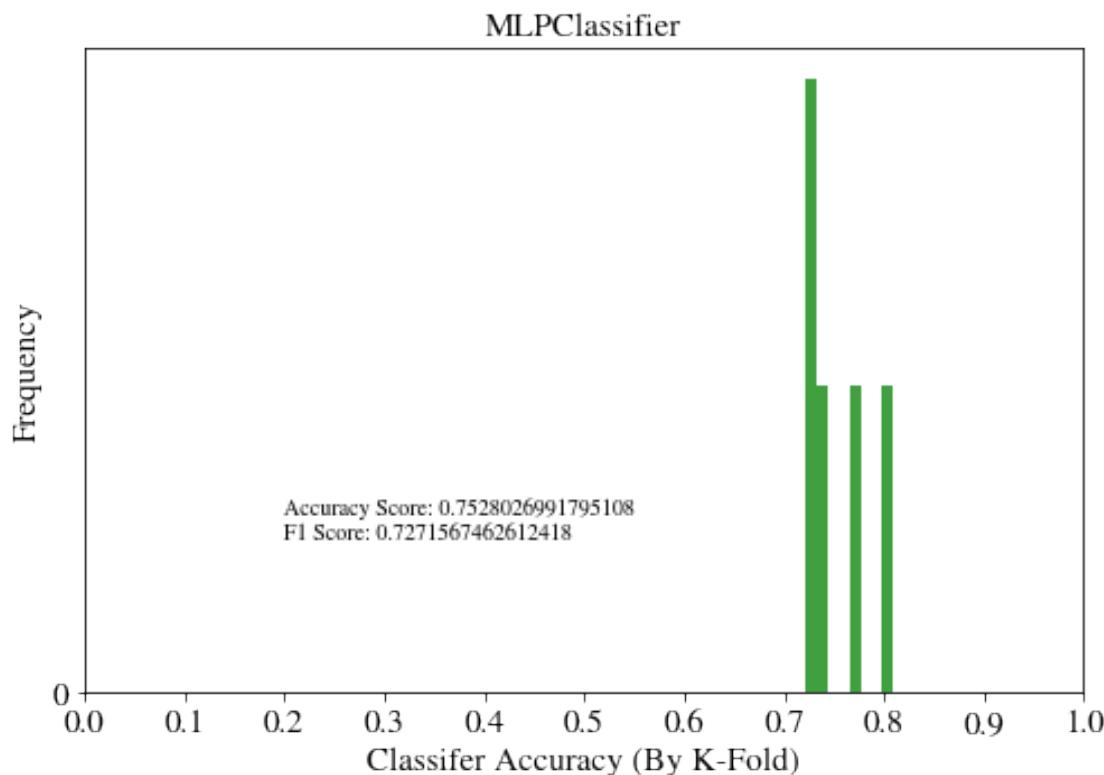
Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles', 'accuracy': [0.6851851851852, 0.7222222222222222, 0.7160493827160493, 0.8024691358024691, 0.7453416149068323], 'avgAccuracy': 0.7342535081665517, 'f1':
```

```
[0.6247762365811498, 0.6521838276834049, 0.6587090548281654, 0.7615457491672244,
0.6973026947598235], 'avgF1': 0.6789035126039537, 'precision':
[0.6851851851851852, 0.7222222222222222, 0.7160493827160493, 0.8024691358024691,
0.7453416149068323], 'avgPrecision': 0.7342535081665517, 'recall':
[0.6851851851851852, 0.7222222222222222, 0.7160493827160493, 0.8024691358024691,
0.7453416149068323], 'avgRecall': 0.7342535081665517, 'params': [{ 'C': 1.0,
'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0,
'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':
'linear', 'max_iter': -1, 'probability': False, 'random_state': None,
'shrinking': True, 'tol': 0.001, 'verbose': False}]}}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
```

polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles', 'accuracy': [0.7222222222222222, 0.7283950617283951, 0.7345679012345679, 0.808641975308642, 0.7701863354037267], 'avgAccuracy': 0.7528026991795108, 'f1': [0.694284684440048, 0.6920673587340254, 0.708425791441405, 0.7871372086518036, 0.7538686880389269], 'avgF1': 0.7271567462612418, 'precision': [0.7222222222222222, 0.7283950617283951, 0.7345679012345679, 0.808641975308642, 0.7701863354037267], 'avgPrecision': 0.7528026991795108, 'recall': [0.7222222222222222, 0.7283950617283951, 0.7345679012345679, 0.808641975308642, 0.7701863354037267], 'avgRecall': 0.7528026991795108, 'params': [{}{'activation': 'logistic', 'alpha': 0.0001, 'batch\_size': 'auto', 'beta\_1': 0.9, 'beta\_2': 0.999, 'early\_stopping': False, 'epsilon': 1e-08, 'hidden\_layer\_sizes': (100,), 'learning\_rate': 'adaptive', 'learning\_rate\_init': 0.001, 'max\_fun': 15000, 'max\_iter': 9000, 'momentum': 0.9, 'n\_iter\_no\_change': 10, 'nesterovs\_momentum': True, 'power\_t': 0.5, 'random\_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation\_fraction': 0.1, 'verbose': False, 'warm\_start': False}]]}

\*\*\*\*\*

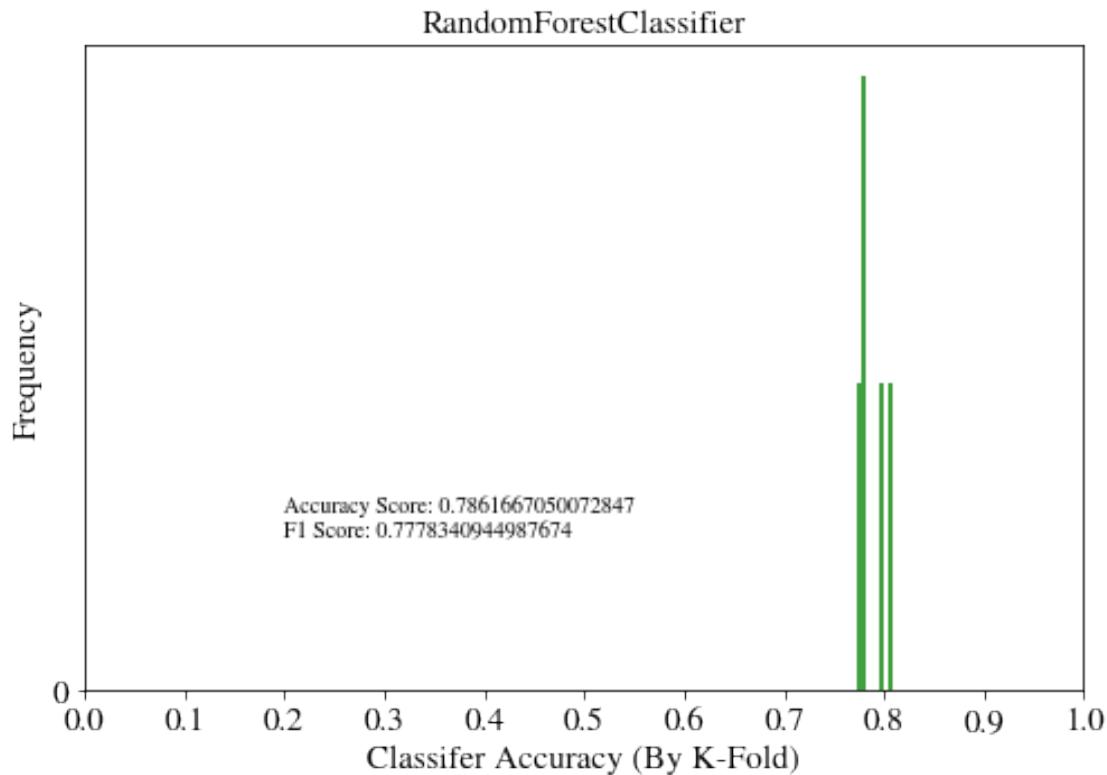
\* Best Performing Model and Params is:

\* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age, Crypt profiles', 'accuracy': [0.7777777777777778, 0.7654320987654321, 0.7839506172839507, 0.808641975308642, 0.782608695652174], 'avgAccuracy': 0.7836822329575953, 'f1': [0.7649507429518596, 0.7489167991388527, 0.7811684126791516, 0.7980946596423862, 0.780555700541086], 'avgF1': 0.7747372629906673, 'precision': [0.7777777777777778, 0.7654320987654321, 0.7839506172839507, 0.808641975308642, 0.782608695652174], 'avgPrecision': 0.7836822329575953, 'recall': [0.7777777777777778, 0.7654320987654321, 0.7839506172839507, 0.808641975308642, 0.782608695652174], 'avgRecall': 0.7836822329575953, 'params': [{}{'bootstrap': True, 'ccp\_alpha': 0.0, 'class\_weight': None, 'criterion': 'entropy', 'max\_depth': None, 'max\_features': 'sqrt', 'max\_leaf\_nodes': None, 'max\_samples': None, 'min\_impurity\_decrease': 0.0, 'min\_impurity\_split': None, 'min\_samples\_leaf': 1, 'min\_samples\_split': 2, 'min\_weight\_fraction\_leaf': 0.0, 'n\_estimators': 700, 'n\_jobs': -1, 'oob\_score': False, 'random\_state': None, 'verbose': 0, 'warm\_start': False}]}

\*\*\*\*\*

	model	features	\		
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...			
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...			
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...			
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...			
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...			
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...			
6	SVC	Active inflammation?, Severity of Crypt Arch, ...			
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...			
	accuracy	f1	precision	recall	\
0	0.781205	0.770564	0.781205	0.781205	
1	0.739169	0.716012	0.739169	0.739169	
2	0.745388	0.714298	0.745388	0.745388	
3	0.627935	0.597992	0.627935	0.627935	
4	0.693474	0.695955	0.693474	0.693474	
5	0.663768	0.668657	0.663768	0.663768	
6	0.734254	0.678904	0.734254	0.734254	
7	0.752803	0.727157	0.752803	0.752803	
	params				
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...				
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...				
2	{'C': 1, 'class_weight': None, 'dual': False, ...				
3	{'priors': None, 'var_smoothing': 1e-09}				
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...				
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...				
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...				
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...				

Processing Model: RandomForestClassifier



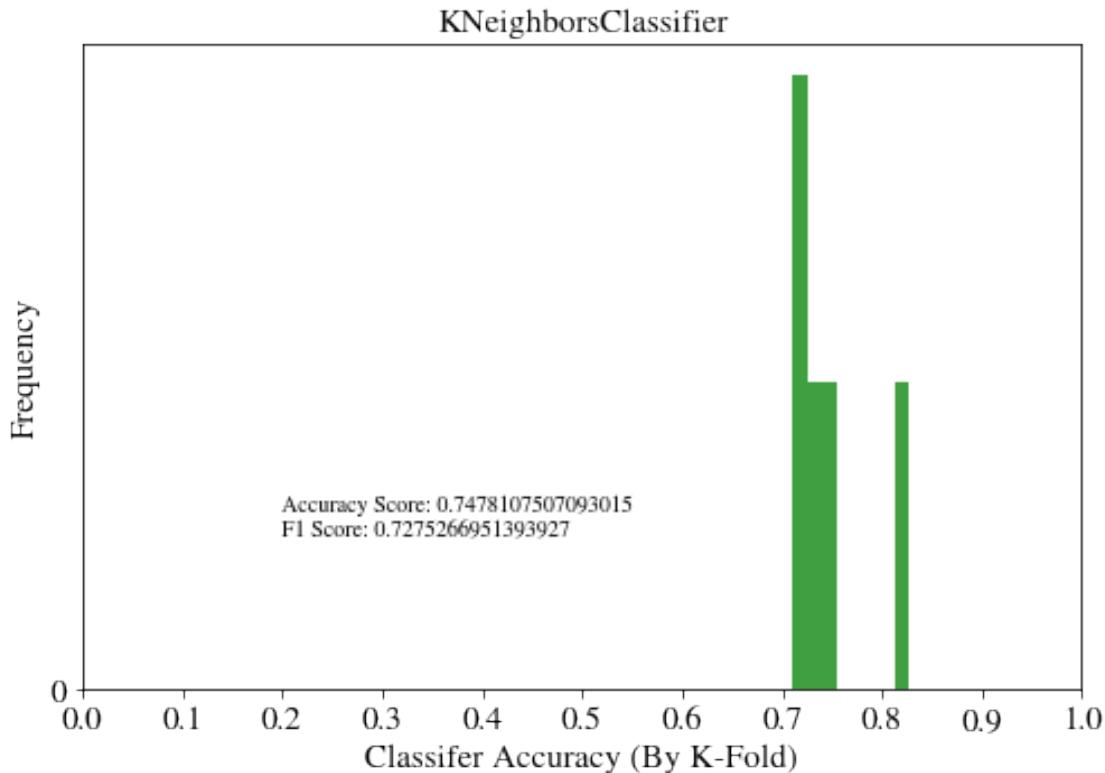
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy': [0.7716049382716049, 0.7777777777777778, 0.7777777777777778, 0.808641975308642, 0.7950310559006211], 'avgAccuracy': 0.7861667050072847, 'f1': [0.7595211372989151, 0.7626418545481423, 0.7768943603186974, 0.8007809027923971, 0.7893322175356852], 'avgF1': 0.7778340944987674, 'precision': [0.7716049382716049, 0.7777777777777778, 0.7777777777777778, 0.808641975308642, 0.7950310559006211], 'avgPrecision': 0.7861667050072847, 'recall': [0.7716049382716049, 0.7777777777777778, 0.7777777777777778, 0.808641975308642, 0.7950310559006211], 'avgRecall': 0.7861667050072847, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth':
```

```

None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None,
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 500,
'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0,
'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



```

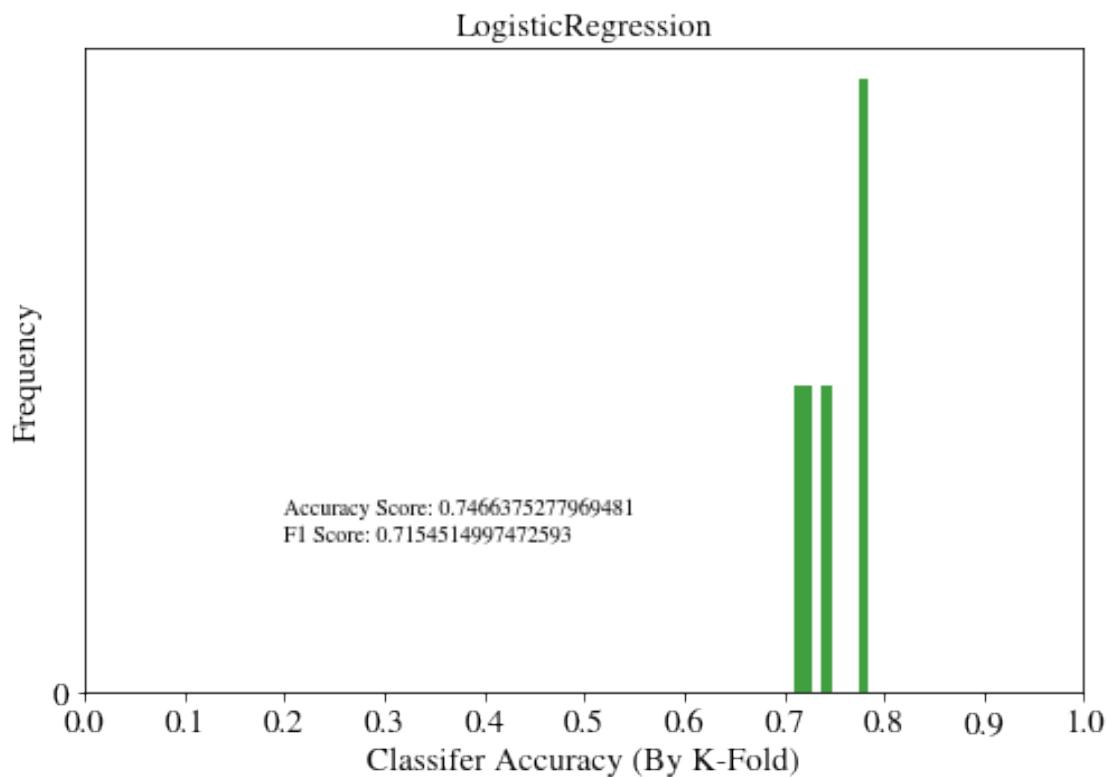
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy':  
[0.7222222222222222, 0.7098765432098766, 0.7530864197530864, 0.8271604938271605,
```

```

0.7267080745341615], 'avgAccuracy': 0.7478107507093015, 'f1':
[0.6938065765651973, 0.6873991112668157, 0.7321643933933605, 0.8088803361845122,
0.715383058287078], 'avgF1': 0.7275266951393927, 'precision':
[0.7222222222222222, 0.7098765432098766, 0.7530864197530864, 0.8271604938271605,
0.7267080745341615], 'avgPrecision': 0.7478107507093015, 'recall':
[0.7222222222222222, 0.7098765432098766, 0.7530864197530864, 0.8271604938271605,
0.7267080745341615], 'avgRecall': 0.7478107507093015, 'params': [{algorithm':
'ball_tree', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None,
'n_jobs': -1, 'n_neighbors': 16, 'p': 2, 'weights': 'distance'}]}}
*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,

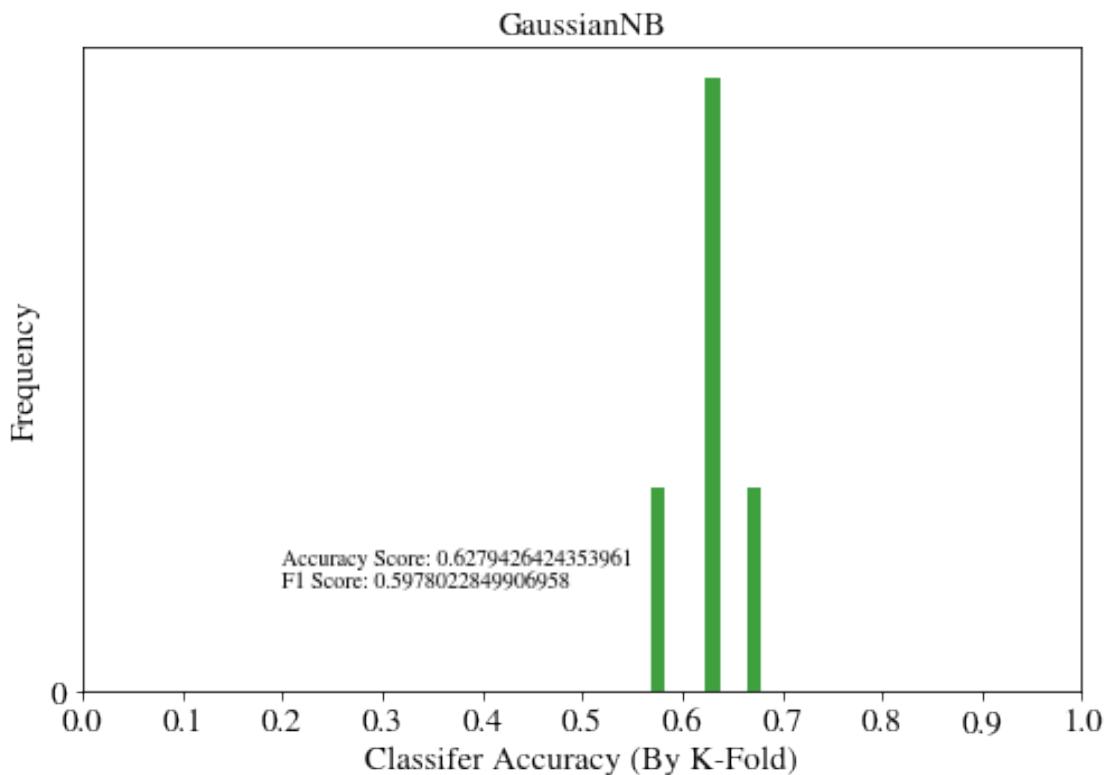
```

```

Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in
lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy':
[0.7222222222222222, 0.7098765432098766, 0.7407407407407407, 0.7839506172839507,
0.7763975155279503], 'avgAccuracy': 0.7466375277969481, 'f1':
[0.6908352445550514, 0.6752552467072781, 0.7036521859071018, 0.7529662742442822,
0.7545485473225829], 'avgF1': 0.7154514997472593, 'precision':
[0.7222222222222222, 0.7098765432098766, 0.7407407407407407, 0.7839506172839507,
0.7763975155279503], 'avgPrecision': 0.7466375277969481, 'recall':
[0.7222222222222222, 0.7098765432098766, 0.7407407407407407, 0.7839506172839507,
0.7763975155279503], 'avgRecall': 0.7466375277969481, 'params': [{C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs':
-1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

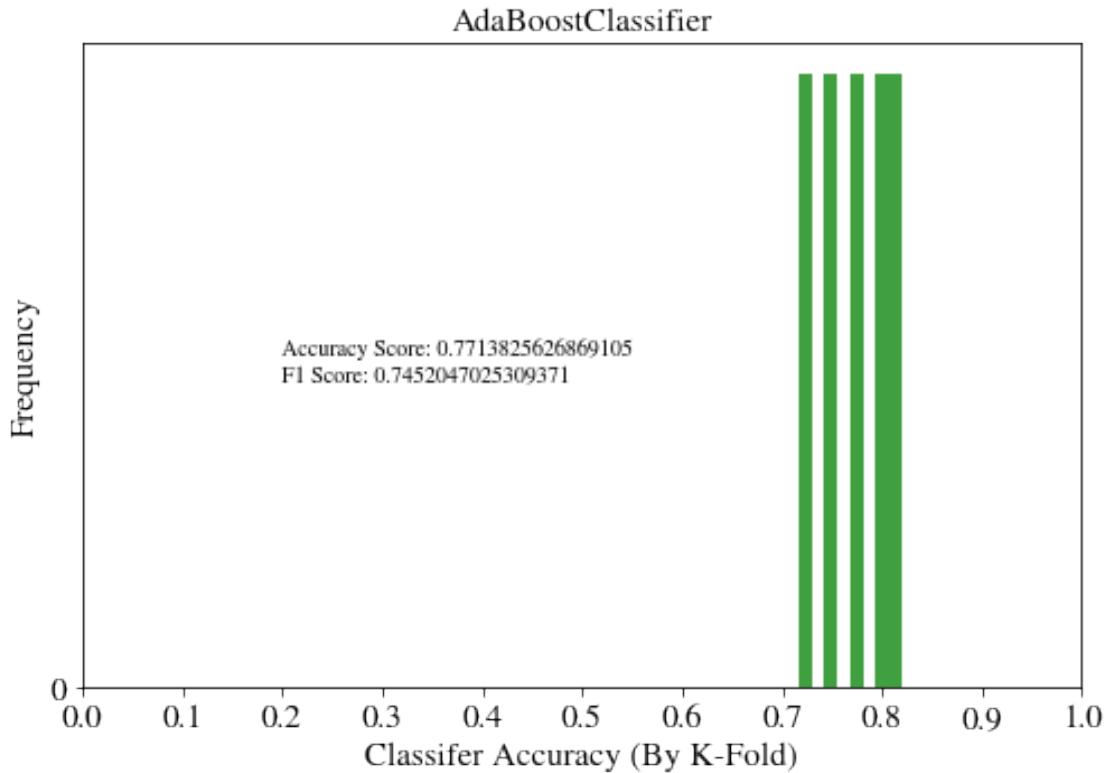
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?', Severity of

```

Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy': [0.5679012345679012, 0.6234567901234568, 0.6358024691358025, 0.6790123456790124, 0.6335403726708074], 'avgAccuracy': 0.6279426424353961, 'f1': [0.5366536949203194, 0.5766598710310114, 0.5997358392925316, 0.6616356136219576, 0.6143264060876589], 'avgF1': 0.5978022849906958, 'precision': [0.5679012345679012, 0.6234567901234568, 0.6358024691358025, 0.6790123456790124, 0.6335403726708074], 'avgPrecision': 0.6279426424353961, 'recall': [0.5679012345679012, 0.6234567901234568, 0.6358024691358025, 0.6790123456790124, 0.6335403726708074], 'avgRecall': 0.6279426424353961, 'params': [{'priors': None, 'var\_smoothing': 1e-09}]}

\*\*\*\*\*

Processing Model: AdaBoostClassifier



\*\*\*\*\*

```

* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  

Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  

Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  

lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy':  

[0.8024691358024691, 0.7469135802469136, 0.7160493827160493, 0.7716049382716049,  

0.8198757763975155], 'avgAccuracy': 0.7713825626869105, 'f1':  

[0.7850273844690371, 0.7130611035002123, 0.7007261262927997, 0.716189340281835,  

0.8110195581108012], 'avgF1': 0.7452047025309371, 'precision':  

[0.8024691358024691, 0.7469135802469136, 0.7160493827160493, 0.7716049382716049,  

0.8198757763975155], 'avgPrecision': 0.7713825626869105, 'recall':  

[0.8024691358024691, 0.7469135802469136, 0.7160493827160493, 0.7716049382716049,  

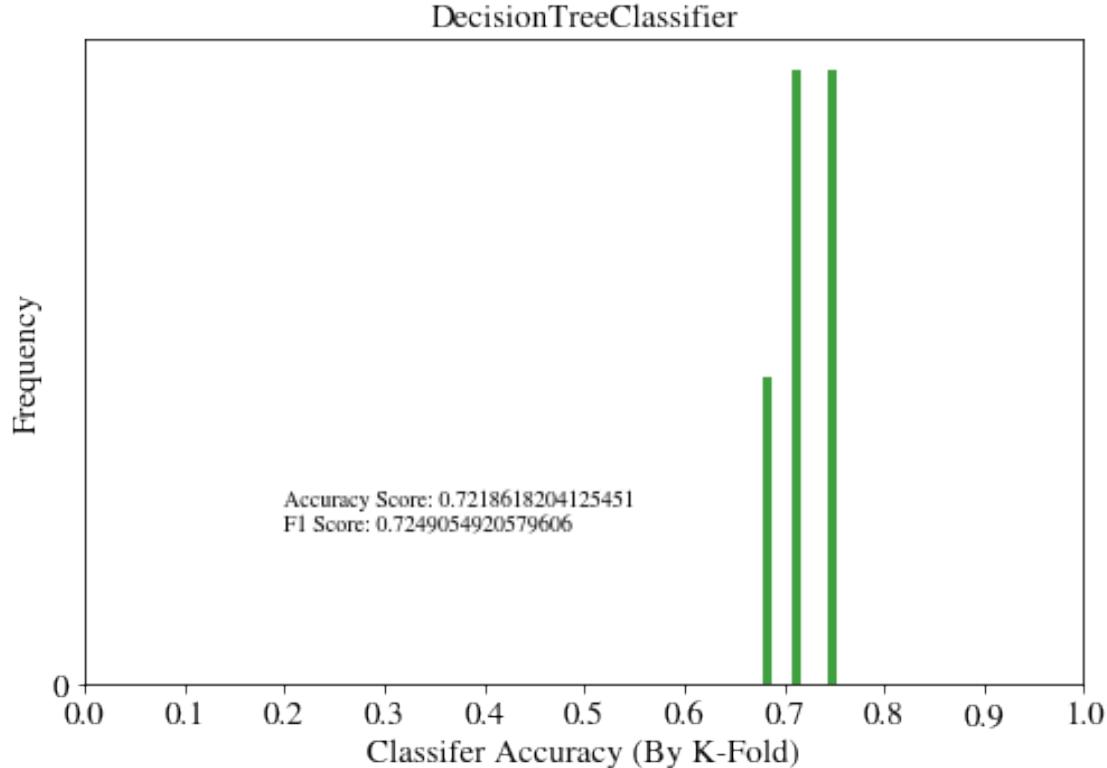
0.8198757763975155], 'avgRecall': 0.7713825626869105, 'params': [{'algorithm':  

'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 20,  

'random_state': None}]}
*****

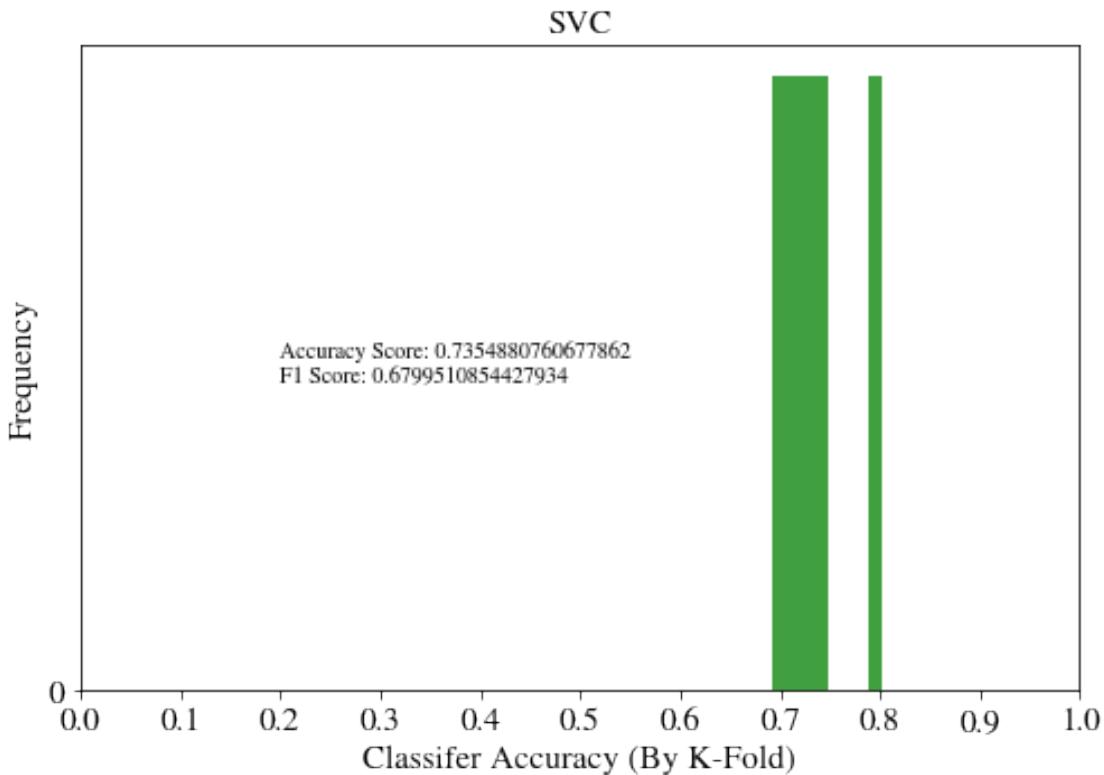
```

Processing Model: DecisionTreeClassifier



```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy': [0.6790123456790124, 0.7530864197530864, 0.7160493827160493, 0.7530864197530864, 0.7080745341614907], 'avgAccuracy': 0.7218618204125451, 'f1': [0.6767695822591124, 0.7516529358234076, 0.7187461642760293, 0.7542241433610481, 0.7231346345702058], 'avgF1': 0.7249054920579606, 'precision': [0.6790123456790124, 0.7530864197530864, 0.7160493827160493, 0.7530864197530864, 0.7080745341614907], 'avgPrecision': 0.7218618204125451, 'recall': [0.6790123456790124, 0.7530864197530864, 0.7160493827160493, 0.7530864197530864, 0.7080745341614907], 'avgRecall': 0.7218618204125451, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****
```

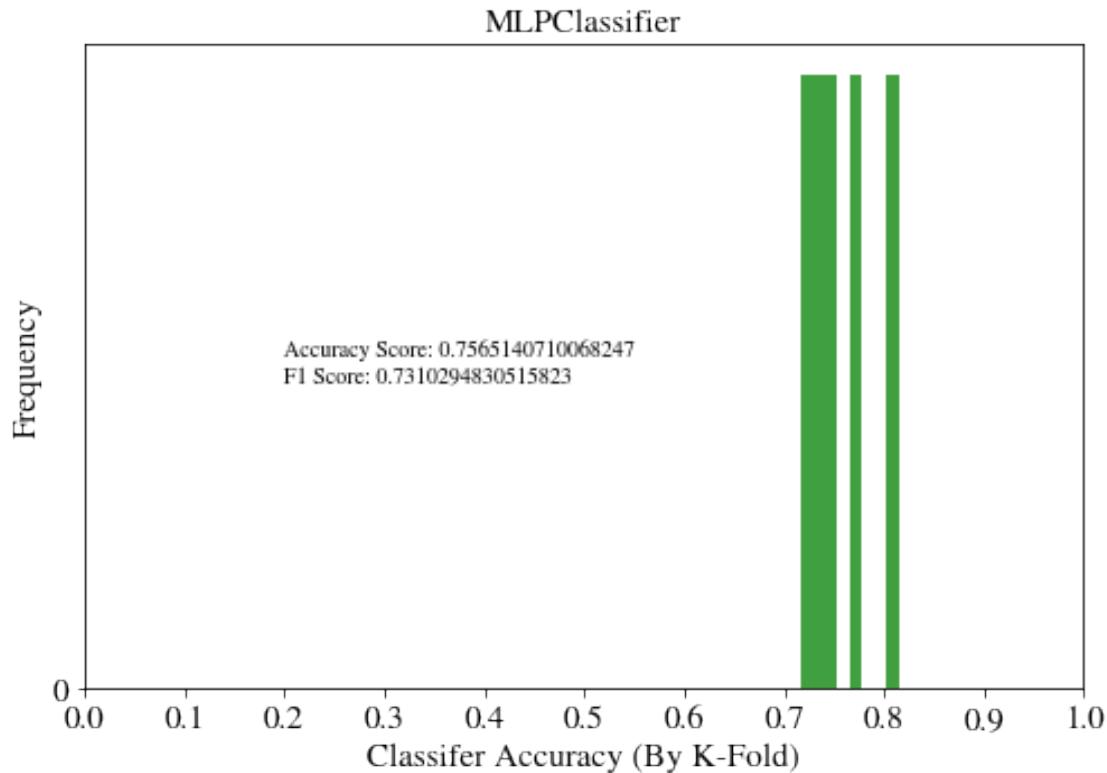
Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy': [0.691358024691358, 0.7222222222222222, 0.7160493827160493, 0.8024691358024691, 0.7453416149068323], 'avgAccuracy': 0.7354880760677862, 'f1': [0.6299816852700939, 0.6521838276834049, 0.6587090548281654, 0.7615781646724789, 0.6973026947598235], 'avgF1': 0.6799510854427934, 'precision': [0.691358024691358, 0.7222222222222222, 0.7160493827160493, 0.8024691358024691, 0.7453416149068323], 'avgPrecision': 0.7354880760677862, 'recall': [0.691358024691358, 0.7222222222222222, 0.7160493827160493, 0.8024691358024691, 0.7453416149068323], 'avgRecall': 0.7354880760677862, 'params': [{C: 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0,
```

```
'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':  
'linear', 'max_iter': -1, 'probability': False, 'random_state': None,  
'shrinking': True, 'tol': 0.001, 'verbose': False}]]}  
*****
```

Processing Model: MLPClassifier



```
*****  
* MLPClassifier  
* Best Params Result:  
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of  
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal  
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt  
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial  
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing  
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses  
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal  
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased  
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina  
propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy':  
[0.7160493827160493, 0.7345679012345679, 0.7407407407407407, 0.8148148148148148,  
0.7763975155279503], 'avgAccuracy': 0.7565140710068247, 'f1':  
[0.6891717631382676, 0.705461852045055, 0.7098126756358286, 0.7922402384126432,
```

```

0.7584608860261174], 'avgF1': 0.7310294830515823, 'precision':
[0.7160493827160493, 0.7345679012345679, 0.7407407407407407, 0.8148148148148148,
0.7763975155279503], 'avgPrecision': 0.7565140710068247, 'recall':
[0.7160493827160493, 0.7345679012345679, 0.7407407407407407, 0.8148148148148148,
0.7763975155279503], 'avgRecall': 0.7565140710068247, 'params': [{}'activation':
'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum':
True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start':
False}]]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes, Age', 'accuracy':
[0.7716049382716049, 0.7777777777777778, 0.7777777777777778, 0.808641975308642,
0.7950310559006211], 'avgAccuracy': 0.7861667050072847, 'f1':
[0.7595211372989151, 0.7626418545481423, 0.7768943603186974, 0.8007809027923971,
0.7893322175356852], 'avgF1': 0.7778340944987674, 'precision':
[0.7716049382716049, 0.7777777777777778, 0.7777777777777778, 0.808641975308642,
0.7950310559006211], 'avgPrecision': 0.7861667050072847, 'recall':
[0.7716049382716049, 0.7777777777777778, 0.7777777777777778, 0.808641975308642,
0.7950310559006211], 'avgRecall': 0.7861667050072847, 'params': [{}'bootstrap':
True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth':
None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None,
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 500,
'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0,
'warm_start': False}]}
*****

```

model	features \
0 RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB	Active inflammation?, Severity of Crypt Arch, ...
4 AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...

```

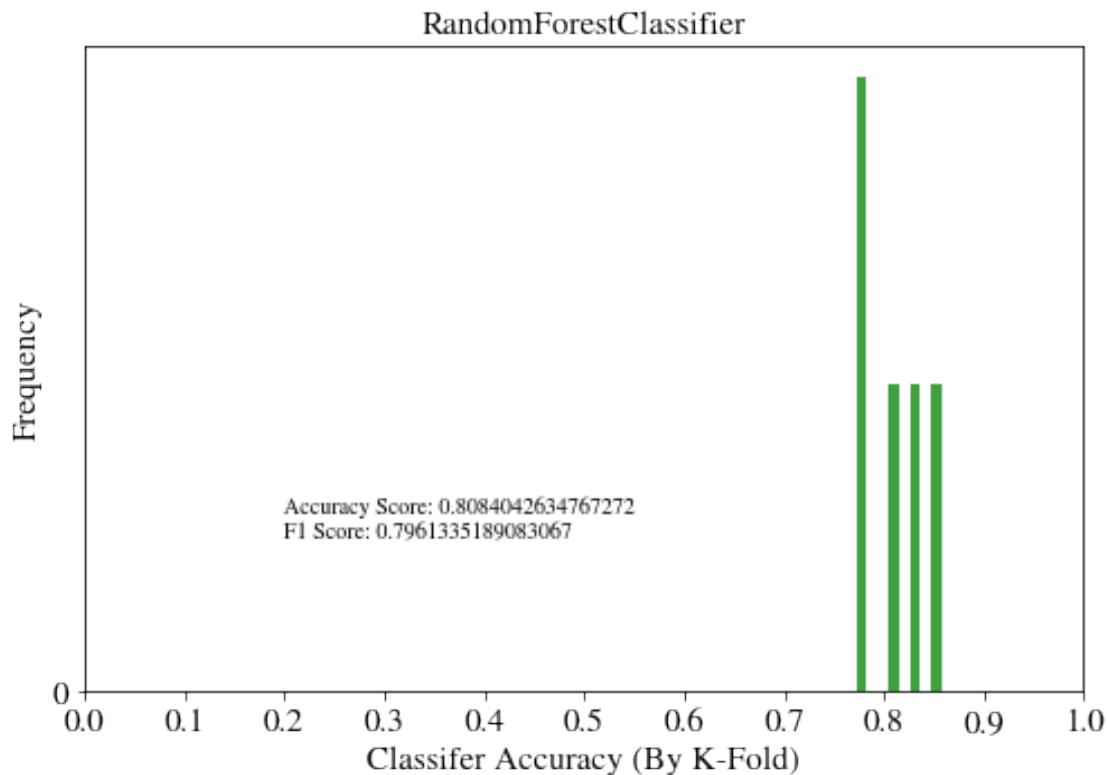
6           SVC  Active inflammation?, Severity of Crypt Arch, ...
7           MLPClassifier  Active inflammation?, Severity of Crypt Arch, ...

accuracy      f1  precision   recall  \
0  0.772548  0.761975  0.772548  0.772548
1  0.739169  0.716012  0.739169  0.739169
2  0.746638  0.715451  0.746638  0.746638
3  0.627943  0.597802  0.627943  0.627943
4  0.694709  0.698175  0.694709  0.694709
5  0.689748  0.692638  0.689748  0.689748
6  0.735488  0.679951  0.735488  0.735488
7  0.752795  0.723470  0.752795  0.752795

                           params
0  {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1  {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2  {'C': 1, 'class_weight': None, 'dual': False, ...
3    {'priors': None, 'var_smoothing': 1e-09}
4  {'algorithm': 'SAMME.R', 'base_estimator': Non...
5  {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6  {'C': 1.0, 'break_ties': False, 'cache_size': ...
7  {'activation': 'logistic', 'alpha': 0.0001, 'b...

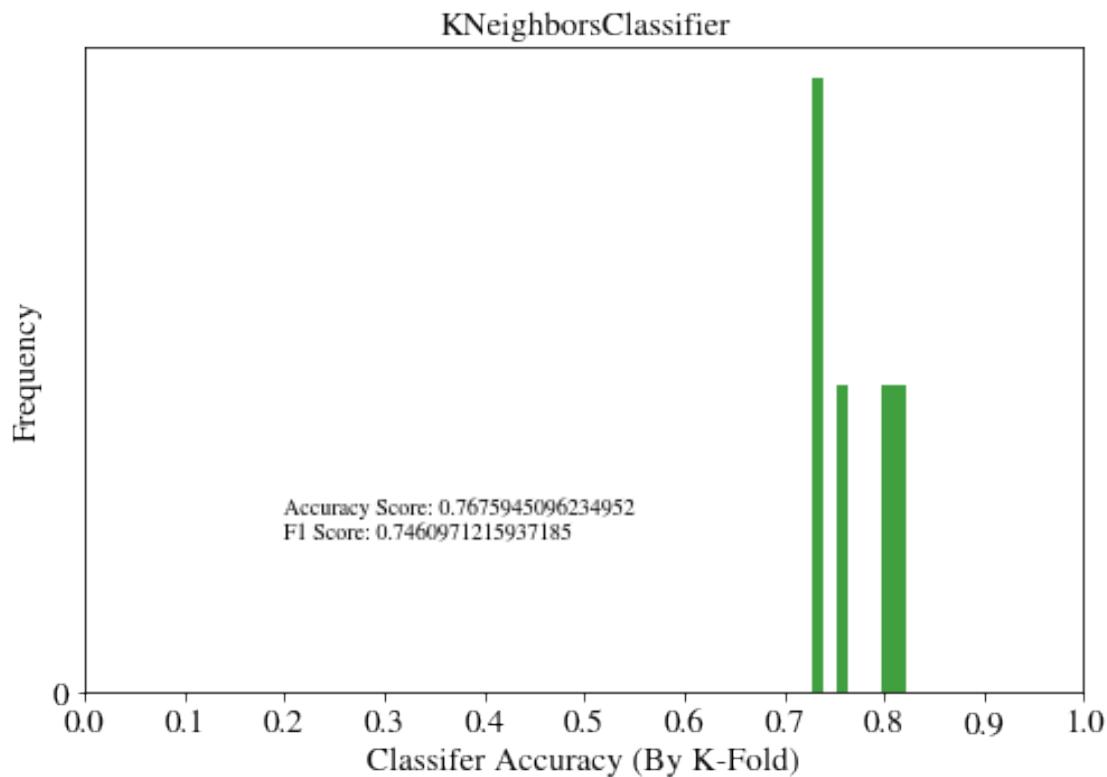
```

Processing Model: RandomForestClassifier



```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes', 'accuracy': [0.7777777777777778, 0.7716049382716049, 0.8271604938271605, 0.8580246913580247, 0.8074534161490683], 'avgAccuracy': 0.8084042634767272, 'f1': [0.759968034439952, 0.7593727305737109, 0.8190718272222394, 0.8441002569551879, 0.7981547453504438], 'avgF1': 0.7961335189083067, 'precision': [0.7777777777777778, 0.7716049382716049, 0.8271604938271605, 0.8580246913580247, 0.8074534161490683], 'avgPrecision': 0.8084042634767272, 'recall': [0.7777777777777778, 0.7716049382716049, 0.8271604938271605, 0.8580246913580247, 0.8074534161490683], 'avgRecall': 0.8084042634767272, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 500, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
```

Processing Model: KNeighborsClassifier

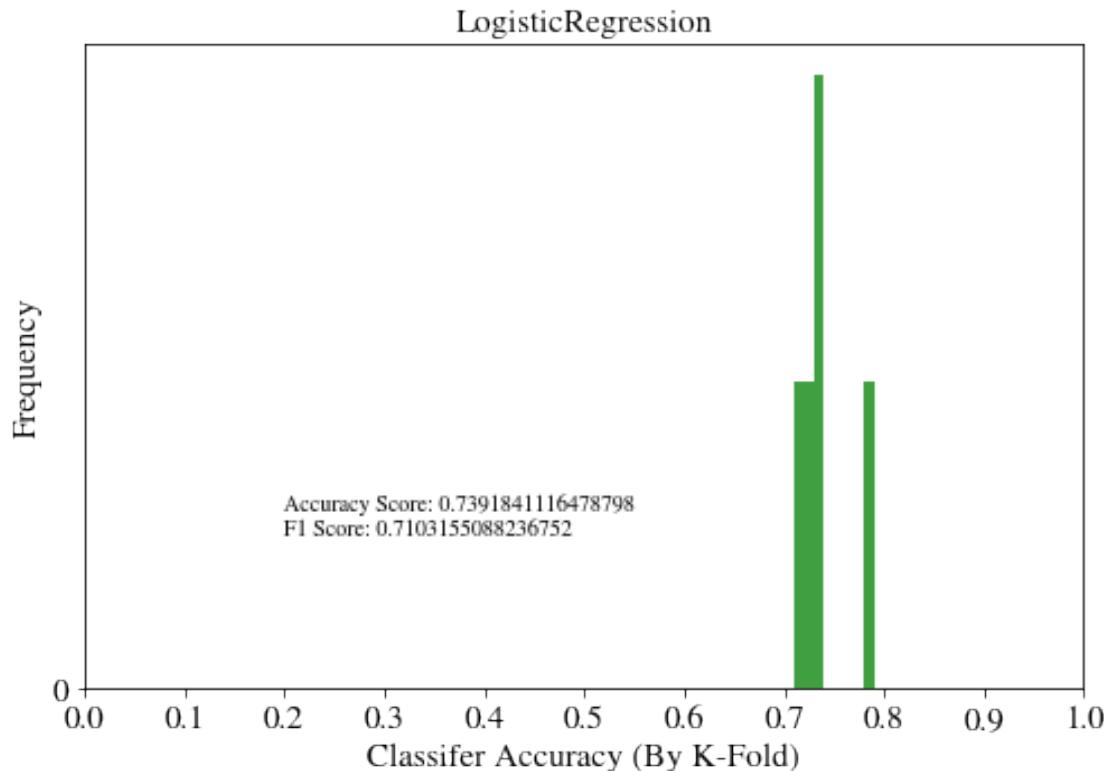


```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes', 'accuracy': [0.7283950617283951, 0.7345679012345679, 0.8024691358024691, 0.8209876543209876, 0.7515527950310559], 'avgAccuracy': 0.7675945096234952, 'f1': [0.7041086071930184, 0.7202436099081435, 0.7811603071650352, 0.7939204179041133, 0.7310526657982823], 'avgF1': 0.7460971215937185, 'precision': [0.7283950617283951, 0.7345679012345679, 0.8024691358024691, 0.8209876543209876, 0.7515527950310559], 'avgPrecision': 0.7675945096234952, 'recall': [0.7283950617283951, 0.7345679012345679, 0.8024691358024691, 0.8209876543209876, 0.7515527950310559], 'avgRecall': 0.7675945096234952, 'params': [{algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': 1}]}*****
```

```
-1, 'n_neighbors': 16, 'p': 2, 'weights': 'distance'}]}}
*****

```

Processing Model: LogisticRegression



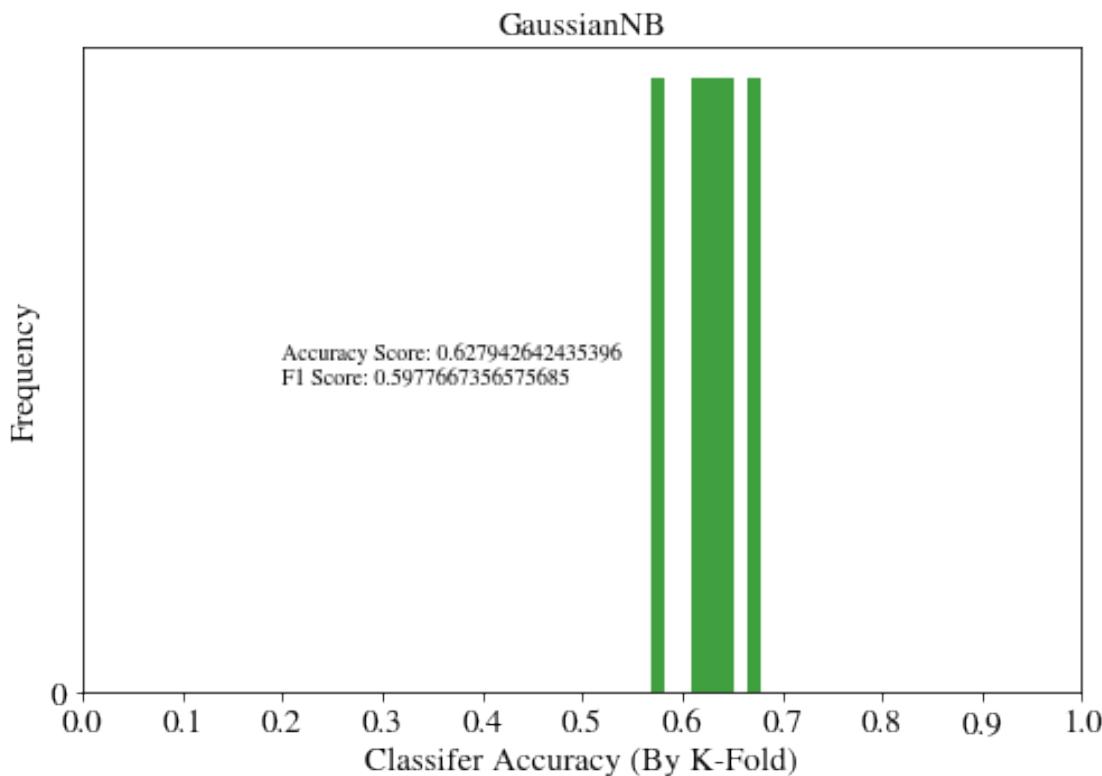
```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?, Intraepithelial lymphocytes', 'accuracy':  
[0.7222222222222222, 0.7098765432098766, 0.7345679012345679, 0.7901234567901234,  
0.7391304347826086], 'avgAccuracy': 0.7391841116478798, 'f1':  
[0.690213994944468, 0.6761962687888614, 0.6990770304148337, 0.7618666474857406,  
0.7242236024844722], 'avgF1': 0.7103155088236752, 'precision':  
[0.7222222222222222, 0.7098765432098766, 0.7345679012345679, 0.7901234567901234,
```

```

0.7391304347826086], 'avgPrecision': 0.7391841116478798, 'recall':
[0.7222222222222222, 0.7098765432098766, 0.7345679012345679, 0.7901234567901234,
0.7391304347826086], 'avgRecall': 0.7391841116478798, 'params': [{'C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling': 1,
'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs': -1,
'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina

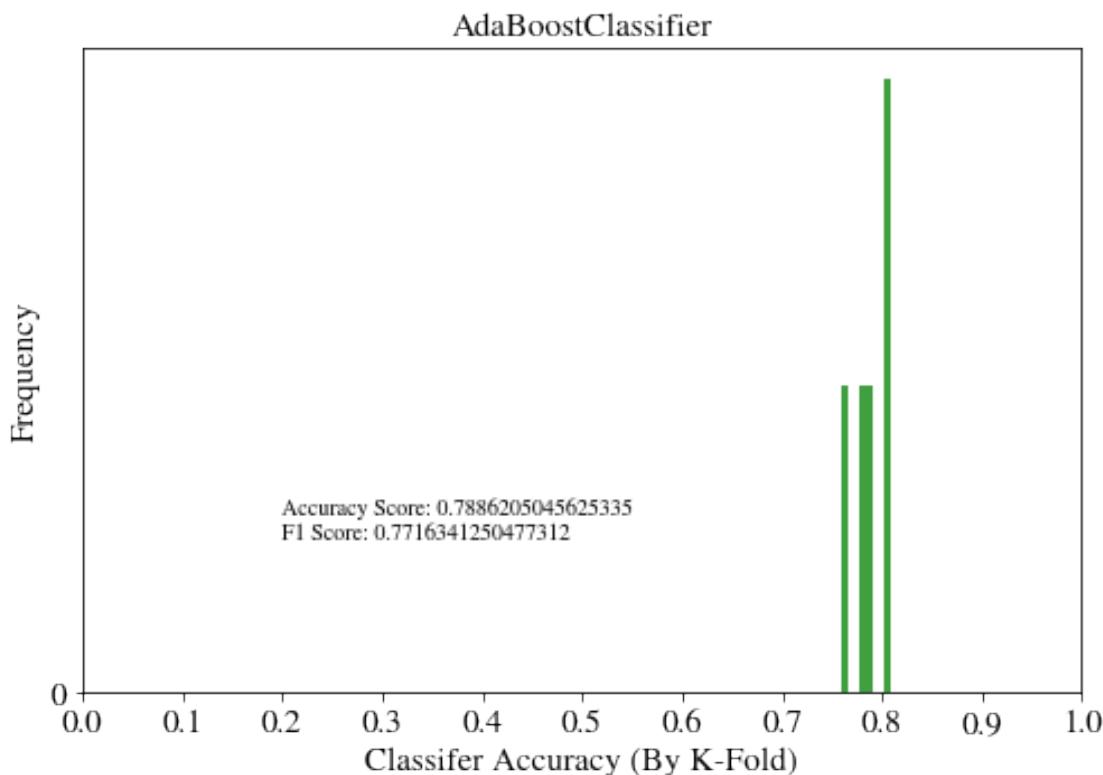
```

```

propria cellularity?, Intraepithelial lymphocytes', 'accuracy':
[0.5679012345679012, 0.6172839506172839, 0.6419753086419753, 0.6790123456790124,
0.6335403726708074], 'avgAccuracy': 0.627942642435396, 'f1':
[0.5366536949203194, 0.5715527715849699, 0.6046651920729372, 0.6616356136219576,
0.6143264060876589], 'avgF1': 0.5977667356575685, 'precision':
[0.5679012345679012, 0.6172839506172839, 0.6419753086419753, 0.6790123456790124,
0.6335403726708074], 'avgPrecision': 0.627942642435396, 'recall':
[0.5679012345679012, 0.6172839506172839, 0.6419753086419753, 0.6790123456790124,
0.6335403726708074], 'avgRecall': 0.627942642435396, 'params': [{'priors': None,
'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

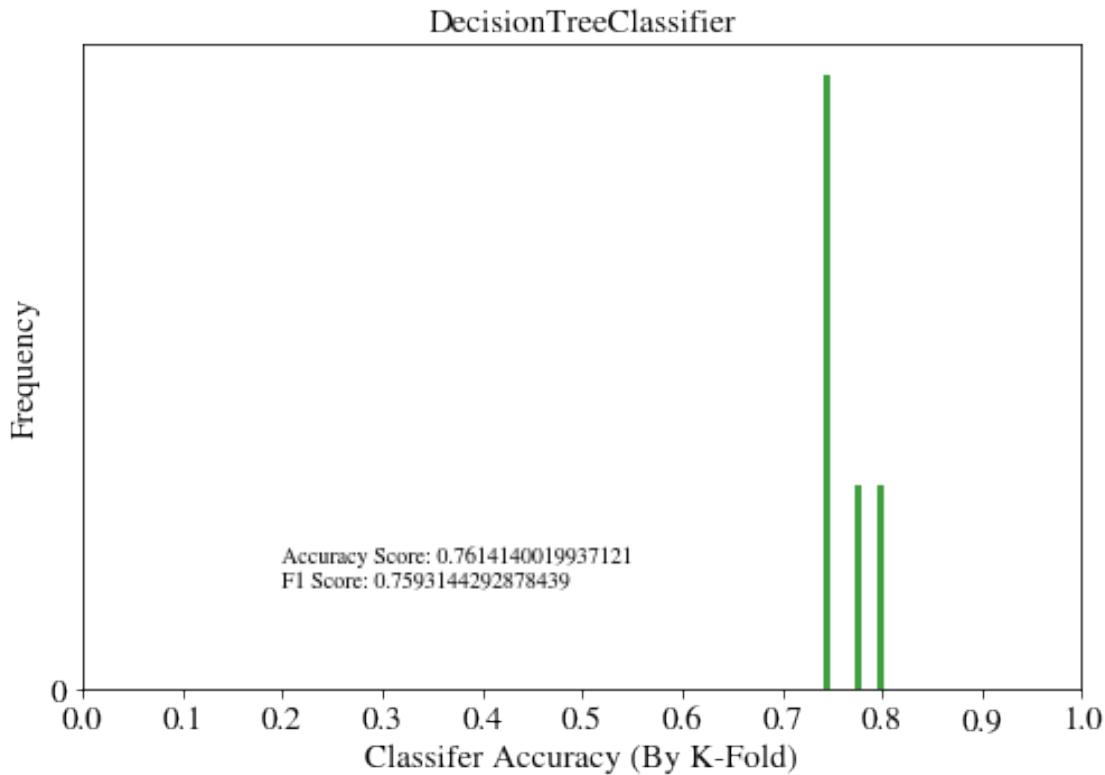
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt

```

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes', 'accuracy': [0.808641975308642, 0.7901234567901234, 0.7592592592592593, 0.8024691358024691, 0.782608695652174], 'avgAccuracy': 0.7886205045625335, 'f1': [0.7959756180051349, 0.7622186081579934, 0.7446938357640677, 0.7788172945347881, 0.7764652687766721], 'avgF1': 0.7716341250477312, 'precision': [0.808641975308642, 0.7901234567901234, 0.7592592592592593, 0.8024691358024691, 0.782608695652174], 'avgPrecision': 0.7886205045625335, 'recall': [0.808641975308642, 0.7901234567901234, 0.7592592592592593, 0.8024691358024691, 0.782608695652174], 'avgRecall': 0.7886205045625335, 'params': [{'algorithm': 'SAMME.R', 'base\_estimator': None, 'learning\_rate': 1, 'n\_estimators': 20, 'random\_state': None}]}

\*\*\*\*\*

Processing Model: DecisionTreeClassifier

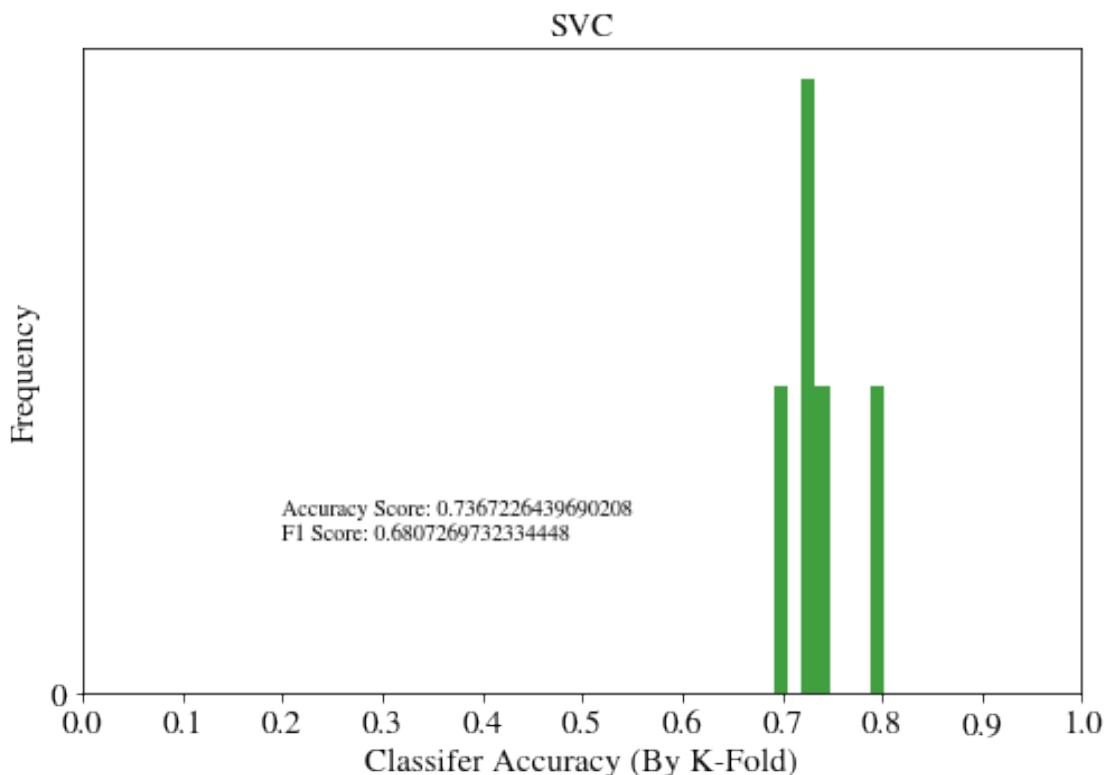


\*\*\*\*\*

- \* DecisionTreeClassifier
- \* Best Params Result:
- \* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?', 'Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &

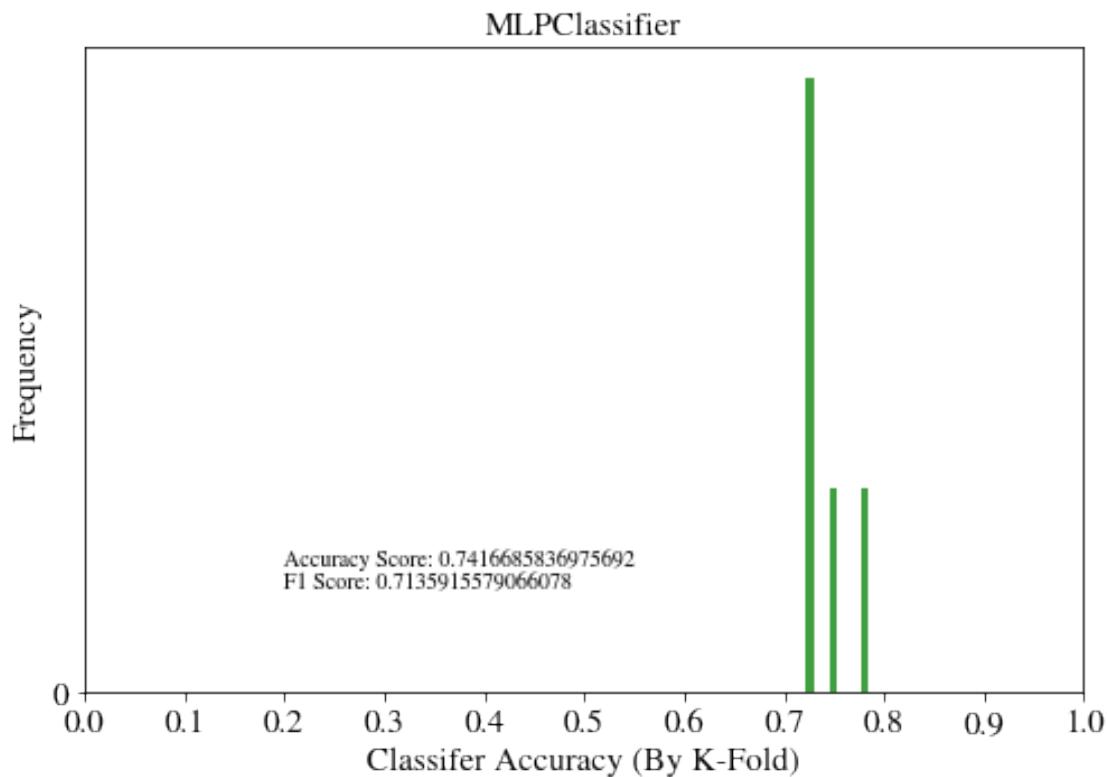
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes', 'accuracy': [0.7407407407407407, 0.7407407407407407, 0.7777777777777778, 0.8024691358024691, 0.7453416149068323], 'avgAccuracy': 0.7614140019937121, 'f1': [0.7324852344460188, 0.7395956342816247, 0.7803360853589164, 0.7855454774502394, 0.7586097149024201], 'avgF1': 0.7593144292878439, 'precision': [0.7407407407407407, 0.7407407407407407, 0.7777777777777778, 0.8024691358024691, 0.7453416149068323], 'avgPrecision': 0.7614140019937121, 'recall': [0.7407407407407407, 0.7407407407407407, 0.7777777777777778, 0.8024691358024691, 0.7453416149068323], 'avgRecall': 0.7614140019937121, 'params': [{ 'ccp\_alpha': 0.0, 'class\_weight': None, 'criterion': 'gini', 'max\_depth': None, 'max\_features': 'sqrt', 'max\_leaf\_nodes': None, 'min\_impurity\_decrease': 0.0, 'min\_impurity\_split': None, 'min\_samples\_leaf': 1, 'min\_samples\_split': 2, 'min\_weight\_fraction\_leaf': 0.0, 'random\_state': None, 'splitter': 'best' }]}  
\*\*\*\*\*

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes', 'accuracy': [0.691358024691358, 0.7222222222222222, 0.7222222222222222, 0.8024691358024691, 0.7453416149068323], 'avgAccuracy': 0.7367226439690208, 'f1': [0.6299816852700939, 0.6521838276834049, 0.6626209092866769, 0.7615457491672244, 0.6973026947598235], 'avgF1': 0.6807269732334448, 'precision': [0.691358024691358, 0.7222222222222222, 0.7222222222222222, 0.8024691358024691, 0.7453416149068323], 'avgPrecision': 0.7367226439690208, 'recall': [0.691358024691358, 0.7222222222222222, 0.7222222222222222, 0.8024691358024691, 0.7453416149068323], 'avgRecall': 0.7367226439690208, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina
propria cellularity?, Intraepithelial lymphocytes', 'accuracy':
[0.7222222222222222, 0.7222222222222222, 0.7283950617283951, 0.7839506172839507,
0.7515527950310559], 'avgAccuracy': 0.7416685836975692, 'f1':
[0.694284684440048, 0.6752871445242922, 0.6990248948582282, 0.757942947464176,
0.7414181182462946], 'avgF1': 0.7135915579066078, 'precision':
[0.7222222222222222, 0.7222222222222222, 0.7283950617283951, 0.7839506172839507,
0.7515527950310559], 'avgPrecision': 0.7416685836975692, 'recall':
[0.7222222222222222, 0.7222222222222222, 0.7283950617283951, 0.7839506172839507,
0.7515527950310559], 'avgRecall': 0.7416685836975692, 'params': [{"activation':
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```

```

0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,),
'learning_rate': 'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000,
'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum':
True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam',
'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start':
False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?, Intraepithelial lymphocytes', 'accuracy':
[0.7777777777777778, 0.7716049382716049, 0.8271604938271605, 0.8580246913580247,
0.8074534161490683], 'avgAccuracy': 0.8084042634767272, 'f1':
[0.759968034439952, 0.7593727305737109, 0.8190718272222394, 0.8441002569551879,
0.7981547453504438], 'avgF1': 0.7961335189083067, 'precision':
[0.7777777777777778, 0.7716049382716049, 0.8271604938271605, 0.8580246913580247,
0.8074534161490683], 'avgPrecision': 0.8084042634767272, 'recall':
[0.7777777777777778, 0.7716049382716049, 0.8271604938271605, 0.8580246913580247,
0.8074534161490683], 'avgRecall': 0.8084042634767272, 'params': [{'bootstrap':
True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy',
'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None,
'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None,
'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0,
'n_estimators': 500, 'n_jobs': -1, 'oob_score': True, 'random_state': None,
'verbose': 0, 'warm_start': False}]}
*****

```

	model	features \			
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...			
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...			
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...			
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...			
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...			
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...			
6	SVC	Active inflammation?, Severity of Crypt Arch, ...			
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...			
		accuracy	f1	precision	recall \
0	0.800989	0.787600	0.800989	0.800989	
1	0.763898	0.738965	0.763898	0.763898	

```

2 0.739184 0.710316 0.739184 0.739184
3 0.627943 0.597767 0.627943 0.627943
4 0.695898 0.702459 0.695898 0.695898
5 0.729231 0.724490 0.729231 0.729231
6 0.736723 0.680727 0.736723 0.736723
7 0.741669 0.713592 0.741669 0.741669

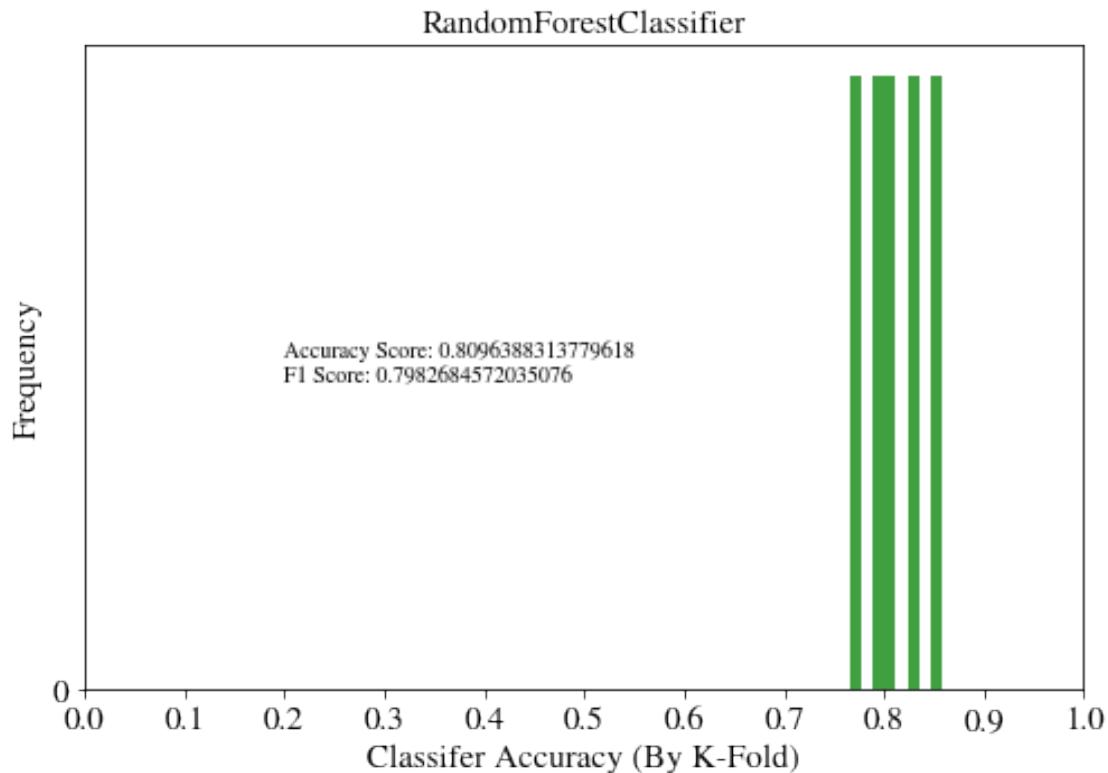
```

```

params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3     {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier

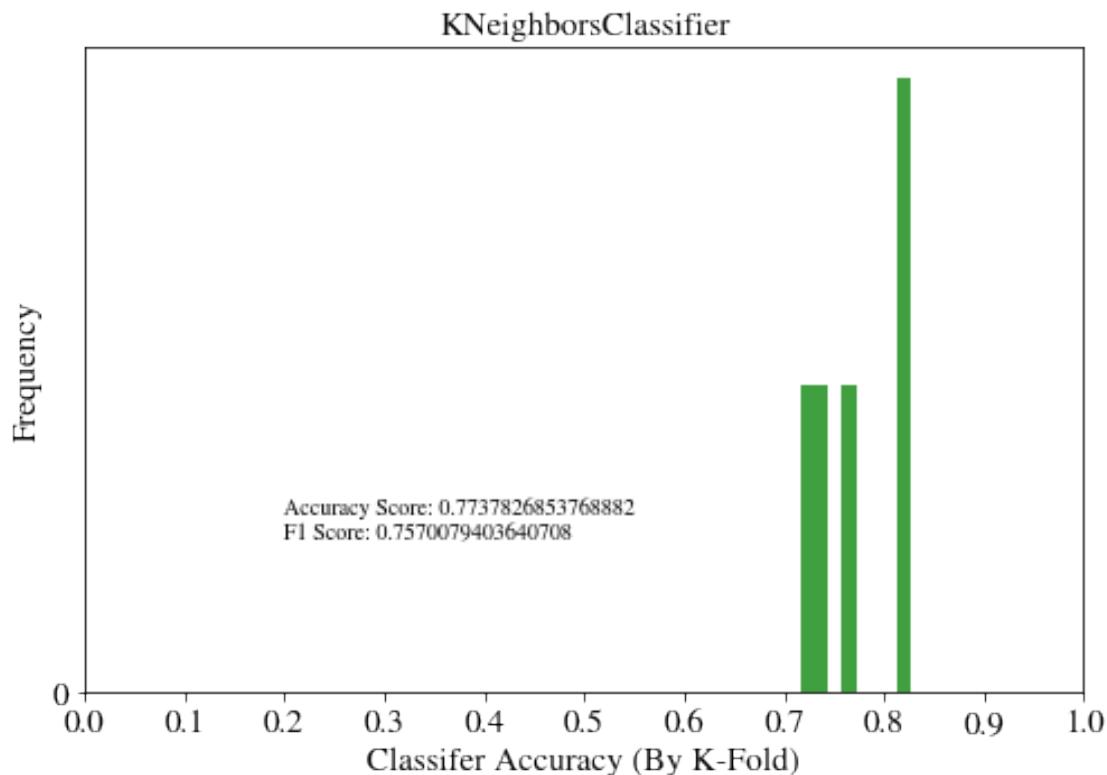


```

*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?',
```

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?', 'accuracy': [0.7901234567901234, 0.7654320987654321, 0.8271604938271605, 0.8580246913580247, 0.8074534161490683], 'avgAccuracy': 0.8096388313779618, 'f1': [0.7764324153213044, 0.7512510793353355, 0.8204987983083804, 0.84118037811971, 0.8019796149328074], 'avgF1': 0.7982684572035076, 'precision': [0.7901234567901234, 0.7654320987654321, 0.8271604938271605, 0.8580246913580247, 0.8074534161490683], 'avgPrecision': 0.8096388313779618, 'recall': [0.7901234567901234, 0.7654320987654321, 0.8271604938271605, 0.8580246913580247, 0.8074534161490683], 'avgRecall': 0.8096388313779618, 'params': [ {'bootstrap': True, 'ccp\_alpha': 0.0, 'class\_weight': None, 'criterion': 'entropy', 'max\_depth': None, 'max\_features': 'auto', 'max\_leaf\_nodes': None, 'max\_samples': None, 'min\_impurity\_decrease': 0.0, 'min\_impurity\_split': None, 'min\_samples\_leaf': 1, 'min\_samples\_split': 2, 'min\_weight\_fraction\_leaf': 0.0, 'n\_estimators': 500, 'n\_jobs': -1, 'oob\_score': True, 'random\_state': None, 'verbose': 0, 'warm\_start': False}]}  
\*\*\*\*\*

Processing Model: KNeighborsClassifier

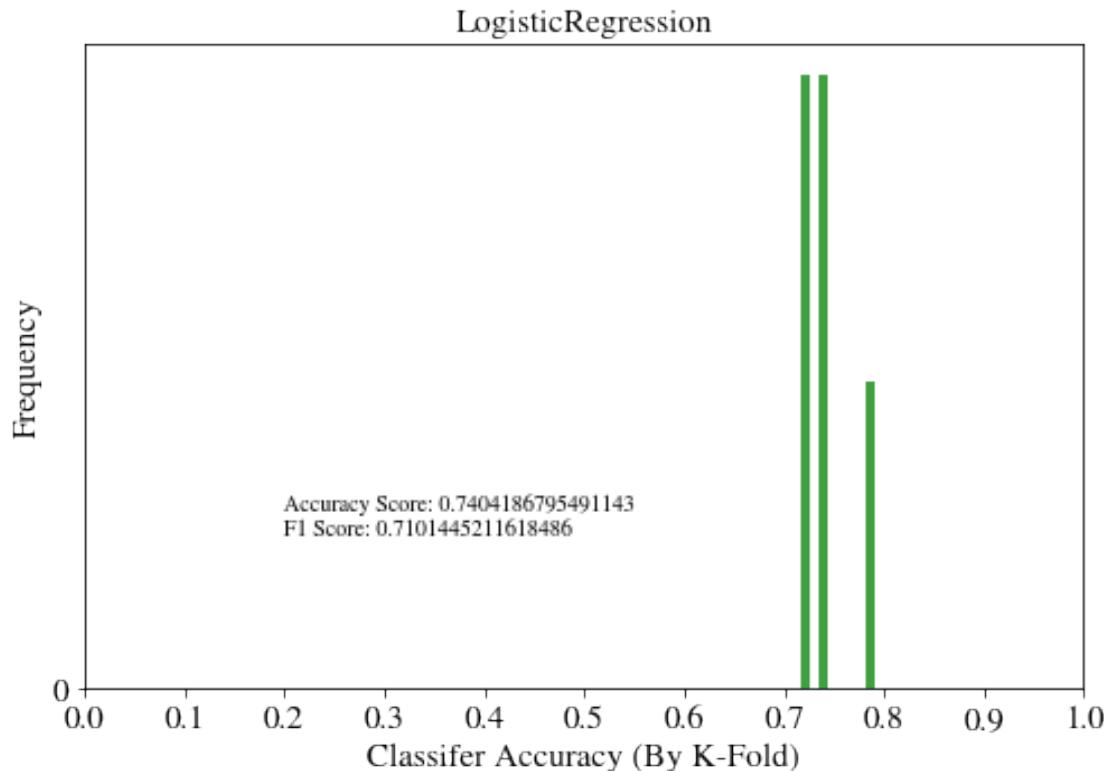


```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?', 'accuracy': [0.7160493827160493,  
0.7407407407407407, 0.8271604938271605, 0.8209876543209876, 0.7639751552795031],  
'avgAccuracy': 0.7737826853768882, 'f1': [0.6942618424099904,  
0.7259982405916384, 0.8114090124983371, 0.8019494270074943, 0.7514211793128939],  
'avgF1': 0.7570079403640708, 'precision': [0.7160493827160493,  
0.7407407407407407, 0.8271604938271605, 0.8209876543209876, 0.7639751552795031],  
'avgPrecision': 0.7737826853768882, 'recall': [0.7160493827160493,  
0.7407407407407407, 0.8271604938271605, 0.8209876543209876, 0.7639751552795031],  
'avgRecall': 0.7737826853768882, 'params': [{'algorithm': 'auto', 'leaf_size':  
30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors':
```

```
13, 'p': 2, 'weights': 'distance'}]}}
*****

```

Processing Model: LogisticRegression



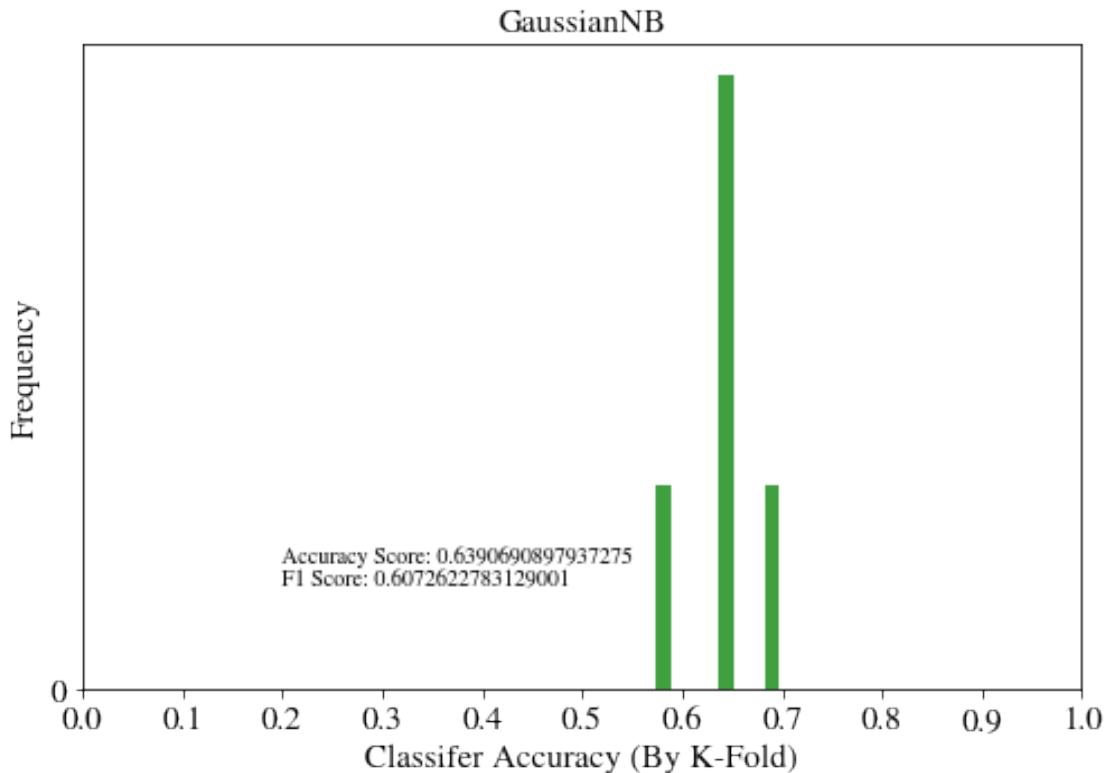
```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
lamina propria cellularity?', 'accuracy': [0.7222222222222222,  
0.7160493827160493, 0.7345679012345679, 0.7901234567901234, 0.7391304347826086],  
'avgAccuracy': 0.7404186795491143, 'f1': [0.690213994944468, 0.6763124263291767,  
0.6990770304148337, 0.7608955516362923, 0.7242236024844722], 'avgF1':  
0.7101445211618486, 'precision': [0.7222222222222222, 0.7160493827160493,  
0.7345679012345679, 0.7901234567901234, 0.7391304347826086], 'avgPrecision':
```

```

0.7404186795491143, 'recall': [0.7222222222222222, 0.7160493827160493,
0.7345679012345679, 0.7901234567901234, 0.7391304347826086], 'avgRecall':
0.7404186795491143, 'params': [{'C': 1, 'class_weight': None, 'dual': False,
'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None, 'max_iter':
100, 'multi_class': 'multinomial', 'n_jobs': -1, 'penalty': 'l2',
'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0,
'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased
lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina

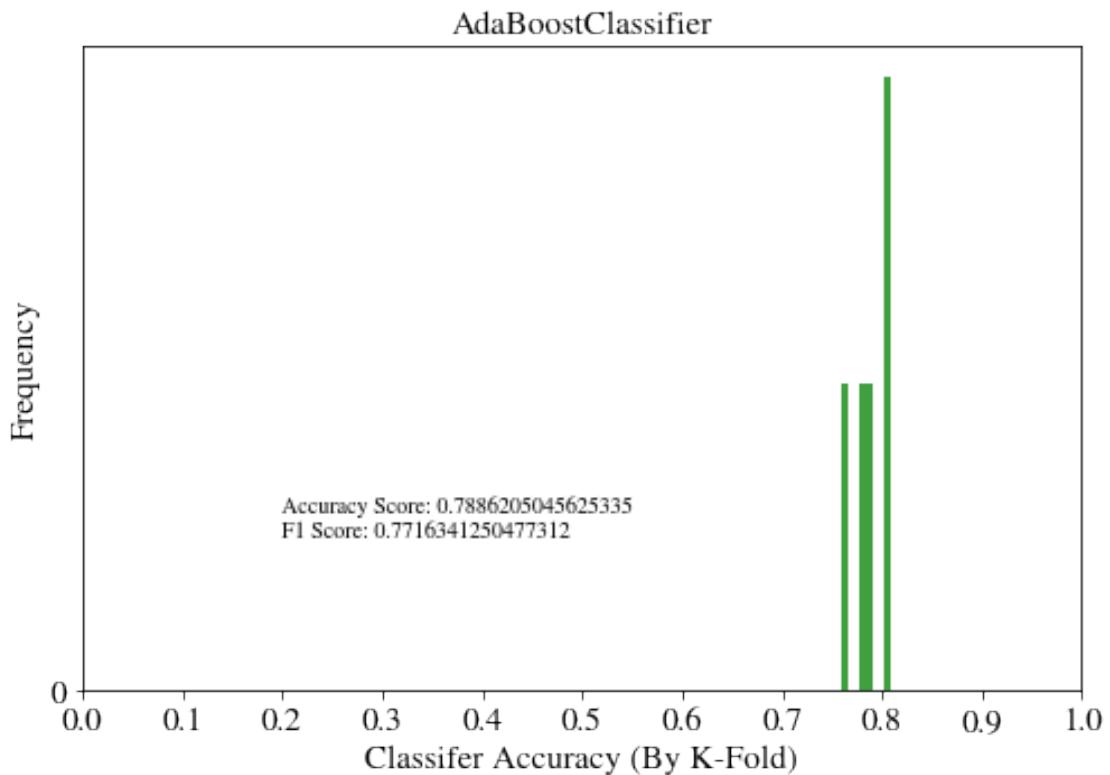
```

```

propria cellularity?', 'accuracy': [0.5740740740740741, 0.6358024691358025,
0.6419753086419753, 0.6975308641975309, 0.6459627329192547], 'avgAccuracy': 0.6390690897937275, 'f1': [0.5418618394008063, 0.5893428636775743, 0.6041723822588019, 0.6766916899261395, 0.6242426163011788], 'avgF1': 0.6072622783129001, 'precision': [0.5740740740740741, 0.6358024691358025, 0.6419753086419753, 0.6975308641975309, 0.6459627329192547], 'avgPrecision': 0.6390690897937275, 'recall': [0.5740740740740741, 0.6358024691358025, 0.6419753086419753, 0.6975308641975309, 0.6459627329192547], 'avgRecall': 0.6390690897937275, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,

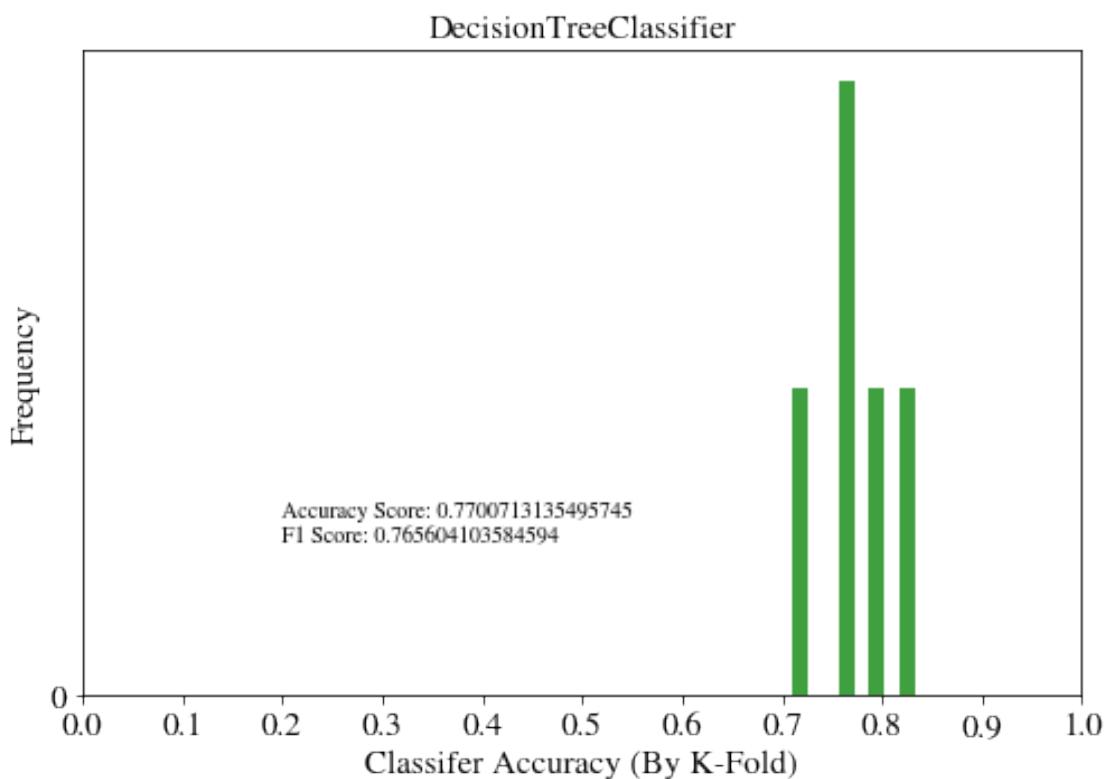
```

```

Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,
Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in
lamina propria cellularity?', 'accuracy': [0.808641975308642,
0.7901234567901234, 0.7592592592592593, 0.8024691358024691, 0.782608695652174],
'avgAccuracy': 0.7886205045625335, 'f1': [0.7959756180051349,
0.7622186081579934, 0.7446938357640677, 0.7788172945347881, 0.7764652687766721],
'avgF1': 0.7716341250477312, 'precision': [0.808641975308642,
0.7901234567901234, 0.7592592592592593, 0.8024691358024691, 0.782608695652174],
'avgPrecision': 0.7886205045625335, 'recall': [0.808641975308642,
0.7901234567901234, 0.7592592592592593, 0.8024691358024691, 0.782608695652174],
'avgRecall': 0.7886205045625335, 'params': [{'algorithm': 'SAMME.R',
'base_estimator': None, 'learning_rate': 1, 'n_estimators': 20, 'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



```

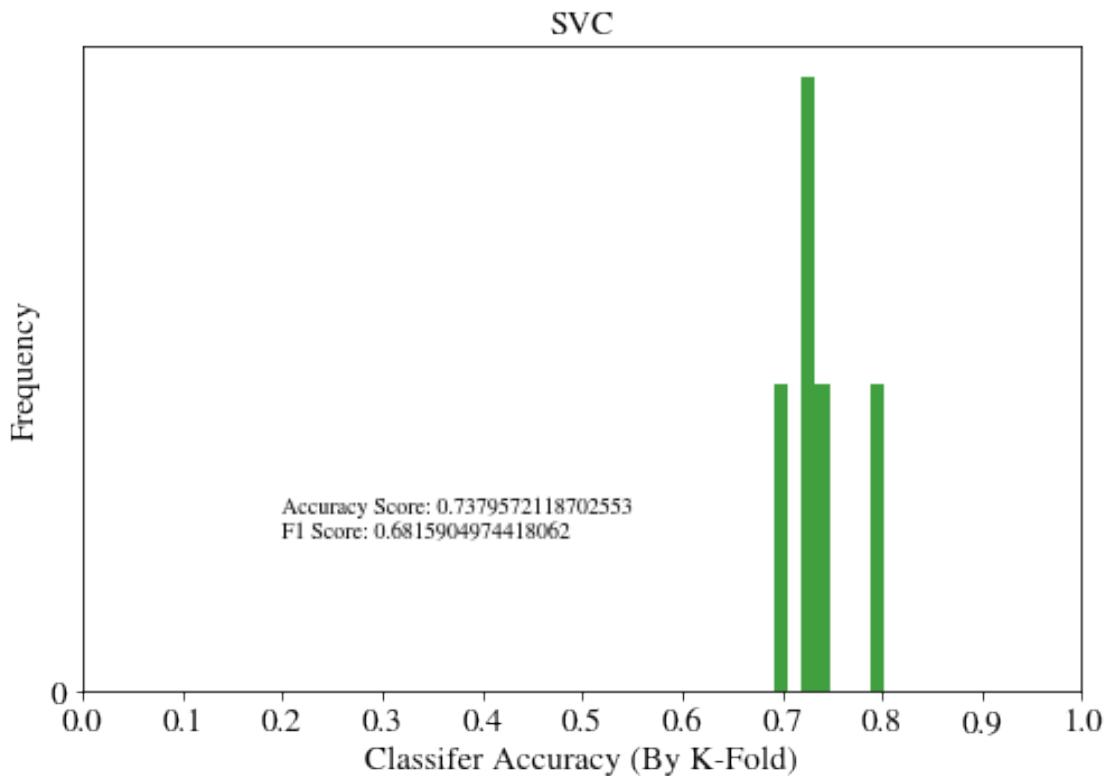
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?',
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,

```

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
 Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
 Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
 abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
 Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
 Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  
 lamina propria cellularity?', 'accuracy': [0.7098765432098766,  
 0.7592592592593, 0.7901234567901234, 0.833333333333334, 0.7577639751552795],  
 'avgAccuracy': 0.7700713135495745, 'f1': [0.7033231484922305,  
 0.7539464930769278, 0.788709508226995, 0.8249202169948936, 0.7571211511319227],  
 'avgF1': 0.765604103584594, 'precision': [0.7098765432098766,  
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 'avgPrecision': 0.7700713135495745, 'recall': [0.7098765432098766,  
 0.7592592592593, 0.7901234567901234, 0.833333333333334, 0.7577639751552795],  
 'avgRecall': 0.7700713135495745, 'params': [{'ccp\_alpha': 0.0, 'class\_weight': None, 'criterion': 'entropy', 'max\_depth': None, 'max\_features': 'auto', 'max\_leaf\_nodes': None, 'min\_impurity\_decrease': 0.0, 'min\_impurity\_split': None, 'min\_samples\_leaf': 1, 'min\_samples\_split': 2, 'min\_weight\_fraction\_leaf': 0.0, 'random\_state': None, 'splitter': 'best'}]}

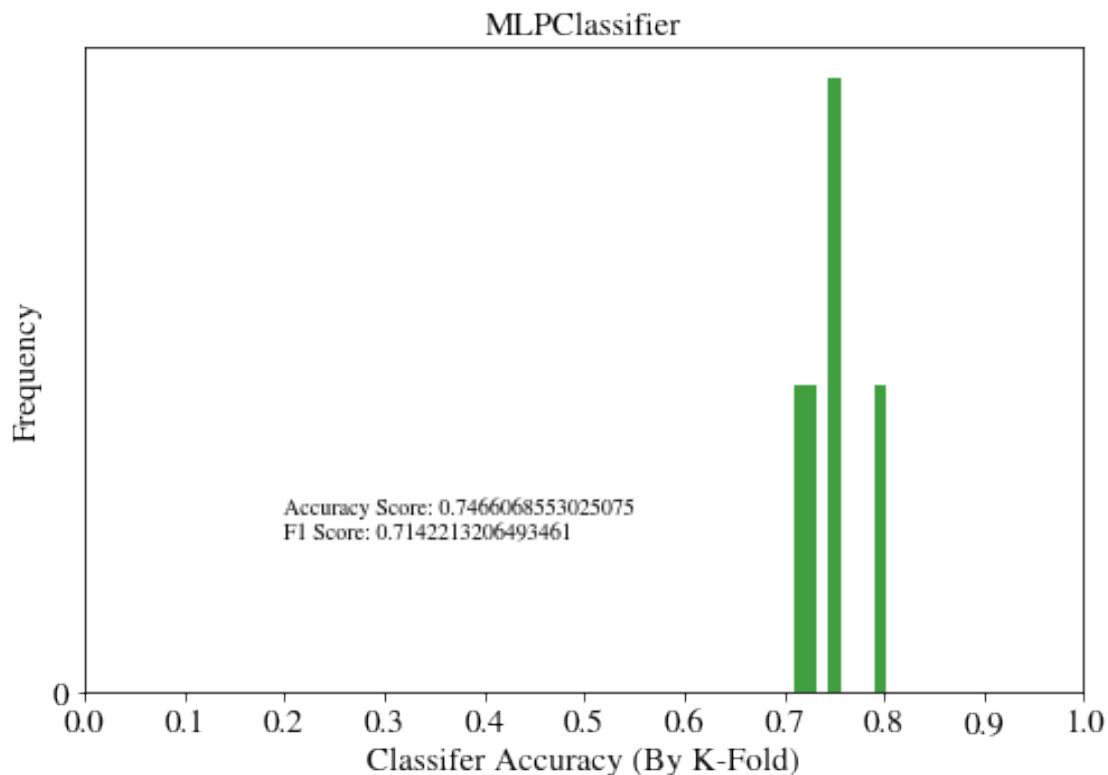
\*\*\*\*\*

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?', 'accuracy': [0.691358024691358, 0.7283950617283951, 0.7222222222222222, 0.8024691358024691, 0.7453416149068323], 'avgAccuracy': 0.7379572118702553, 'f1': [0.6299816852700939, 0.6565014487252122, 0.6626209092866769, 0.7615457491672244, 0.6973026947598235], 'avgF1': 0.6815904974418062, 'precision': [0.691358024691358, 0.7283950617283951, 0.7222222222222222, 0.8024691358024691, 0.7453416149068323], 'avgPrecision': 0.7379572118702553, 'recall': [0.691358024691358, 0.7283950617283951, 0.7222222222222222, 0.8024691358024691, 0.7453416149068323], 'avgRecall': 0.7379572118702553, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in lamina propria cellularity?', 'accuracy': [0.7098765432098766, 0.7222222222222222, 0.7469135802469136, 0.8024691358024691, 0.7515527950310559], 'avgAccuracy': 0.7466068553025075, 'f1': [0.6751393215606801, 0.6743677334292222, 0.7161324875111961, 0.7726414265437769, 0.732825634201855], 'avgF1': 0.7142213206493461, 'precision': [0.7098765432098766, 0.7222222222222222, 0.7469135802469136, 0.8024691358024691, 0.7515527950310559], 'avgPrecision': 0.7466068553025075, 'recall': [0.7098765432098766, 0.7222222222222222, 0.7469135802469136, 0.8024691358024691, 0.7515527950310559], 'avgRecall': 0.7466068553025075, 'params': [{'activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'hidden_layer_sizes': (100,), 'max_iter': 1000, 'solver': 'sgd'}]}
```

```

'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'constant',
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'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'verlowse': False, 'warm_start': False}]}
*****
*****  

* Best Performing Model and Params is:  

* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  

Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  

Increased lymphoid aggregates in lamina propria?, Mild & superficial increase in  

lamina propria cellularity?', 'accuracy': [0.7901234567901234,  

0.7654320987654321, 0.8271604938271605, 0.8580246913580247, 0.8074534161490683],  

'avgAccuracy': 0.8096388313779618, 'f1': [0.7764324153213044,  

0.7512510793353355, 0.8204987983083804, 0.84118037811971, 0.8019796149328074],  

'avgF1': 0.7982684572035076, 'precision': [0.7901234567901234,  

0.7654320987654321, 0.8271604938271605, 0.8580246913580247, 0.8074534161490683],  

'avgPrecision': 0.8096388313779618, 'recall': [0.7901234567901234,  

0.7654320987654321, 0.8271604938271605, 0.8580246913580247, 0.8074534161490683],  

'avgRecall': 0.8096388313779618, 'params': [{bootstrap': True, 'ccp_alpha':  

0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None,  

'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None,  

'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,  

'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 500,  

'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0,  

'warm_start': False}]}
*****

```

	model	features \			
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...			
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...			
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...			
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...			
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...			
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...			
6	SVC	Active inflammation?, Severity of Crypt Arch, ...			
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...			
	accuracy	f1	precision	recall	\
0	0.804693	0.793092	0.804693	0.804693	
1	0.767595	0.743996	0.767595	0.767595	
2	0.740419	0.710145	0.740419	0.740419	

```

3 0.639069 0.607262 0.639069 0.639069
4 0.695875 0.702569 0.695875 0.695875
5 0.736661 0.733491 0.736661 0.736661
6 0.737957 0.681590 0.737957 0.737957
7 0.737957 0.708151 0.737957 0.737957

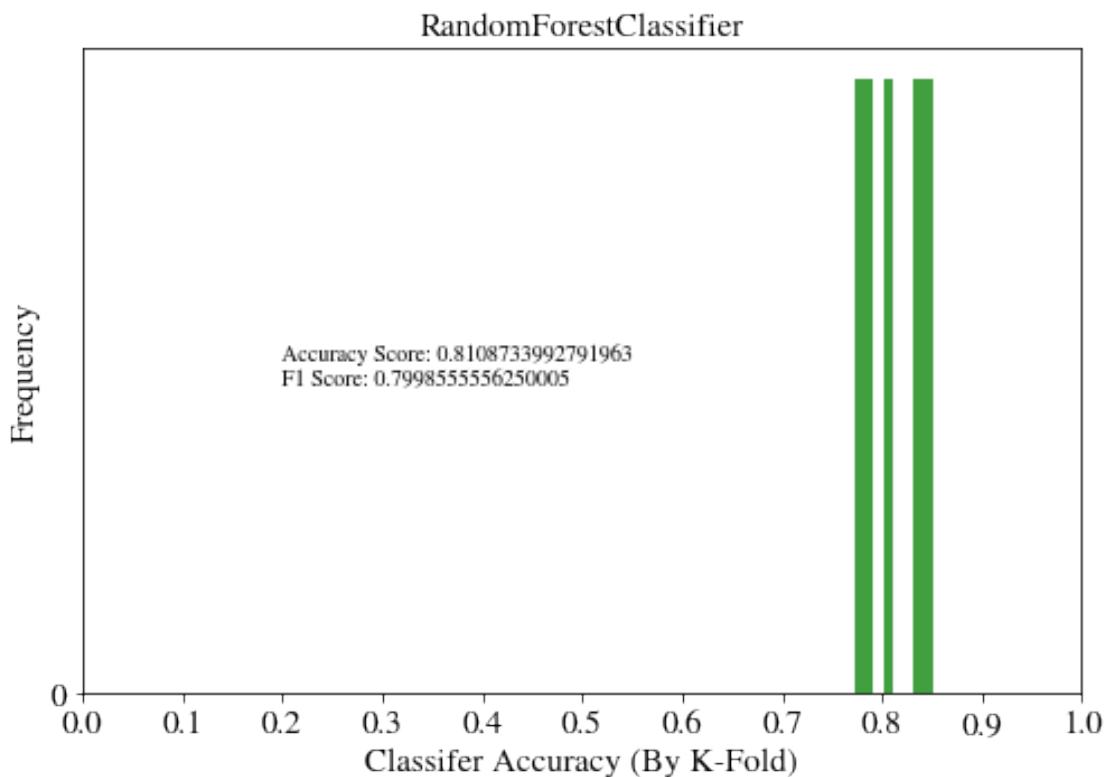
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```

params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3     {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier



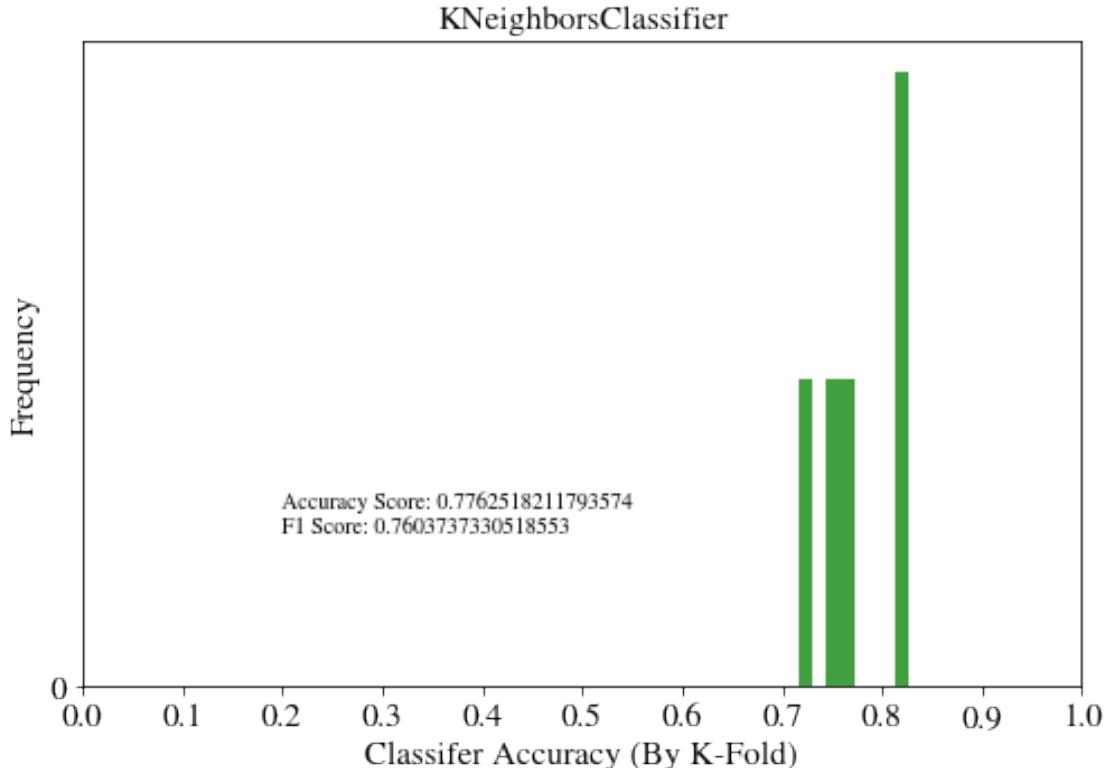
```

*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &

```

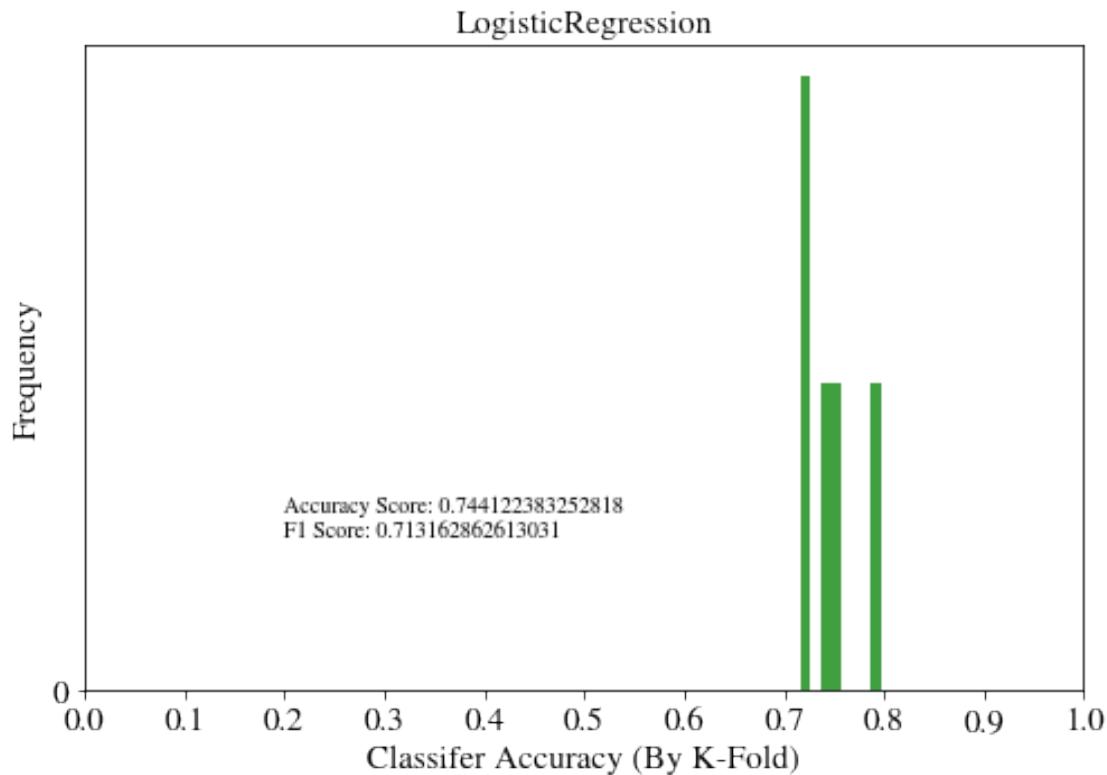
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?', 'accuracy': [0.7839506172839507, 0.7716049382716049, 0.8395061728395061, 0.8518518518518519, 0.8074534161490683], 'avgAccuracy': 0.8108733992791963, 'f1': [0.7708598897602335, 0.7593727305737109, 0.831393578191329, 0.8356719646669222, 0.8019796149328074], 'avgF1': 0.7998555556250005, 'precision': [0.7839506172839507, 0.7716049382716049, 0.8395061728395061, 0.8518518518518519, 0.8074534161490683], 'avgPrecision': 0.8108733992791963, 'recall': [0.7839506172839507, 0.7716049382716049, 0.8395061728395061, 0.8518518518518519, 0.8074534161490683], 'avgRecall': 0.8108733992791963, 'params': {'bootstrap': True, 'ccp\_alpha': 0.0, 'class\_weight': None, 'criterion': 'entropy', 'max\_depth': None, 'max\_features': 'auto', 'max\_leaf\_nodes': None, 'max\_samples': None, 'min\_impurity\_decrease': 0.0, 'min\_impurity\_split': None, 'min\_samples\_leaf': 1, 'min\_samples\_split': 2, 'min\_weight\_fraction\_leaf': 0.0, 'n\_estimators': 500, 'n\_jobs': -1, 'oob\_score': False, 'random\_state': None, 'verbose': 0, 'warm\_start': False}}]  
\*\*\*\*\*

Processing Model: KNeighborsClassifier



```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?', 'accuracy':  
[0.7160493827160493, 0.7469135802469136, 0.8271604938271605, 0.8271604938271605,  
0.7639751552795031], 'avgAccuracy': 0.7762518211793574, 'f1':  
[0.6942618424099904, 0.7341678715858283, 0.8114090124983371, 0.8106087594522268,  
0.7514211793128939], 'avgF1': 0.7603737330518553, 'precision':  
[0.7160493827160493, 0.7469135802469136, 0.8271604938271605, 0.8271604938271605,  
0.7639751552795031], 'avgPrecision': 0.7762518211793574, 'recall':  
[0.7160493827160493, 0.7469135802469136, 0.8271604938271605, 0.8271604938271605,  
0.7639751552795031], 'avgRecall': 0.7762518211793574, 'params': [{}{'algorithm':  
'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs':  
-1, 'n_neighbors': 13, 'p': 2, 'weights': 'distance'}]]}
*****
```

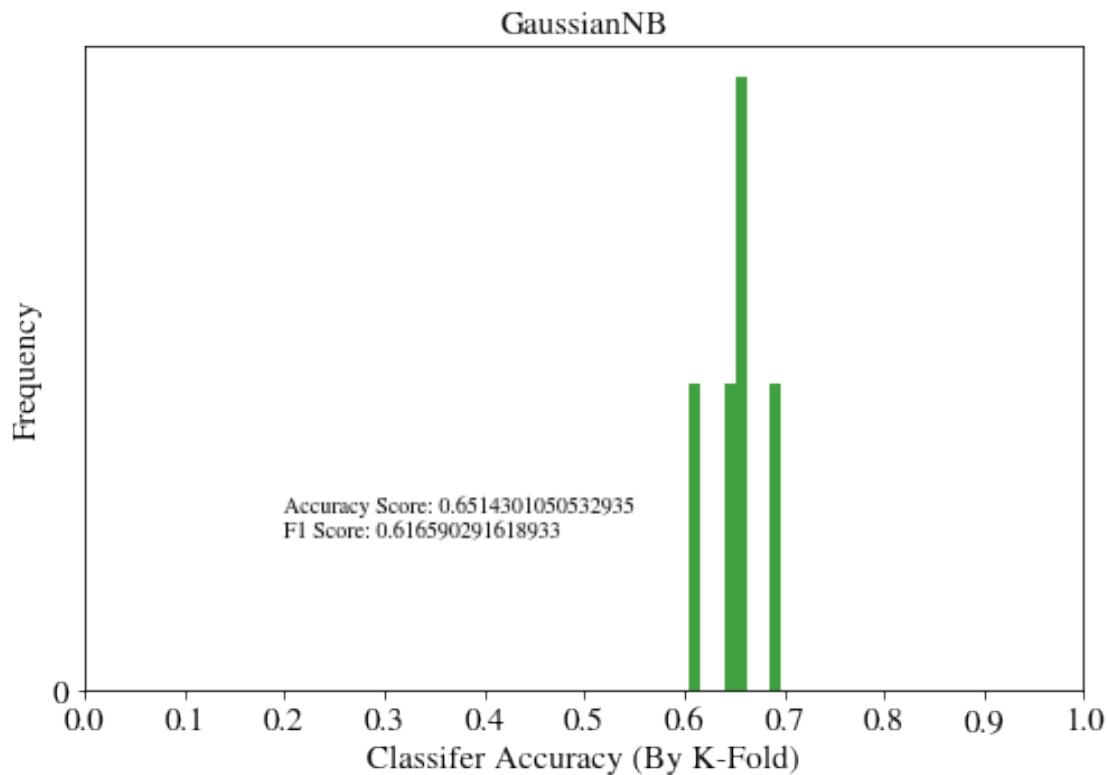
Processing Model: LogisticRegression



```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?', 'accuracy':  
[0.7222222222222222, 0.7160493827160493, 0.7469135802469136, 0.7962962962962963,  
0.7391304347826086], 'avgAccuracy': 0.744122383252818, 'f1': [0.690213994944468,  
0.6763124263291767, 0.7082517657853898, 0.766812523521648, 0.7242236024844722],  
'avgF1': 0.713162862613031, 'precision': [0.7222222222222222,  
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'avgPrecision': 0.744122383252818, 'recall': [0.7222222222222222,  
0.7160493827160493, 0.7469135802469136, 0.7962962962962963, 0.7391304347826086],  
'avgRecall': 0.744122383252818, 'params': [{'C': 1, 'class_weight': None,  
'dual': False, 'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None,  
'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs': -1, 'penalty': 'l2',
```

```
'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0,  
'warm_start': False}]}  
*****
```

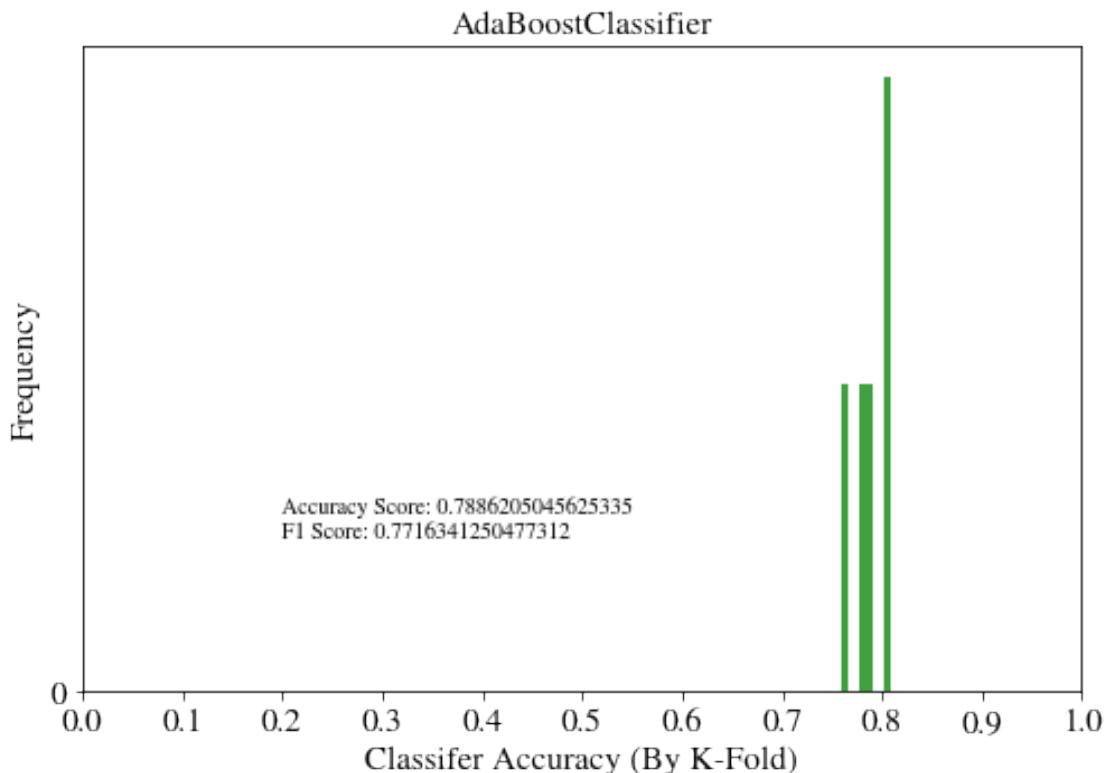
Processing Model: GaussianNB



```
*****  
* GaussianNB  
* Best Params Result:  
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of  
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal  
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt  
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial  
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing  
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses  
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal  
granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased  
lymphoid aggregates in lamina propria?', 'accuracy': [0.6049382716049383,  
0.6419753086419753, 0.654320987654321, 0.6975308641975309, 0.6583850931677019],  
'avgAccuracy': 0.6514301050532935, 'f1': [0.5649573882318354,  
0.5943597040274312, 0.614114724480578, 0.6754538991063272, 0.6340657422484931],  
'avgF1': 0.616590291618933, 'precision': [0.6049382716049383,  
0.6419753086419753, 0.654320987654321, 0.6975308641975309, 0.6583850931677019],
```

```
'avgPrecision': 0.6514301050532935, 'recall': [0.6049382716049383,  
0.6419753086419753, 0.654320987654321, 0.6975308641975309, 0.6583850931677019],  
'avgRecall': 0.6514301050532935, 'params': [{'priors': None, 'var_smoothing':  
1e-09}]}  
*****
```

Processing Model: AdaBoostClassifier



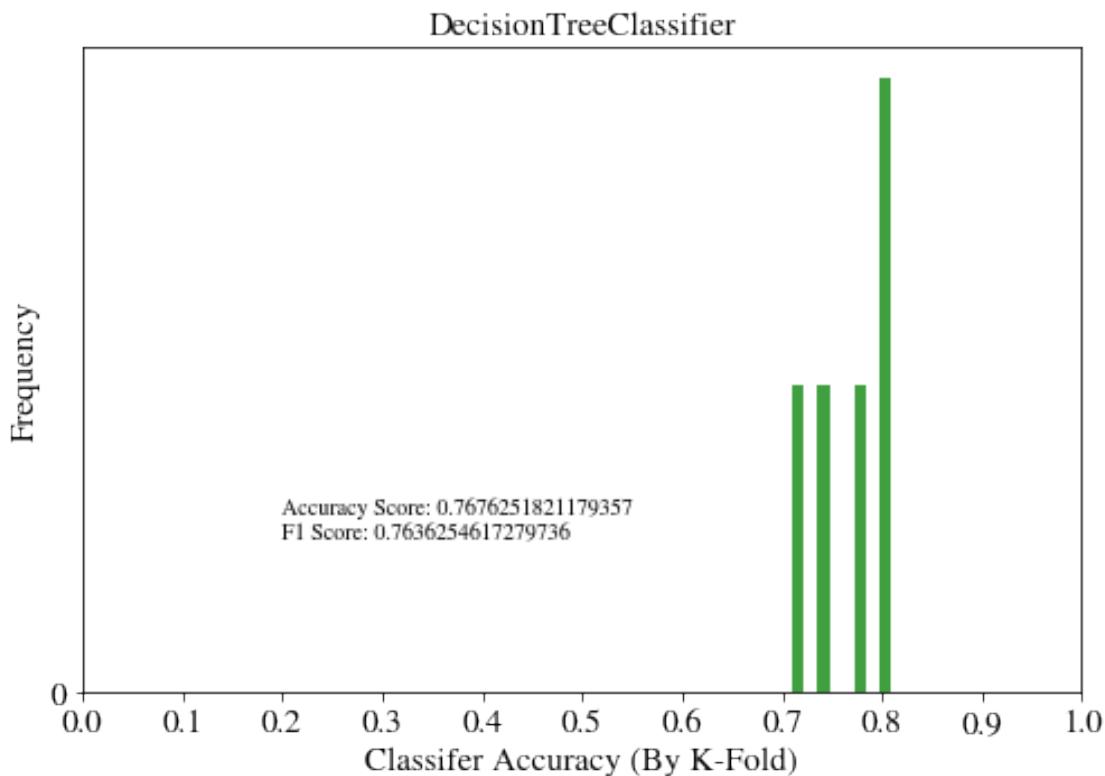
```
*****  
* AdaBoostClassifier  
* Best Params Result:  
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?', 'accuracy':  
[0.808641975308642, 0.7901234567901234, 0.7592592592592593, 0.8024691358024691,  
0.782608695652174], 'avgAccuracy': 0.7886205045625335, 'f1':  
[0.7959756180051349, 0.7622186081579934, 0.7446938357640677, 0.7788172945347881,
```

```

0.7764652687766721], 'avgF1': 0.7716341250477312, 'precision':
[0.808641975308642, 0.7901234567901234, 0.7592592592592593, 0.8024691358024691,
0.782608695652174], 'avgPrecision': 0.7886205045625335, 'recall':
[0.808641975308642, 0.7901234567901234, 0.7592592592592593, 0.8024691358024691,
0.782608695652174], 'avgRecall': 0.7886205045625335, 'params': [{}{'algorithm':
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 20,
'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



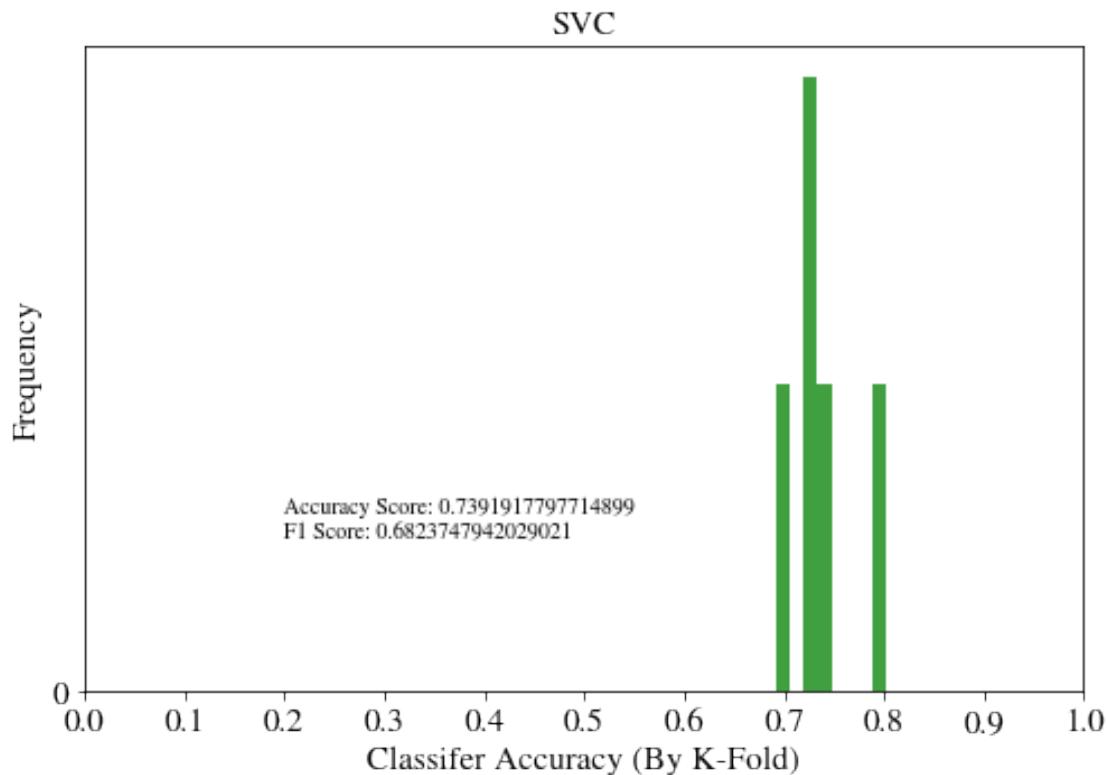
```

*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation,  
Increased lymphoid aggregates in lamina propria?', 'accuracy':
```

```
[0.7098765432098766, 0.7407407407407407, 0.808641975308642, 0.8024691358024691,
0.7763975155279503], 'avgAccuracy': 0.7676251821179357, 'f1':
[0.6978515311848644, 0.7397376730629099, 0.8100594063237742, 0.7865227016528813,
0.7839559964154383], 'avgF1': 0.7636254617279736, 'precision':
[0.7098765432098766, 0.7407407407407407, 0.808641975308642, 0.8024691358024691,
0.7763975155279503], 'avgPrecision': 0.7676251821179357, 'recall':
[0.7098765432098766, 0.7407407407407407, 0.808641975308642, 0.8024691358024691,
0.7763975155279503], 'avgRecall': 0.7676251821179357, 'params': [{'ccp_alpha':
0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None,
'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****

```

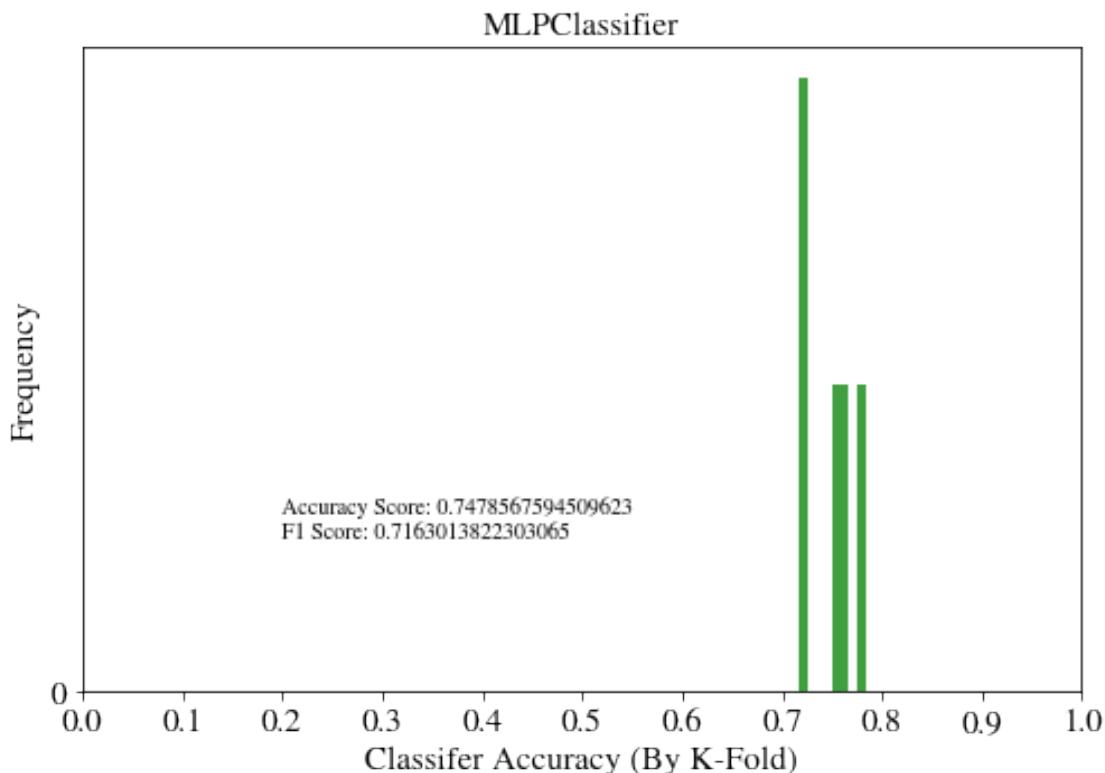
Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt
Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in
lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,
Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,
```

Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?', 'accuracy': [0.691358024691358, 0.7283950617283951, 0.7283950617283951, 0.8024691358024691, 0.7453416149068323], 'avgAccuracy': 0.7391917797714899, 'f1': [0.6299816852700939, 0.6565014487252122, 0.6665423930921565, 0.7615457491672244, 0.6973026947598235], 'avgF1': 0.6823747942029021, 'precision': [0.691358024691358, 0.7283950617283951, 0.7283950617283951, 0.8024691358024691, 0.7453416149068323], 'avgPrecision': 0.7391917797714899, 'recall': [0.691358024691358, 0.7283950617283951, 0.7283950617283951, 0.8024691358024691, 0.7453416149068323], 'avgRecall': 0.7391917797714899, 'params': [{C': 1.0, 'break\_ties': False, 'cache\_size': 4000, 'class\_weight': None, 'coef0': 0.0, 'decision\_function\_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max\_iter': -1, 'probability': False, 'random\_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}  
\*\*\*\*\*

Processing Model: MLPClassifier



\*\*\*\*\*

\* MLPClassifier

```

* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?', 'accuracy': [0.7160493827160493, 0.7222222222222222, 0.7530864197530864, 0.7839506172839507, 0.7639751552795031], 'avgAccuracy': 0.7478567594509623, 'f1': [0.6848298191581773, 0.6752871445242922, 0.7188373970549606, 0.7589270339037866, 0.7436255165103157], 'avgF1': 0.7163013822303065, 'precision': [0.7160493827160493, 0.7222222222222222, 0.7530864197530864, 0.7839506172839507, 0.7639751552795031], 'avgPrecision': 0.7478567594509623, 'recall': [0.7160493827160493, 0.7222222222222222, 0.7530864197530864, 0.7839506172839507, 0.7639751552795031], 'avgRecall': 0.7478567594509623, 'params': [{'activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'invscaling', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation, Increased lymphoid aggregates in lamina propria?', 'accuracy': [0.7839506172839507, 0.7716049382716049, 0.8395061728395061, 0.8518518518518519, 0.8074534161490683], 'avgAccuracy': 0.8108733992791963, 'f1': [0.7708598897602335, 0.7593727305737109, 0.831393578191329, 0.8356719646669222, 0.8019796149328074], 'avgF1': 0.7998555556250005, 'precision': [0.7839506172839507, 0.7716049382716049, 0.8395061728395061, 0.8518518518518519, 0.8074534161490683], 'avgPrecision': 0.8108733992791963, 'recall': [0.7839506172839507, 0.7716049382716049, 0.8395061728395061, 0.8518518518518519, 0.8074534161490683], 'avgRecall': 0.8108733992791963, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 100, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}

```

```

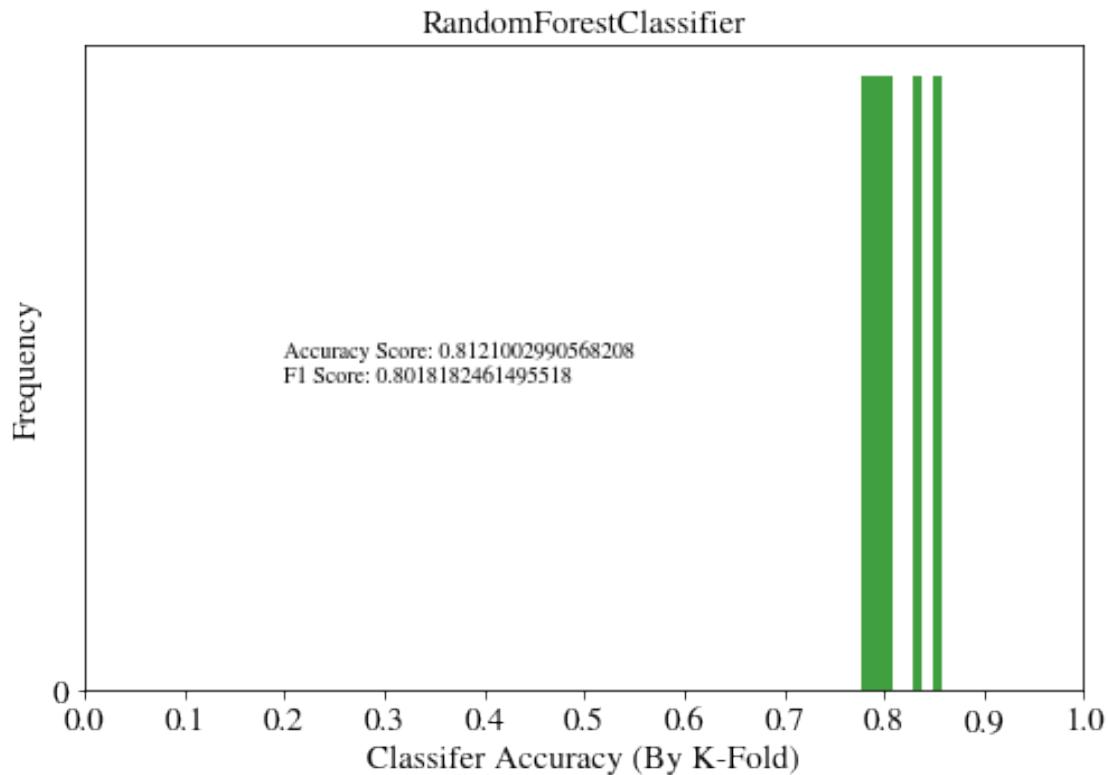
'n_estimators': 500, 'n_jobs': -1, 'oob_score': False, 'random_state': None,
'verbose': 0, 'warm_start': False}]}
*****
model features \
0 RandomForestClassifier Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB Active inflammation?, Severity of Crypt Arch, ...
4 AdaBoostClassifier Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier Active inflammation?, Severity of Crypt Arch, ...
6 SVC Active inflammation?, Severity of Crypt Arch, ...
7 MLPClassifier Active inflammation?, Severity of Crypt Arch, ...

accuracy f1 precision recall \
0 0.807162 0.795751 0.807162 0.807162
1 0.766360 0.742331 0.766360 0.766360
2 0.744122 0.713163 0.744122 0.744122
3 0.651430 0.616590 0.651430 0.651430
4 0.695844 0.702450 0.695844 0.695844
5 0.747795 0.743047 0.747795 0.747795
6 0.739192 0.682375 0.739192 0.739192
7 0.741669 0.711985 0.741669 0.741669

params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3 {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

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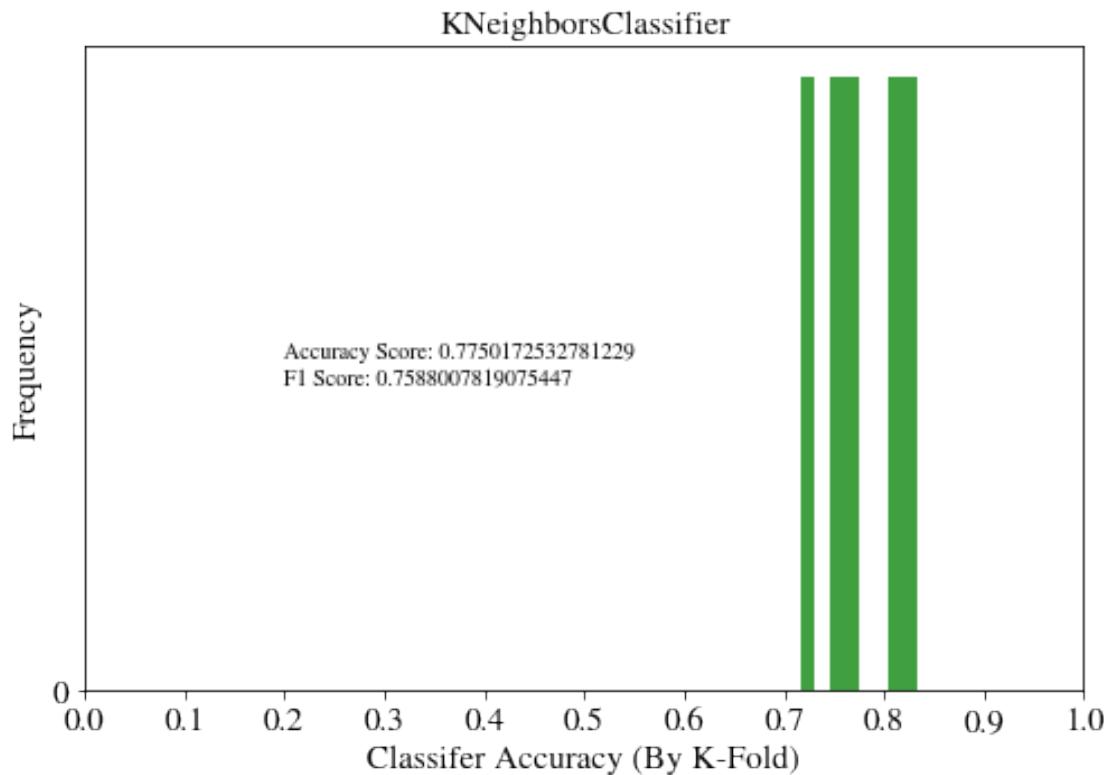
Processing Model: RandomForestClassifier



```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation', 'accuracy': [0.7901234567901234, 0.7777777777777778, 0.8333333333333334, 0.8580246913580247, 0.8012422360248447], 'avgAccuracy': 0.8121002990568208, 'f1': [0.7764324153213044, 0.7673490995121218, 0.8244555416840063, 0.8441002569551879, 0.7967539172751386], 'avgF1': 0.8018182461495518, 'precision': [0.7901234567901234, 0.7777777777777778, 0.8333333333333334, 0.8580246913580247, 0.8012422360248447], 'avgPrecision': 0.8121002990568208, 'recall': [0.7901234567901234, 0.7777777777777778, 0.8333333333333334, 0.8580246913580247, 0.8012422360248447], 'avgRecall': 0.8121002990568208, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_samples_leaf': 1, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 100, 'oob_score': False, 'random_state': 42, 'verbose': 0, 'warm_start': False}]}*****
```

```
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 500, 'n_jobs': -1, 'oob_score':
True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
```

Processing Model: KNeighborsClassifier



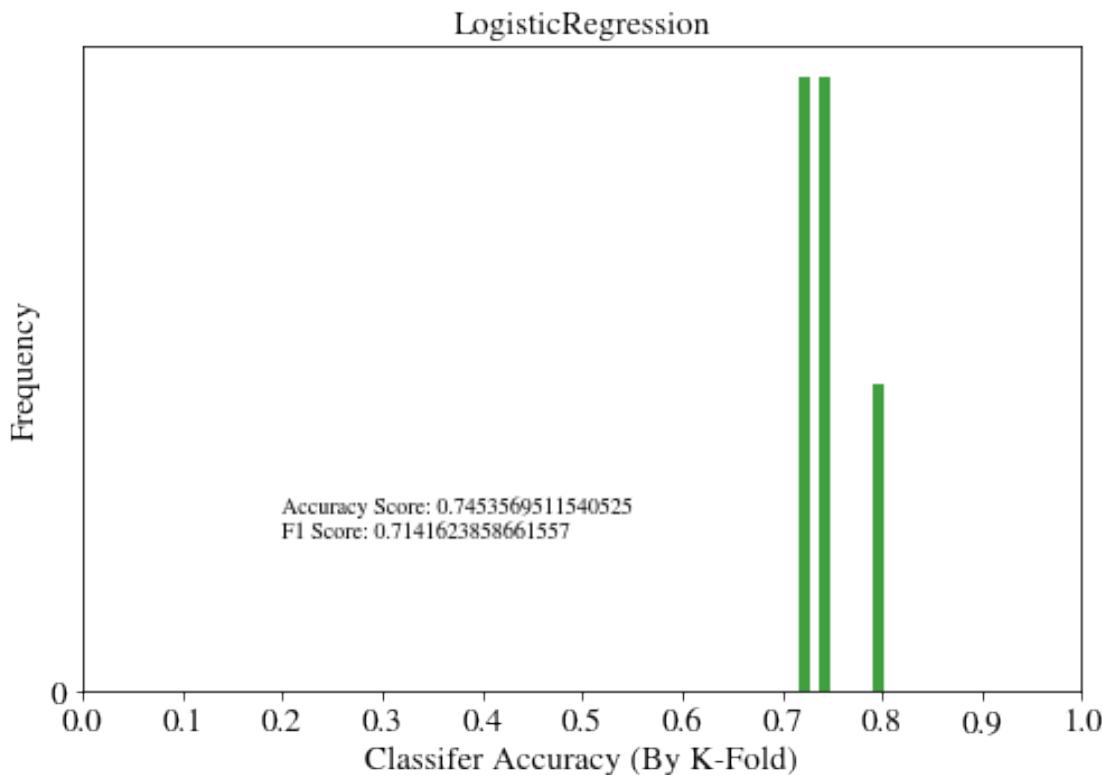
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation', 'accuracy': [0.7160493827160493, 0.7469135802469136, 0.8333333333333334, 0.8148148148148, 0.7639751552795031], 'avgAccuracy': 0.7750172532781229, 'f1': [0.6942618424099904, 0.7341678715858283, 0.819800707168113, 0.7930492239534903, 0.7527242644203018], 'avgF1': 0.7588007819075447, 'precision': [0.7160493827160493, 0.7469135802469136, 0.8333333333333334,
```

```

0.8148148148148148, 0.7639751552795031], 'avgPrecision': 0.7750172532781229,
'recall': [0.7160493827160493, 0.7469135802469136, 0.8333333333333334,
0.8148148148148148, 0.7639751552795031], 'avgRecall': 0.7750172532781229,
'params': [{ 'algorithm': 'kd_tree', 'leaf_size': 30, 'metric': 'minkowski',
'metric_params': None, 'n_jobs': -1, 'n_neighbors': 13, 'p': 2, 'weights':
'distance' }]}
*****

```

Processing Model: LogisticRegression



```

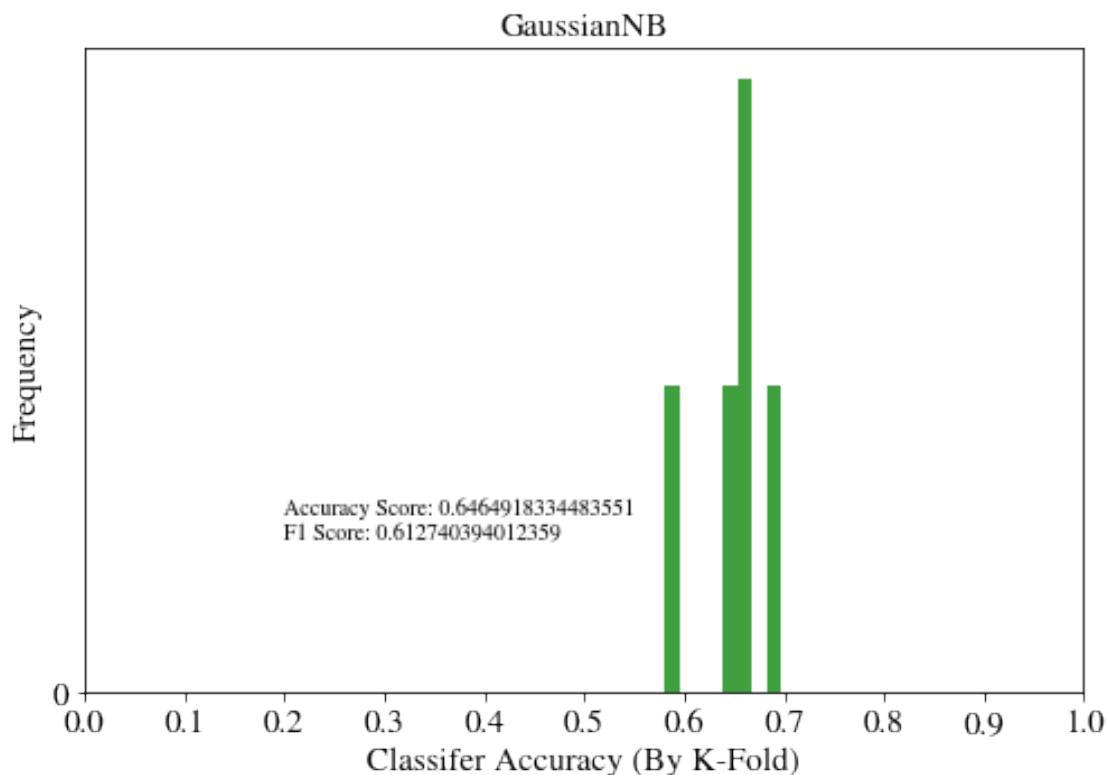
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,
Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation',
'accuracy': [0.7222222222222222, 0.7160493827160493, 0.7469135802469136,
0.8024691358024691, 0.7391304347826086], 'avgAccuracy': 0.7453569511540525,
```

```

'f1': [0.690213994944468, 0.6763124263291767, 0.7082517657853898,
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'precision': [0.7222222222222222, 0.7160493827160493, 0.7469135802469136,
0.8024691358024691, 0.7391304347826086], 'avgPrecision': 0.7453569511540525,
'recall': [0.7222222222222222, 0.7160493827160493, 0.7469135802469136,
0.8024691358024691, 0.7391304347826086], 'avgRecall': 0.7453569511540525,
'params': [{C': 1, 'class_weight': None, 'dual': False, 'fit_intercept': True,
'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class':
'multinomial', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver':
'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses

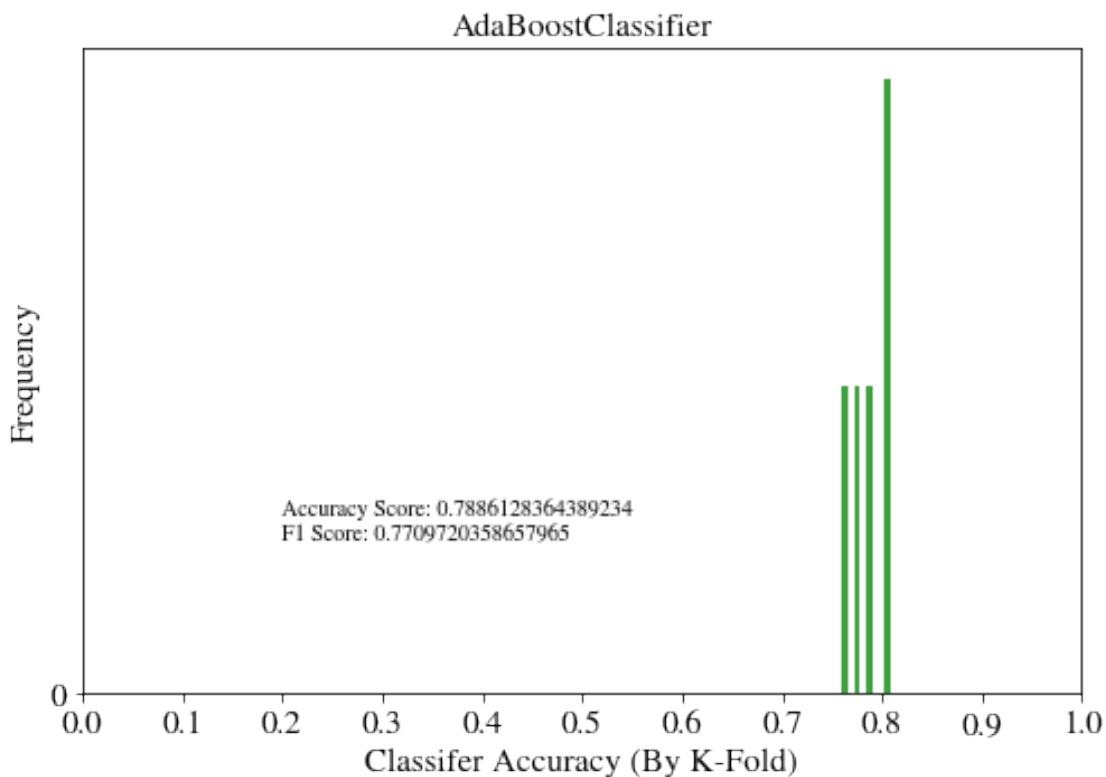
```

```

polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal
granulomas, Basal histiocytic cells, Sex, Method of confirmation', 'accuracy':
[0.5802469135802469, 0.6419753086419753, 0.654320987654321, 0.6975308641975309,
0.6583850931677019], 'avgAccuracy': 0.6464918334483551, 'f1':
[0.5457079001989656, 0.5943597040274312, 0.614114724480578, 0.6754538991063272,
0.6340657422484931], 'avgF1': 0.612740394012359, 'precision':
[0.5802469135802469, 0.6419753086419753, 0.654320987654321, 0.6975308641975309,
0.6583850931677019], 'avgPrecision': 0.6464918334483551, 'recall':
[0.5802469135802469, 0.6419753086419753, 0.654320987654321, 0.6975308641975309,
0.6583850931677019], 'avgRecall': 0.6464918334483551, 'params': [{'priors':
None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



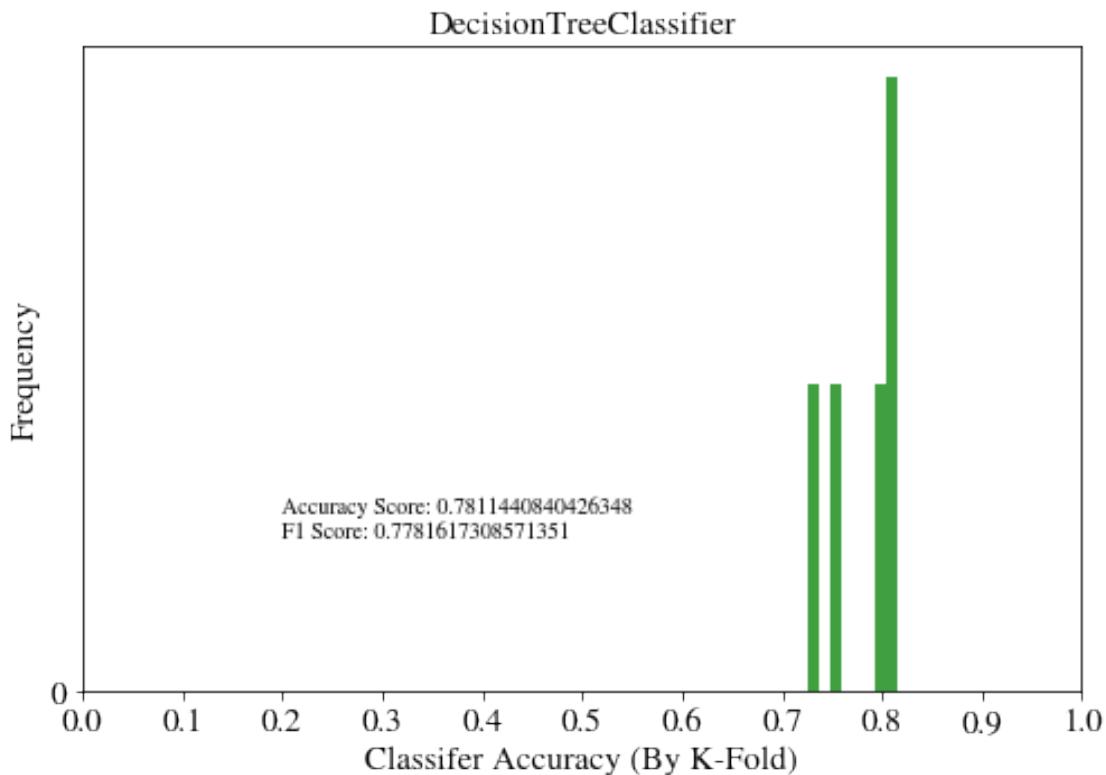
```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,'
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,

```

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation', 'accuracy': [0.808641975308642, 0.7901234567901234, 0.7592592592592593, 0.808641975308642, 0.7763975155279503], 'avgAccuracy': 0.7886128364389234, 'f1': [0.7959756180051349, 0.7622186081579934, 0.7422356995504344, 0.7791080293609681, 0.775322224254452], 'avgF1': 0.7709720358657965, 'precision': [0.808641975308642, 0.7901234567901234, 0.7592592592592593, 0.808641975308642, 0.7763975155279503], 'avgPrecision': 0.7886128364389234, 'recall': [0.808641975308642, 0.7901234567901234, 0.7592592592592593, 0.808641975308642, 0.7763975155279503], 'avgRecall': 0.7886128364389234, 'params': [{ 'algorithm': 'SAMME.R', 'base\_estimator': None, 'learning\_rate': 1, 'n\_estimators': 20, 'random\_state': None}]}  
\*\*\*\*\*

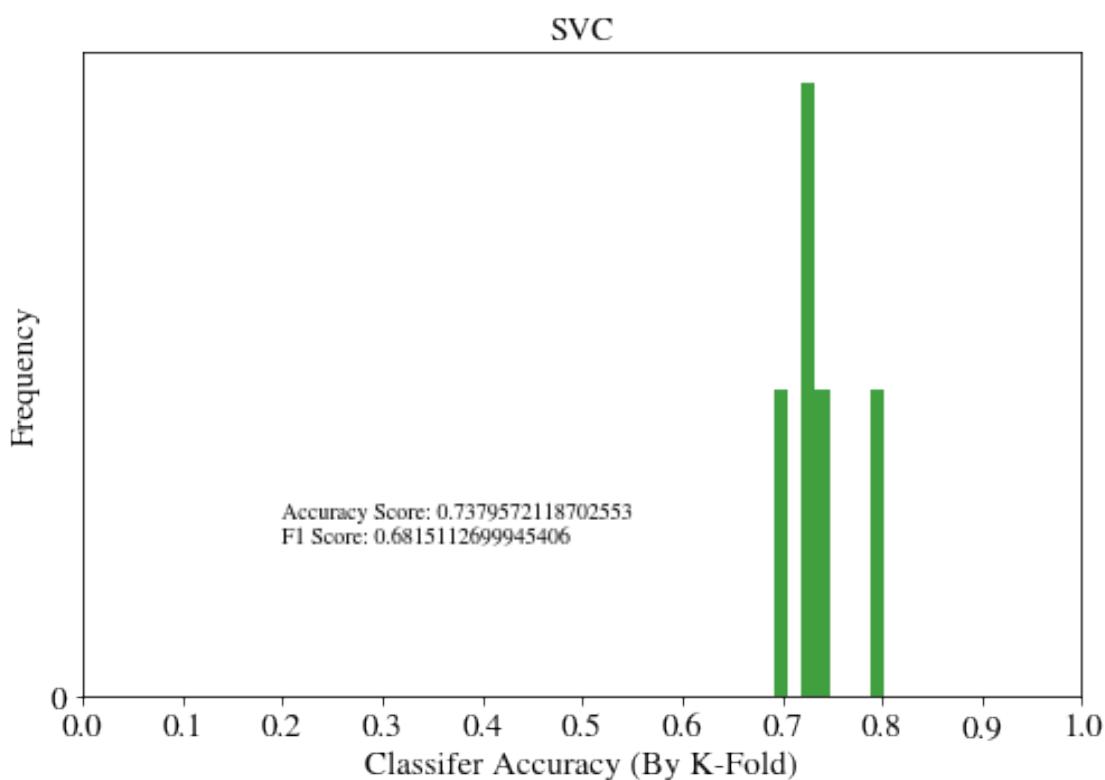
Processing Model: DecisionTreeClassifier



\*\*\*\*\*  
\* DecisionTreeClassifier  
\* Best Params Result:  
\* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation', 'accuracy': [0.7530864197530864, 0.808641975308642, 0.8148148148148, 0.8024691358024691, 0.7267080745341615], 'avgAccuracy': 0.7811440840426348, 'f1': [0.7507963011150625, 0.8069308059598861, 0.8103465612593403, 0.7927838051294842, 0.7299511808219027], 'avgF1': 0.7781617308571351, 'precision': [0.7530864197530864, 0.808641975308642, 0.8148148148148, 0.8024691358024691, 0.7267080745341615], 'avgPrecision': 0.7811440840426348, 'recall': [0.7530864197530864, 0.808641975308642, 0.8148148148148, 0.8024691358024691, 0.7267080745341615], 'avgRecall': 0.7811440840426348, 'params': [{ 'ccp\_alpha': 0.0, 'class\_weight': None, 'criterion': 'gini', 'max\_depth': None, 'max\_features': 'auto', 'max\_leaf\_nodes': None, 'min\_impurity\_decrease': 0.0, 'min\_impurity\_split': None, 'min\_samples\_leaf': 1, 'min\_samples\_split': 2, 'min\_weight\_fraction\_leaf': 0.0, 'random\_state': None, 'splitter': 'best' }]}  
\*\*\*\*\*

Processing Model: SVC



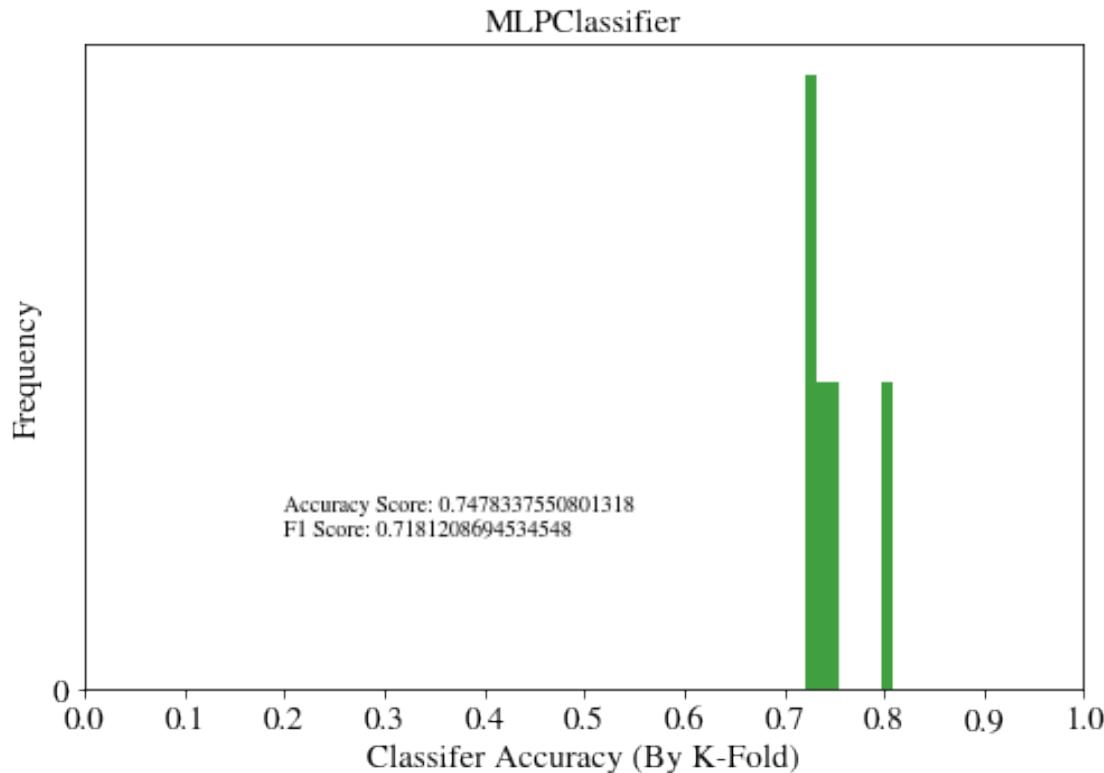
\*\*\*\*\*

```

* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation', 'accuracy': [0.691358024691358, 0.7222222222222222, 0.7283950617283951, 0.8024691358024691, 0.7453416149068323], 'avgAccuracy': 0.7379572118702553, 'f1': [0.6299816852700939, 0.6521838276834049, 0.6665423930921565, 0.7615457491672244, 0.6973026947598235], 'avgF1': 0.6815112699945406, 'precision': [0.691358024691358, 0.7222222222222222, 0.7283950617283951, 0.8024691358024691, 0.7453416149068323], 'avgPrecision': 0.7379572118702553, 'recall': [0.691358024691358, 0.7222222222222222, 0.7283950617283951, 0.8024691358024691, 0.7453416149068323], 'avgRecall': 0.7379572118702553, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}}
*****

```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation', 'accuracy': [0.7222222222222222, 0.7222222222222222, 0.7407407407407407, 0.808641975308642, 0.7453416149068323], 'avgAccuracy': 0.7478337550801318, 'f1': [0.694284684440048, 0.6752871445242922, 0.7078161504218767, 0.7776319818886617, 0.7355843859923952], 'avgF1': 0.7181208694534548, 'precision': [0.7222222222222222, 0.7222222222222222, 0.7407407407407407, 0.808641975308642, 0.7453416149068323], 'avgPrecision': 0.7478337550801318, 'recall': [0.7222222222222222, 0.7222222222222222, 0.7407407407407407, 0.808641975308642, 0.7453416149068323], 'avgRecall': 0.7478337550801318, 'params': [{activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'invscaling', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}

*****
*****
```

\* Best Performing Model and Params is:

```
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex, Method of confirmation', 'accuracy': [0.7901234567901234, 0.7777777777777778, 0.8333333333333334, 0.8580246913580247, 0.8012422360248447], 'avgAccuracy': 0.8121002990568208, 'f1': [0.7764324153213044, 0.7673490995121218, 0.8244555416840063, 0.8441002569551879, 0.7967539172751386], 'avgF1': 0.8018182461495518, 'precision': [0.7901234567901234, 0.7777777777777778, 0.8333333333333334, 0.8580246913580247, 0.8012422360248447], 'avgPrecision': 0.8121002990568208, 'recall': [0.7901234567901234, 0.7777777777777778, 0.8333333333333334, 0.8580246913580247, 0.8012422360248447], 'avgRecall': 0.8121002990568208,
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```

'params': [ {'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None,
'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto',
'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 500, 'n_jobs': -1, 'oob_score':
True, 'random_state': None, 'verbose': 0, 'warm_start': False} ] }

*****



model features \
0 RandomForestClassifier Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB Active inflammation?, Severity of Crypt Arch, ...
4 AdaBoostClassifier Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier Active inflammation?, Severity of Crypt Arch, ...
6 SVC Active inflammation?, Severity of Crypt Arch, ...
7 MLPClassifier Active inflammation?, Severity of Crypt Arch, ...



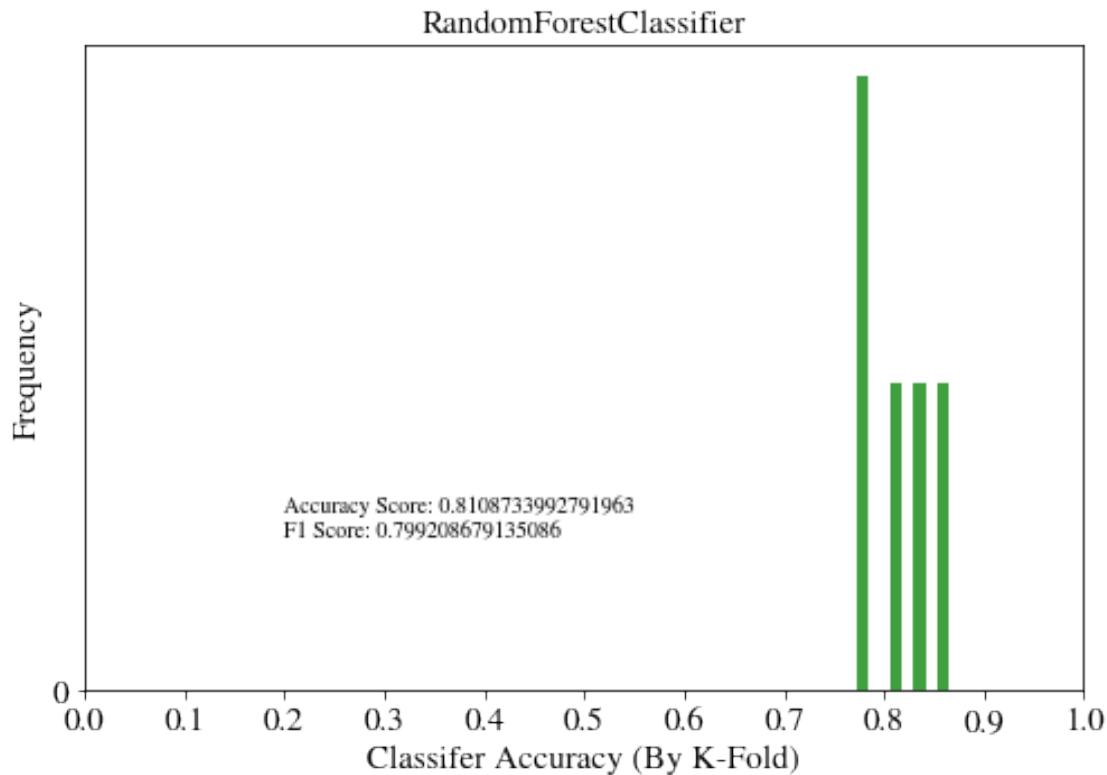
accuracy f1 precision recall \
0 0.807162 0.795121 0.807162 0.807162
1 0.770064 0.747968 0.770064 0.770064
2 0.745357 0.714162 0.745357 0.745357
3 0.646492 0.612740 0.646492 0.646492
4 0.688436 0.694065 0.688436 0.688436
5 0.735450 0.729809 0.735450 0.735450
6 0.737957 0.681511 0.737957 0.737957
7 0.739184 0.712249 0.739184 0.739184



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0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3 {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier

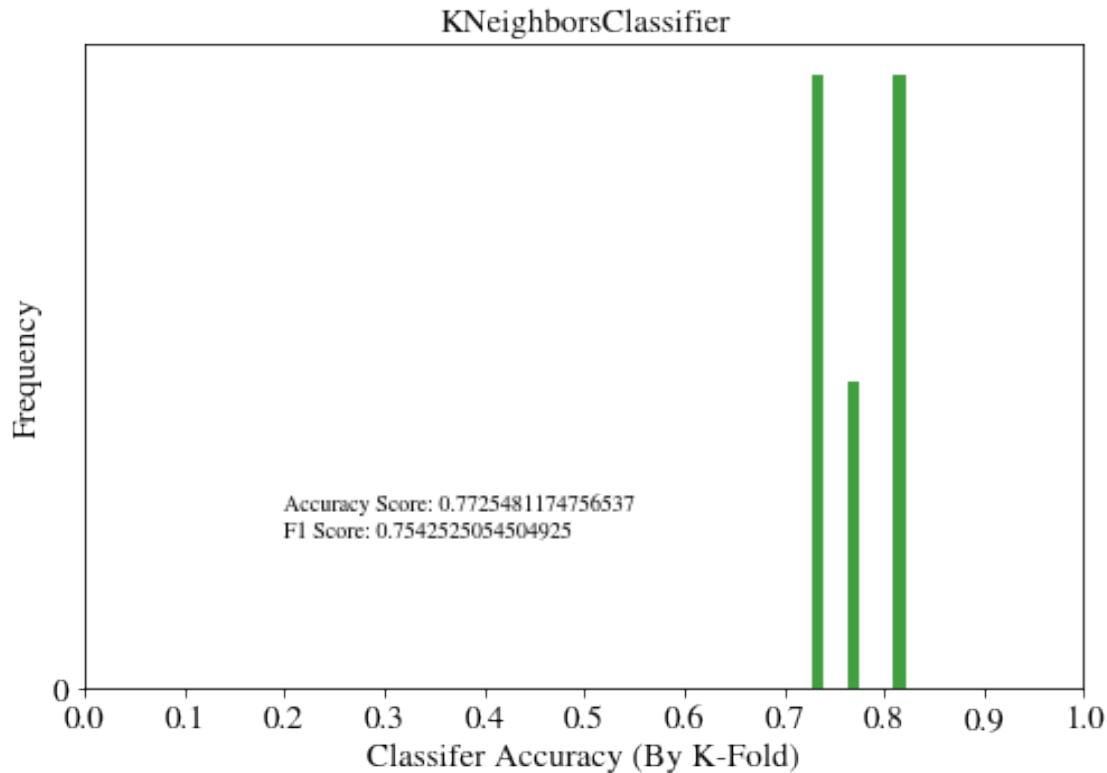


```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex', 'accuracy': [0.7777777777777778, 0.7716049382716049, 0.8333333333333334, 0.8641975308641975, 0.8074534161490683], 'avgAccuracy': 0.8108733992791963, 'f1': [0.7656776094276094, 0.756524053413012, 0.8221770092330599, 0.8496851086689412, 0.8019796149328074], 'avgF1': 0.799208679135086, 'precision': [0.7777777777777778, 0.7716049382716049, 0.8333333333333334, 0.8641975308641975, 0.8074534161490683], 'avgPrecision': 0.8108733992791963, 'recall': [0.7777777777777778, 0.7716049382716049, 0.8333333333333334, 0.8641975308641975, 0.8074534161490683], 'avgRecall': 0.8108733992791963, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None},
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```
'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0,
'n_estimators': 700, 'n_jobs': -1, 'oob_score': True, 'random_state': None,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



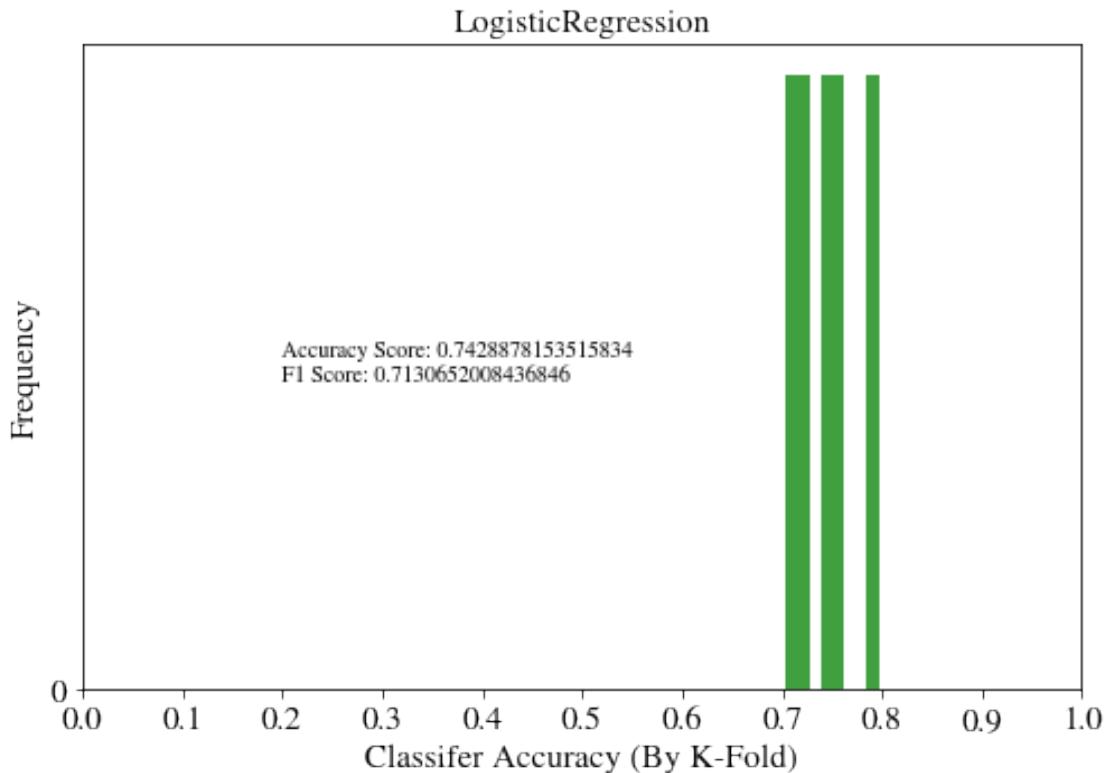
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells, Sex', 'accuracy':  
[0.7345679012345679, 0.7283950617283951, 0.8209876543209876, 0.8148148148148148,  
0.7639751552795031], 'avgAccuracy': 0.7725481174756537, 'f1':  
[0.7101654063402697, 0.7091745347226361, 0.8061490978157645, 0.7930492239534903,  
0.7527242644203018], 'avgF1': 0.7542525054504925, 'precision':  
[0.7345679012345679, 0.7283950617283951, 0.8209876543209876, 0.8148148148148148,
```

```

0.7639751552795031], 'avgPrecision': 0.7725481174756537, 'recall':
[0.7345679012345679, 0.7283950617283951, 0.8209876543209876, 0.8148148148148,
0.7639751552795031], 'avgRecall': 0.7725481174756537, 'params': [{algorithm':
'ball_tree', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None,
'n_jobs': -1, 'n_neighbors': 12, 'p': 2, 'weights': 'distance'}]}}
*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  

Submucosal granulomas, Basal histiocytic cells, Sex', 'accuracy':  

[0.7222222222222222, 0.7037037037037037, 0.7530864197530864, 0.7962962962962963,  

0.7391304347826086], 'avgAccuracy': 0.7428878153515834, 'f1':  

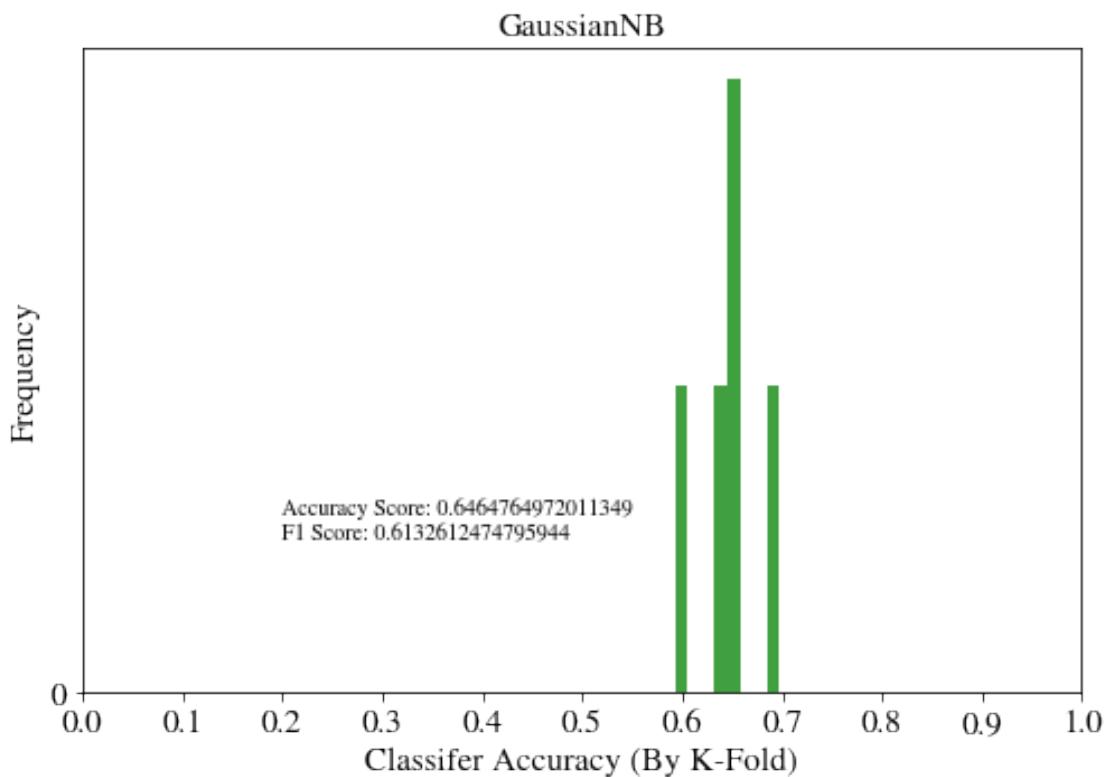
[0.690213994944468, 0.6708837693609266, 0.7141149609494385, 0.765889676479118,
```

```

0.7242236024844722], 'avgF1': 0.7130652008436846, 'precision':
[0.7222222222222222, 0.7037037037037037, 0.7530864197530864, 0.7962962962962963,
0.7391304347826086], 'avgPrecision': 0.7428878153515834, 'recall':
[0.7222222222222222, 0.7037037037037037, 0.7530864197530864, 0.7962962962962963,
0.7391304347826086], 'avgRecall': 0.7428878153515834, 'params': [ {'C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs':
-1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal

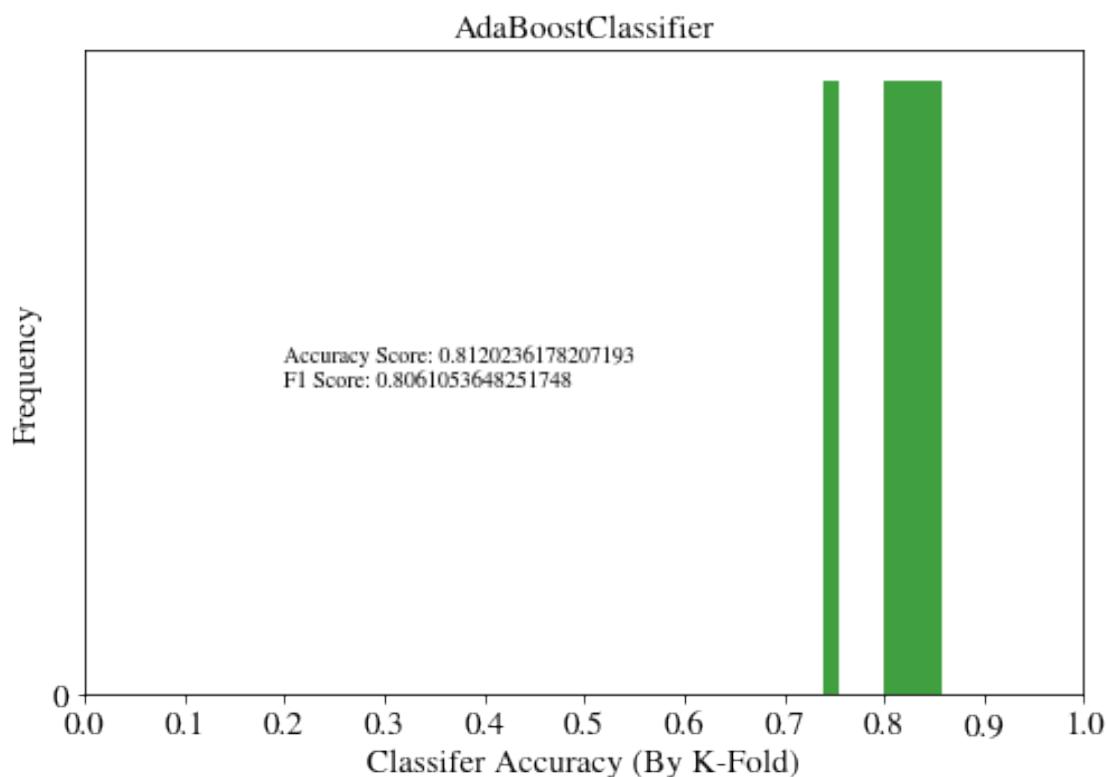
```

```

granulomas, Basal histiocytic cells, Sex', 'accuracy': [0.5925925925925926,
0.6419753086419753, 0.654320987654321, 0.6975308641975309, 0.6459627329192547],
'avgAccuracy': 0.6464764972011349, 'f1': [0.5573149900812726,
0.5943597040274312, 0.6152045175846284, 0.6754538991063272, 0.6239731265983129],
'avgF1': 0.6132612474795944, 'precision': [0.5925925925925926,
0.6419753086419753, 0.654320987654321, 0.6975308641975309, 0.6459627329192547],
'avgPrecision': 0.6464764972011349, 'recall': [0.5925925925925926,
0.6419753086419753, 0.654320987654321, 0.6975308641975309, 0.6459627329192547],
'avgRecall': 0.6464764972011349, 'params': [{'priors': None, 'var_smoothing':
1e-09}]}}
*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt

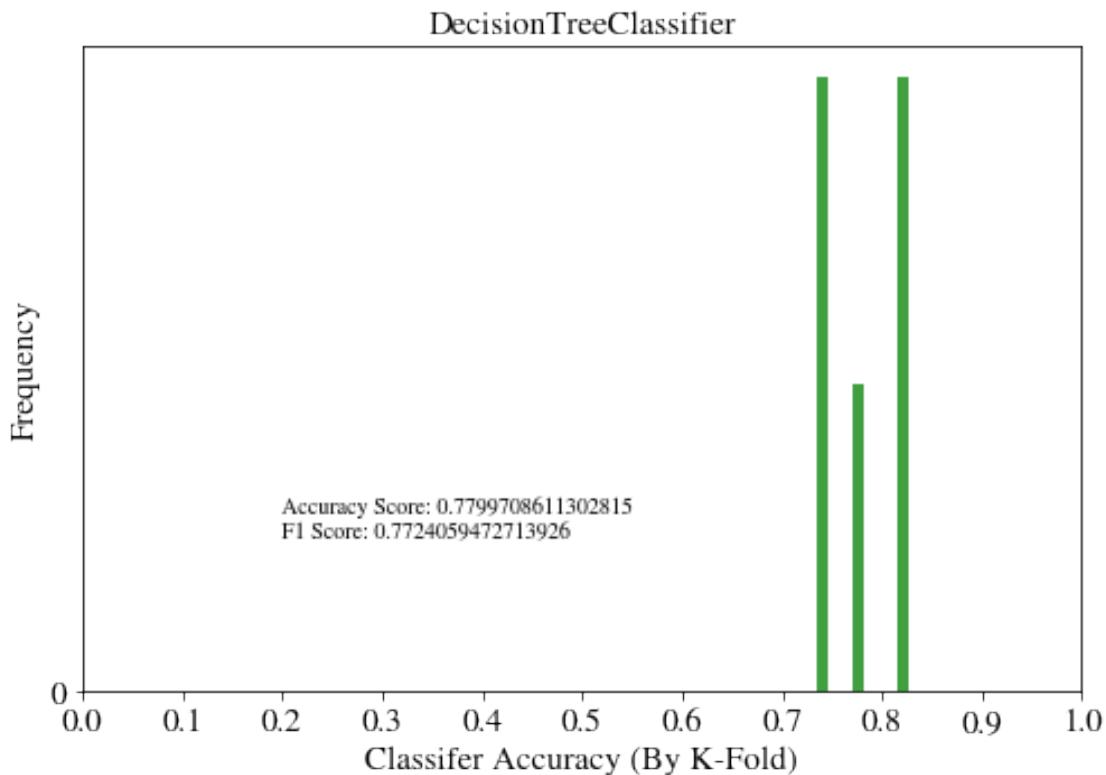
```

```

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,
Submucosal granulomas, Basal histiocytic cells, Sex', 'accuracy':
[0.8148148148148, 0.8580246913580247, 0.808641975308642, 0.8395061728395061,
0.7391304347826086], 'avgAccuracy': 0.8120236178207193, 'f1':
[0.8041864514086737, 0.8513811142635619, 0.8007207825796381, 0.8264848601798486,
0.7477536156941519], 'avgF1': 0.8061053648251748, 'precision':
[0.8148148148148, 0.8580246913580247, 0.808641975308642, 0.8395061728395061,
0.7391304347826086], 'avgPrecision': 0.8120236178207193, 'recall':
[0.8148148148148, 0.8580246913580247, 0.808641975308642, 0.8395061728395061,
0.7391304347826086], 'avgRecall': 0.8120236178207193, 'params': [{algorithm':
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 50,
'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



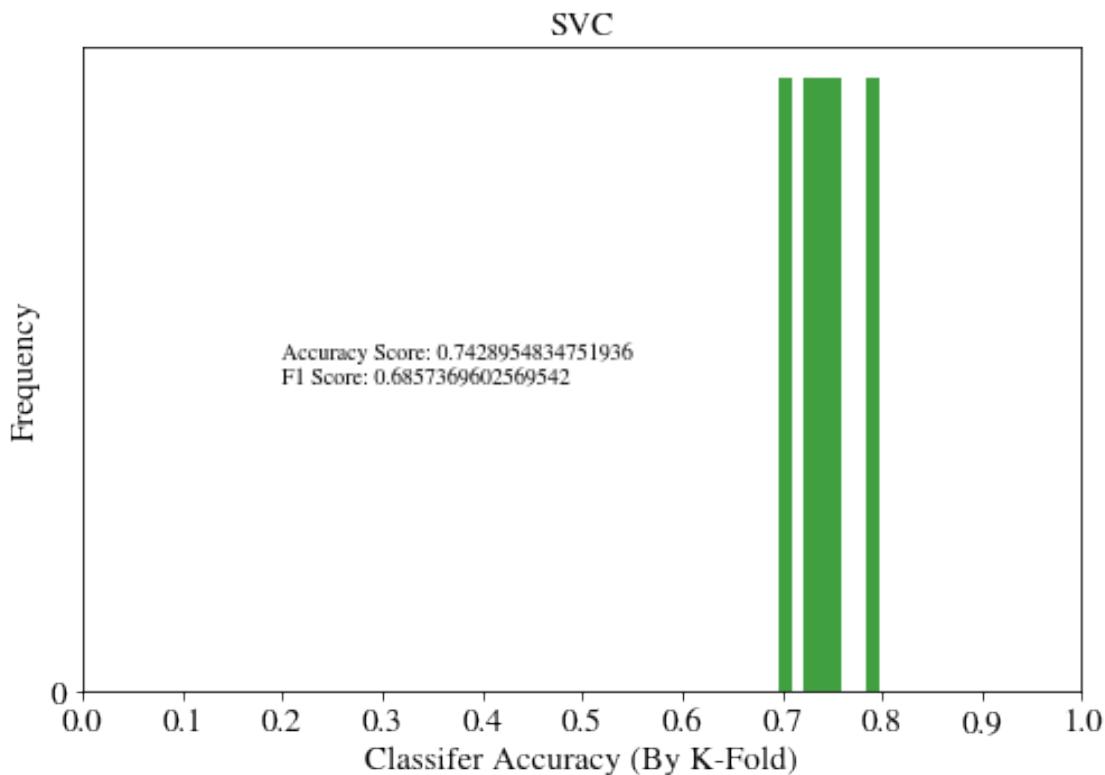
```

*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?',
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,

```

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
 Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
 abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
 Submucosal granulomas, Basal histiocytic cells, Sex', 'accuracy':  
 [0.7345679012345679, 0.7345679012345679, 0.8271604938271605, 0.8271604938271605,  
 0.7763975155279503], 'avgAccuracy': 0.7799708611302815, 'f1':  
 [0.7279073945740612, 0.7284065639138103, 0.8217107772813222, 0.8038057588357322,  
 0.7801992417520367], 'avgF1': 0.7724059472713926, 'precision':  
 [0.7345679012345679, 0.7345679012345679, 0.8271604938271605, 0.8271604938271605,  
 0.7763975155279503], 'avgPrecision': 0.7799708611302815, 'recall':  
 [0.7345679012345679, 0.7345679012345679, 0.8271604938271605, 0.8271604938271605,  
 0.7763975155279503], 'avgRecall': 0.7799708611302815, 'params': [{'ccp\_alpha':  
 0.0, 'class\_weight': None, 'criterion': 'entropy', 'max\_depth': None,  
 'max\_features': 'log2', 'max\_leaf\_nodes': None, 'min\_impurity\_decrease': 0.0,  
 'min\_impurity\_split': None, 'min\_samples\_leaf': 1, 'min\_samples\_split': 2,  
 'min\_weight\_fraction\_leaf': 0.0, 'random\_state': None, 'splitter': 'best'}]]  
\*\*\*\*\*

Processing Model: SVC



\*\*\*\*\*

\* SVC

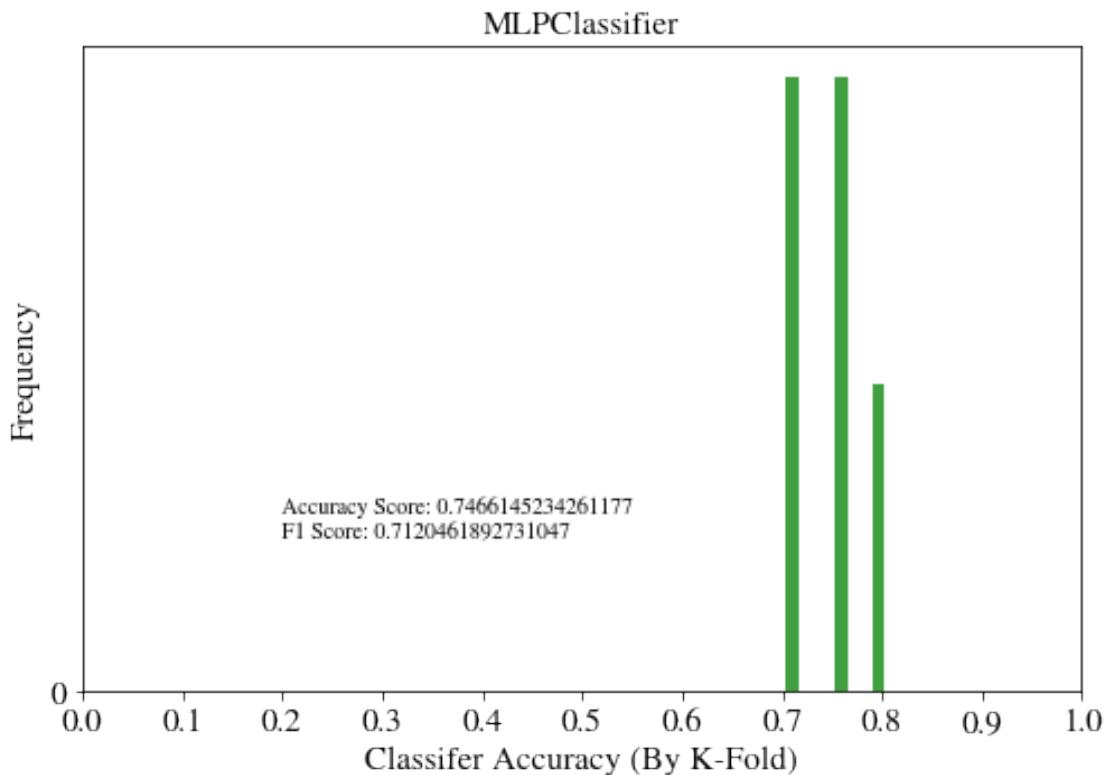
\* Best Params Result:

```

* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex', 'accuracy': [0.6975308641975309, 0.7283950617283951, 0.7469135802469136, 0.7962962962962963, 0.7453416149068323], 'avgAccuracy': 0.7428954834751936, 'f1': [0.6352100804096146, 0.6565014487252122, 0.683743981063914, 0.7559265963262064, 0.6973026947598235], 'avgF1': 0.6857369602569542, 'precision': [0.6975308641975309, 0.7283950617283951, 0.7469135802469136, 0.7962962962962963, 0.7453416149068323], 'avgPrecision': 0.7428954834751936, 'recall': [0.6975308641975309, 0.7283950617283951, 0.7469135802469136, 0.7962962962962963, 0.7453416149068323], 'avgRecall': 0.7428954834751936, 'params': [{ 'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex', 'accuracy': [0.7098765432098766, 0.7037037037037037, 0.7592592592592593, 0.8024691358024691, 0.7577639751552795], 'avgAccuracy': 0.7466145234261177, 'f1': [0.6751393215606801, 0.6591236450972424, 0.7244057536575331, 0.773405501436218, 0.7281567246138497], 'avgF1': 0.7120461892731047, 'precision': [0.7098765432098766, 0.7037037037037037, 0.7592592592592593, 0.8024691358024691, 0.7577639751552795], 'avgPrecision': 0.7466145234261177, 'recall': [0.7098765432098766, 0.7037037037037037, 0.7592592592592593, 0.8024691358024691, 0.7577639751552795], 'avgRecall': 0.7466145234261177, 'params': [{activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells, Sex', 'accuracy': [0.7098765432098766, 0.7037037037037037, 0.7592592592592593, 0.8024691358024691, 0.7577639751552795], 'avgAccuracy': 0.7466145234261177, 'f1': [0.6751393215606801, 0.6591236450972424, 0.7244057536575331, 0.773405501436218, 0.7281567246138497], 'avgF1': 0.7120461892731047, 'precision': [0.7098765432098766, 0.7037037037037037, 0.7592592592592593, 0.8024691358024691, 0.7577639751552795], 'avgPrecision': 0.7466145234261177, 'recall': [0.7098765432098766, 0.7037037037037037, 0.7592592592592593, 0.8024691358024691, 0.7577639751552795], 'avgRecall': 0.7466145234261177, 'params': [{activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
```

```

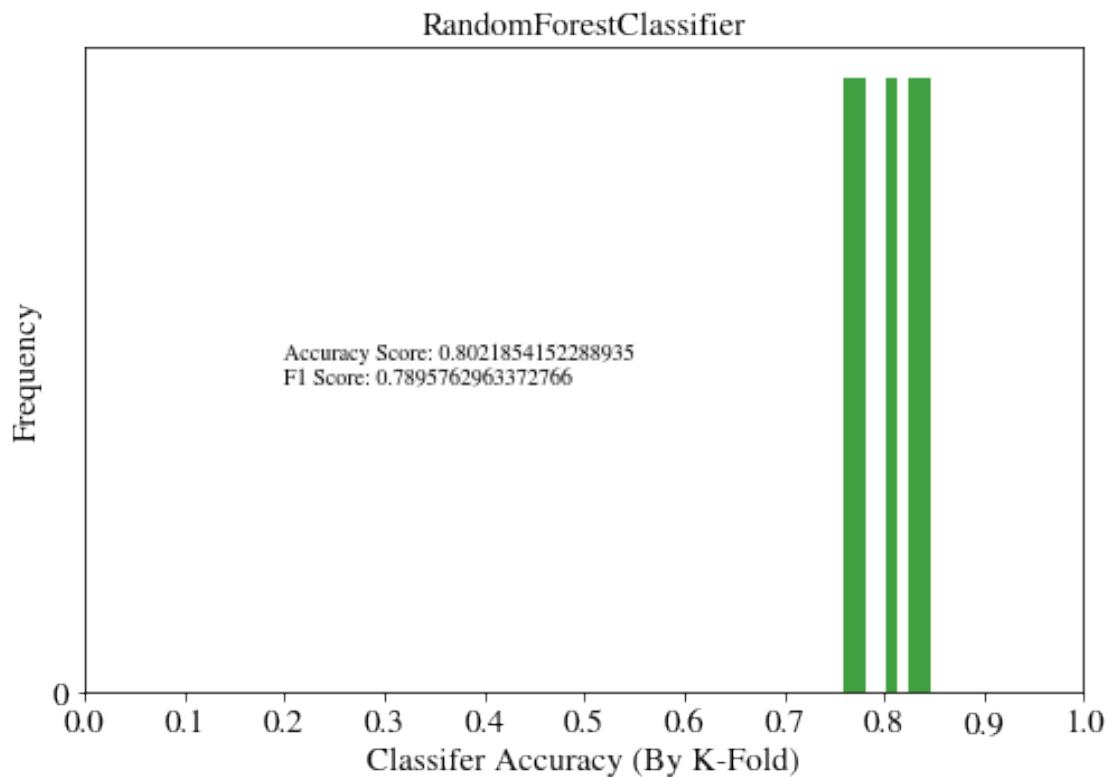
'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000,
'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t':
0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'verlation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
model features \
0 RandomForestClassifier Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB Active inflammation?, Severity of Crypt Arch, ...
4 AdaBoostClassifier Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier Active inflammation?, Severity of Crypt Arch, ...
6 SVC Active inflammation?, Severity of Crypt Arch, ...
7 MLPClassifier Active inflammation?, Severity of Crypt Arch, ...

accuracy f1 precision recall \
0 0.805927 0.793657 0.805927 0.805927
1 0.770064 0.747537 0.770064 0.770064
2 0.742888 0.713065 0.742888 0.742888
3 0.646476 0.613261 0.646476 0.646476
4 0.704547 0.711210 0.704547 0.704547
5 0.735381 0.733193 0.735381 0.735381
6 0.742895 0.685737 0.742895 0.742895
7 0.742872 0.711630 0.742872 0.742872

params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3 {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

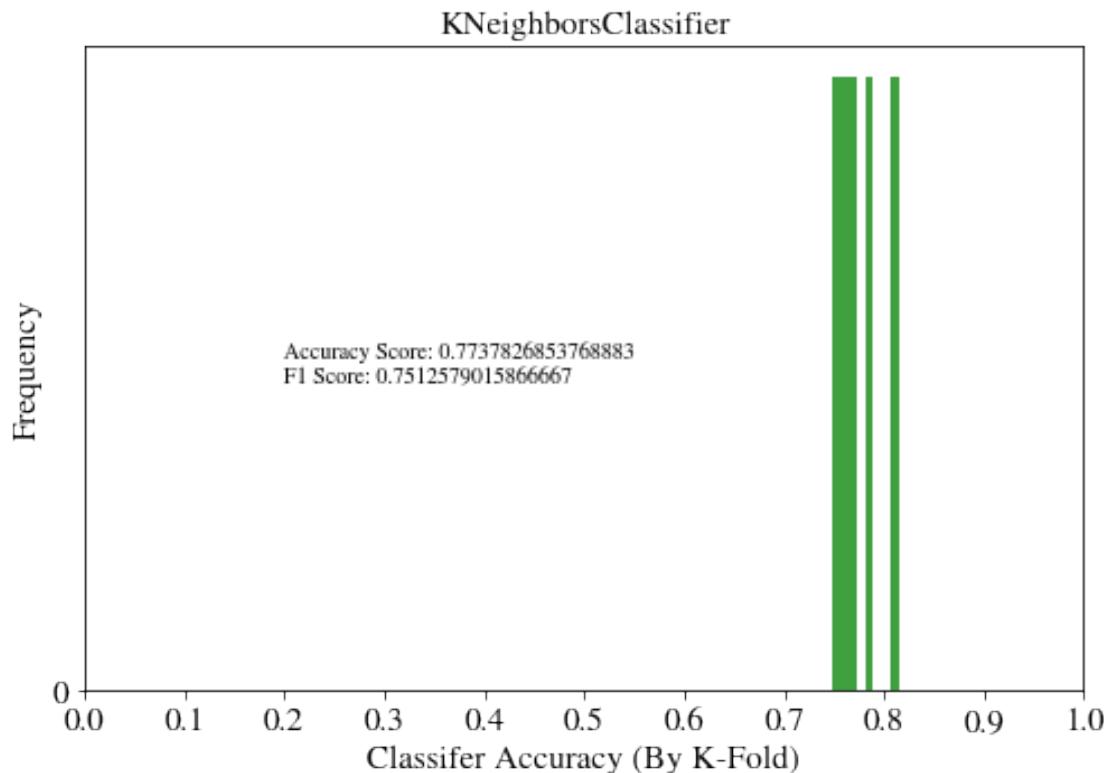
Processing Model: RandomForestClassifier



```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells', 'accuracy': [0.7592592592593, 0.8024691358024691, 0.833333333333334, 0.845679012345679, 0.7701863354037267], 'avgAccuracy': 0.8021854152288935, 'f1': [0.746708399231126, 0.7841072883374068, 0.8244949494949495, 0.8270287625774391, 0.7655420820454611], 'avgF1': 0.7895762963372766, 'precision': [0.7592592592593, 0.8024691358024691, 0.833333333333334, 0.845679012345679, 0.7701863354037267], 'avgPrecision': 0.8021854152288935, 'recall': [0.7592592592593, 0.8024691358024691, 0.833333333333334, 0.845679012345679, 0.7701863354037267], 'avgRecall': 0.8021854152288935, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2}]}*****
```

```
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200,
'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0,
'warm_start': False}]}
*****
```

Processing Model: KNeighborsClassifier



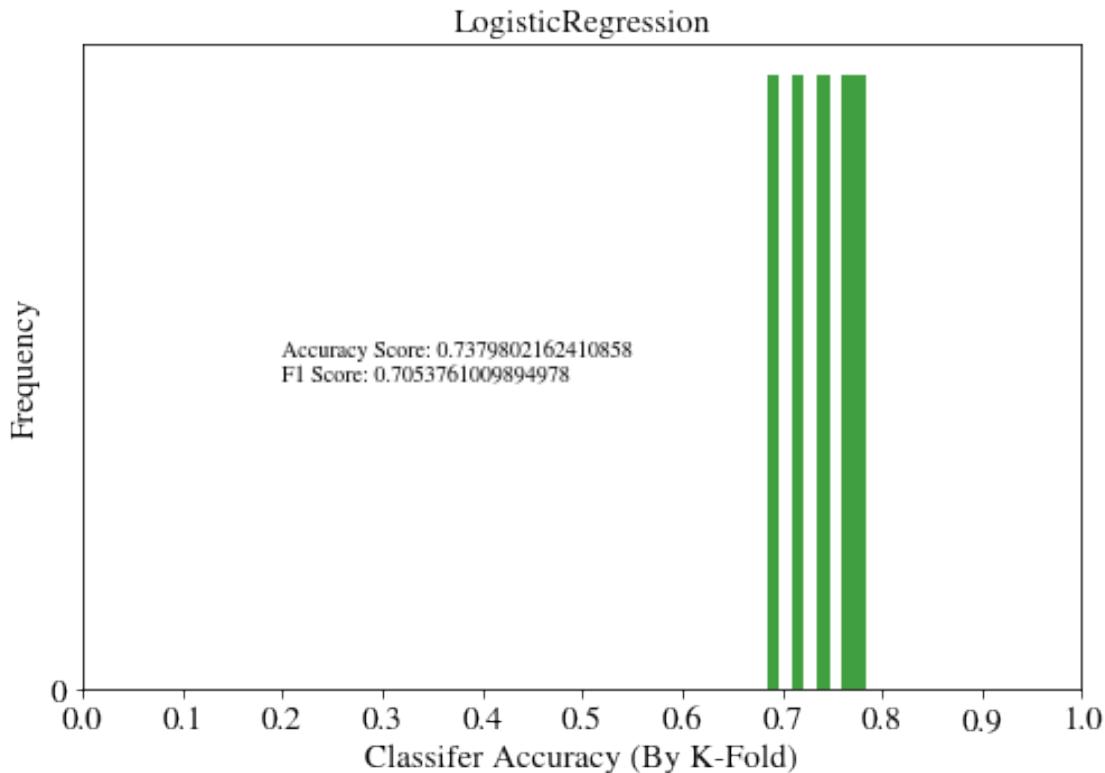
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells', 'accuracy':  
[0.7469135802469136, 0.7592592592592593, 0.7839506172839507, 0.8148148148148148,  
0.7639751552795031], 'avgAccuracy': 0.7737826853768883, 'f1':  
[0.724122013496634, 0.7266931821387267, 0.767111713053804, 0.7929223819087962,  
0.7454402173353727], 'avgF1': 0.7512579015866667, 'precision':  
[0.7469135802469136, 0.7592592592592593, 0.7839506172839507, 0.8148148148148148,
```

```

0.7639751552795031], 'avgPrecision': 0.7737826853768883, 'recall':
[0.7469135802469136, 0.7592592592592593, 0.7839506172839507, 0.8148148148148148,
0.7639751552795031], 'avgRecall': 0.7737826853768883, 'params': [{algorithm':
'ball_tree', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None,
'n_jobs': -1, 'n_neighbors': 13, 'p': 2, 'weights': 'distance'}]}}
*****

```

Processing Model: LogisticRegression



```

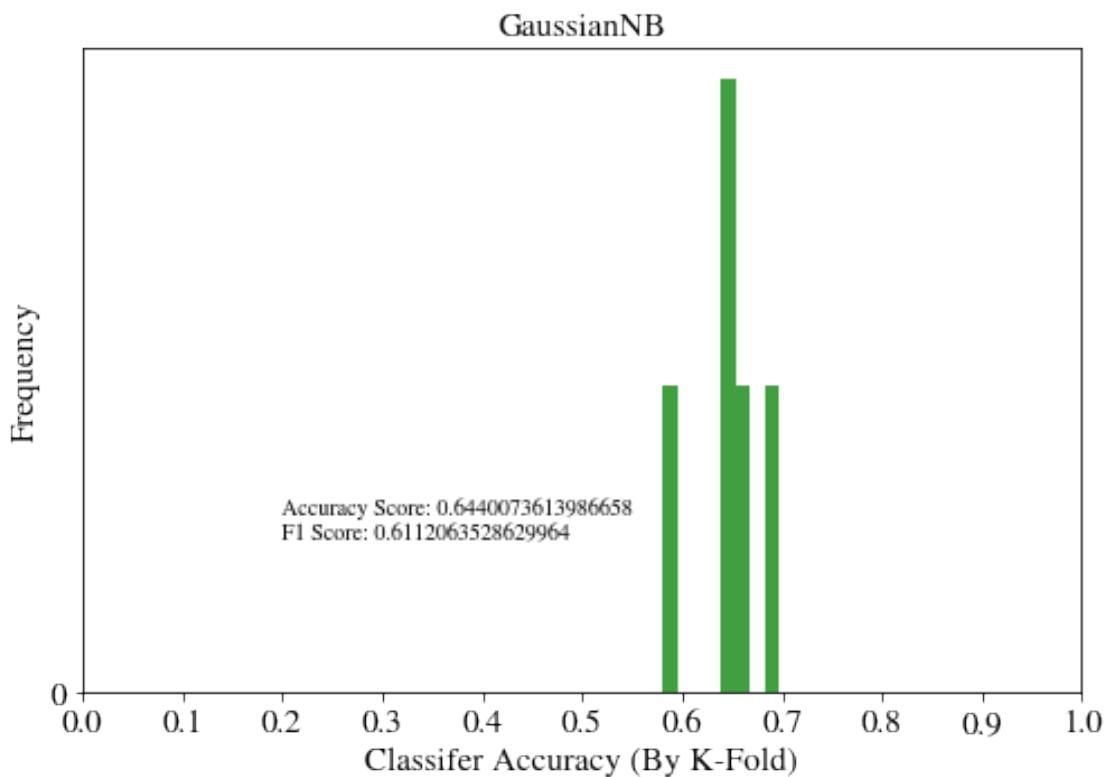
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas, Basal histiocytic cells', 'accuracy':  
[0.7160493827160493, 0.6851851851852, 0.7407407407407, 0.7839506172839507,  
0.7639751552795031], 'avgAccuracy': 0.7379802162410858, 'f1':  
[0.686086025177423, 0.6401485021212732, 0.7046711137660958, 0.7562535759742066,
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```

0.73972128790849], 'avgF1': 0.7053761009894978, 'precision':
[0.7160493827160493, 0.6851851851852, 0.7407407407407, 0.7839506172839507,
0.7639751552795031], 'avgPrecision': 0.7379802162410858, 'recall':
[0.7160493827160493, 0.6851851851852, 0.7407407407407, 0.7839506172839507,
0.7639751552795031], 'avgRecall': 0.7379802162410858, 'params': [{C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'ovr', 'n_jobs': -1,
'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal

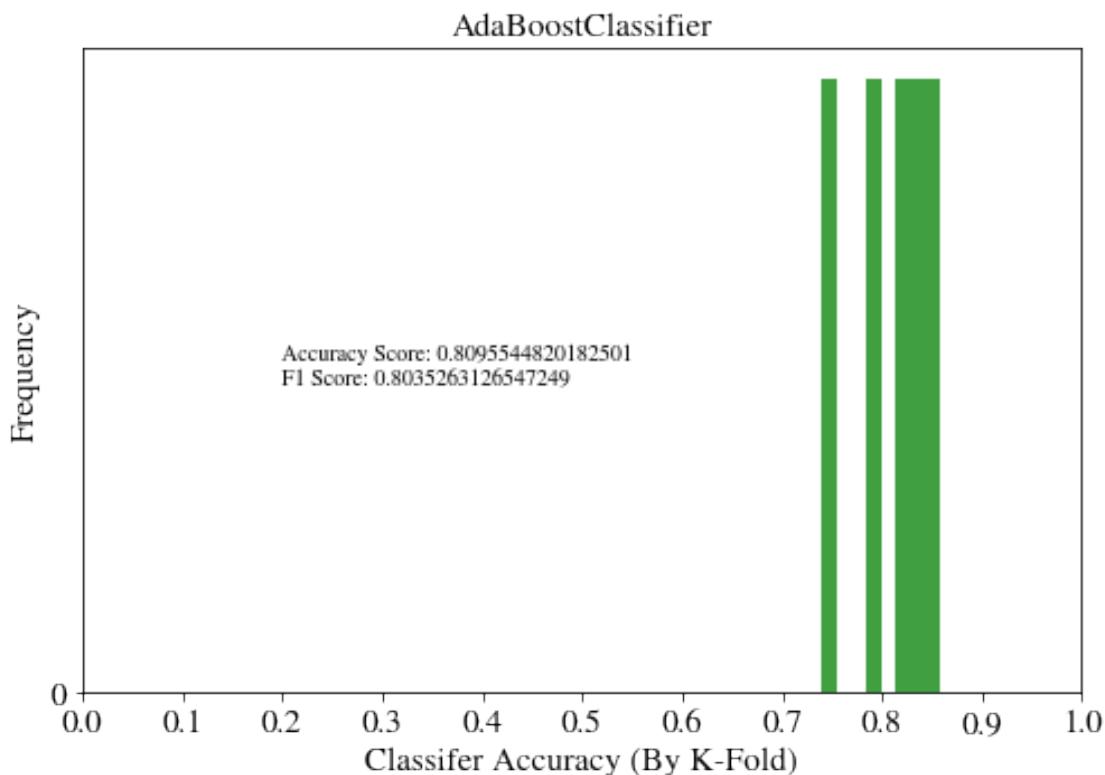
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granulomas, Basal histiocytic cells', 'accuracy': [0.5802469135802469,
0.6419753086419753, 0.654320987654321, 0.6975308641975309, 0.6459627329192547],
'avgAccuracy': 0.6440073613986658, 'f1': [0.5470405169982825,
0.5943597040274312, 0.6152045175846284, 0.6754538991063272, 0.6239731265983129],
'avgF1': 0.6112063528629964, 'precision': [0.5802469135802469,
0.6419753086419753, 0.654320987654321, 0.6975308641975309, 0.6459627329192547],
'avgPrecision': 0.6440073613986658, 'recall': [0.5802469135802469,
0.6419753086419753, 0.654320987654321, 0.6975308641975309, 0.6459627329192547],
'avgRecall': 0.6440073613986658, 'params': [{'priors': None, 'var_smoothing':
1e-09}]}}
*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt

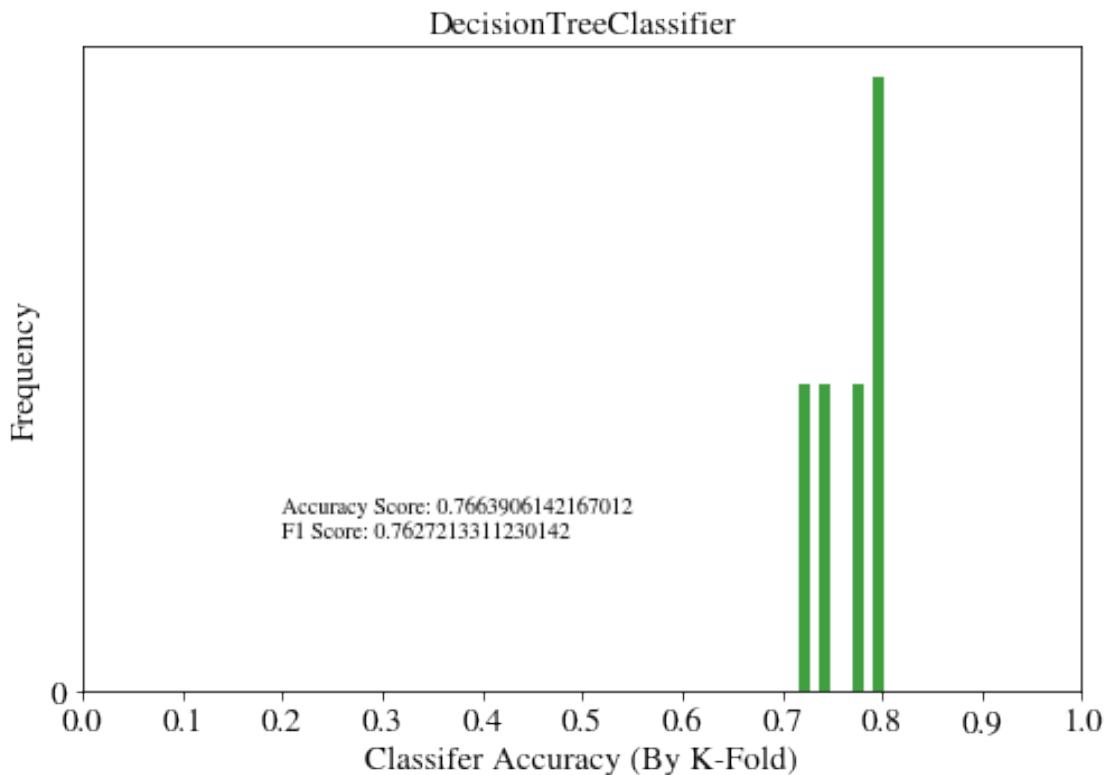
```

```

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,
Submucosal granulomas, Basal histiocytic cells', 'accuracy':
[0.8148148148148, 0.8580246913580247, 0.7962962962962963, 0.8395061728395061,
0.7391304347826086], 'avgAccuracy': 0.8095544820182501, 'f1':
[0.8041864514086737, 0.8513811142635619, 0.787825521727388, 0.8264848601798486,
0.7477536156941519], 'avgF1': 0.8035263126547249, 'precision':
[0.8148148148148148, 0.8580246913580247, 0.7962962962962963, 0.8395061728395061,
0.7391304347826086], 'avgPrecision': 0.8095544820182501, 'recall':
[0.8148148148148148, 0.8580246913580247, 0.7962962962962963, 0.8395061728395061,
0.7391304347826086], 'avgRecall': 0.8095544820182501, 'params': [{algorithm':
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 50,
'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



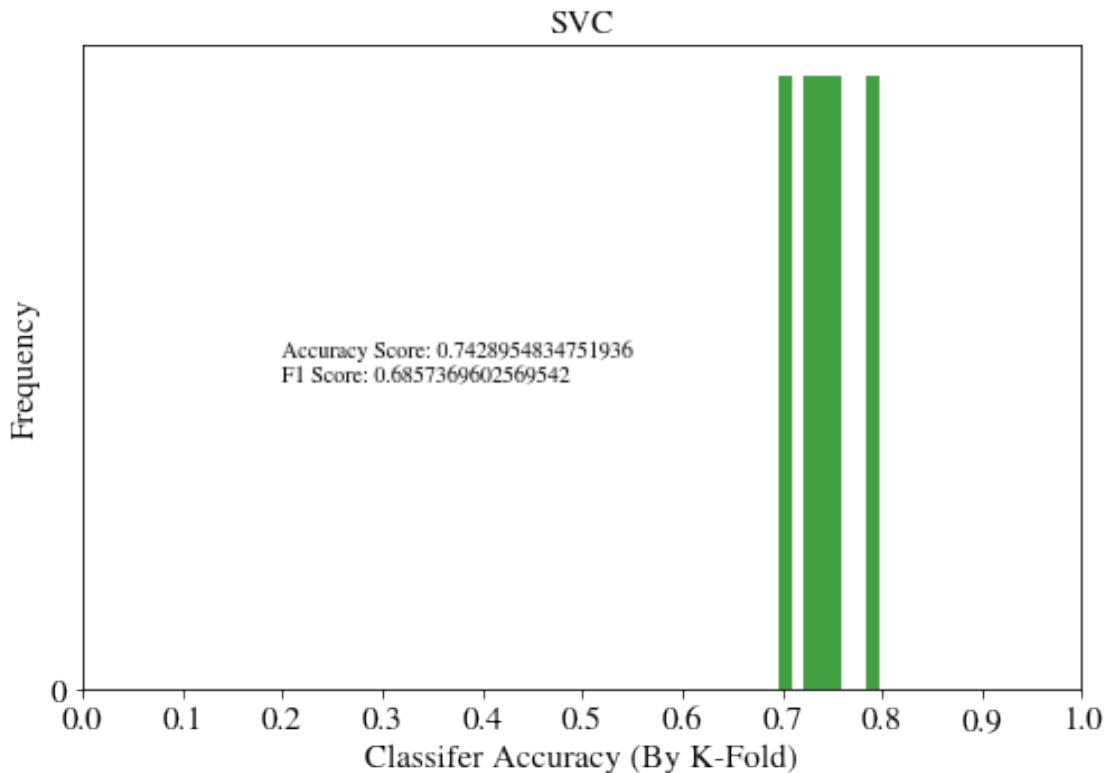
```

*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?',
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,

```

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
 Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
 abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
 Submucosal granulomas, Basal histiocytic cells', 'accuracy':  
 [0.7407407407407407, 0.7160493827160493, 0.8024691358024691, 0.7962962962962963,  
 0.7763975155279503], 'avgAccuracy': 0.7663906142167012, 'f1':  
 [0.7330167488503123, 0.7068458682377489, 0.7993221029356143, 0.7929188438856618,  
 0.7815030917057335], 'avgF1': 0.7627213311230142, 'precision':  
 [0.7407407407407407, 0.7160493827160493, 0.8024691358024691, 0.7962962962962963,  
 0.7763975155279503], 'avgPrecision': 0.7663906142167012, 'recall':  
 [0.7407407407407407, 0.7160493827160493, 0.8024691358024691, 0.7962962962962963,  
 0.7763975155279503], 'avgRecall': 0.7663906142167012, 'params': [{'ccp\_alpha':  
 0.0, 'class\_weight': None, 'criterion': 'gini', 'max\_depth': None,  
 'max\_features': 'sqrt', 'max\_leaf\_nodes': None, 'min\_impurity\_decrease': 0.0,  
 'min\_impurity\_split': None, 'min\_samples\_leaf': 1, 'min\_samples\_split': 2,  
 'min\_weight\_fraction\_leaf': 0.0, 'random\_state': None, 'splitter': 'best'}]]  
\*\*\*\*\*

Processing Model: SVC



\*\*\*\*\*

\* SVC

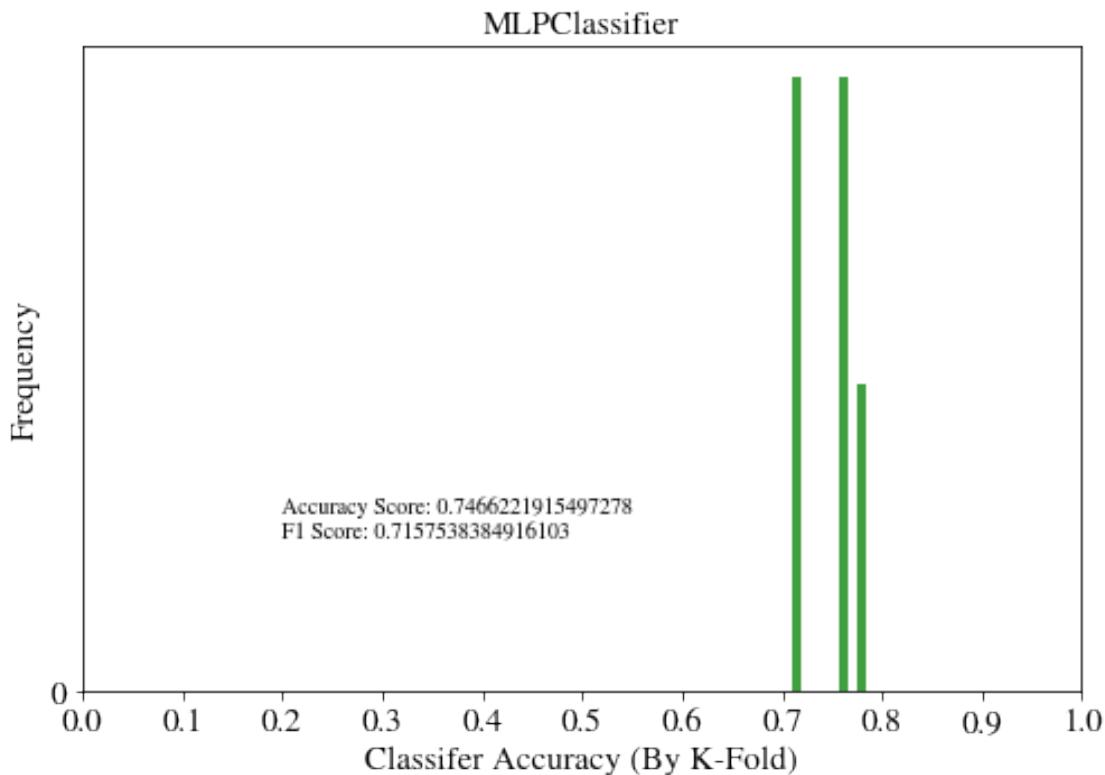
\* Best Params Result:

```

* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells', 'accuracy': [0.6975308641975309, 0.7283950617283951, 0.7469135802469136, 0.7962962962962963, 0.7453416149068323], 'avgAccuracy': 0.7428954834751936, 'f1': [0.6352100804096146, 0.6565014487252122, 0.683743981063914, 0.7559265963262064, 0.6973026947598235], 'avgF1': 0.6857369602569542, 'precision': [0.6975308641975309, 0.7283950617283951, 0.7469135802469136, 0.7962962962962963, 0.7453416149068323], 'avgPrecision': 0.7428954834751936, 'recall': [0.6975308641975309, 0.7283950617283951, 0.7469135802469136, 0.7962962962962963, 0.7453416149068323], 'avgRecall': 0.7428954834751936, 'params': [{ 'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells', 'accuracy': [0.7098765432098766, 0.7160493827160493, 0.7592592592592593, 0.7839506172839507, 0.7639751552795031], 'avgAccuracy': 0.7466221915497278, 'f1': [0.679818580909617, 0.6754562337188422, 0.7261425167857916, 0.7531000723452593, 0.7442517886985416], 'avgF1': 0.7157538384916103, 'precision': [0.7098765432098766, 0.7160493827160493, 0.7592592592592593, 0.7839506172839507, 0.7639751552795031], 'avgPrecision': 0.7466221915497278, 'recall': [0.7098765432098766, 0.7160493827160493, 0.7592592592592593, 0.7839506172839507, 0.7639751552795031], 'avgRecall': 0.7466221915497278, 'params': [{activation': 'identity', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}

*****
* Best Performing Model and Params is:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas, Basal histiocytic cells', 'accuracy': [0.7098765432098766, 0.7160493827160493, 0.7592592592592593, 0.7839506172839507, 0.7639751552795031], 'avgAccuracy': 0.7466221915497278, 'f1': [0.679818580909617, 0.6754562337188422, 0.7261425167857916, 0.7531000723452593, 0.7442517886985416], 'avgF1': 0.7157538384916103, 'precision': [0.7098765432098766, 0.7160493827160493, 0.7592592592592593, 0.7839506172839507, 0.7639751552795031], 'avgPrecision': 0.7466221915497278, 'recall': [0.7098765432098766, 0.7160493827160493, 0.7592592592592593, 0.7839506172839507, 0.7639751552795031], 'avgRecall': 0.7466221915497278, 'params': [{activation': 'identity', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'adaptive',
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```

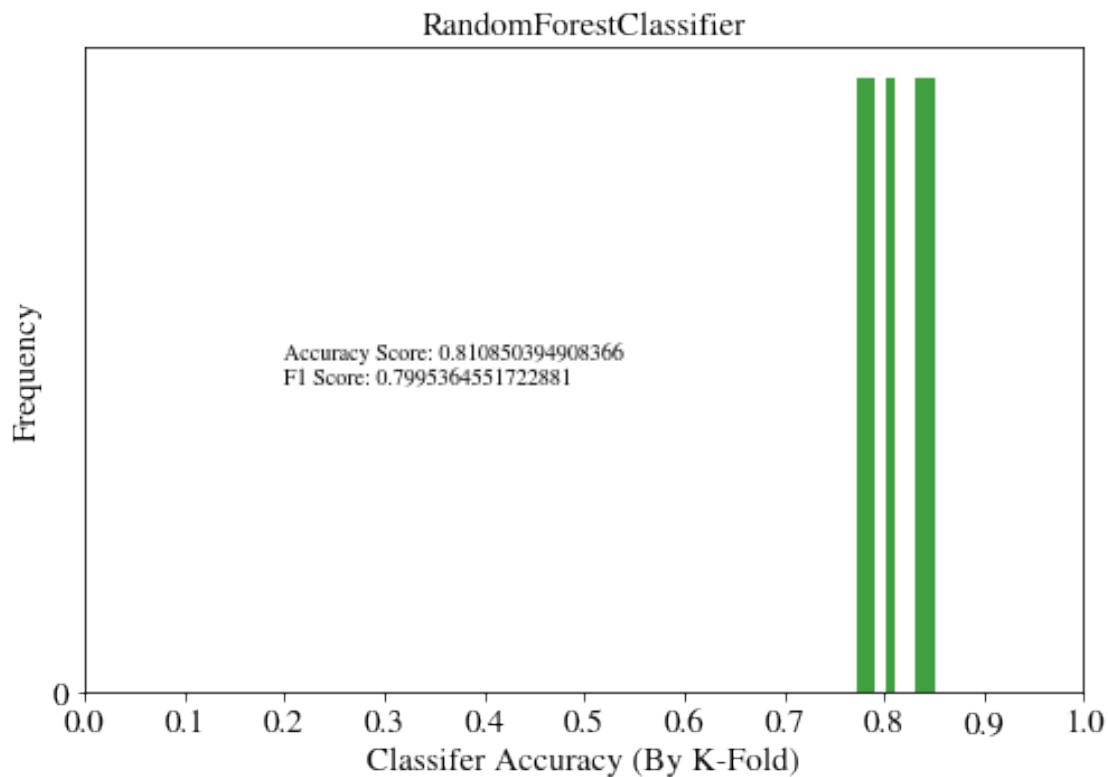
'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
model features \
0 RandomForestClassifier Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB Active inflammation?, Severity of Crypt Arch, ...
4 AdaBoostClassifier Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier Active inflammation?, Severity of Crypt Arch, ...
6 SVC Active inflammation?, Severity of Crypt Arch, ...
7 MLPClassifier Active inflammation?, Severity of Crypt Arch, ...

accuracy f1 precision recall \
0 0.799709 0.787139 0.799709 0.799709
1 0.767587 0.744063 0.767587 0.767587
2 0.733034 0.701133 0.733034 0.733034
3 0.644007 0.611206 0.644007 0.644007
4 0.702109 0.712469 0.702109 0.702109
5 0.740350 0.735131 0.740350 0.740350
6 0.742895 0.685737 0.742895 0.742895
7 0.742918 0.709405 0.742918 0.742918

params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3 {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier

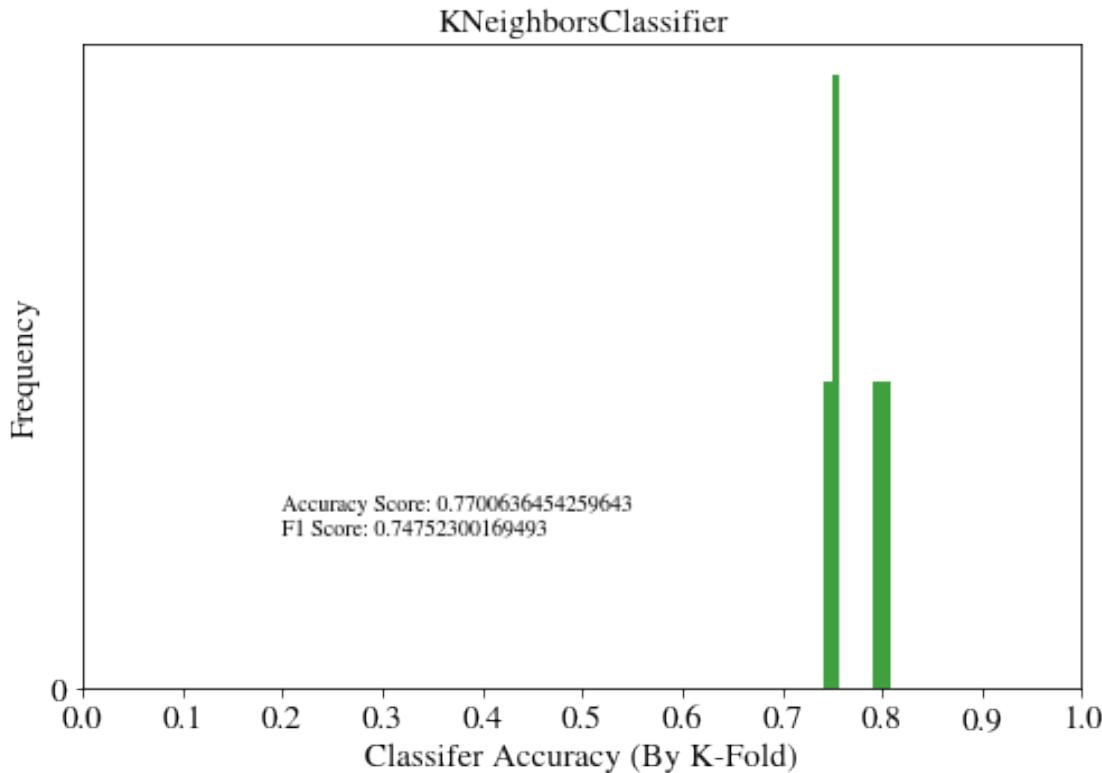


```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas', 'accuracy': [0.7716049382716049, 0.808641975308642, 0.8333333333333334, 0.8518518518519, 0.7888198757763976], 'avgAccuracy': 0.810850394908366, 'f1': [0.760154837771971, 0.7955156760425948, 0.8226896442791828, 0.8356846573456541, 0.7836374604168117], 'avgF1': 0.7995364551722881, 'precision': [0.7716049382716049, 0.808641975308642, 0.8333333333333334, 0.8518518518519, 0.7888198757763976], 'avgPrecision': 0.810850394908366, 'recall': [0.7716049382716049, 0.808641975308642, 0.8333333333333334, 0.8518518518519, 0.7888198757763976], 'avgRecall': 0.810850394908366, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'n_estimators': 100}]}*****
```

```
'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas', 'accuracy': [0.7407407407407407, 0.7530864197530864, 0.7962962962962963, 0.808641975308642, 0.7515527950310559], 'avgAccuracy': 0.7700636454259643, 'f1': [0.7184661543906541, 0.7216468322260118, 0.7802979987547096, 0.7837354373152495, 0.7334685857880249], 'avgF1': 0.74752300169493, 'precision': [0.7407407407407407, 0.7530864197530864, 0.7962962962962963, 0.808641975308642, 0.7515527950310559], 'avgPrecision': 0.7700636454259643, 'recall': [0.7407407407407407, 0.7530864197530864,
```

```

0.7962962962962963, 0.808641975308642, 0.7515527950310559], 'avgRecall':  

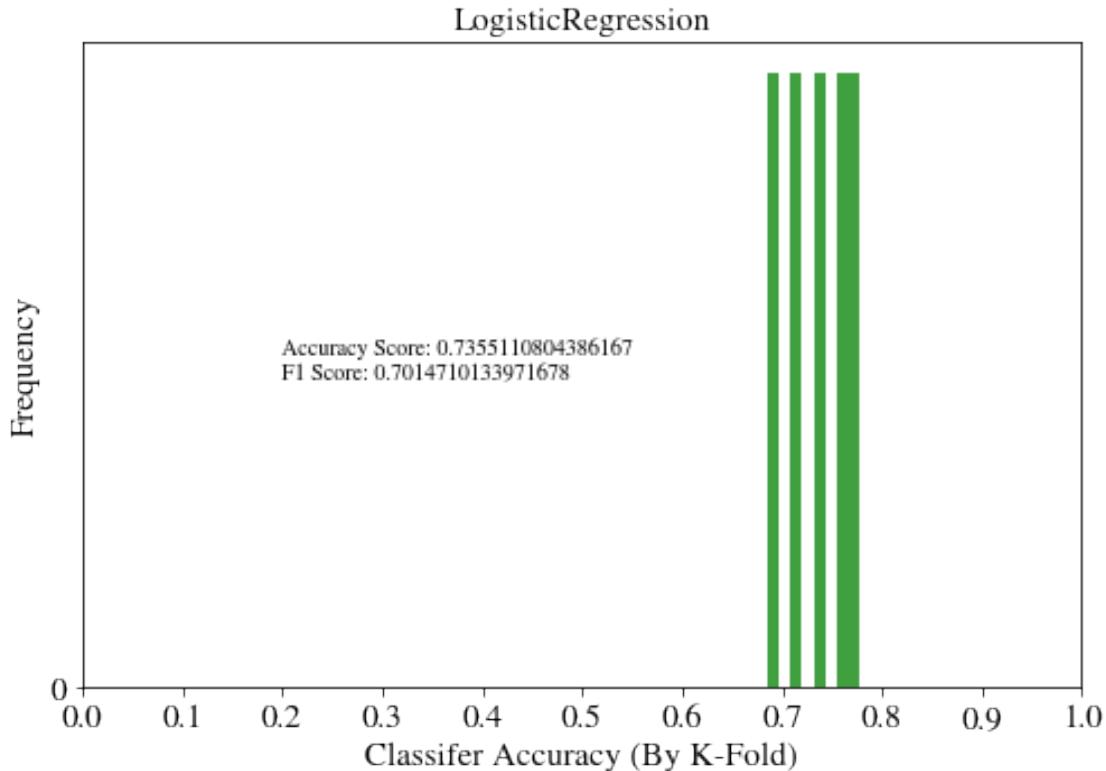
0.7700636454259643, 'params': [{'algorithm': 'auto', 'leaf_size': 30, 'metric':  

'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 17, 'p': 2,  

'weights': 'distance'}]}
*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  

Submucosal granulomas', 'accuracy': [0.7098765432098766, 0.6851851851852,  

0.7407407407407, 0.7777777777777778, 0.7639751552795031], 'avgAccuracy':  

0.7355110804386167, 'f1': [0.6764529515509907, 0.6401485021212732,  

0.7046711137660958, 0.7463612116389893, 0.73972128790849], 'avgF1':  

0.7014710133971678, 'precision': [0.7098765432098766, 0.6851851851852,
```

```

0.7407407407407407, 0.7777777777777778, 0.7639751552795031], 'avgPrecision':  

0.7355110804386167, 'recall': [0.7098765432098766, 0.6851851851852,  

0.7407407407407407, 0.7777777777777778, 0.7639751552795031], 'avgRecall':  

0.7355110804386167, 'params': [{ 'C': 1, 'class_weight': None, 'dual': False,  

'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None, 'max_iter':  

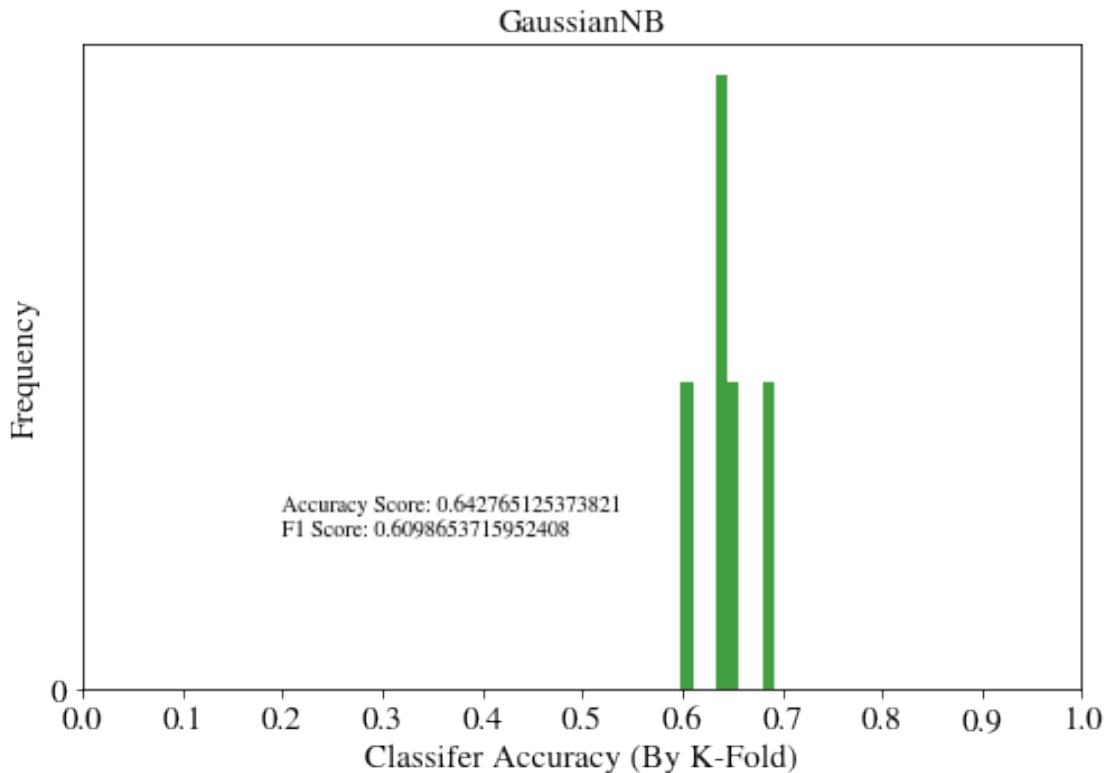
100, 'multi_class': 'ovr', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None,  

'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]]}  

*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of  

Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal  

increase in lamina propria cellularity, Lamina propria polymorphs, Crypt  

architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial  

changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing  

pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses  

polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal  

granulomas', 'accuracy': [0.5987654320987654, 0.6358024691358025,  

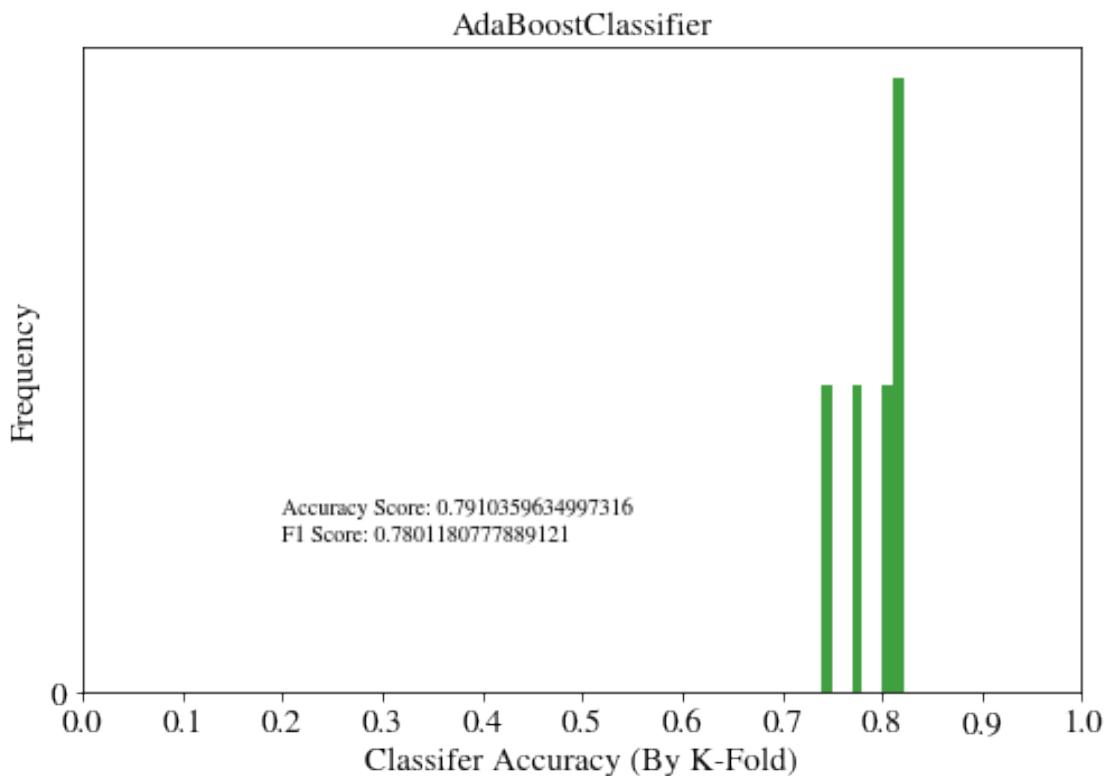
0.6481481481481, 0.691358024691358, 0.639751552795031], 'avgAccuracy':
```

```

0.642765125373821, 'f1': [0.5611118783197918, 0.5893428636775743,
0.609826762246117, 0.6701478054223279, 0.6188975483103929], 'avgF1':
0.6098653715952408, 'precision': [0.5987654320987654, 0.6358024691358025,
0.6481481481481481, 0.691358024691358, 0.639751552795031], 'avgPrecision':
0.642765125373821, 'recall': [0.5987654320987654, 0.6358024691358025,
0.6481481481481481, 0.691358024691358, 0.639751552795031], 'avgRecall':
0.642765125373821, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

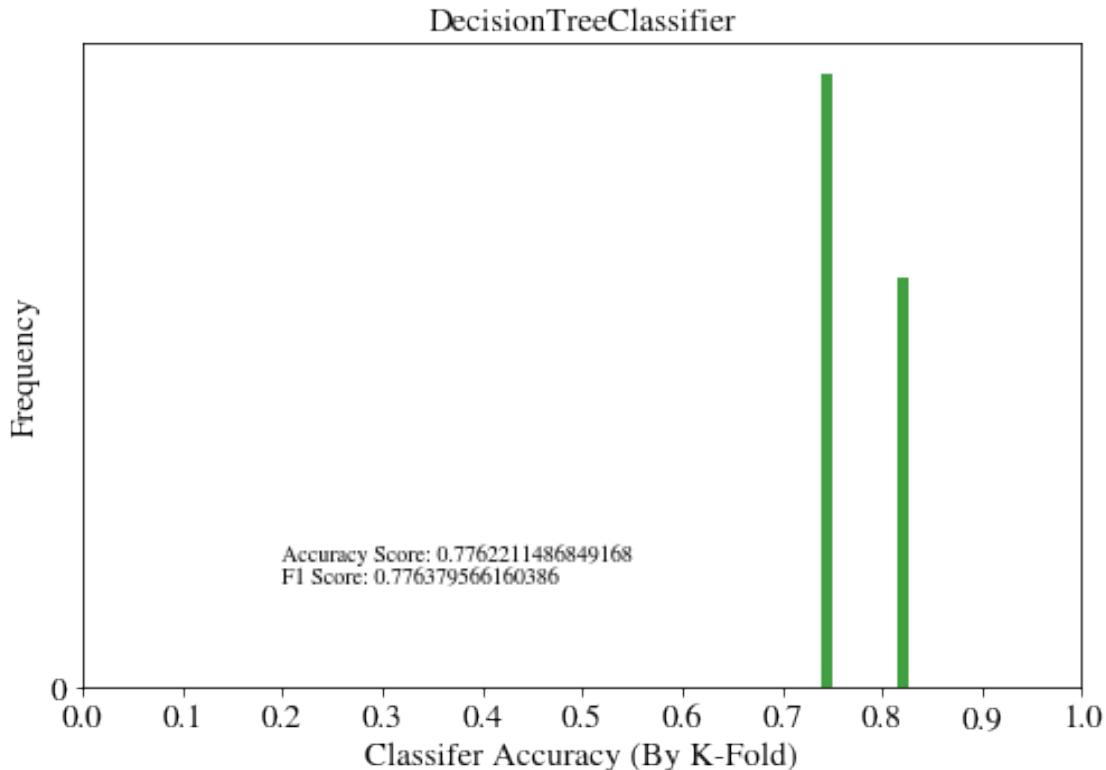
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas', 'accuracy': [0.8209876543209876, 0.7716049382716049,  
0.8148148148148148, 0.808641975308642, 0.7391304347826086], 'avgAccuracy':
```

```

0.7910359634997316, 'f1': [0.8117837923393479, 0.7538514307465476,
0.8041994014216236, 0.7830021487428895, 0.7477536156941519], 'avgF1':
0.7801180777889121, 'precision': [0.8209876543209876, 0.7716049382716049,
0.8148148148148148, 0.808641975308642, 0.7391304347826086], 'avgPrecision':
0.7910359634997316, 'recall': [0.8209876543209876, 0.7716049382716049,
0.8148148148148148, 0.808641975308642, 0.7391304347826086], 'avgRecall':
0.7910359634997316, 'params': [{'algorithm': 'SAMME.R', 'base_estimator': None,
'learning_rate': 1, 'n_estimators': 50, 'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



```

*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent,  
Submucosal granulomas', 'accuracy': [0.7469135802469136, 0.8209876543209876,

```

```

0.7469135802469136, 0.8271604938271605, 0.7391304347826086], 'avgAccuracy':  

0.7762211486849168, 'f1': [0.748433060707567, 0.8177821506938099,  

0.7517237307449326, 0.8173320980917929, 0.7466267905638274], 'avgF1':  

0.776379566160386, 'precision': [0.7469135802469136, 0.8209876543209876,  

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0.7762211486849168, 'recall': [0.7469135802469136, 0.8209876543209876,  

0.7469135802469136, 0.8271604938271605, 0.7391304347826086], 'avgRecall':  

0.7762211486849168, 'params': [{'ccp_alpha': 0.0, 'class_weight': None,  

'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt',  

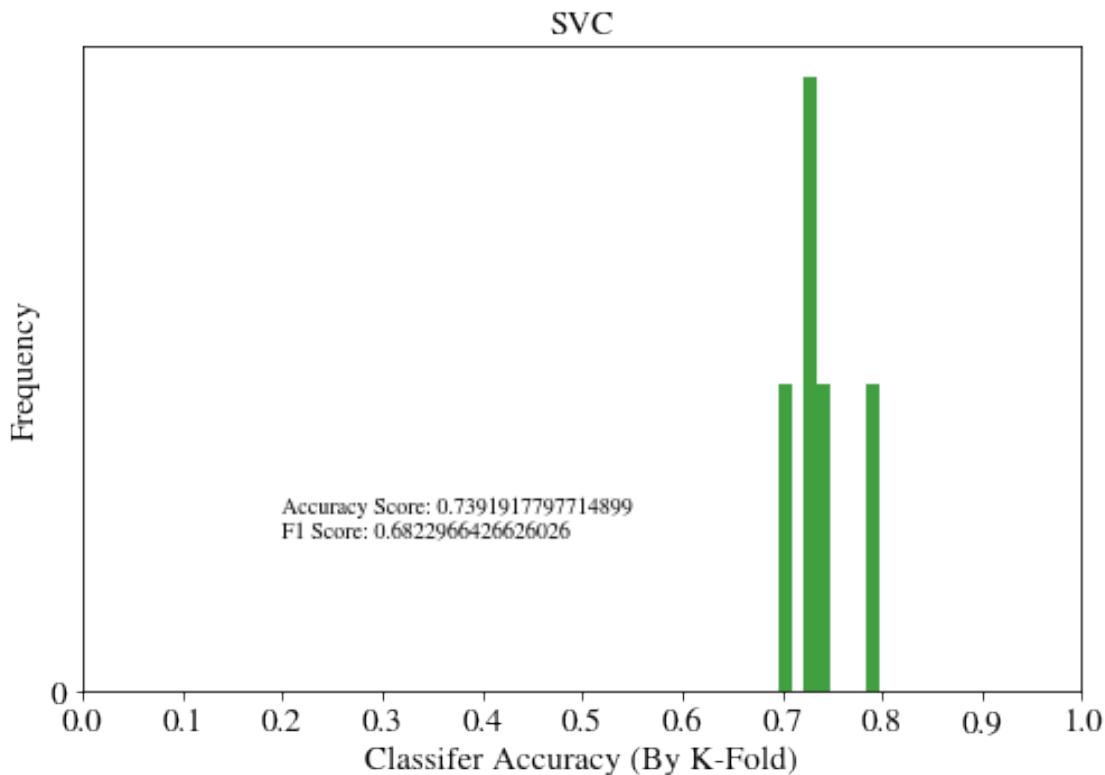
'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split':  

None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf':  

0.0, 'random_state': None, 'splitter': 'best'}]}
*****

```

Processing Model: SVC



```

*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt  

Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in  

lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,  

Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,

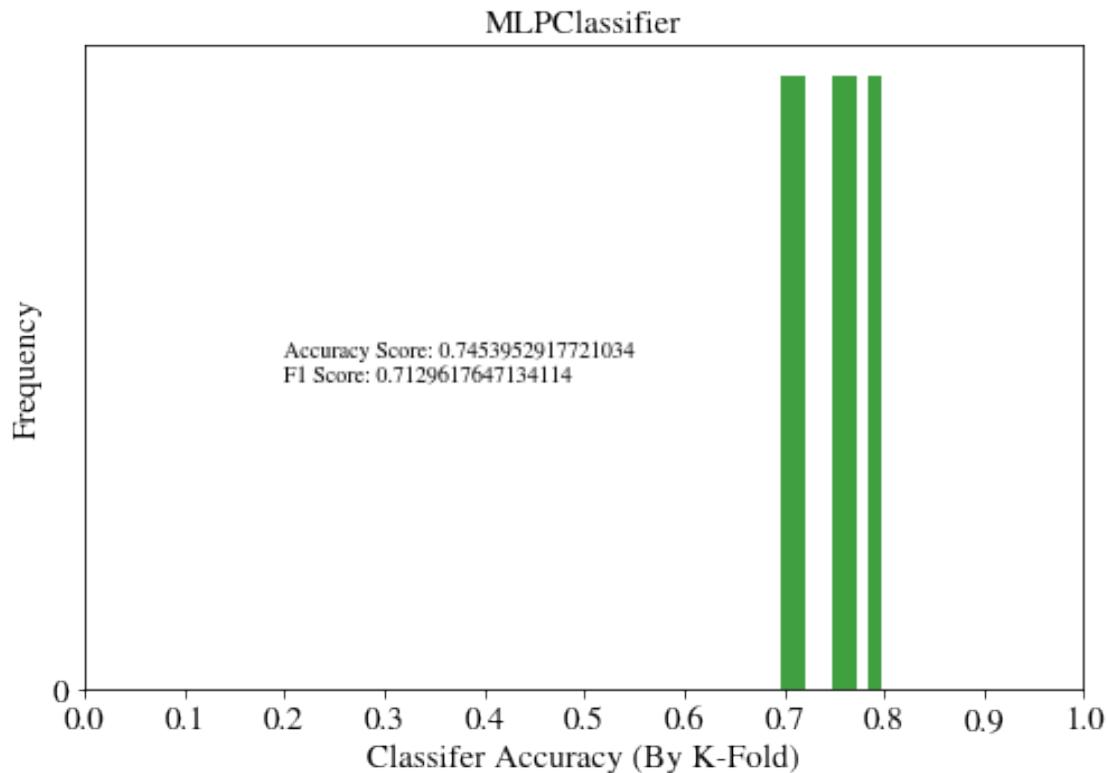
```

```

Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists
diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina
propria granulomas, Crypt abscesses extent, Submucosal granulomas', 'accuracy':
[0.6975308641975309, 0.7283950617283951, 0.7283950617283951, 0.7962962962962963,
0.7453416149068323], 'avgAccuracy': 0.7391917797714899, 'f1':
[0.6352100804096146, 0.6565014487252122, 0.6665423930921565, 0.7559265963262064,
0.6973026947598235], 'avgF1': 0.6822966426626026, 'precision':
[0.6975308641975309, 0.7283950617283951, 0.7283950617283951, 0.7962962962962963,
0.7453416149068323], 'avgPrecision': 0.7391917797714899, 'recall':
[0.6975308641975309, 0.7283950617283951, 0.7283950617283951, 0.7962962962962963,
0.7453416149068323], 'avgRecall': 0.7391917797714899, 'params': [{ 'C': 1.0,
'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0,
'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':
'linear', 'max_iter': -1, 'probability': False, 'random_state': None,
'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```

*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of

```

Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas', 'accuracy': [0.6975308641975309, 0.7098765432098766, 0.7530864197530864, 0.7962962962962963, 0.7701863354037267], 'avgAccuracy': 0.7453952917721034, 'f1': [0.665352477379186, 0.6710924218227611, 0.7214383695865177, 0.7626487136073415, 0.744276841171251], 'avgF1': 0.7129617647134114, 'precision': [0.6975308641975309, 0.7098765432098766, 0.7530864197530864, 0.7962962962962963, 0.7701863354037267], 'avgPrecision': 0.7453952917721034, 'recall': [0.6975308641975309, 0.7098765432098766, 0.7530864197530864, 0.7962962962962963, 0.7701863354037267], 'avgRecall': 0.7453952917721034, 'params': [{}{'activation': 'logistic', 'alpha': 0.0001, 'batch\_size': 'auto', 'beta\_1': 0.9, 'beta\_2': 0.999, 'early\_stopping': False, 'epsilon': 1e-08, 'hidden\_layer\_sizes': (100,), 'learning\_rate': 'constant', 'learning\_rate\_init': 0.001, 'max\_fun': 15000, 'max\_iter': 5000, 'momentum': 0.9, 'n\_iter\_no\_change': 10, 'nesterovs\_momentum': True, 'power\_t': 0.5, 'random\_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation\_fraction': 0.1, 'verbose': False, 'warm\_start': False}]}

\*\*\*\*\*

\* Best Performing Model and Params is:

\* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent, Submucosal granulomas', 'accuracy': [0.7716049382716049, 0.808641975308642, 0.8333333333333334, 0.8518518518518519, 0.7888198757763976], 'avgAccuracy': 0.810850394908366, 'f1': [0.7601548377771971, 0.7955156760425948, 0.8226896442791828, 0.8356846573456541, 0.7836374604168117], 'avgF1': 0.7995364551722881, 'precision': [0.7716049382716049, 0.808641975308642, 0.8333333333333334, 0.8518518518518519, 0.7888198757763976], 'avgPrecision': 0.810850394908366, 'recall': [0.7716049382716049, 0.808641975308642, 0.8333333333333334, 0.8518518518518519, 0.7888198757763976], 'avgRecall': 0.810850394908366, 'params': [{}{'bootstrap': True, 'ccp\_alpha': 0.0, 'class\_weight': None, 'criterion': 'entropy', 'max\_depth': None, 'max\_features': 'sqrt', 'max\_leaf\_nodes': None, 'max\_samples': None, 'min\_impurity\_decrease': 0.0, 'min\_impurity\_split': None, 'min\_samples\_leaf': 1, 'min\_samples\_split': 2, 'min\_weight\_fraction\_leaf': 0.0, 'n\_estimators': 200, 'n\_jobs': -1, 'oob\_score': True, 'random\_state': None, 'verbose': 0, 'warm\_start': False}]}

\*\*\*\*\*

model

features \

```

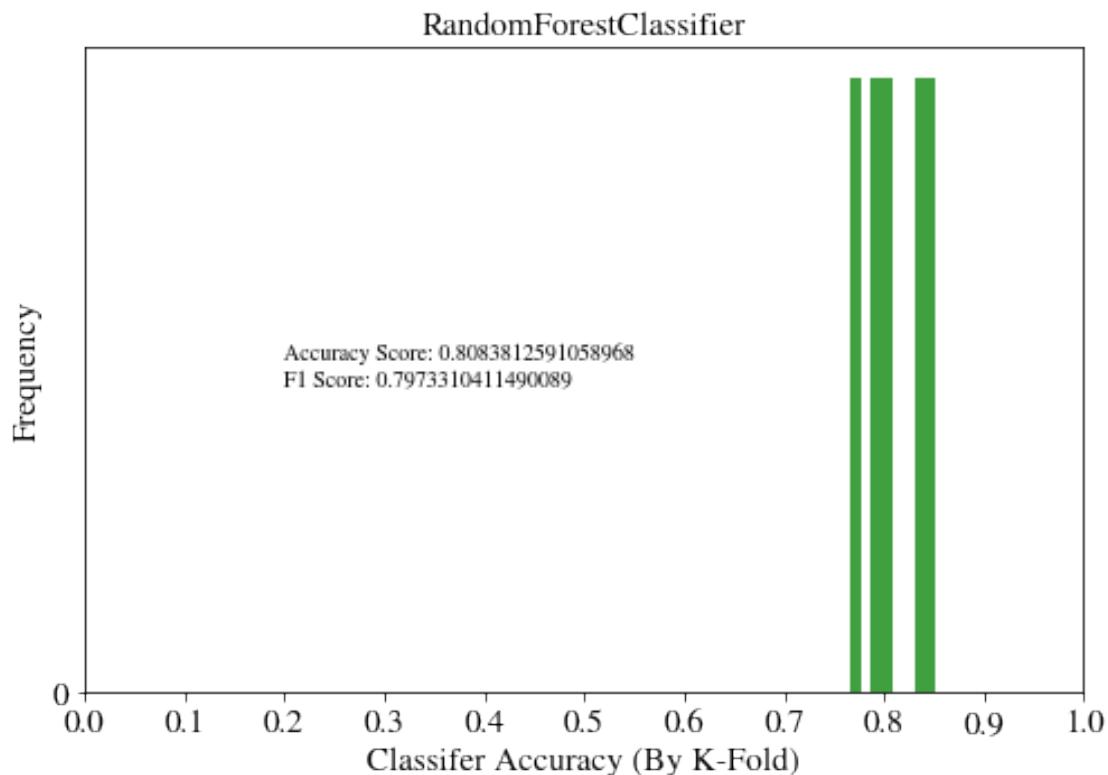
0 RandomForestClassifier Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB Active inflammation?, Severity of Crypt Arch, ...
4 AdaBoostClassifier Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier Active inflammation?, Severity of Crypt Arch, ...
6 SVC Active inflammation?, Severity of Crypt Arch, ...
7 MLPClassifier Active inflammation?, Severity of Crypt Arch, ...

accuracy      f1  precision   recall  \
0 0.800951  0.789327  0.800951  0.800951
1 0.770064  0.747523  0.770064  0.770064
2 0.730565  0.697177  0.730565  0.730565
3 0.642765  0.609865  0.642765  0.642765
4 0.714385  0.719180  0.714385  0.714385
5 0.733011  0.728310  0.733011  0.733011
6 0.739192  0.682297  0.739192  0.739192
7 0.739215  0.708310  0.739215  0.739215

                                params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3     {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier

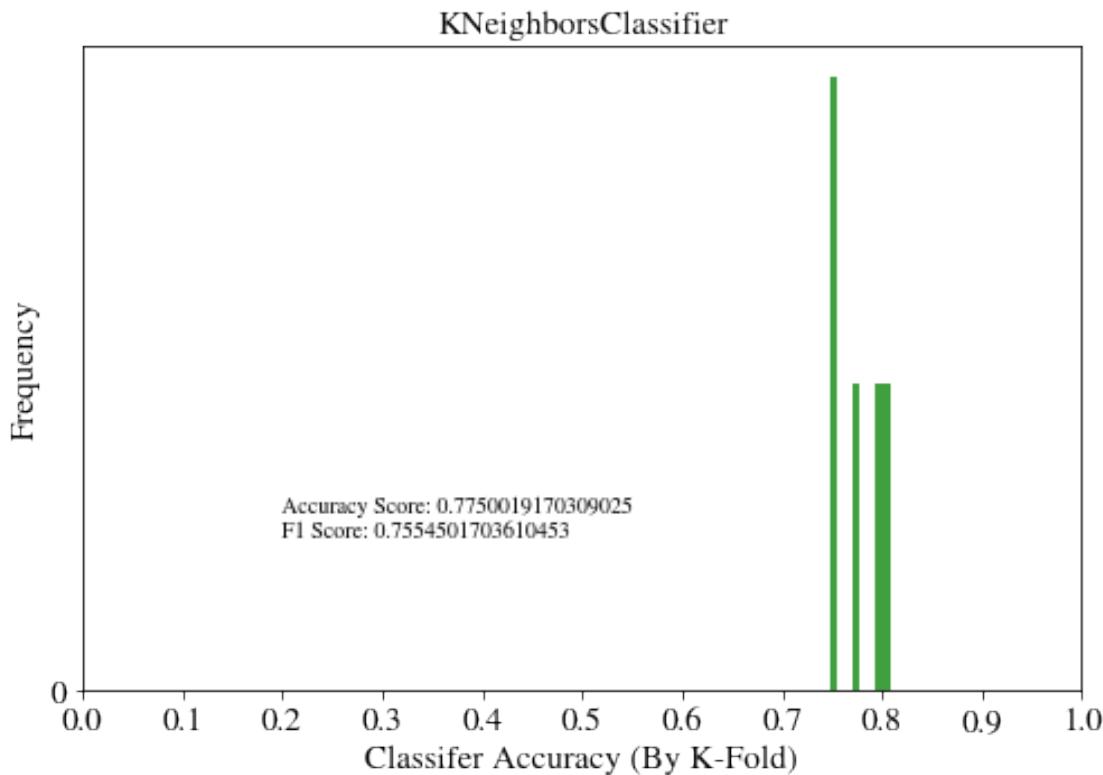


```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent', 'accuracy': [0.7654320987654321, 0.8024691358024691, 0.8333333333333334, 0.8518518518519, 0.7888198757763976], 'avgAccuracy': 0.8083812591058968, 'f1': [0.7546542132713443, 0.7899892304320515, 0.8226896442791828, 0.8356846573456541, 0.7836374604168117], 'avgF1': 0.7973310411490089, 'precision': [0.7654320987654321, 0.8024691358024691, 0.8333333333333334, 0.8518518518519, 0.7888198757763976], 'avgPrecision': 0.8083812591058968, 'recall': [0.7654320987654321, 0.8024691358024691, 0.8333333333333334, 0.8518518518519, 0.7888198757763976], 'avgRecall': 0.8083812591058968, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2}]}*****
```

```
'min_weight_fraction_leaf': 0.0, 'n_estimators': 500, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



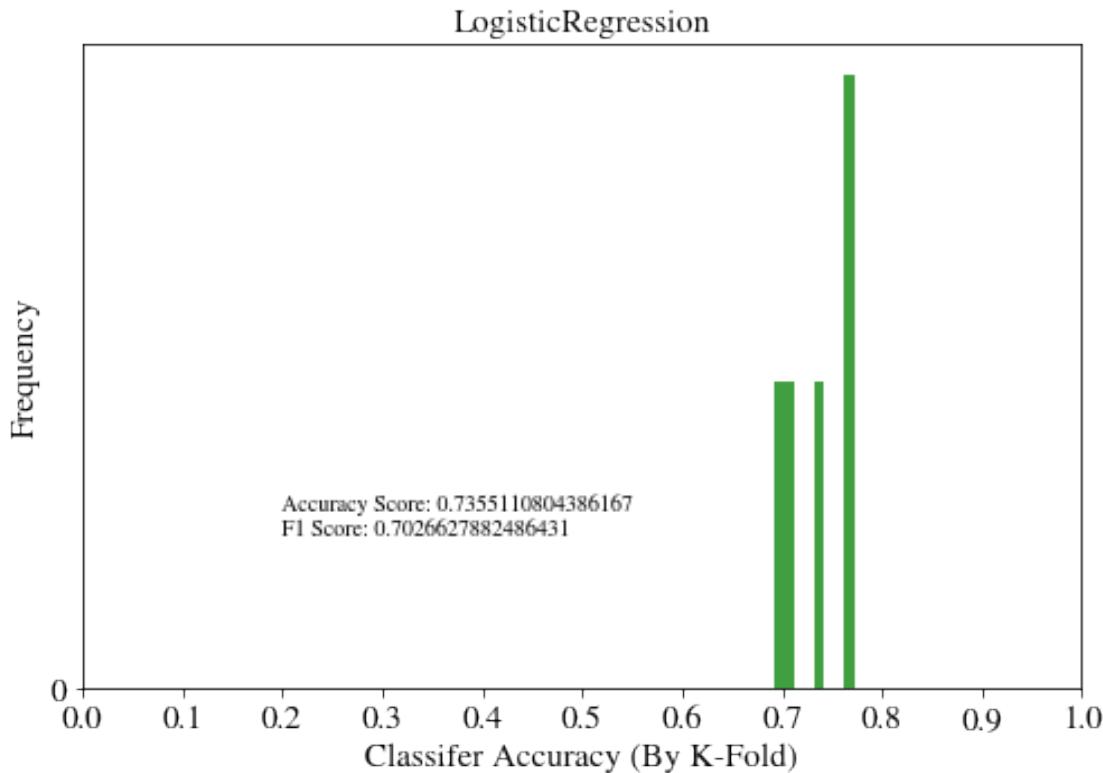
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent', 'accuracy': [0.7469135802469136, 0.7716049382716049, 0.7962962962962963, 0.808641975308642, 0.7515527950310559], 'avgAccuracy': 0.7750019170309025, 'f1': [0.7303634416729655, 0.7493853882742771, 0.7802979987547096, 0.7837354373152495, 0.7334685857880249], 'avgF1': 0.7554501703610453, 'precision': [0.7469135802469136, 0.7716049382716049, 0.7962962962962963, 0.808641975308642, 0.7515527950310559], 'avgPrecision': 0.7750019170309025, 'recall': [0.7469135802469136, 0.7716049382716049, 0.7962962962962963, 0.808641975308642, 0.7515527950310559]}
```

```

0.7515527950310559], 'avgRecall': 0.7750019170309025, 'params': [{}{'algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 16, 'p': 2, 'weights': 'distance'}]}
*****

```

Processing Model: LogisticRegression

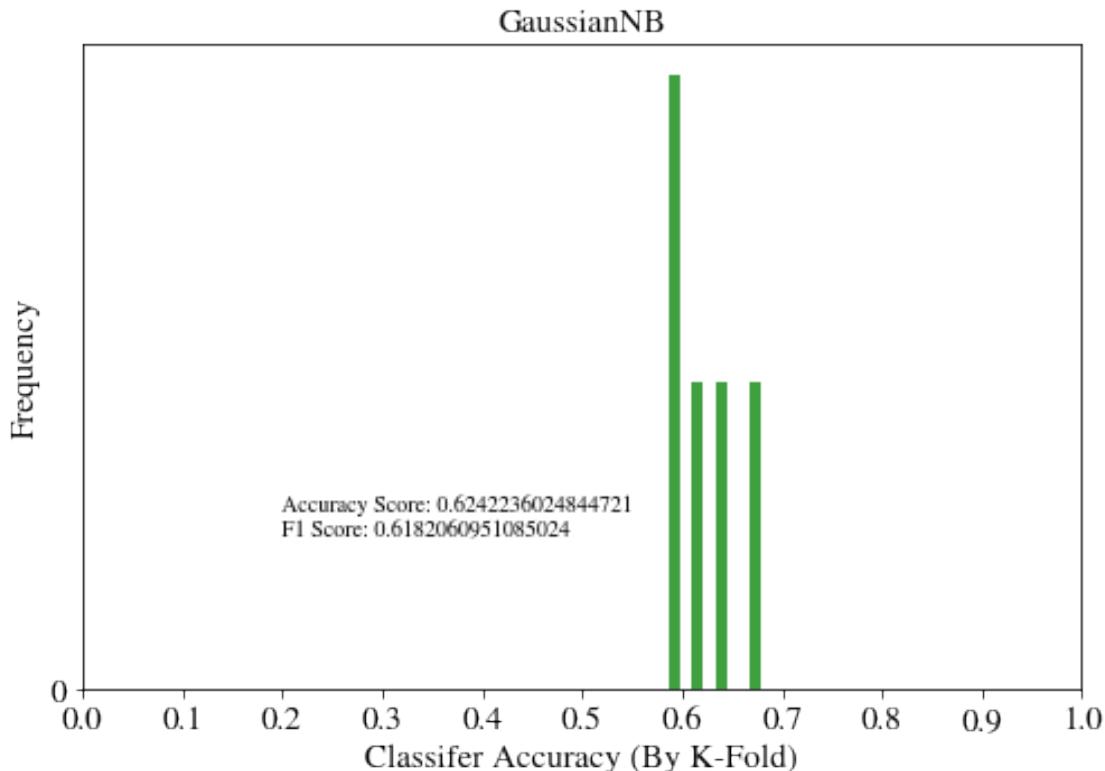


```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent',  
'accuracy': [0.7098765432098766, 0.691358024691358, 0.7407407407407407,  
0.7716049382716049, 0.7639751552795031], 'avgAccuracy': 0.7355110804386167,  
'f1': [0.6764529515509907, 0.650900558541884, 0.7046711137660958,  
0.7415680294757552, 0.73972128790849], 'avgF1': 0.7026627882486431, 'precision':  
[0.7098765432098766, 0.691358024691358, 0.7407407407407407, 0.7716049382716049,  
0.7639751552795031], 'avgPrecision': 0.7355110804386167, 'recall':
```

```
[0.7098765432098766, 0.691358024691358, 0.7407407407407407, 0.7716049382716049,
0.7639751552795031], 'avgRecall': 0.7355110804386167, 'params': [{ 'C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling': 1,
'l1_ratio': None, 'max_iter': 100, 'multi_class': 'ovr', 'n_jobs': -1,
'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****
*****
```

Processing Model: GaussianNB



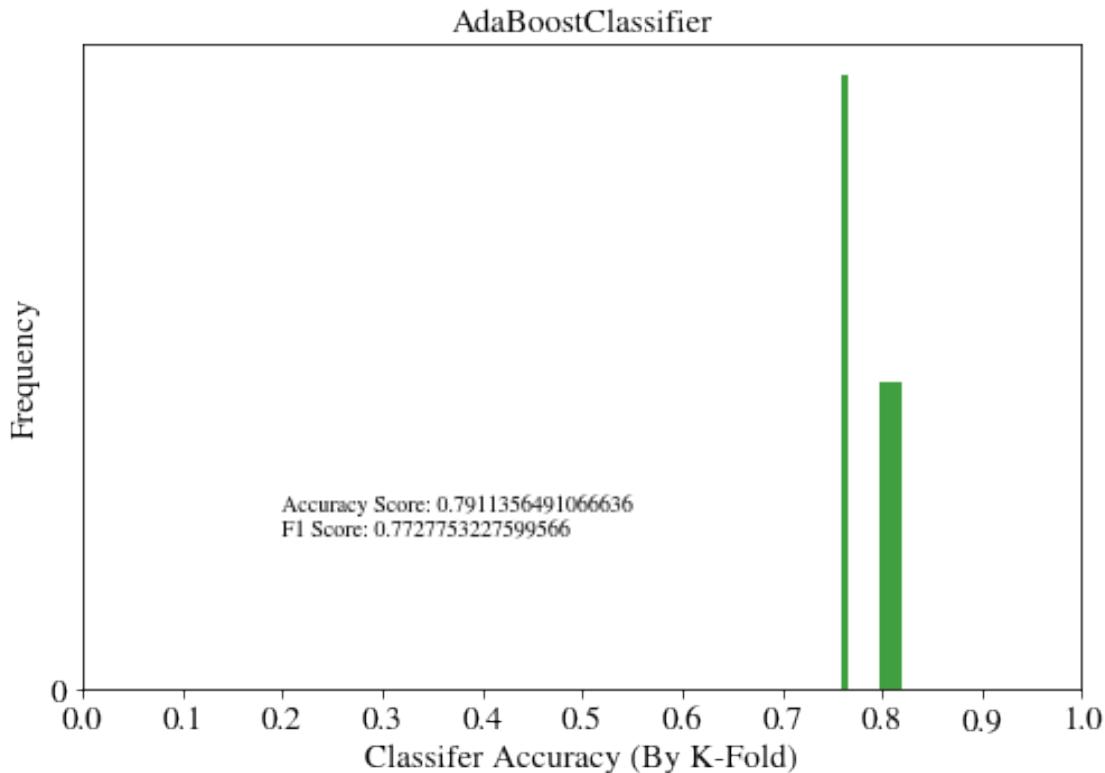
```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent', 'accuracy':
[0.5864197530864198, 0.5925925925925926, 0.6419753086419753, 0.6790123456790124,
0.6211180124223602], 'avgAccuracy': 0.6242236024844721, 'f1':
[0.5809409163814105, 0.5728233680303396, 0.6326288320607655, 0.6751532672966412,
```

```

0.6294840917733553], 'avgF1': 0.6182060951085024, 'precision':
[0.5864197530864198, 0.5925925925925926, 0.6419753086419753, 0.6790123456790124,
0.6211180124223602], 'avgPrecision': 0.6242236024844721, 'recall':
[0.5864197530864198, 0.5925925925925926, 0.6419753086419753, 0.6790123456790124,
0.6211180124223602], 'avgRecall': 0.6242236024844721, 'params': {'priors':
None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

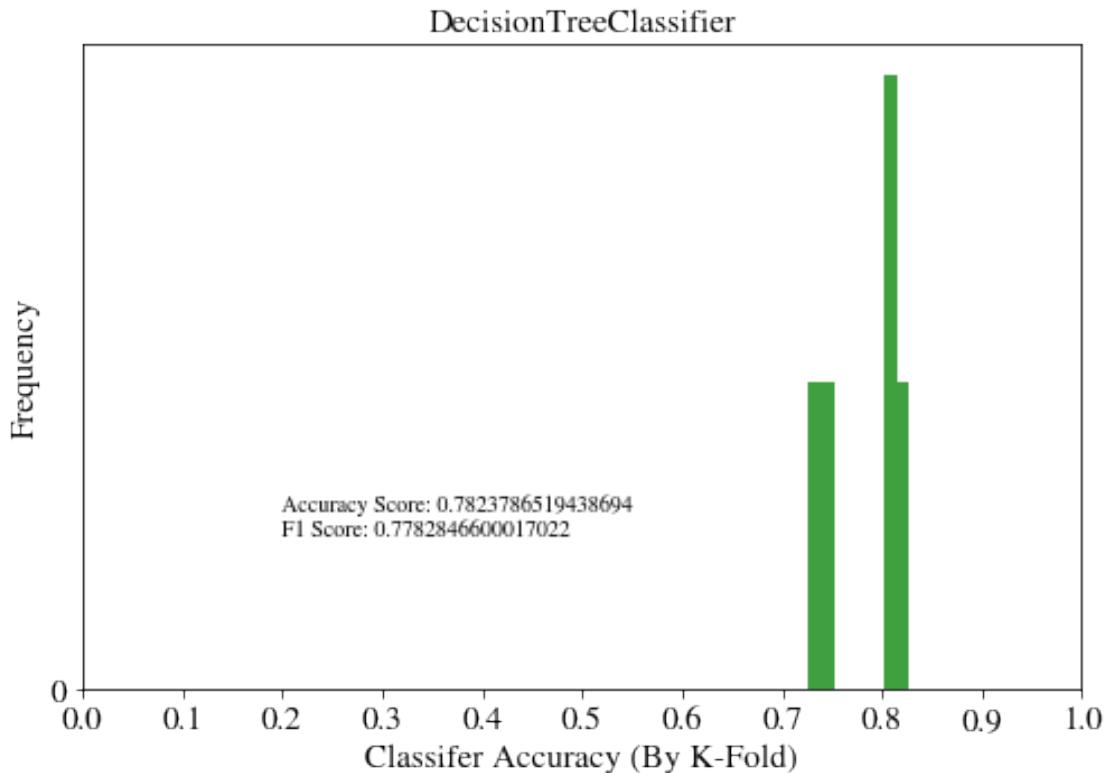
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent',
'accuracy': [0.808641975308642, 0.7592592592592593, 0.7654320987654321,
0.8024691358024691, 0.8198757763975155], 'avgAccuracy': 0.7911356491066636,
'f1': [0.7937713257646256, 0.7236540899555273, 0.7491276945086626,
```

```

0.7820926817611987, 0.8152308218097692], 'avgF1': 0.7727753227599566,
'precision': [0.808641975308642, 0.7592592592593, 0.7654320987654321,
0.8024691358024691, 0.8198757763975155], 'avgPrecision': 0.7911356491066636,
'recall': [0.808641975308642, 0.7592592592593, 0.7654320987654321,
0.8024691358024691, 0.8198757763975155], 'avgRecall': 0.7911356491066636,
'params': [{algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1,
'n_estimators': 20, 'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



```

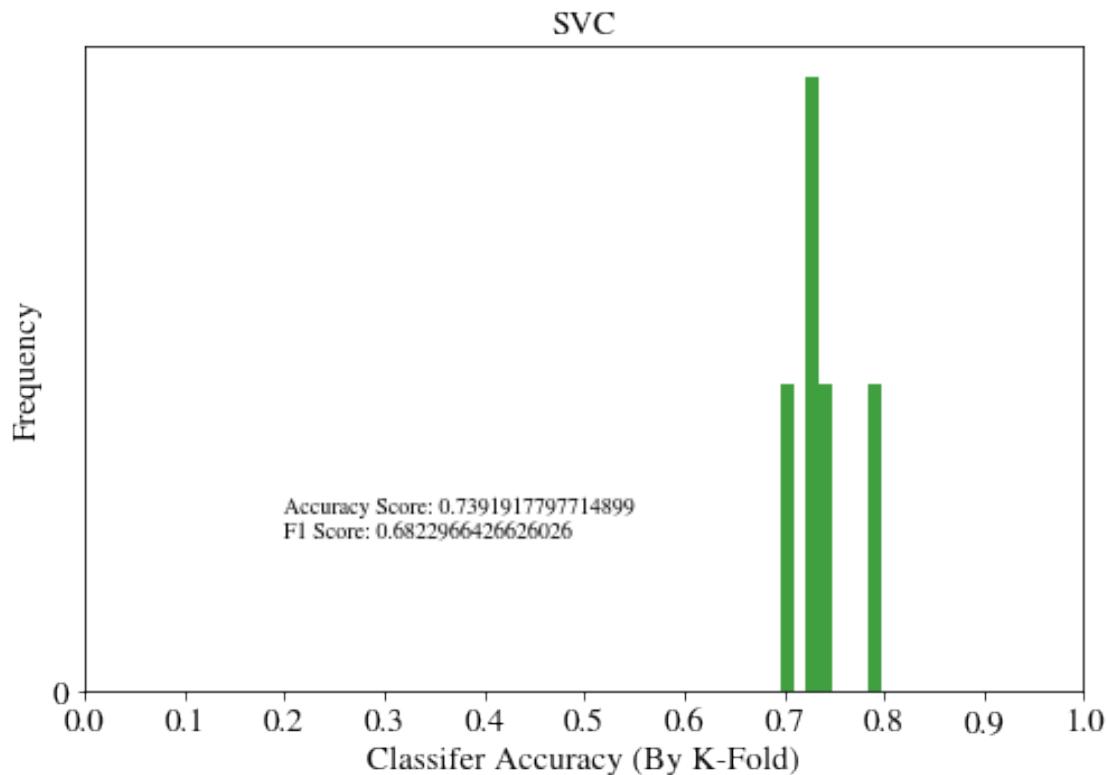
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent', 'accuracy': [0.7469135802469136, 0.808641975308642, 0.8024691358024691, 0.8271604938271605, 0.7267080745341615], 'avgAccuracy': 0.7823786519438694,
```

```

'f1': [0.7461058831429201, 0.8026561915450804, 0.8068701253461337,
0.8105383581222353, 0.7252527418521415], 'avgF1': 0.7782846600017022,
'precision': [0.7469135802469136, 0.808641975308642, 0.8024691358024691,
0.8271604938271605, 0.7267080745341615], 'avgPrecision': 0.7823786519438694,
'recall': [0.7469135802469136, 0.808641975308642, 0.8024691358024691,
0.8271604938271605, 0.7267080745341615], 'avgRecall': 0.7823786519438694,
'params': [{ 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini',
'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None,
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None,
'splitter': 'best' }]}
*****

```

Processing Model: SVC



```

*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt
Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in
lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,
Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,
Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists

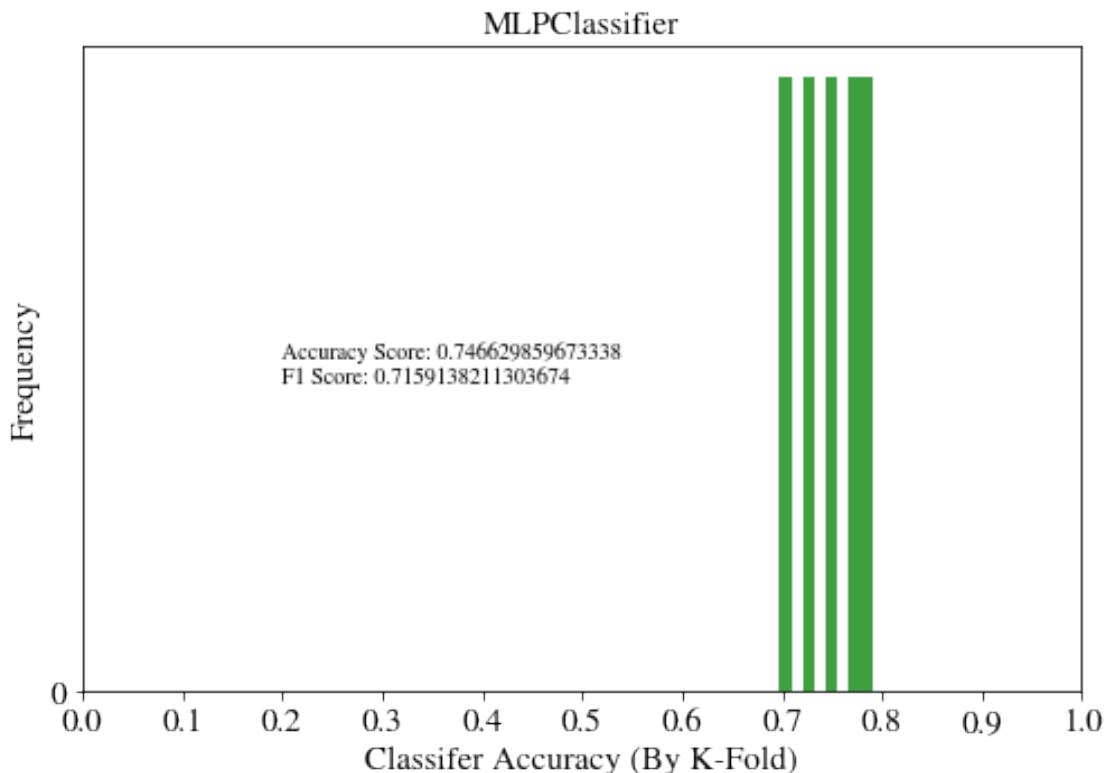
```

```

diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina
propria granulomas, Crypt abscesses extent', 'accuracy': [0.6975308641975309,
0.7283950617283951, 0.7283950617283951, 0.7962962962962963, 0.7453416149068323],
'avgAccuracy': 0.7391917797714899, 'f1': [0.6352100804096146,
0.6565014487252122, 0.6665423930921565, 0.7559265963262064, 0.6973026947598235],
'avgF1': 0.6822966426626026, 'precision': [0.6975308641975309,
0.7283950617283951, 0.7283950617283951, 0.7962962962962963, 0.7453416149068323],
'avgPrecision': 0.7391917797714899, 'recall': [0.6975308641975309,
0.7283950617283951, 0.7283950617283951, 0.7962962962962963, 0.7453416149068323],
'avgRecall': 0.7391917797714899, 'params': [{ 'C': 1.0, 'break_ties': False,
'cache_size': 4000, 'class_weight': None, 'coef0': 0.0,
'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':
'linear', 'max_iter': -1, 'probability': False, 'random_state': None,
'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```

*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal

```

```

increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas, Crypt abscesses extent', 'accuracy':
[0.6975308641975309, 0.7222222222222222, 0.7530864197530864, 0.7901234567901234,
0.7701863354037267], 'avgAccuracy': 0.746629859673338, 'f1': [0.665352477379186,
0.6855492244381134, 0.7214383695865177, 0.7578536379276576, 0.7493753963203624],
'avgF1': 0.7159138211303674, 'precision': [0.6975308641975309,
0.7222222222222222, 0.7530864197530864, 0.7901234567901234, 0.7701863354037267],
'avgPrecision': 0.746629859673338, 'recall': [0.6975308641975309,
0.7222222222222222, 0.7530864197530864, 0.7901234567901234, 0.7701863354037267],
'avgRecall': 0.746629859673338, 'params': [{activation': 'identity', 'alpha':
0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping':
False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'invscaling', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000,
'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t':
0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs, Lamina propria granulomas, Crypt abscesses extent',
'accuracy': [0.7654320987654321, 0.8024691358024691, 0.8333333333333334,
0.8518518518519, 0.7888198757763976], 'avgAccuracy': 0.8083812591058968,
'f1': [0.7546542132713443, 0.7899892304320515, 0.8226896442791828,
0.8356846573456541, 0.7836374604168117], 'avgF1': 0.7973310411490089,
'precision': [0.7654320987654321, 0.8024691358024691, 0.8333333333333334,
0.8518518518519, 0.7888198757763976], 'avgPrecision': 0.8083812591058968,
'recall': [0.7654320987654321, 0.8024691358024691, 0.8333333333333334,
0.8518518518519, 0.7888198757763976], 'avgRecall': 0.8083812591058968,
'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None,
criterion': 'entropy', 'max_depth': None, 'max_features': 'auto',
'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 500, 'n_jobs': -1, 'oob_score':
True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
model features \
0 RandomForestClassifier Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier Active inflammation?, Severity of Crypt Arch, ...

```

```

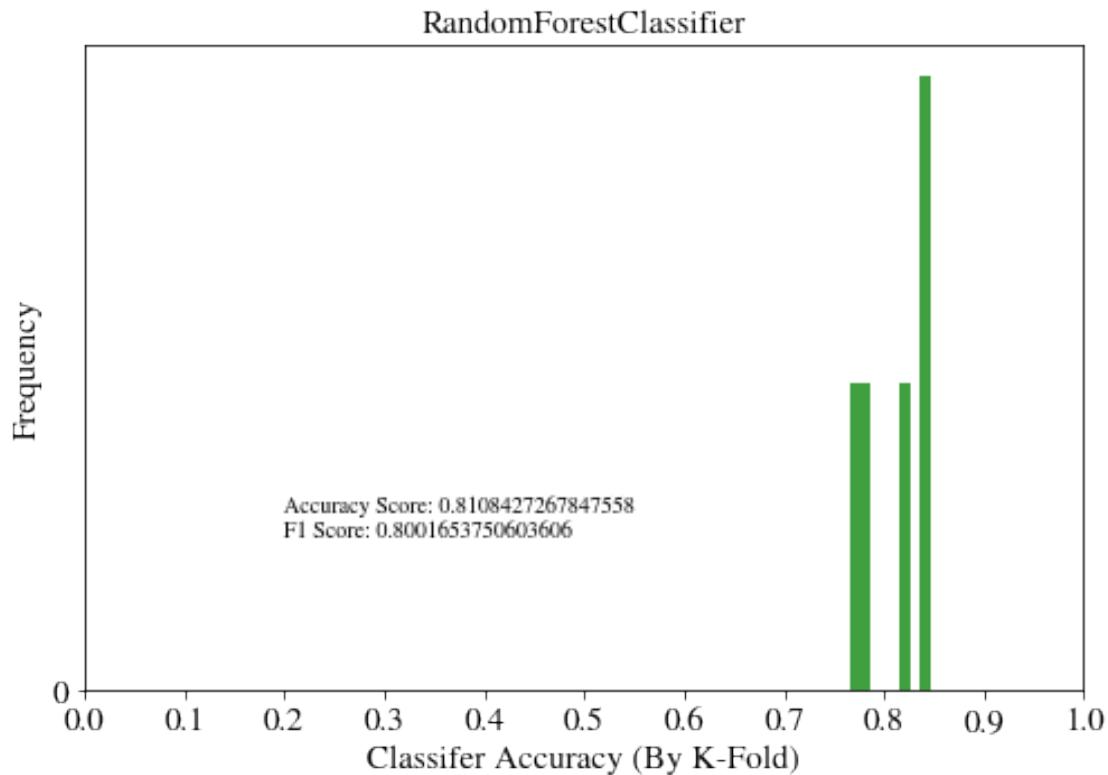
2      LogisticRegression Active inflammation?, Severity of Crypt Arch, ...
3          GaussianNB   Active inflammation?, Severity of Crypt Arch, ...
4      AdaBoostClassifier Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier Active inflammation?, Severity of Crypt Arch, ...
6          SVC        Active inflammation?, Severity of Crypt Arch, ...
7      MLPClassifier  Active inflammation?, Severity of Crypt Arch, ...

    accuracy      f1  precision   recall  \
0  0.804662  0.792529  0.804662  0.804662
1  0.772533  0.751797  0.772533  0.772533
2  0.730565  0.698338  0.730565  0.730565
3  0.624224  0.618206  0.624224  0.624224
4  0.714385  0.719180  0.714385  0.714385
5  0.731677  0.727523  0.731677  0.731677
6  0.739192  0.682297  0.739192  0.739192
7  0.741699  0.712373  0.741699  0.741699

                                params
0  {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1  {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2  {'C': 1, 'class_weight': None, 'dual': False, ...
3  {'priors': None, 'var_smoothing': 1e-09}
4  {'algorithm': 'SAMME.R', 'base_estimator': Non...
5  {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6  {'C': 1.0, 'break_ties': False, 'cache_size': ...
7  {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

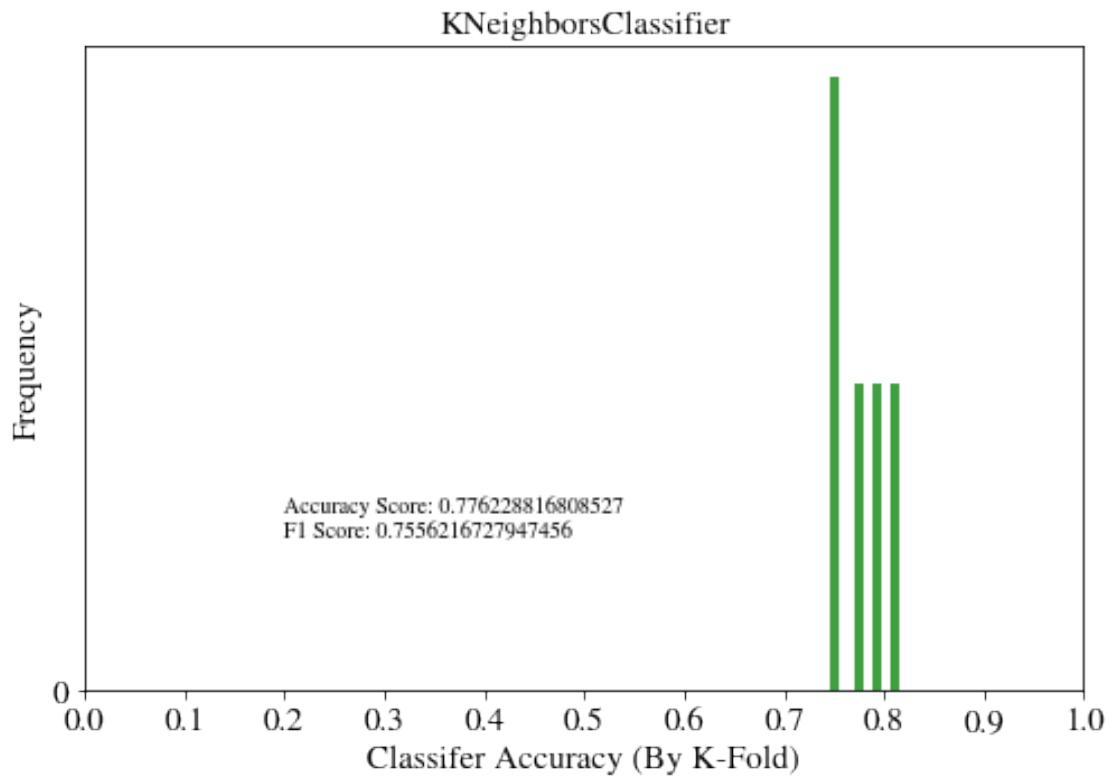
Processing Model: RandomForestClassifier



```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina propria granulomas', 'accuracy': [0.7654320987654321, 0.8209876543209876, 0.8395061728395061, 0.845679012345679, 0.782608695652174], 'avgAccuracy': 0.8108427267847558, 'f1': [0.7546542132713443, 0.8093165330278732, 0.8285633907605032, 0.8270287625774391, 0.7812639756646431], 'avgF1': 0.8001653750603606, 'precision': [0.7654320987654321, 0.8209876543209876, 0.8395061728395061, 0.845679012345679, 0.782608695652174], 'avgPrecision': 0.8108427267847558, 'recall': [0.7654320987654321, 0.8209876543209876, 0.8395061728395061, 0.845679012345679, 0.782608695652174], 'avgRecall': 0.8108427267847558, 'params': [{"bootstrap": True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 500, 'oob_score': 0.8108427267847558}]}*****
```

```
'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0,  
'warm_start': False}]}  
*****
```

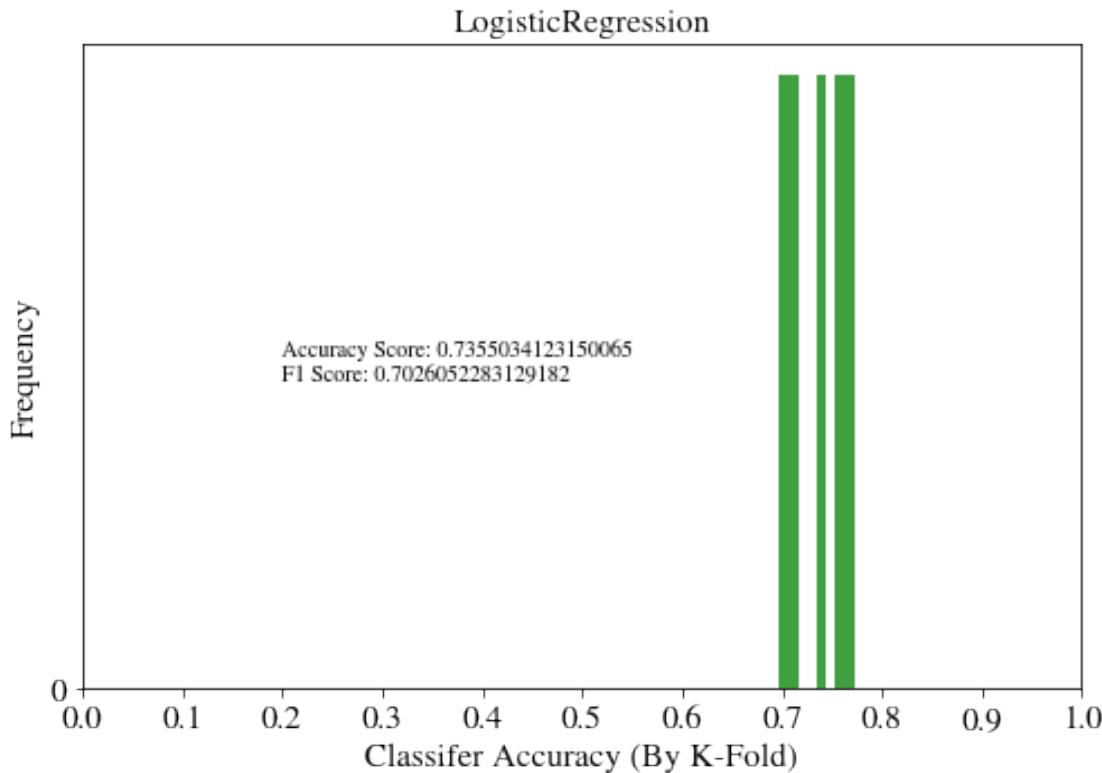
Processing Model: KNeighborsClassifier



```
*****  
* KNeighborsClassifier  
* Best Params Result:  
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas', 'accuracy':  
[0.7530864197530864, 0.7716049382716049, 0.7962962962962963, 0.8148148148148148,  
0.7453416149068323], 'avgAccuracy': 0.776228816808527, 'f1':  
[0.7356569515692472, 0.7493853882742771, 0.7802979987547096, 0.7886980753919227,  
0.7240699499835712], 'avgF1': 0.7556216727947456, 'precision':  
[0.7530864197530864, 0.7716049382716049, 0.7962962962962963, 0.8148148148148148,  
0.7453416149068323], 'avgPrecision': 0.776228816808527, 'recall':  
[0.7530864197530864, 0.7716049382716049, 0.7962962962962963, 0.8148148148148148,
```

```
0.7453416149068323], 'avgRecall': 0.776228816808527, 'params': [{'algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 16, 'p': 2, 'weights': 'distance'}]}  
*****
```

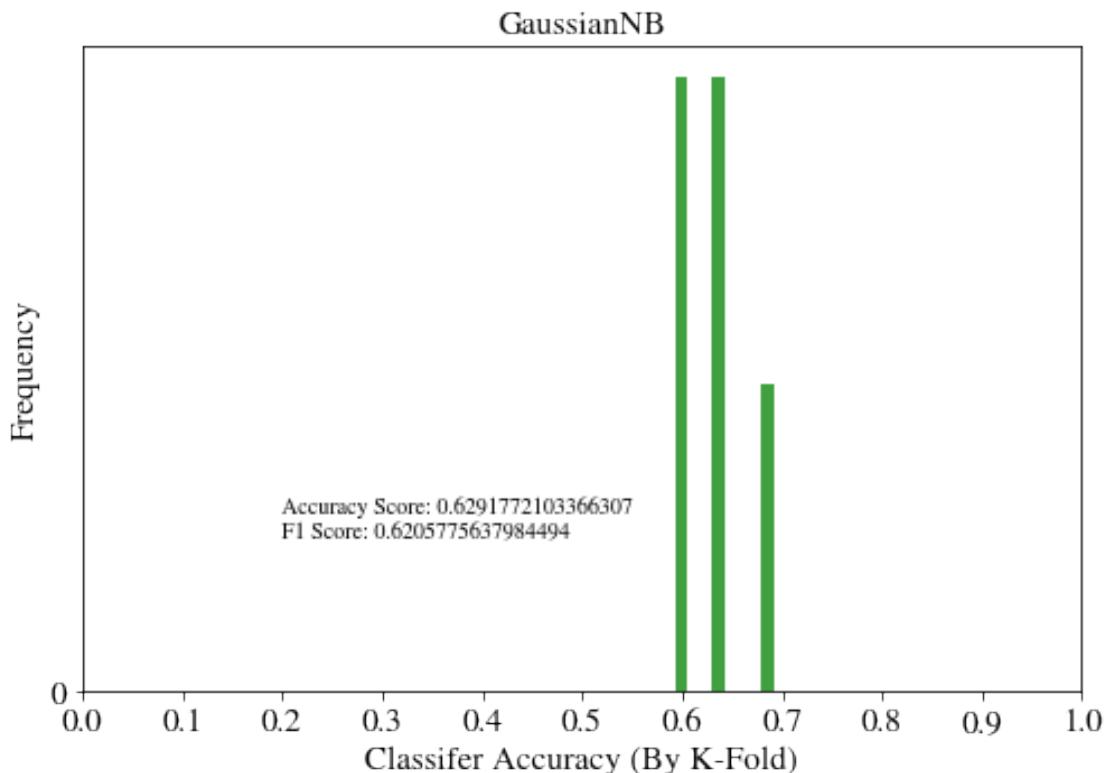
Processing Model: LogisticRegression



```
*****  
* LogisticRegression  
* Best Params Result:  
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas', 'accuracy':  
[0.7098765432098766, 0.6975308641975309, 0.7407407407407407, 0.7716049382716049,  
0.7577639751552795], 'avgAccuracy': 0.7355034123150065, 'f1':  
[0.6764529515509907, 0.661345833128804, 0.7046711137660958, 0.7415680294757552,  
0.7289882136429451], 'avgF1': 0.7026052283129182, 'precision':  
[0.7098765432098766, 0.6975308641975309, 0.7407407407407407, 0.7716049382716049,  
0.7577639751552795], 'avgPrecision': 0.7355034123150065, 'recall':
```

```
[0.7098765432098766, 0.6975308641975309, 0.7407407407407407, 0.7716049382716049,
0.7577639751552795], 'avgRecall': 0.7355034123150065, 'params': [{ 'C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling': 1,
'l1_ratio': None, 'max_iter': 100, 'multi_class': 'ovr', 'n_jobs': -1,
'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****
*****
```

Processing Model: GaussianNB



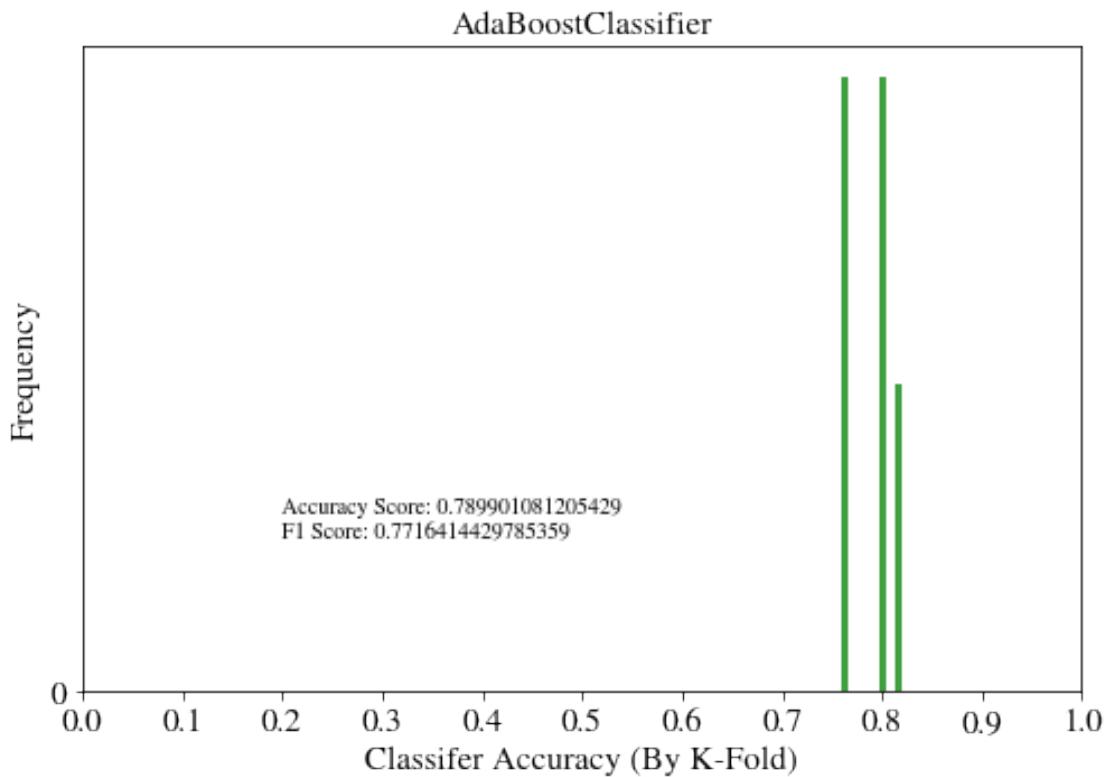
```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas', 'accuracy': [0.5925925925925926,
0.5925925925925926, 0.6358024691358025, 0.691358024691358, 0.6335403726708074],
'avgAccuracy': 0.6291772103366307, 'f1': [0.5864947019335793,
0.5680620253532349, 0.6243603310269977, 0.6832949710539165, 0.6406757896245185],
```

```

'avgF1': 0.6205775637984494, 'precision': [0.5925925925925926,
0.5925925925925926, 0.6358024691358025, 0.691358024691358, 0.6335403726708074],
'avgPrecision': 0.6291772103366307, 'recall': [0.5925925925925926,
0.5925925925925926, 0.6358024691358025, 0.691358024691358, 0.6335403726708074],
'avgRecall': 0.6291772103366307, 'params': [{'priors': None, 'var_smoothing':
1e-09}]}}
*****

```

Processing Model: AdaBoostClassifier



```

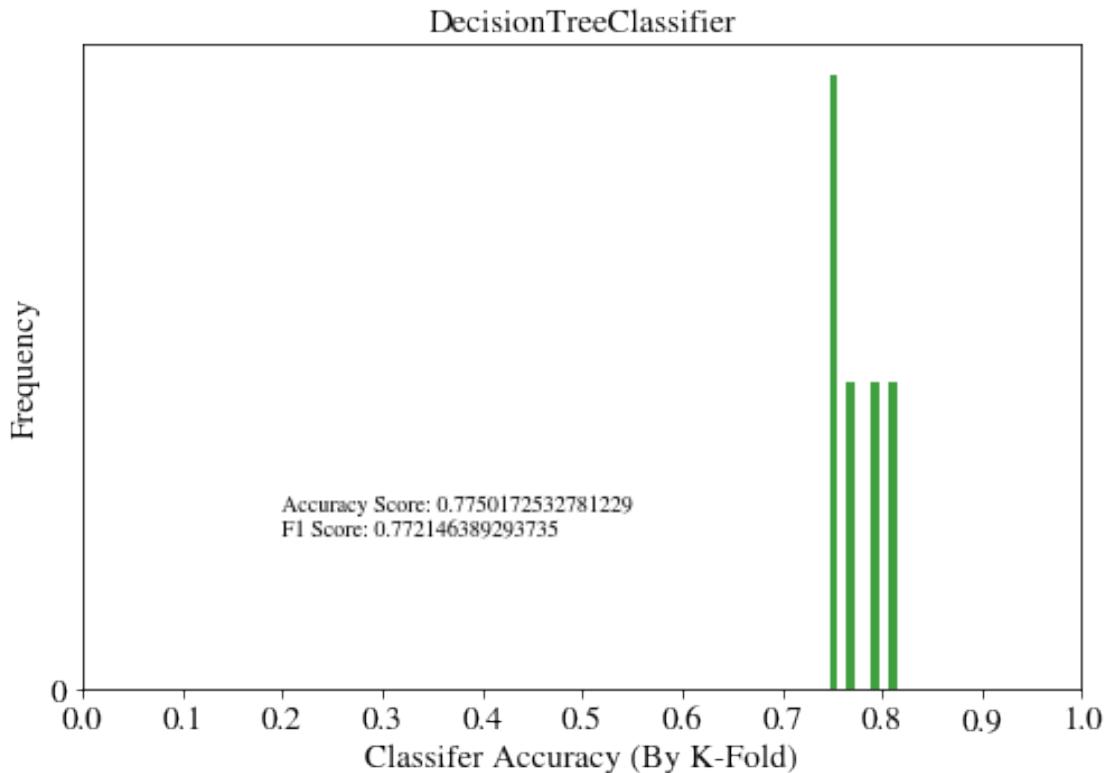
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs, Lamina propria granulomas', 'accuracy':
[0.8024691358024691, 0.7592592592592593, 0.7654320987654321, 0.8024691358024691,
0.8198757763975155], 'avgAccuracy': 0.789901081205429, 'f1':
[0.7881019268575218, 0.7236540899555273, 0.7491276945086626, 0.7820926817611987,
```

```

0.8152308218097692], 'avgF1': 0.7716414429785359, 'precision':
[0.8024691358024691, 0.7592592592592593, 0.7654320987654321, 0.8024691358024691,
0.8198757763975155], 'avgPrecision': 0.789901081205429, 'recall':
[0.8024691358024691, 0.7592592592592593, 0.7654320987654321, 0.8024691358024691,
0.8198757763975155], 'avgRecall': 0.789901081205429, 'params': [{}{'algorithm':
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 20,
'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



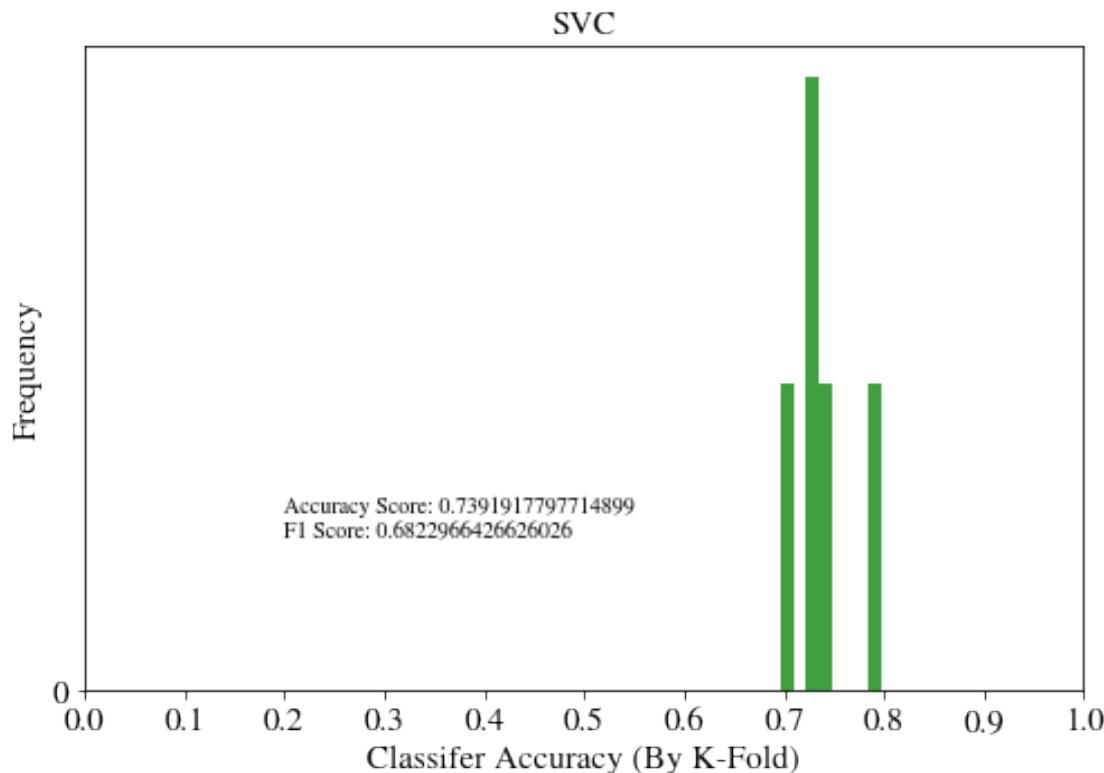
```

*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs, Lamina propria granulomas', 'accuracy':
[0.7469135802469136, 0.7530864197530864, 0.7962962962962963, 0.8148148148148148,
0.7639751552795031], 'avgAccuracy': 0.7750172532781229, 'f1':
```

```
[0.7409822352425582, 0.745940029259154, 0.7962962962962963, 0.8092723102469691,
0.7682410754236977], 'avgF1': 0.772146389293735, 'precision':
[0.7469135802469136, 0.7530864197530864, 0.7962962962962963, 0.8148148148148148,
0.7639751552795031], 'avgPrecision': 0.7750172532781229, 'recall':
[0.7469135802469136, 0.7530864197530864, 0.7962962962962963, 0.8148148148148148,
0.7639751552795031], 'avgRecall': 0.7750172532781229, 'params': [{'ccp_alpha':
0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None,
'max_features': 'log2', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****

```

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt
Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in
lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,
Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,
Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists
diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs, Lamina

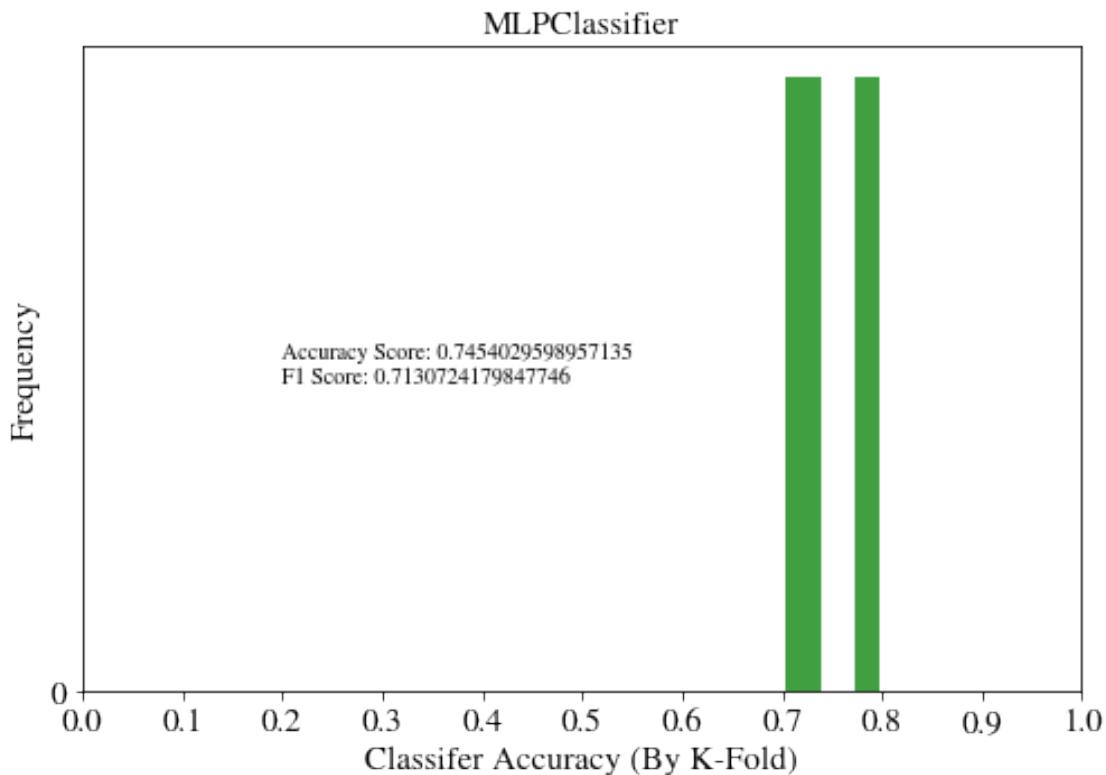
```

```

propria granulomas', 'accuracy': [0.6975308641975309, 0.7283950617283951,
0.7283950617283951, 0.7962962962962963, 0.7453416149068323], 'avgAccuracy':
0.7391917797714899, 'f1': [0.6352100804096146, 0.6565014487252122,
0.6665423930921565, 0.7559265963262064, 0.6973026947598235], 'avgF1':
0.6822966426626026, 'precision': [0.6975308641975309, 0.7283950617283951,
0.7283950617283951, 0.7962962962962963, 0.7453416149068323], 'avgPrecision':
0.7391917797714899, 'recall': [0.6975308641975309, 0.7283950617283951,
0.7283950617283951, 0.7962962962962963, 0.7453416149068323], 'avgRecall':
0.7391917797714899, 'params': [{ 'C': 1.0, 'break_ties': False, 'cache_size':
4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr',
'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1,
'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001,
'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```

*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt

```

```

architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs, Lamina propria granulomas', 'accuracy': [0.7037037037037037,
0.7160493827160493, 0.7345679012345679, 0.7962962962962963, 0.7763975155279503],
'avgAccuracy': 0.7454029598957135, 'f1': [0.6790045510992385,
0.6754562337188422, 0.6987706131488984, 0.7626487136073415, 0.7494819783495524],
'avgF1': 0.7130724179847746, 'precision': [0.7037037037037037,
0.7160493827160493, 0.7345679012345679, 0.7962962962962963, 0.7763975155279503],
'avgPrecision': 0.7454029598957135, 'recall': [0.7037037037037037,
0.7160493827160493, 0.7345679012345679, 0.7962962962962963, 0.7763975155279503],
'avgRecall': 0.7454029598957135, 'params': [{activation': 'logistic', 'alpha':
0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping':
False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000,
'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t':
0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'verlodation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt
abscesses polymorphs, Lamina propria granulomas', 'accuracy':
[0.7654320987654321, 0.8209876543209876, 0.8395061728395061, 0.845679012345679,
0.782608695652174], 'avgAccuracy': 0.8108427267847558, 'f1':
[0.7546542132713443, 0.8093165330278732, 0.8285633907605032, 0.8270287625774391,
0.7812639756646431], 'avgF1': 0.8001653750603606, 'precision':
[0.7654320987654321, 0.8209876543209876, 0.8395061728395061, 0.845679012345679,
0.782608695652174], 'avgPrecision': 0.8108427267847558, 'recall':
[0.7654320987654321, 0.8209876543209876, 0.8395061728395061, 0.845679012345679,
0.782608695652174], 'avgRecall': 0.8108427267847558, 'params': [{bootstrap':
True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth':
None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None,
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 500,
'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0,
'warm_start': False}]}
*****

```

model	features \
0 RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...

```

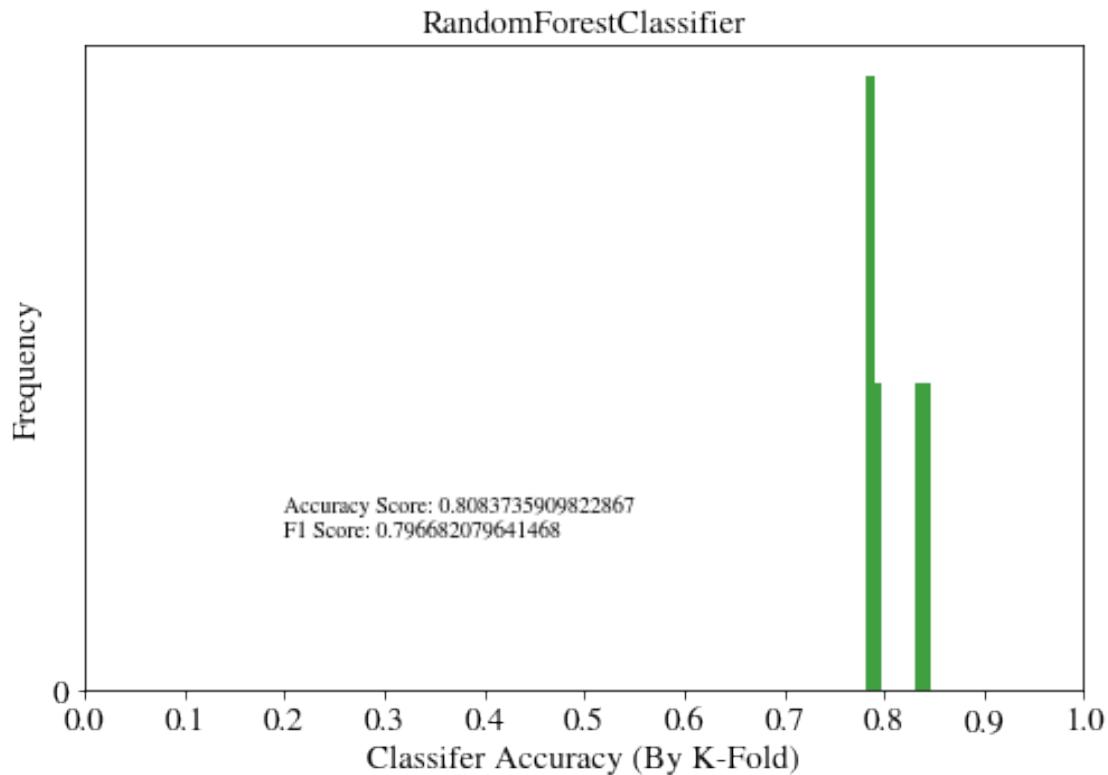
3      GaussianNB  Active inflammation?, Severity of Crypt Arch, ...
4      AdaBoostClassifier  Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier  Active inflammation?, Severity of Crypt Arch, ...
6          SVC  Active inflammation?, Severity of Crypt Arch, ...
7      MLPClassifier  Active inflammation?, Severity of Crypt Arch, ...

    accuracy      f1  precision   recall  \
0  0.802193  0.791963  0.802193  0.802193
1  0.771291  0.750884  0.771291  0.771291
2  0.734269  0.704081  0.734269  0.734269
3  0.629177  0.620578  0.629177  0.629177
4  0.685990  0.695333  0.685990  0.685990
5  0.736700  0.731715  0.736700  0.736700
6  0.739192  0.682297  0.739192  0.739192
7  0.740449  0.707747  0.740449  0.740449

                                params
0  {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1  {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2  {'C': 1, 'class_weight': None, 'dual': False, ...
3      {'priors': None, 'var_smoothing': 1e-09}
4  {'algorithm': 'SAMME.R', 'base_estimator': Non...
5  {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6  {'C': 1.0, 'break_ties': False, 'cache_size': ...
7  {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier

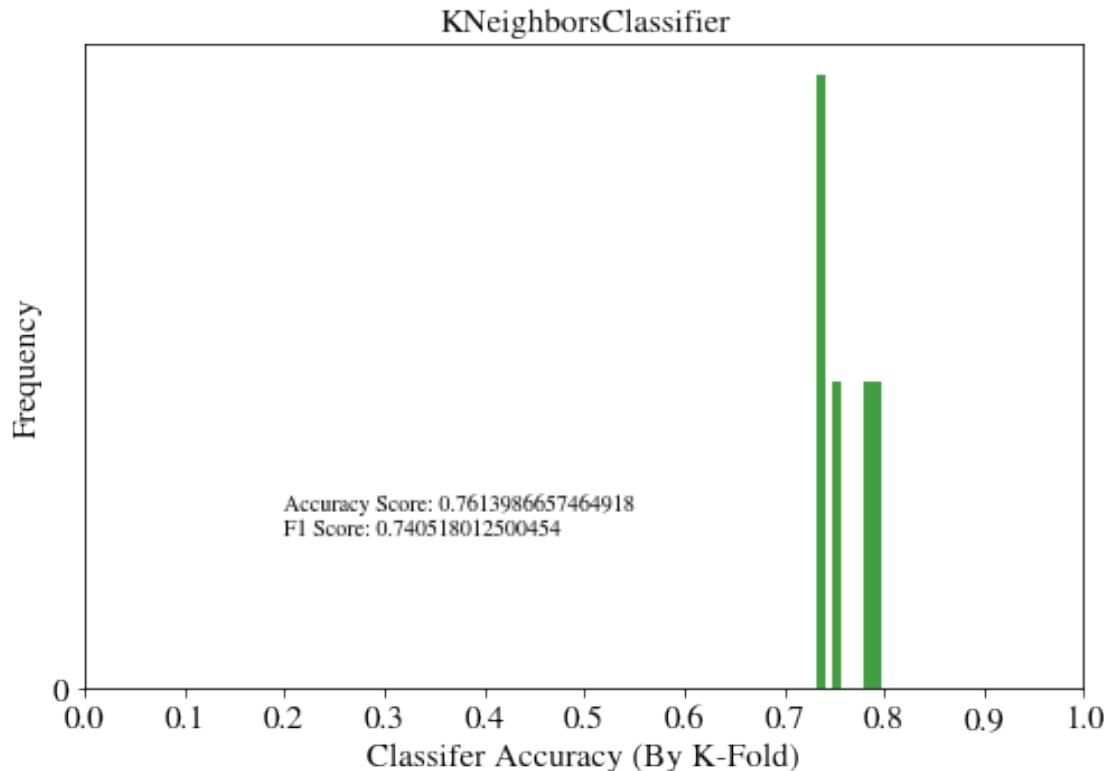


```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs', 'accuracy': [0.7839506172839507, 0.7962962962962963, 0.8333333333333334, 0.845679012345679, 0.782608695652174], 'avgAccuracy': 0.8083735909822867, 'f1': [0.7712258316748818, 0.7817148190573161, 0.8221770092330599, 0.8270287625774391, 0.7812639756646431], 'avgF1': 0.796682079641468, 'precision': [0.7839506172839507, 0.7962962962962963, 0.8333333333333334, 0.845679012345679, 0.782608695652174], 'avgPrecision': 0.8083735909822867, 'recall': [0.7839506172839507, 0.7962962962962963, 0.8333333333333334, 0.845679012345679, 0.782608695652174], 'avgRecall': 0.8083735909822867, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score':
```

```
False, 'random_state': None, 'verbose': 0, 'warm_start': False}]]}
*****

```

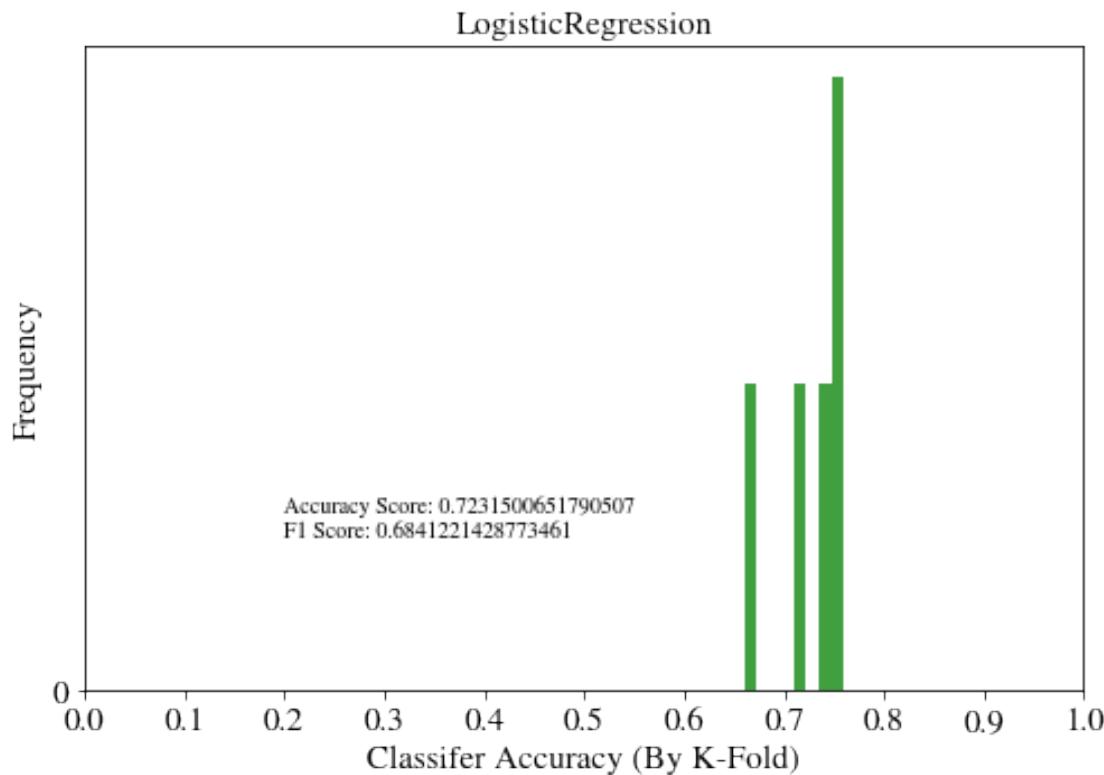
Processing Model: KNeighborsClassifier



```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs', 'accuracy': [0.7407407407407407, 0.7530864197530864,  
0.7839506172839507, 0.7962962962962963, 0.7329192546583851], 'avgAccuracy':  
0.7613986657464918, 'f1': [0.7146791804734437, 0.7335683358282229,  
0.7703289891408993, 0.7739383657480546, 0.7100751913116495], 'avgF1':  
0.740518012500454, 'precision': [0.7407407407407407, 0.7530864197530864,  
0.7839506172839507, 0.7962962962962963, 0.7329192546583851], 'avgPrecision':  
0.7613986657464918, 'recall': [0.7407407407407407, 0.7530864197530864,  
0.7839506172839507, 0.7962962962962963, 0.7329192546583851], 'avgRecall':  
0.7613986657464918, 'params': [{'algorithm': 'brute', 'leaf_size': 30, 'metric':
```

```
'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 17, 'p': 2,
'weights': 'distance'}]}}
*****
```

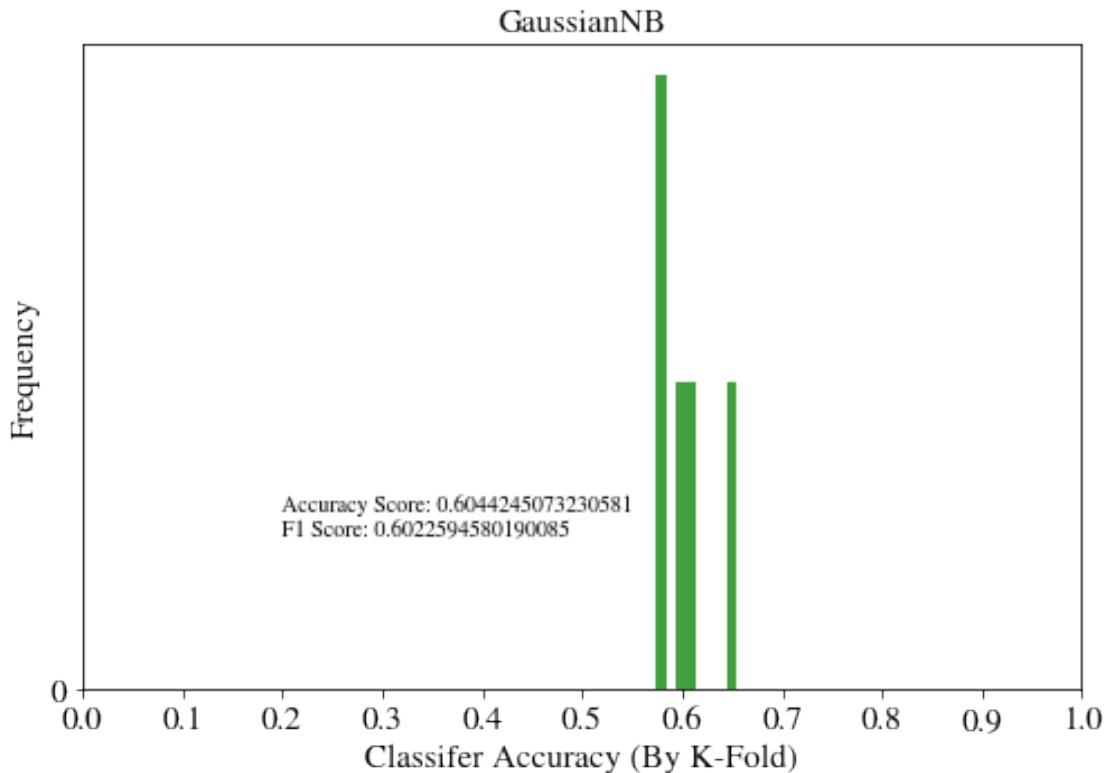
Processing Model: LogisticRegression



```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs', 'accuracy': [0.7098765432098766, 0.6604938271604939,  
0.7345679012345679, 0.7592592592592593, 0.7515527950310559], 'avgAccuracy':  
0.7231500651790507, 'f1': [0.6713390051181347, 0.6160771146242938,  
0.6945224740802547, 0.7145427519308508, 0.7241293686331963], 'avgF1':  
0.6841221428773461, 'precision': [0.7098765432098766, 0.6604938271604939,  
0.7345679012345679, 0.7592592592592593, 0.7515527950310559], 'avgPrecision':  
0.7231500651790507, 'recall': [0.7098765432098766, 0.6604938271604939,  
0.7345679012345679, 0.7592592592592593, 0.7515527950310559], 'avgRecall':
```

```
0.7231500651790507, 'params': [ {'C': 1, 'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'ovr', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}  
*****
```

Processing Model: GaussianNB



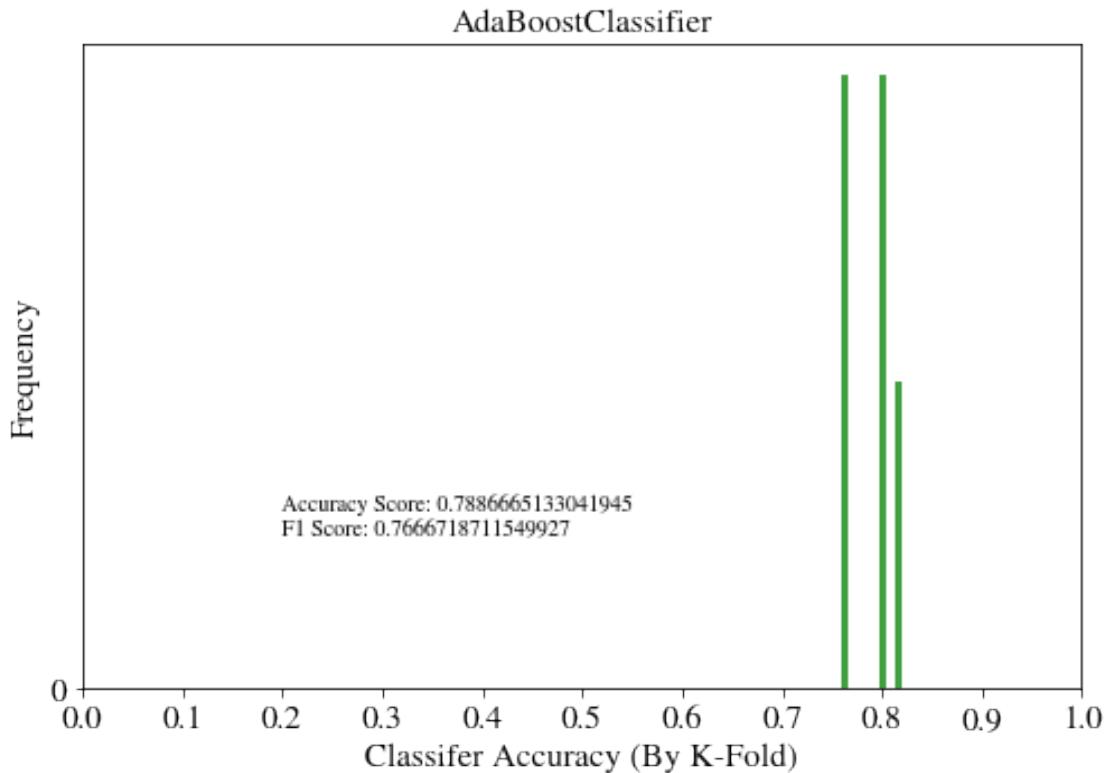
```
*****  
* GaussianNB  
* Best Params Result:  
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs', 'accuracy': [0.5987654320987654, 0.5740740740741, 0.6111111111111112, 0.654320987654321, 0.5838509316770186], 'avgAccuracy': 0.6044245073230581, 'f1': [0.604291789013086, 0.5568425465606943, 0.6040487963321612, 0.6529900741636979, 0.593124084025403], 'avgF1': 0.6022594580190085, 'precision': [0.5987654320987654, 0.5740740740741, 0.6111111111111112, 0.654320987654321, 0.5838509316770186], 'avgPrecision':
```

```

0.6044245073230581, 'recall': [0.5987654320987654, 0.5740740740740741,
0.6111111111111112, 0.654320987654321, 0.5838509316770186], 'avgRecall':
0.6044245073230581, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  
abscesses polymorphs', 'accuracy': [0.8024691358024691, 0.7592592592592593,  
0.7592592592593, 0.8024691358024691, 0.8198757763975155], 'avgAccuracy':  
0.7886665133041945, 'f1': [0.7881019268575218, 0.7236540899555273,  
0.7242798353909465, 0.7820926817611987, 0.8152308218097692], 'avgF1':  
0.7666718711549927, 'precision': [0.8024691358024691, 0.7592592592592593,  
0.7592592592593, 0.8024691358024691, 0.8198757763975155], 'avgPrecision':  
0.7886665133041945, 'recall': [0.8024691358024691, 0.7592592592593,
```

```

0.7592592592592593, 0.8024691358024691, 0.8198757763975155], 'avgRecall':  

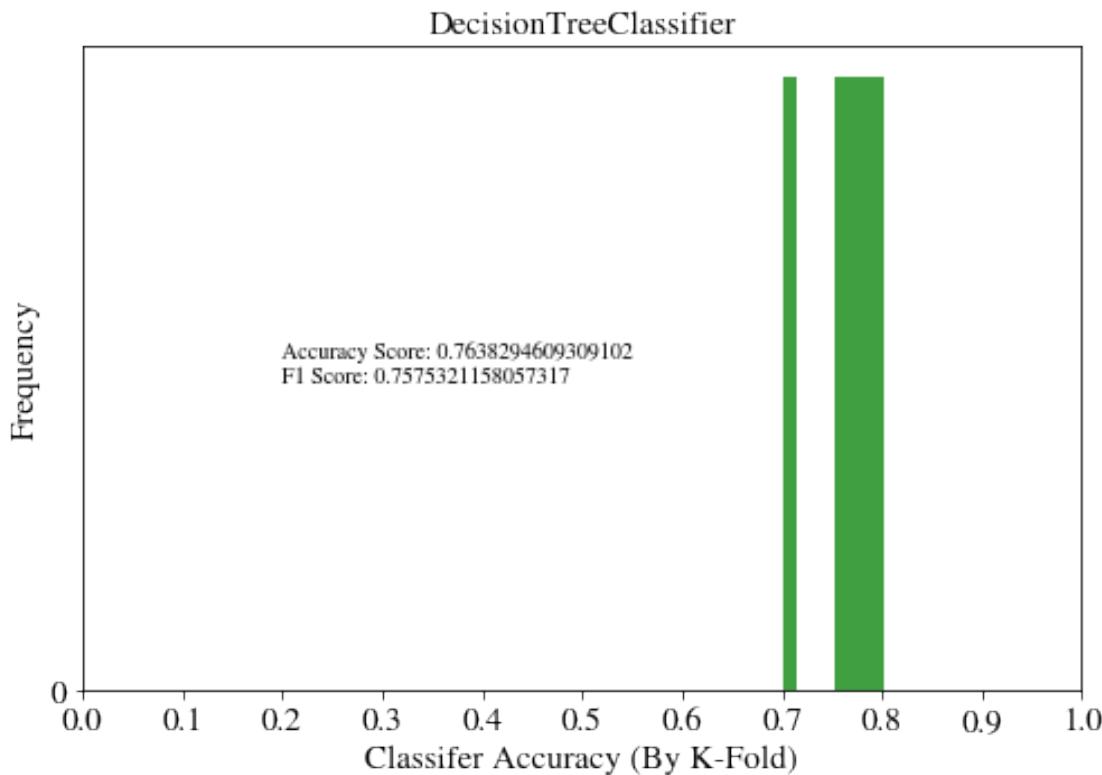
0.7886665133041945, 'params': [{'algorithm': 'SAMME.R', 'base_estimator': None,  

'learning_rate': 1, 'n_estimators': 20, 'random_state': None}]}  

*****

```

Processing Model: DecisionTreeClassifier



```

*****  

* DecisionTreeClassifier  

* Best Params Result:  

* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt  

abscesses polymorphs', 'accuracy': [0.7716049382716049, 0.7839506172839507,  

0.8024691358024691, 0.7592592592592593, 0.7018633540372671], 'avgAccuracy':  

0.7638294609309102, 'f1': [0.7674663054430882, 0.7707853789742435,  

0.79221753375115, 0.7516859966591601, 0.7055053642010164], 'avgF1':  

0.7575321158057317, 'precision': [0.7716049382716049, 0.7839506172839507,  

0.8024691358024691, 0.7592592592592593, 0.7018633540372671], 'avgPrecision':  

0.7638294609309102, 'recall': [0.7716049382716049, 0.7839506172839507,
```

```

0.8024691358024691, 0.7592592592592593, 0.7018633540372671], 'avgRecall':  

0.7638294609309102, 'params': [{'ccp_alpha': 0.0, 'class_weight': None,  

'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt',  

'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split':  

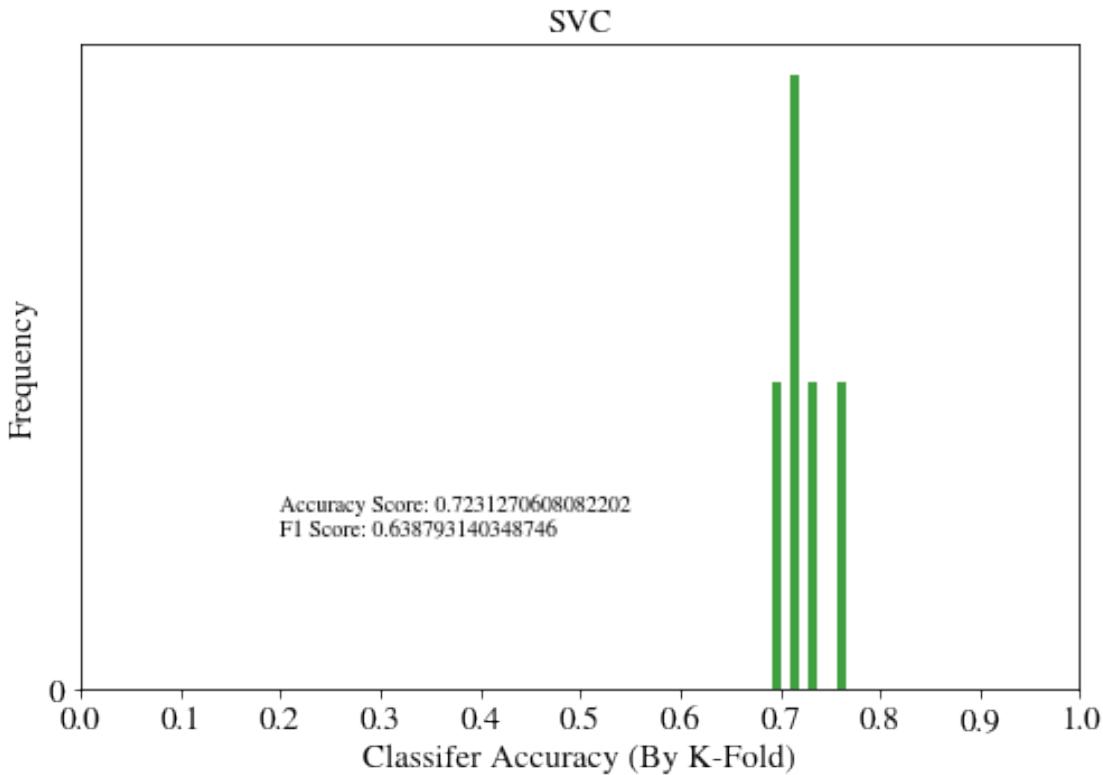
None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf':  

0.0, 'random_state': None, 'splitter': 'random'}]}  

*****

```

Processing Model: SVC



```

*****
* SVC  

* Best Params Result:  

* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt  

Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in  

lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,  

Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,  

Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists  

diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs',  

'accuracy': [0.691358024691358, 0.7098765432098766, 0.7160493827160493,  

0.7654320987654321, 0.7329192546583851], 'avgAccuracy': 0.7231270608082202,  

'f1': [0.5942518165275348, 0.6155436329371947, 0.6302635930272691,  

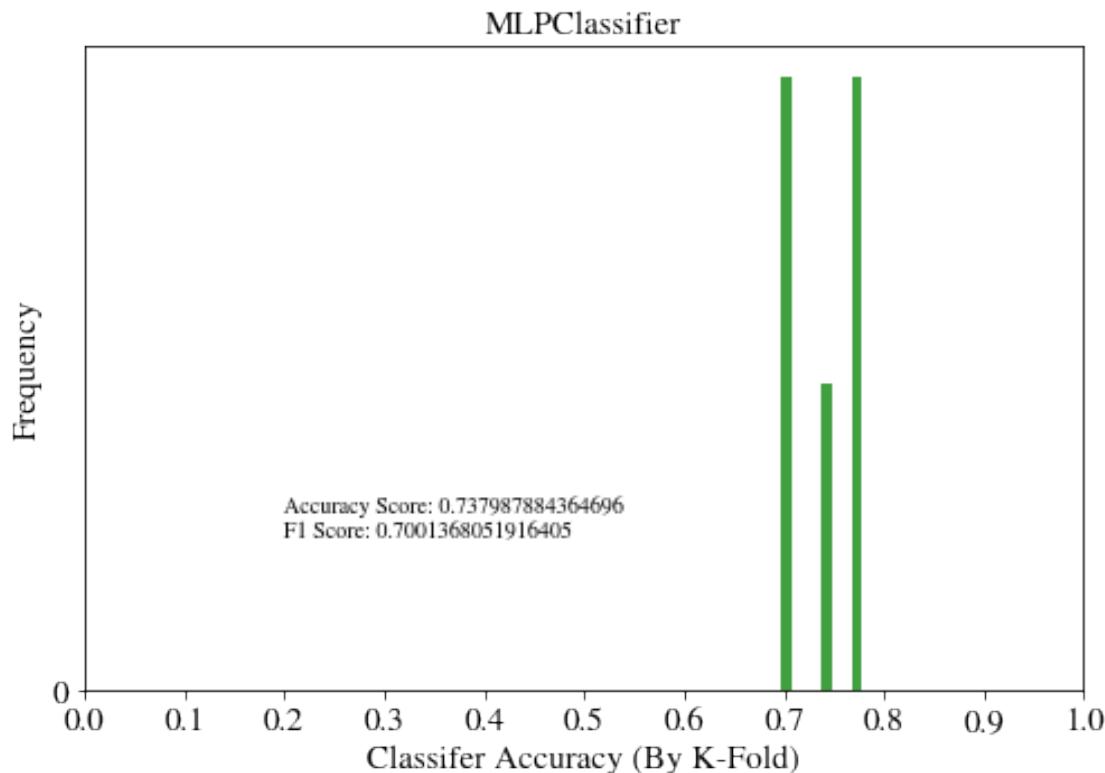
0.6846829746680269, 0.6692236845837045], 'avgF1': 0.638793140348746,
```

```

'precision': [0.691358024691358, 0.7098765432098766, 0.7160493827160493,
0.7654320987654321, 0.7329192546583851], 'avgPrecision': 0.7231270608082202,
'recall': [0.691358024691358, 0.7098765432098766, 0.7160493827160493,
0.7654320987654321, 0.7329192546583851], 'avgRecall': 0.7231270608082202,
'params': [{C: 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None,
'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale',
'kernel': 'linear', 'max_iter': -1, 'probability': False,
'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```

*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses
polymorphs', 'accuracy': [0.7037037037037037, 0.6975308641975309,
0.7407407407407407, 0.7777777777777778, 0.7701863354037267], 'avgAccuracy':

```

```

0.737987884364696, 'f1': [0.665198472623671, 0.6499470317402112,
0.7016291290362064, 0.7371109372283081, 0.7467984553298054], 'avgF1':
0.7001368051916405, 'precision': [0.7037037037037037, 0.6975308641975309,
0.7407407407407407, 0.7777777777777778, 0.7701863354037267], 'avgPrecision':
0.737987884364696, 'recall': [0.7037037037037037, 0.6975308641975309,
0.7407407407407407, 0.7777777777777778, 0.7701863354037267], 'avgRecall':
0.737987884364696, 'params': [{activation': 'identity', 'alpha': 0.0001,
'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False,
'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'adaptive',
'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5,
'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'verlodation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis, Crypt abscesses polymorphs', 'accuracy': [0.7839506172839507, 0.7962962962962963, 0.833333333333334, 0.845679012345679, 0.782608695652174], 'avgAccuracy':
0.8083735909822867, 'f1': [0.7712258316748818, 0.7817148190573161,
0.8221770092330599, 0.8270287625774391, 0.7812639756646431], 'avgF1':
0.796682079641468, 'precision': [0.7839506172839507, 0.7962962962962963,
0.833333333333334, 0.845679012345679, 0.782608695652174], 'avgPrecision':
0.8083735909822867, 'recall': [0.7839506172839507, 0.7962962962962963,
0.833333333333334, 0.845679012345679, 0.782608695652174], 'avgRecall':
0.8083735909822867, 'params': [{bootstrap': True, 'ccp_alpha': 0.0,
'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features':
'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease':
0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score':
False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

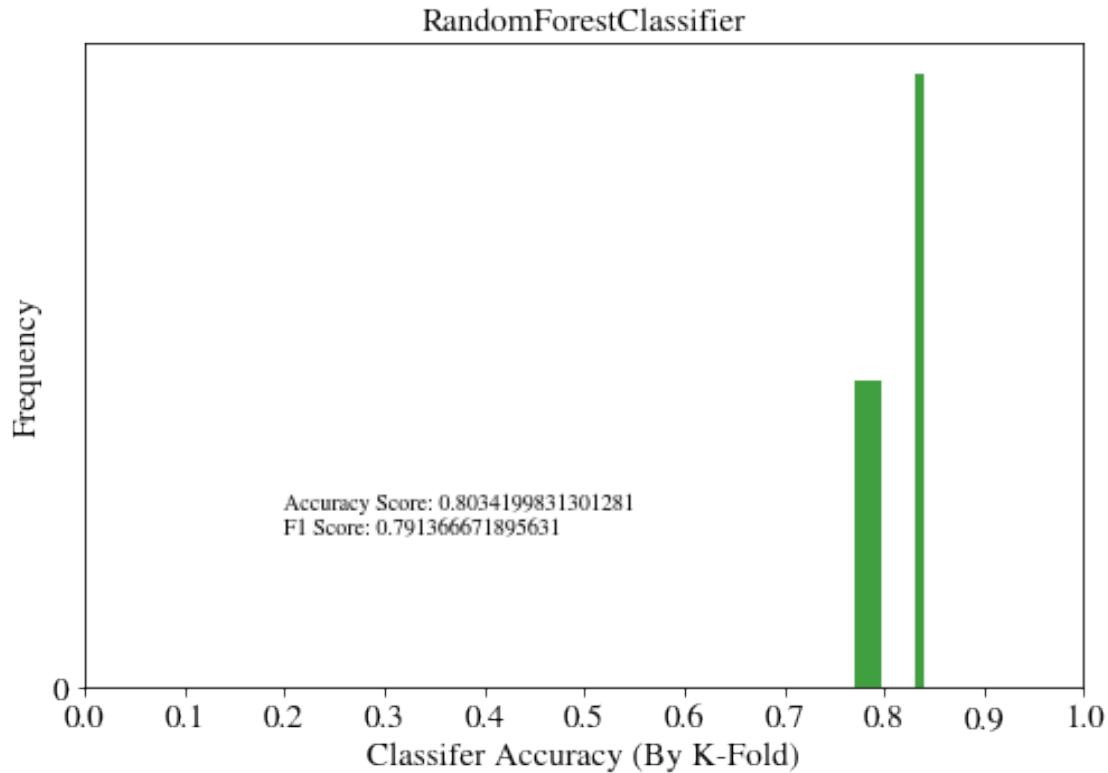
model	features \
0 RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB	Active inflammation?, Severity of Crypt Arch, ...
4 AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...
6 SVC	Active inflammation?, Severity of Crypt Arch, ...
7 MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...

	accuracy	f1	precision	recall	\
0	0.804670	0.792247	0.804670	0.804670	
1	0.761399	0.740518	0.761399	0.761399	
2	0.719446	0.680886	0.719446	0.719446	
3	0.604425	0.602259	0.604425	0.604425	
4	0.682348	0.692229	0.682348	0.682348	
5	0.729216	0.723506	0.729216	0.729216	
6	0.723127	0.638793	0.723127	0.723127	
7	0.725619	0.688095	0.725619	0.725619	

```
params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3     {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...
```

Processing Model: RandomForestClassifier



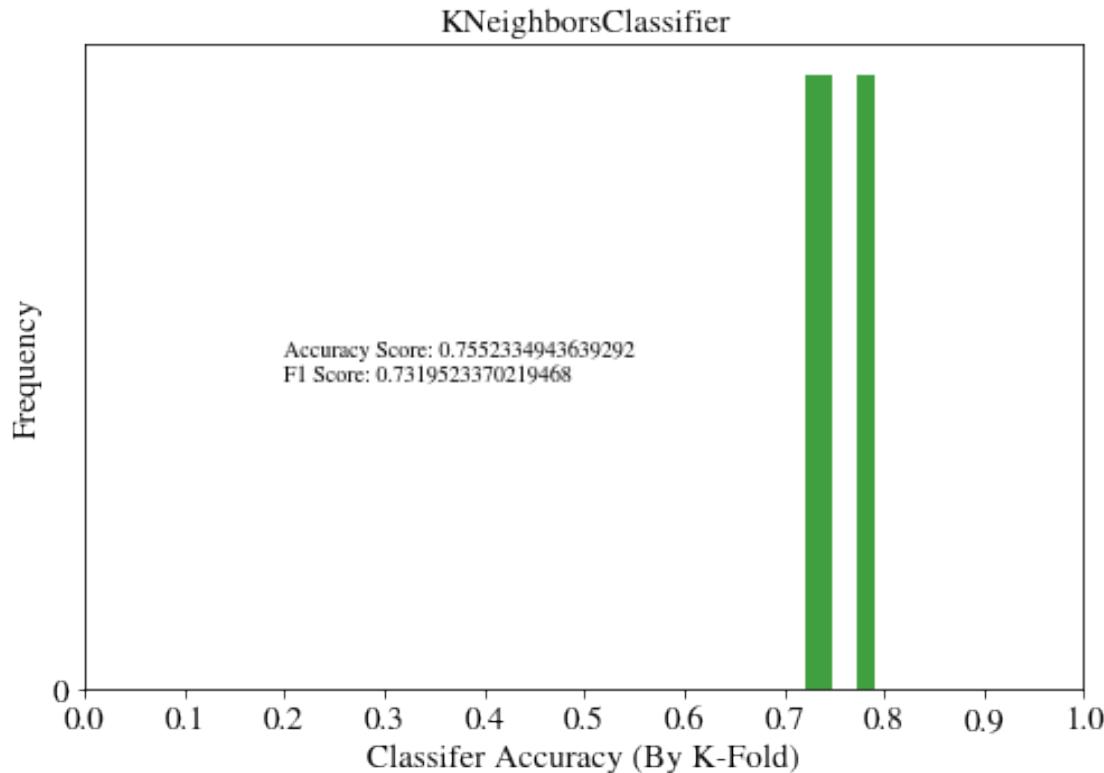
\*\*\*\*\*

```

* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy': [0.7839506172839507, 0.7901234567901234, 0.8333333333333334, 0.8395061728395061, 0.7701863354037267], 'avgAccuracy': 0.8034199831301281, 'f1': [0.7712258316748818, 0.7762855581876504, 0.8201395429202776, 0.8181308522693387, 0.7710515744260066], 'avgF1': 0.791366671895631, 'precision': [0.7839506172839507, 0.7901234567901234, 0.8333333333333334, 0.8395061728395061, 0.7701863354037267], 'avgPrecision': 0.8034199831301281, 'recall': [0.7839506172839507, 0.7901234567901234, 0.8333333333333334, 0.8395061728395061, 0.7701863354037267], 'avgRecall': 0.8034199831301281, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 500, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

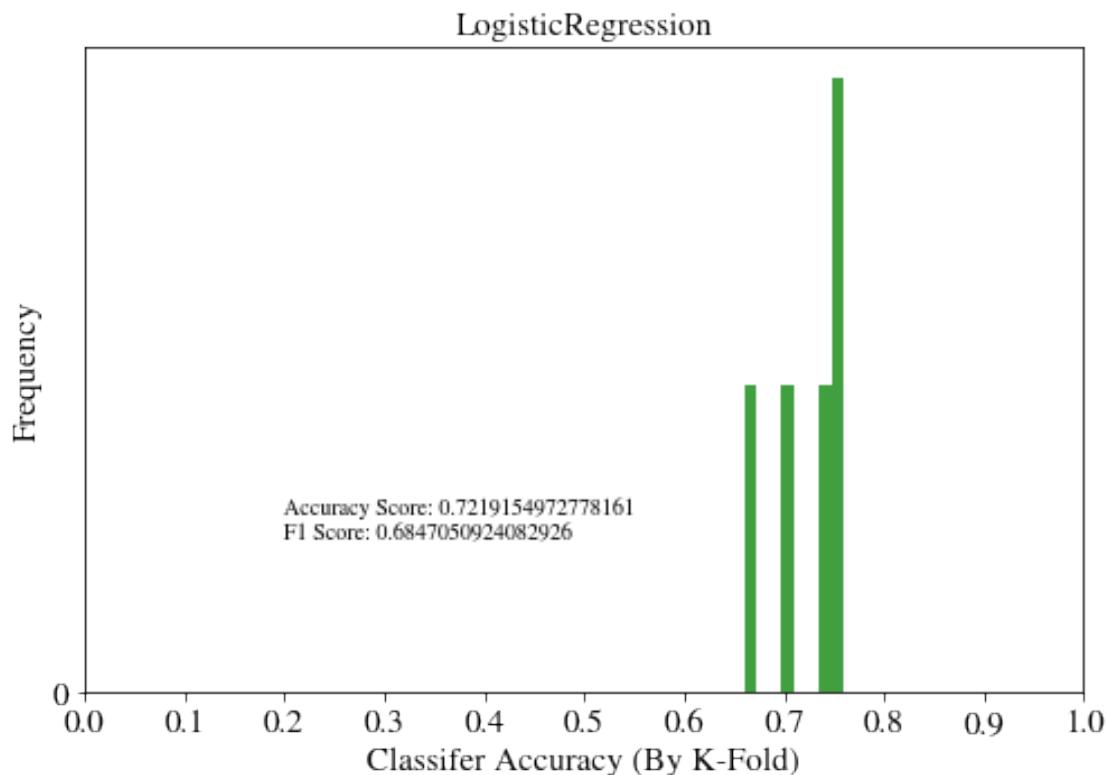
```

Processing Model: KNeighborsClassifier



```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy': [0.7222222222222222, 0.7469135802469136, 0.7777777777777778, 0.7901234567901234, 0.7391304347826086], 'avgAccuracy': 0.7552334943639292, 'f1': [0.6865576477504581, 0.7283483942132282, 0.76538191307839, 0.7598422658343588, 0.7196314642332993], 'avgF1': 0.7319523370219468, 'precision': [0.7222222222222222, 0.7469135802469136, 0.7777777777777778, 0.7901234567901234, 0.7391304347826086], 'avgPrecision': 0.7552334943639292, 'recall': [0.7222222222222222, 0.7469135802469136, 0.7777777777777778, 0.7901234567901234, 0.7391304347826086], 'avgRecall': 0.7552334943639292, 'params': [{'algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 17, 'p': 2, 'weights': 'distance'}]}
*****
```

Processing Model: LogisticRegression



```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy':  

[0.7037037037037037, 0.6604938271604939, 0.7345679012345679, 0.7592592592592593,  

0.7515527950310559], 'avgAccuracy': 0.7219154972778161, 'f1':  

[0.6665789688909384, 0.6212074758606062, 0.6945224740802547, 0.7145427519308508,  

0.7266737912788128], 'avgF1': 0.6847050924082926, 'precision':  

[0.7037037037037037, 0.6604938271604939, 0.7345679012345679, 0.7592592592592593,  

0.7515527950310559], 'avgPrecision': 0.7219154972778161, 'recall':  

[0.7037037037037037, 0.6604938271604939, 0.7345679012345679, 0.7592592592592593,  

0.7515527950310559], 'avgRecall': 0.7219154972778161, 'params': [{C': 1,  

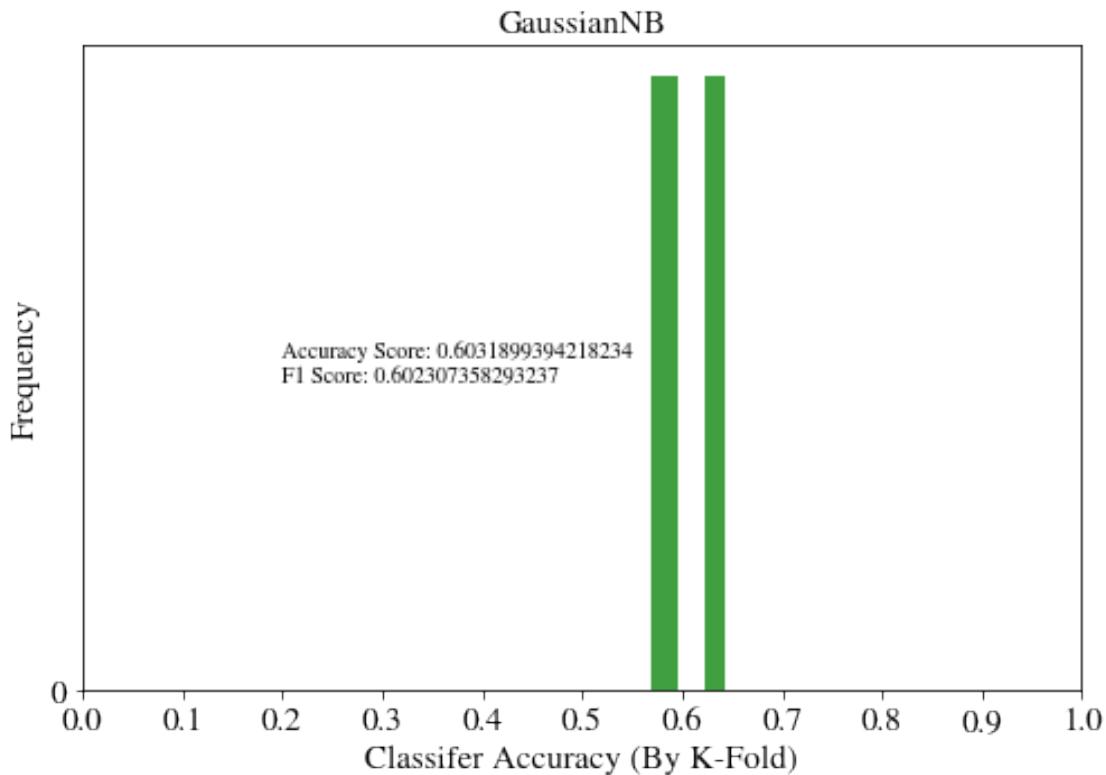
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':  

1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'ovr', 'n_jobs': -1,  

'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,  

'verbose': 0, 'warm_start': False}]}}
*****
```

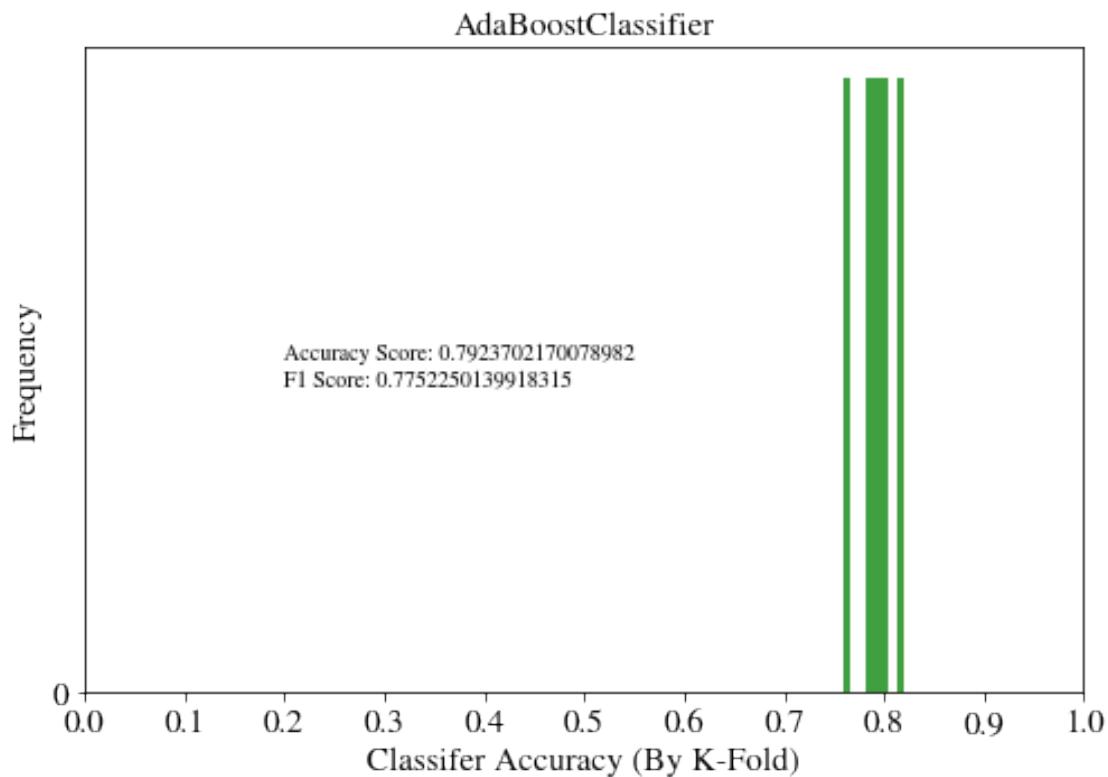
Processing Model: GaussianNB



```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis, Initial pathologists diagnosis', 'accuracy':
[0.5925925925925926, 0.5679012345679012, 0.6296296296296297, 0.6419753086419753,
0.5838509316770186], 'avgAccuracy': 0.6031899394218234, 'f1':
[0.5980762023224868, 0.5570668212645697, 0.6238812667345829, 0.6393884171191424,
0.593124084025403], 'avgF1': 0.602307358293237, 'precision':
[0.5925925925925926, 0.5679012345679012, 0.6296296296296297, 0.6419753086419753,
0.5838509316770186], 'avgPrecision': 0.6031899394218234, 'recall':
[0.5925925925925926, 0.5679012345679012, 0.6296296296296297, 0.6419753086419753,
0.5838509316770186], 'avgRecall': 0.6031899394218234, 'params': [{'priors':
None, 'var_smoothing': 1e-09}]}
```

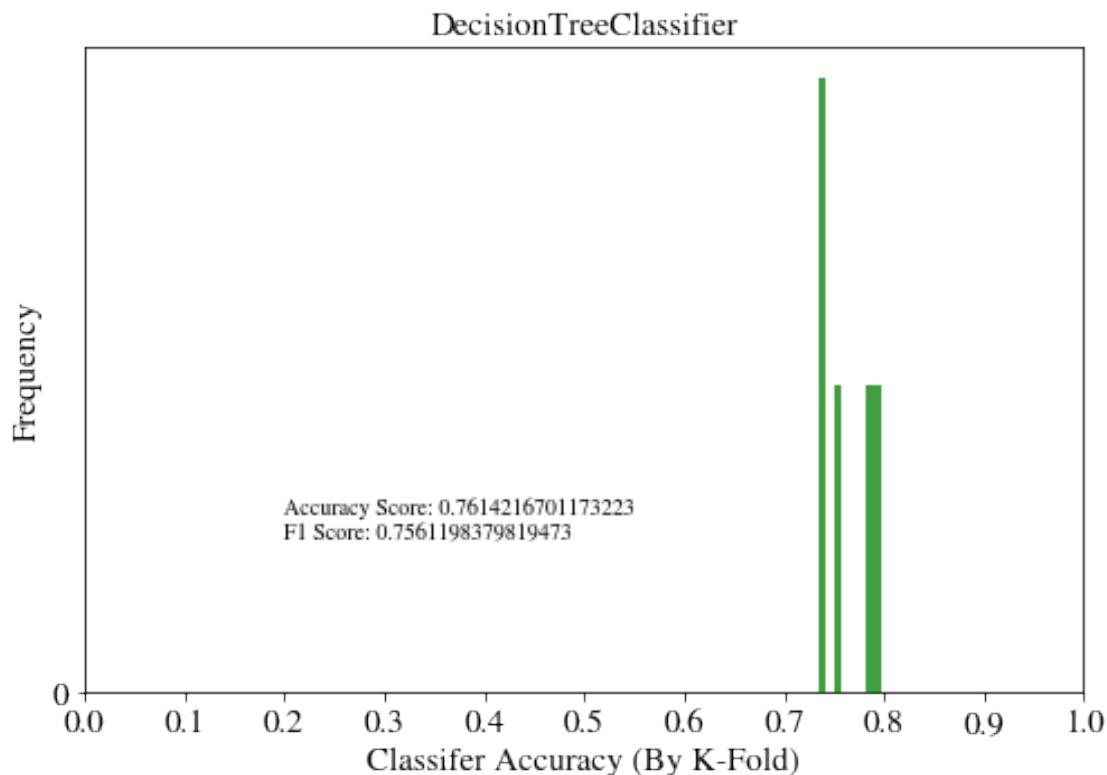
\*\*\*\*\*

Processing Model: AdaBoostClassifier



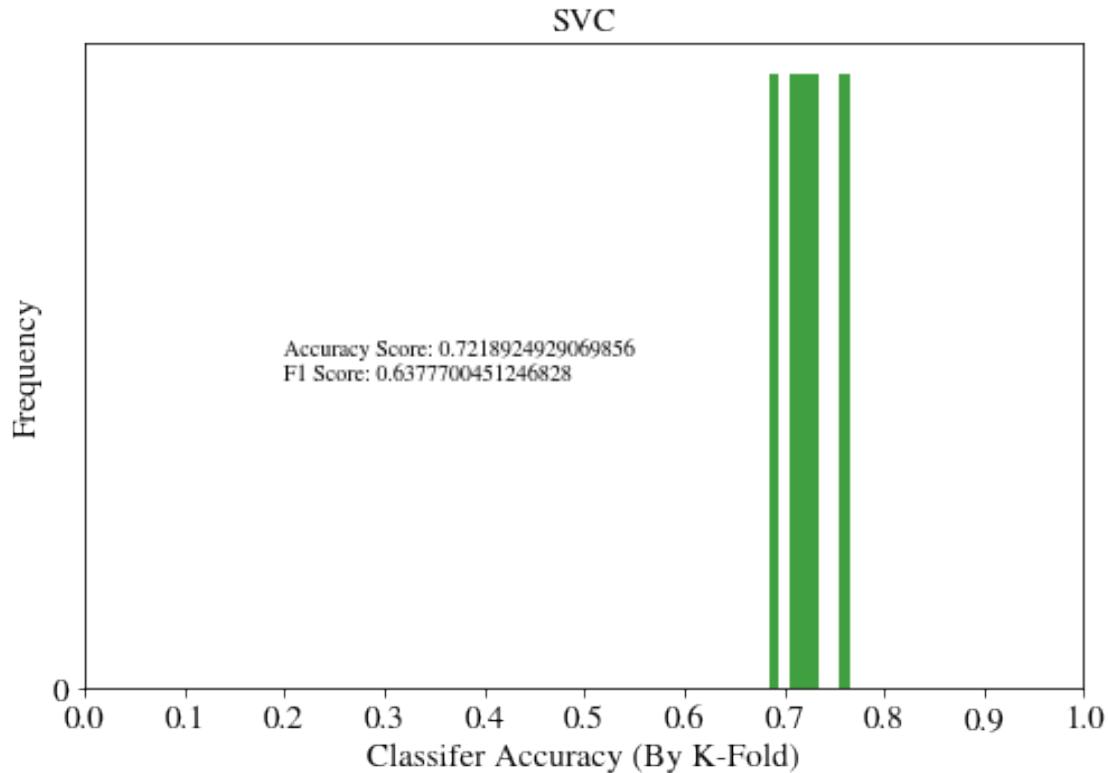
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  
Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy':  
[0.8024691358024691, 0.7592592592592593, 0.7962962962962963, 0.7839506172839507,  
0.8198757763975155], 'avgAccuracy': 0.7923702170078982, 'f1':  
[0.7881019268575218, 0.7236540899555273, 0.7901242419638451, 0.7590139893724943,  
0.8152308218097692], 'avgF1': 0.7752250139918315, 'precision':  
[0.8024691358024691, 0.7592592592592593, 0.7962962962962963, 0.7839506172839507,  
0.8198757763975155], 'avgPrecision': 0.7923702170078982, 'recall':  
[0.8024691358024691, 0.7592592592592593, 0.7962962962962963, 0.7839506172839507,  
0.8198757763975155], 'avgRecall': 0.7923702170078982, 'params': [{}{'algorithm':  
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 20,  
'random_state': None}]}
*****
```

Processing Model: DecisionTreeClassifier



```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy': [0.7345679012345679, 0.7407407407407407, 0.7839506172839507, 0.7962962962962963, 0.7515527950310559], 'avgAccuracy': 0.7614216701173223, 'f1': [0.7279782654948364, 0.7349560429506534, 0.7817395979350684, 0.778868380665227, 0.7570569028639513], 'avgF1': 0.7561198379819473, 'precision': [0.7345679012345679, 0.7407407407407407, 0.7839506172839507, 0.7962962962962963, 0.7515527950310559], 'avgPrecision': 0.7614216701173223, 'recall': [0.7345679012345679, 0.7407407407407407, 0.7839506172839507, 0.7962962962962963, 0.7515527950310559], 'avgRecall': 0.7614216701173223, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}*****
*****
```

Processing Model: SVC

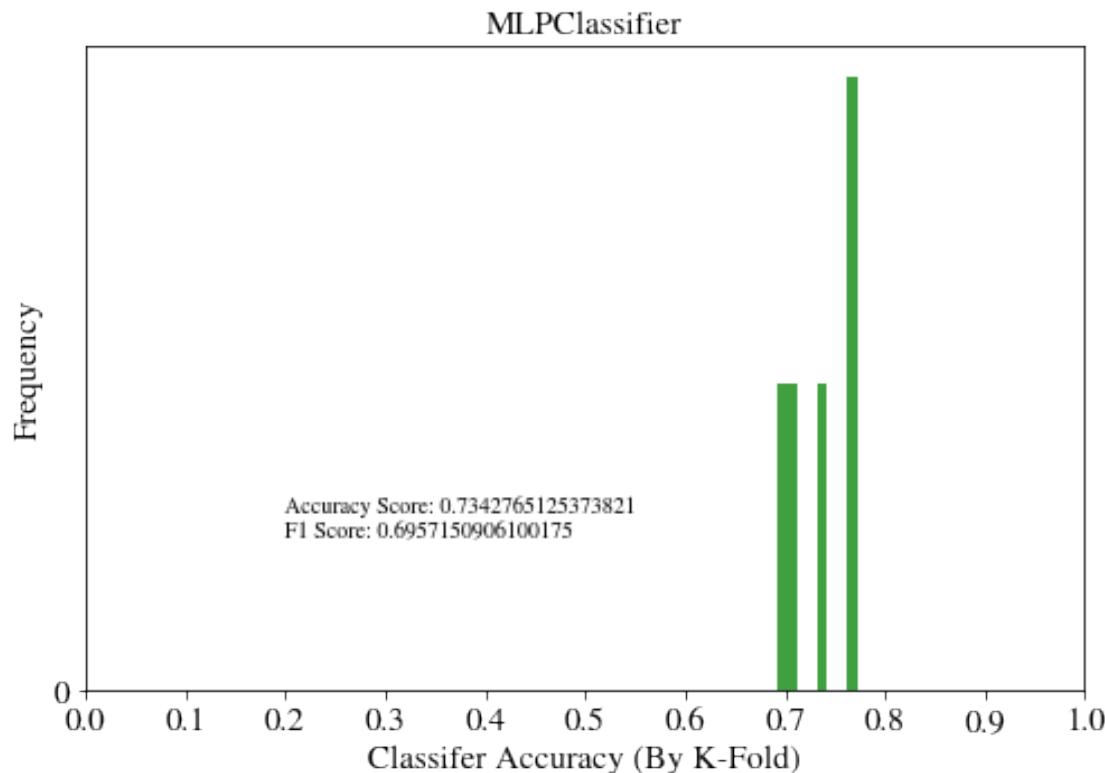


```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy': [0.6851851851852, 0.7098765432098766, 0.7160493827160493, 0.7654320987654321, 0.7329192546583851], 'avgAccuracy': 0.7218924929069856, 'f1': [0.5891363404072192, 0.6155436329371947, 0.6302635930272691, 0.6846829746680269, 0.6692236845837045], 'avgF1': 0.6377700451246828, 'precision': [0.6851851851852, 0.7098765432098766, 0.7160493827160493, 0.7654320987654321, 0.7329192546583851], 'avgPrecision': 0.7218924929069856, 'recall': [0.6851851851852, 0.7098765432098766, 0.7160493827160493, 0.7654320987654321, 0.7329192546583851], 'avgRecall': 0.7218924929069856, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None}], 'support': [1, 1, 1, 1, 1]}*****
```

```
'shrinking': True, 'tol': 0.001, 'verbose': False}]]}
*****

```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis, Initial pathologists diagnosis', 'accuracy': [0.7037037037037037, 0.691358024691358, 0.7407407407407407, 0.7716049382716049, 0.7639751552795031], 'avgAccuracy': 0.7342765125373821, 'f1': [0.665198472623671, 0.6513219681761553, 0.7016291290362064, 0.726159878091196, 0.7342660051228583], 'avgF1': 0.6957150906100175, 'precision': [0.7037037037037037, 0.691358024691358, 0.7407407407407407, 0.7716049382716049, 0.7639751552795031], 'avgPrecision': 0.7342765125373821, 'recall': [0.7037037037037037, 0.691358024691358, 0.7407407407407407, 0.7716049382716049, 0.7639751552795031], 'avgRecall': 0.7342765125373821, 'params': [{activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
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```

0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,),  

'learning_rate': 'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000,  

'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum':  

True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam',  

'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start':  

False}]}  

*****  

*****  

* Best Performing Model and Params is:  

* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of  

Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal  

increase in lamina propria cellularity, Lamina propria polymorphs, Crypt  

architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial  

changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing  

pathologists diagnosis, Initial pathologists diagnosis', 'accuracy':  

[0.7037037037037037, 0.691358024691358, 0.7407407407407407, 0.7716049382716049,  

0.7639751552795031], 'avgAccuracy': 0.7342765125373821, 'f1':  

[0.665198472623671, 0.6513219681761553, 0.7016291290362064, 0.726159878091196,  

0.7342660051228583], 'avgF1': 0.6957150906100175, 'precision':  

[0.7037037037037037, 0.691358024691358, 0.7407407407407407, 0.7716049382716049,  

0.7639751552795031], 'avgPrecision': 0.7342765125373821, 'recall':  

[0.7037037037037037, 0.691358024691358, 0.7407407407407407, 0.7716049382716049,  

0.7639751552795031], 'avgRecall': 0.7342765125373821, 'params': [{activation':  

'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':  

0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,),  

'learning_rate': 'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000,  

'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum':  

True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam',  

'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start':  

False}]}  

*****

```

	model	features \			
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...			
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...			
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...			
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...			
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...			
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...			
6	SVC	Active inflammation?, Severity of Crypt Arch, ...			
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...			
		accuracy	f1	precision	recall
0	0.789824	0.776871	0.789824	0.789824	
1	0.755233	0.731952	0.755233	0.755233	
2	0.718196	0.681737	0.718196	0.718196	
3	0.603190	0.602307	0.603190	0.603190	
4	0.673652	0.685748	0.673652	0.673652	

```

5 0.721808 0.719444 0.721808 0.721808
6 0.721892 0.637770 0.721892 0.721892
7 0.734277 0.695715 0.734277 0.734277

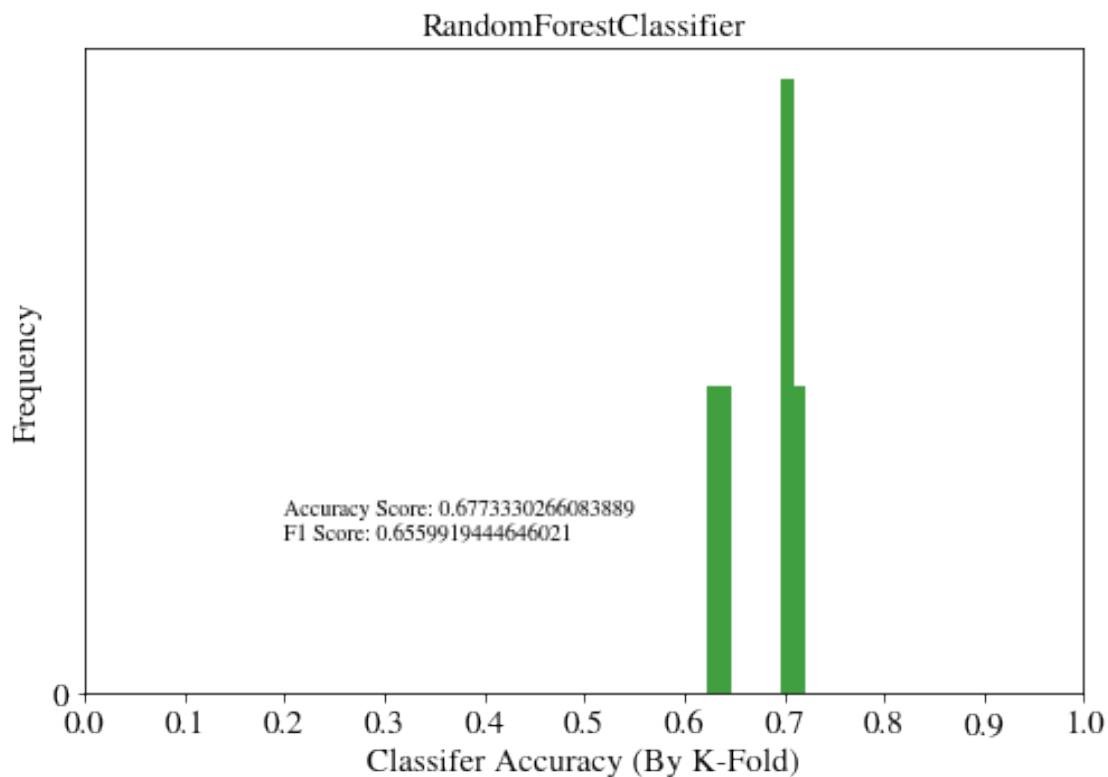
```

```

                                params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3         {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier



```

*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,

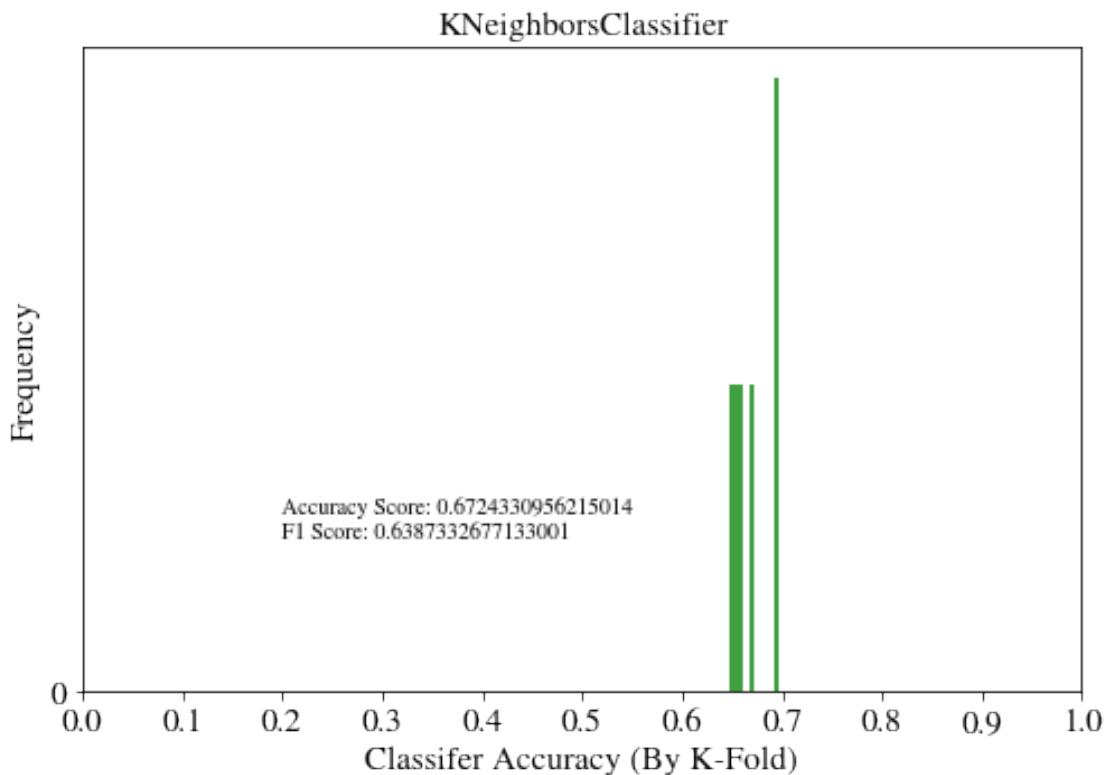
```

```

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,
Observing pathologists diagnosis', 'accuracy': [0.6975308641975309,
0.6234567901234568, 0.7037037037037037, 0.7222222222222222, 0.639751552795031],
'avgAccuracy': 0.6773330266083889, 'f1': [0.6742774567099377,
0.6062065984546604, 0.6670215046629968, 0.7030467546493573, 0.6294074078460584],
'avgF1': 0.6559919444646021, 'precision': [0.6975308641975309,
0.6234567901234568, 0.7037037037037037, 0.7222222222222222, 0.639751552795031],
'avgPrecision': 0.6773330266083889, 'recall': [0.6975308641975309,
0.6234567901234568, 0.7037037037037037, 0.7222222222222222, 0.639751552795031],
'avgRecall': 0.6773330266083889, 'params': [{bootstrap': True, 'ccp_alpha':
0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None,
'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None,
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 700,
'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0,
'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



```
*****

```

- \* KNeighborsClassifier
- \* Best Params Result:

```

* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis', 'accuracy': [0.654320987654321,  

0.6481481481481, 0.691358024691358, 0.6975308641975309, 0.6708074534161491],  

'avgAccuracy': 0.6724330956215014, 'f1': [0.6229947904795442, 0.616488356982033,  

0.6510127131930987, 0.6622910552735115, 0.6408794226383128], 'avgF1':  

0.6387332677133001, 'precision': [0.654320987654321, 0.6481481481481,  

0.691358024691358, 0.6975308641975309, 0.6708074534161491], 'avgPrecision':  

0.6724330956215014, 'recall': [0.654320987654321, 0.6481481481481,  

0.691358024691358, 0.6975308641975309, 0.6708074534161491], 'avgRecall':  

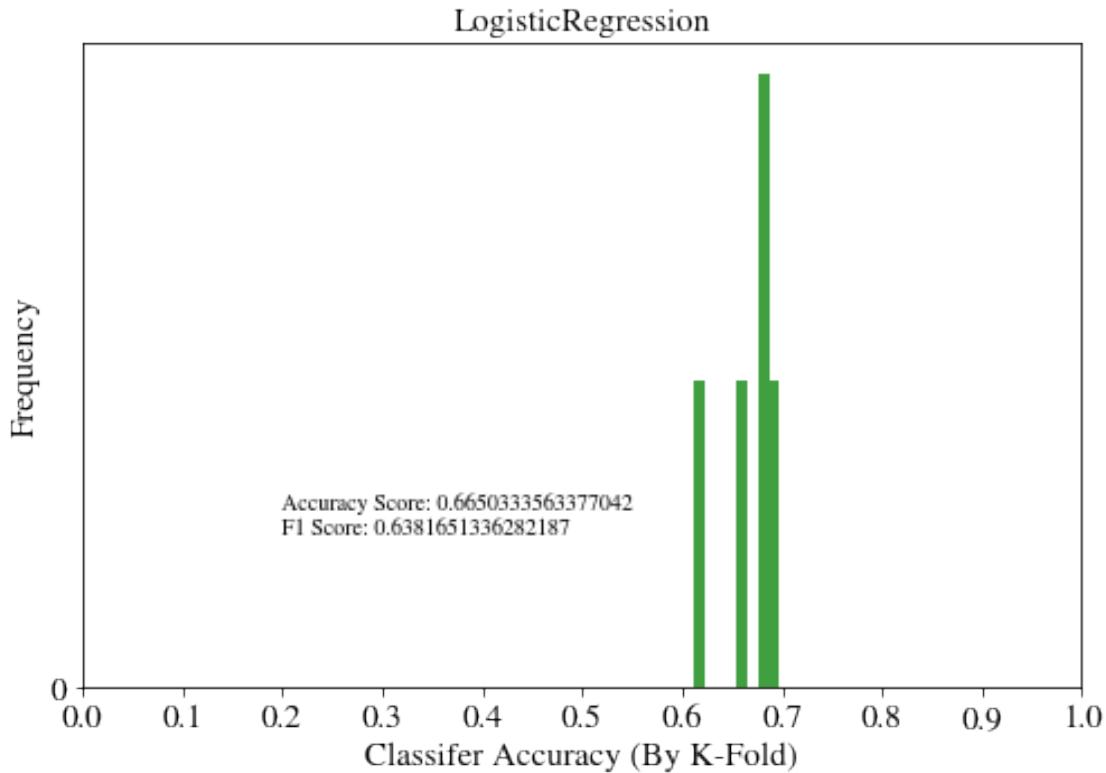
0.6724330956215014, 'params': [{'algorithm': 'auto', 'leaf_size': 30, 'metric':  

'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 17, 'p': 2,  

'weights': 'uniform'}]}
*****

```

Processing Model: LogisticRegression



```
*****

```

```

* LogisticRegression
* Best Params Result:

```

```

* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis', 'accuracy': [0.654320987654321,  

0.61111111111112, 0.6851851851852, 0.6975308641975309, 0.6770186335403726],  

'avgAccuracy': 0.6650333563377042, 'f1': [0.6282657238550529,  

0.5813482097969886, 0.65354622203565, 0.6620274645065085, 0.6656380479468935],  

'avgF1': 0.6381651336282187, 'precision': [0.654320987654321,  

0.61111111111112, 0.6851851851852, 0.6975308641975309, 0.6770186335403726],  

'avgPrecision': 0.6650333563377042, 'recall': [0.654320987654321,  

0.61111111111112, 0.6851851851852, 0.6975308641975309, 0.6770186335403726],  

'avgRecall': 0.6650333563377042, 'params': [{'C': 1, 'class_weight': None,  

'dual': False, 'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None,  

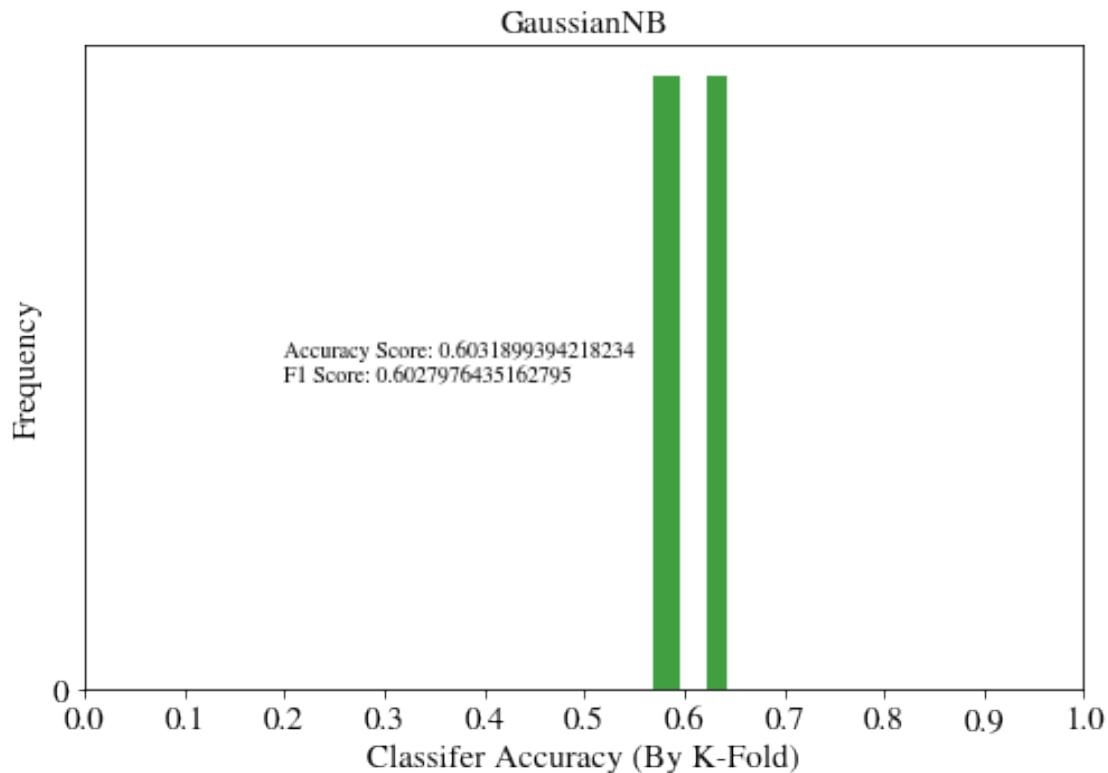
'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs': -1, 'penalty': 'l2',  

'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0,  

'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```
*****

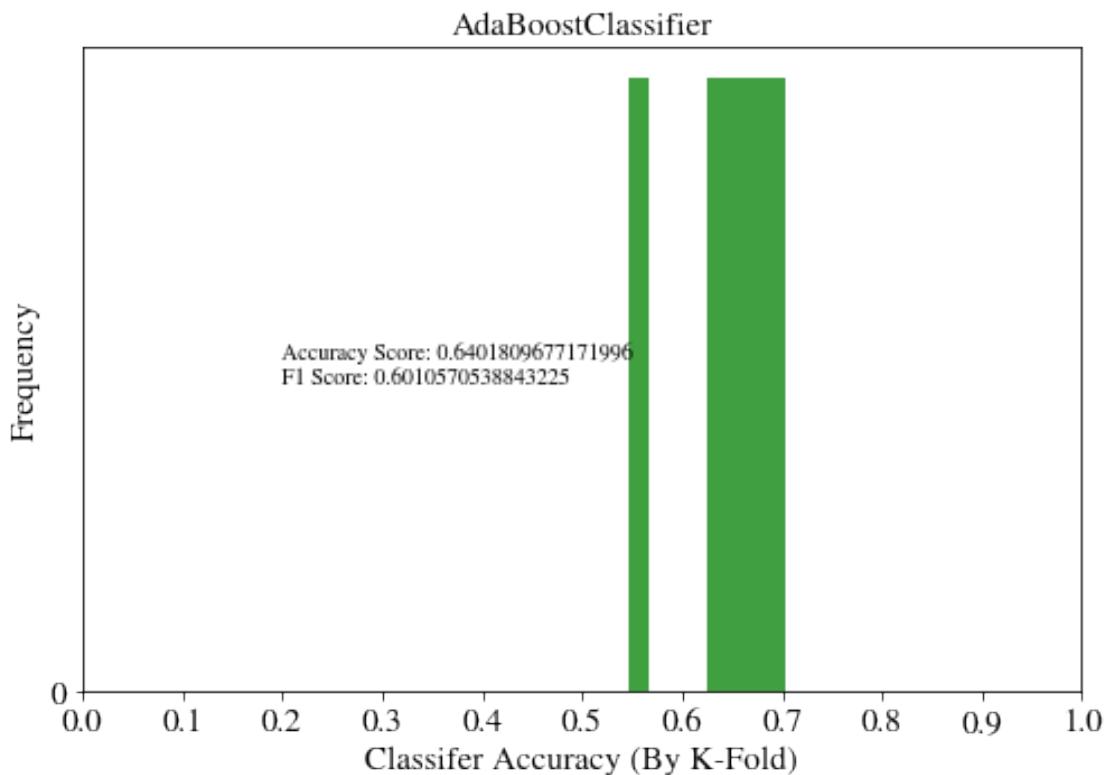
```

```

* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing
pathologists diagnosis', 'accuracy': [0.5925925925925926, 0.5679012345679012,
0.6296296296296297, 0.6419753086419753, 0.5838509316770186], 'avgAccuracy':
0.6031899394218234, 'f1': [0.5980762023224868, 0.5570668212645697,
0.6238812667345829, 0.6418398432343551, 0.593124084025403], 'avgF1':
0.6027976435162795, 'precision': [0.5925925925925926, 0.5679012345679012,
0.6296296296296297, 0.6419753086419753, 0.5838509316770186], 'avgPrecision':
0.6031899394218234, 'recall': [0.5925925925925926, 0.5679012345679012,
0.6296296296296297, 0.6419753086419753, 0.5838509316770186], 'avgRecall':
0.6031899394218234, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:

```

```

* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis', 'accuracy': [0.654320987654321,  

0.6296296296296297, 0.6666666666666666, 0.7037037037037, 0.546583850931677],  

'avgAccuracy': 0.6401809677171996, 'f1': [0.6037145176043268,  

0.5656119351444905, 0.6186873001937258, 0.660572334140312, 0.5566991823387576],  

'avgF1': 0.6010570538843225, 'precision': [0.654320987654321,  

0.6296296296296297, 0.6666666666666666, 0.7037037037037, 0.546583850931677],  

'avgPrecision': 0.6401809677171996, 'recall': [0.654320987654321,  

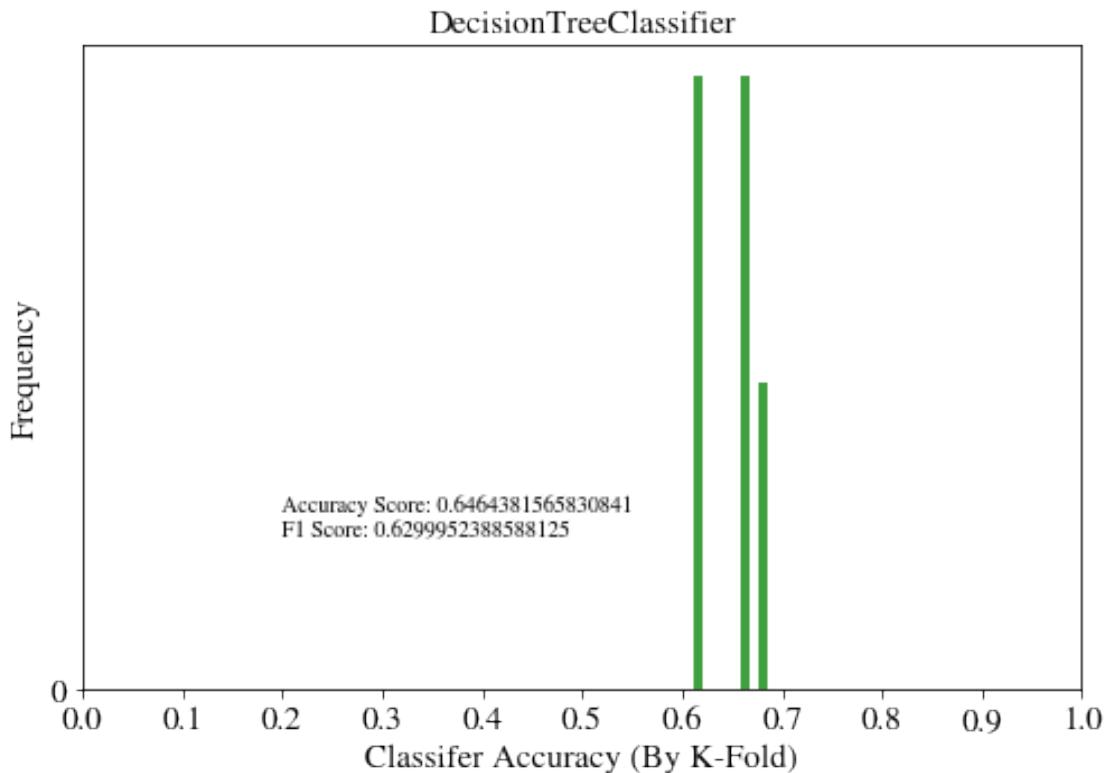
0.6296296296296297, 0.6666666666666666, 0.7037037037037, 0.546583850931677],  

'avgRecall': 0.6401809677171996, 'params': [{'algorithm': 'SAMME.R',  

'base_estimator': None, 'learning_rate': 1, 'n_estimators': 20, 'random_state': None}]}
*****

```

Processing Model: DecisionTreeClassifier



```
*****

```

```

* DecisionTreeClassifier
* Best Params Result:

```

```

* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs,  

Observing pathologists diagnosis', 'accuracy': [0.6604938271604939,  

0.61111111111112, 0.6851851851852, 0.6604938271604939, 0.6149068322981367],  

'avgAccuracy': 0.6464381565830841, 'f1': [0.6381940368302812,  

0.5995990154425831, 0.6523195684165289, 0.6506201710776066, 0.6092434025270627],  

'avgF1': 0.6299952388588125, 'precision': [0.6604938271604939,  

0.61111111111112, 0.6851851851852, 0.6604938271604939, 0.6149068322981367],  

'avgPrecision': 0.6464381565830841, 'recall': [0.6604938271604939,  

0.61111111111112, 0.6851851851852, 0.6604938271604939, 0.6149068322981367],  

'avgRecall': 0.6464381565830841, 'params': [{'ccp_alpha': 0.0, 'class_weight':  

None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt',  

'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split':  

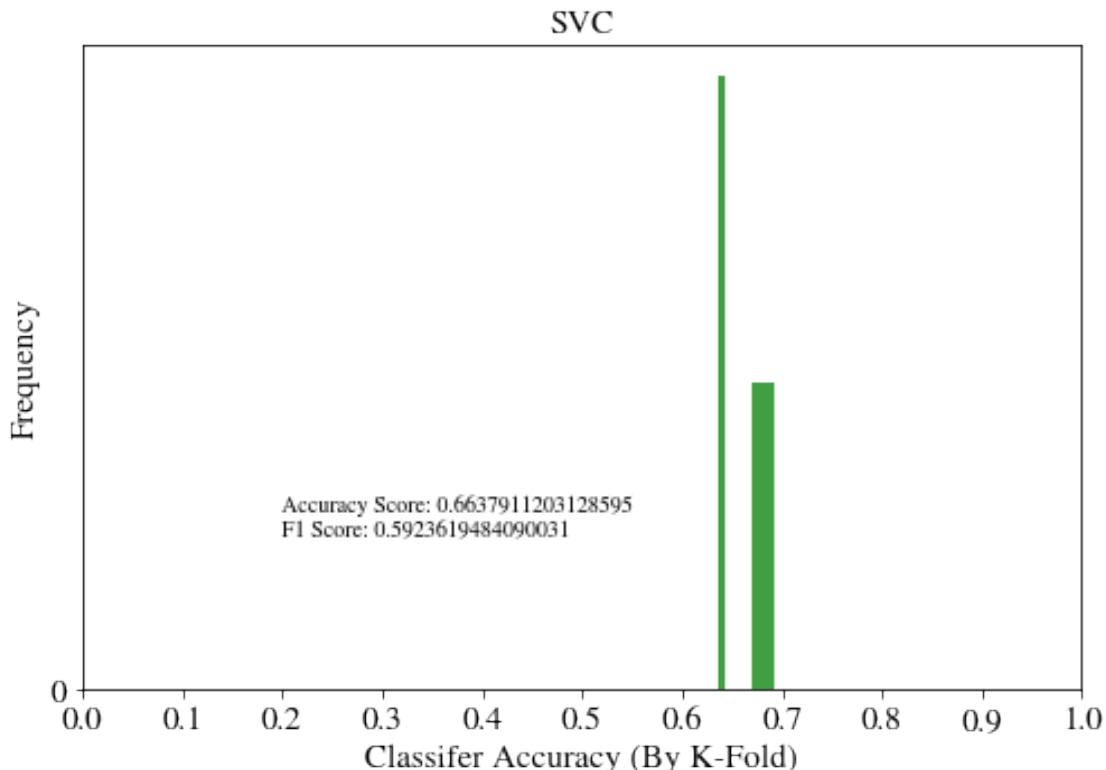
None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf':  

0.0, 'random_state': None, 'splitter': 'random'}]}  

*****

```

Processing Model: SVC



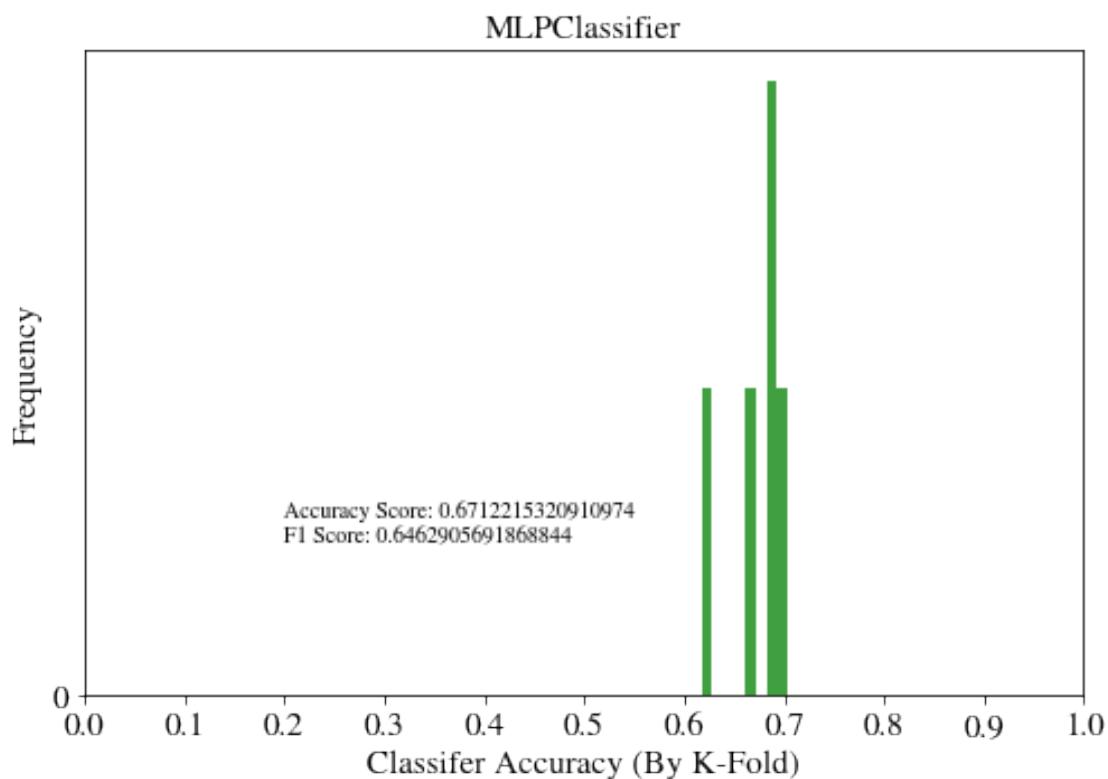
```
*****
```

```

* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis', 'accuracy': [0.6419753086419753, 0.6358024691358025, 0.6790123456790124, 0.691358024691358, 0.6708074534161491], 'avgAccuracy': 0.6637911203128595, 'f1': [0.5586258799709618, 0.5587625610106229, 0.6001226483969817, 0.6224141309709637, 0.6218845216954857], 'avgF1': 0.5923619484090031, 'precision': [0.6419753086419753, 0.6358024691358025, 0.6790123456790124, 0.691358024691358, 0.6708074534161491], 'avgPrecision': 0.6637911203128595, 'recall': [0.6419753086419753, 0.6358024691358025, 0.6790123456790124, 0.691358024691358, 0.6708074534161491], 'avgRecall': 0.6637911203128595, 'params': [{C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



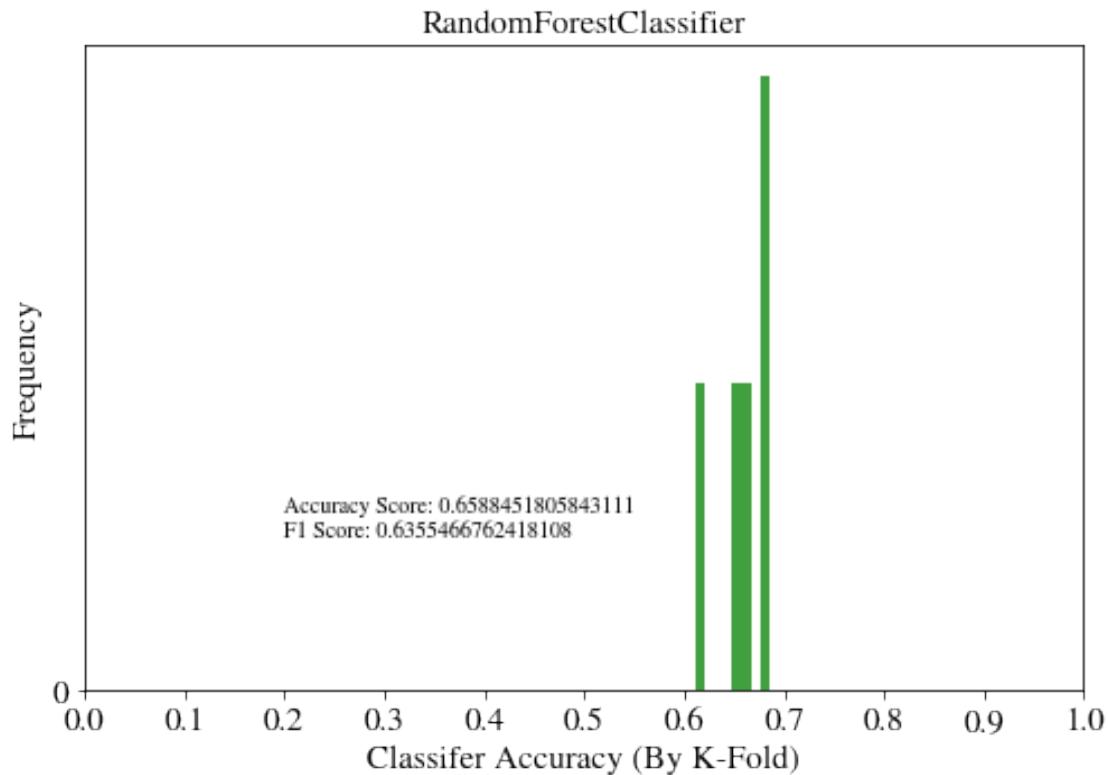
```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis', 'accuracy': [0.6604938271604939, 0.6172839506172839, 0.6851851851852, 0.7037037037037037, 0.6894409937888198], 'avgAccuracy': 0.6712215320910974, 'f1': [0.6416205964915137, 0.5916420442674649, 0.65354622203565, 0.6659561830127132, 0.6786878001270805], 'avgF1': 0.6462905691868844, 'precision': [0.6604938271604939, 0.6172839506172839, 0.6851851851852, 0.7037037037037037, 0.6894409937888198], 'avgPrecision': 0.6712215320910974, 'recall': [0.6604938271604939, 0.6172839506172839, 0.6851851851852, 0.7037037037037037, 0.6894409937888198], 'avgRecall': 0.6712215320910974, 'params': [{'activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs, Observing pathologists diagnosis', 'accuracy': [0.6975308641975309, 0.6234567901234568, 0.7037037037037037, 0.7222222222222222, 0.639751552795031], 'avgAccuracy': 0.677330266083889, 'f1': [0.6742774567099377, 0.6062065984546604, 0.6670215046629968, 0.7030467546493573, 0.6294074078460584], 'avgF1': 0.6559919444646021, 'precision': [0.6975308641975309, 0.6234567901234568, 0.7037037037037037, 0.7222222222222222, 0.639751552795031], 'avgPrecision': 0.677330266083889, 'recall': [0.6975308641975309, 0.6234567901234568, 0.7037037037037037, 0.7222222222222222, 0.639751552795031], 'avgRecall': 0.677330266083889, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 700, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]} 
```

```
*****
model                                         features \
0 RandomForestClassifier Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression Active inflammation?, Severity of Crypt Arch, ...
3 GaussianNB Active inflammation?, Severity of Crypt Arch, ...
4 AdaBoostClassifier Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier Active inflammation?, Severity of Crypt Arch, ...
6 SVC Active inflammation?, Severity of Crypt Arch, ...
7 MLPClassifier Active inflammation?, Severity of Crypt Arch, ...

accuracy      f1  precision   recall \
0 0.674849  0.651959  0.674849  0.674849
1 0.655103  0.622627  0.655103  0.655103
2 0.665033  0.638165  0.665033  0.665033
3 0.603190  0.602798  0.603190  0.603190
4 0.510567  0.508428  0.510567  0.510567
5 0.629124  0.613825  0.629124  0.629124
6 0.663791  0.592362  0.663791  0.663791
7 0.669987  0.644357  0.669987  0.669987

params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3     {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...
```

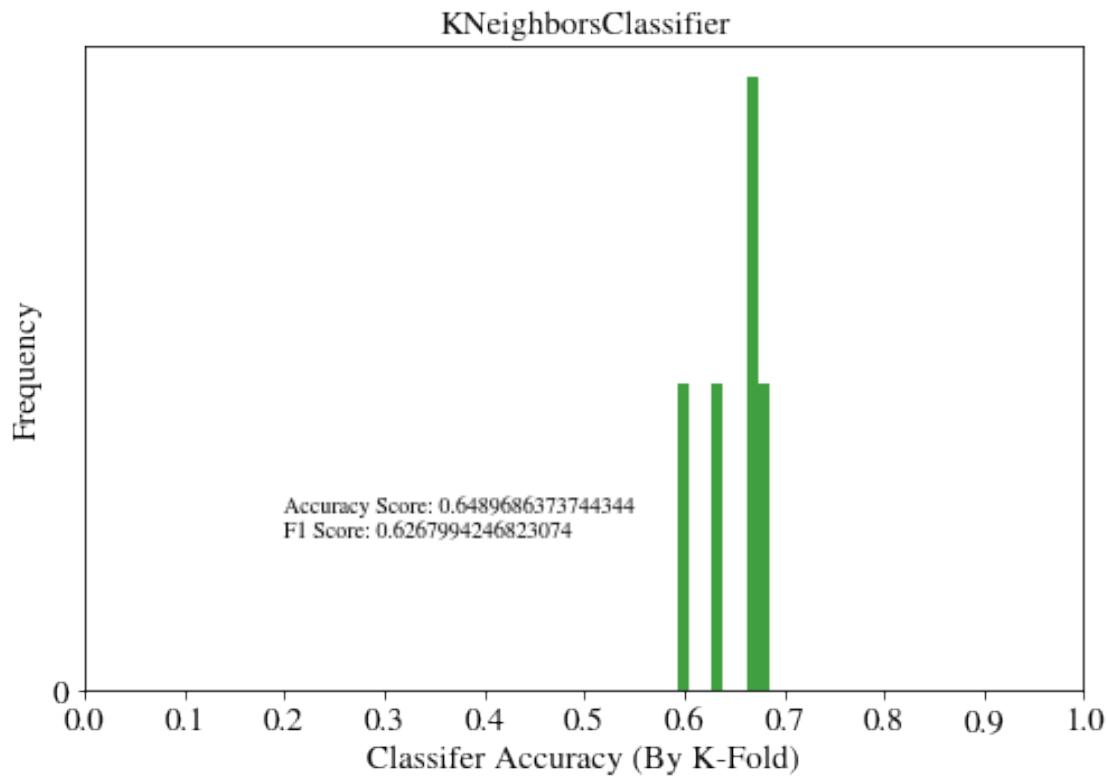
Processing Model: RandomForestClassifier



```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs', 'accuracy': [0.6481481481481, 0.61111111111112, 0.6851851851852, 0.6851851851852, 0.6645962732919255], 'avgAccuracy': 0.6588451805843111, 'f1': [0.6220598745119486, 0.5914528337008957, 0.6523195684165289, 0.6519890260631002, 0.6599120785165806], 'avgF1': 0.6355466762418108, 'precision': [0.6481481481481, 0.61111111111112, 0.6851851851852, 0.6851851851852, 0.6645962732919255], 'avgPrecision': 0.6588451805843111, 'recall': [0.6481481481481, 0.61111111111112, 0.6851851851852, 0.6851851851852, 0.6645962732919255], 'avgRecall': 0.6588451805843111, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}}
```

```
*****
```

Processing Model: KNeighborsClassifier

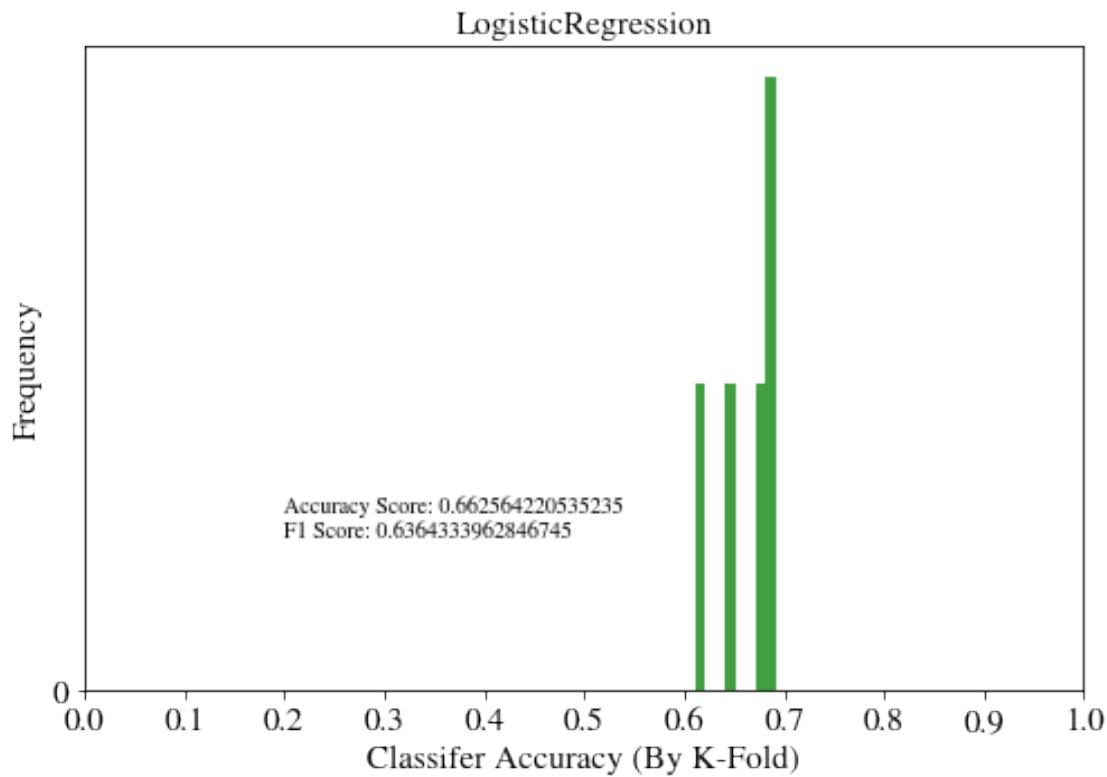


```
*****
```

```
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs', 'accuracy': [0.6358024691358025, 0.5925925925925926, 0.6666666666666666, 0.6851851851852, 0.6645962732919255], 'avgAccuracy': 0.6489686373744344, 'f1': [0.625888046851562, 0.566818407882499, 0.6384173647609738, 0.6444823944823945, 0.6583909094341079], 'avgF1': 0.6267994246823074, 'precision': [0.6358024691358025, 0.5925925925925926, 0.6666666666666666, 0.6851851851852, 0.6645962732919255], 'avgPrecision': 0.6489686373744344, 'recall': [0.6358024691358025, 0.5925925925925926, 0.6666666666666666, 0.6851851851852, 0.6645962732919255], 'avgRecall': 0.6489686373744344, 'params': [{'algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 16, 'p': 2, 'weights': 'uniform'}]}
```

\*\*\*\*\*

Processing Model: LogisticRegression



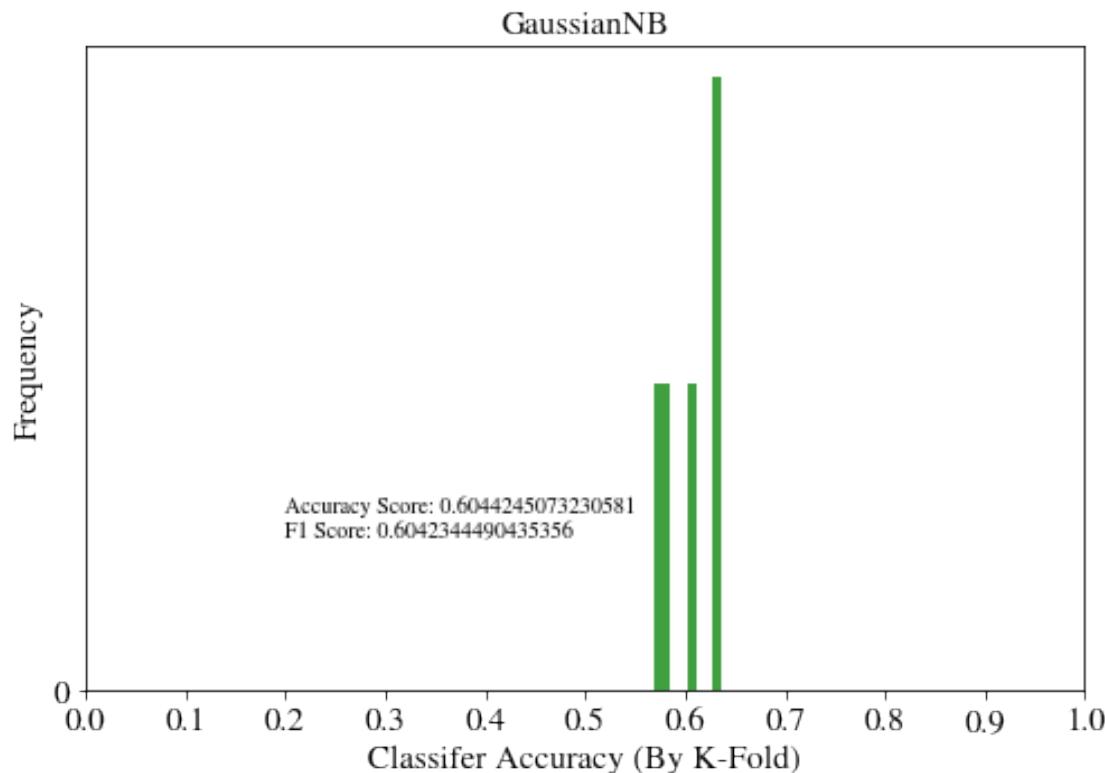
\*\*\*\*\*

```
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs', 'accuracy': [0.6481481481481, 0.61111111111112, 0.6851851851852, 0.691358024691358, 0.6770186335403726], 'avgAccuracy': 0.662564220535235, 'f1': [0.6220598745119486, 0.5813482097969886, 0.65354622203565, 0.6567057085575605, 0.6685069665212248], 'avgF1': 0.6364333962846745, 'precision': [0.6481481481481, 0.61111111111112, 0.6851851851852, 0.691358024691358, 0.6770186335403726], 'avgPrecision': 0.662564220535235, 'recall': [0.6481481481481, 0.61111111111112, 0.6851851851852, 0.691358024691358, 0.6770186335403726], 'avgRecall': 0.662564220535235, 'params': [{'C': 1, 'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001},
```

```
'verbose': 0, 'warm_start': False}]]}
*****

```

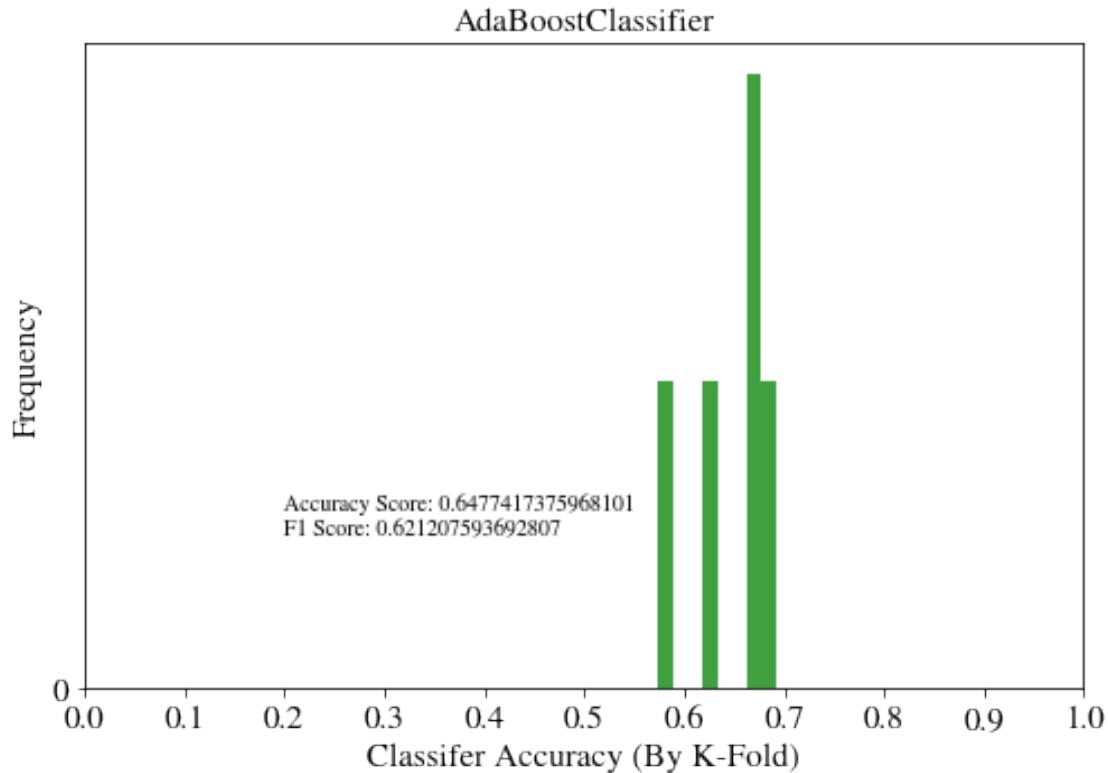
Processing Model: GaussianNB



```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs', 'accuracy': [0.6049382716049383, 0.5679012345679012, 0.6296296296296297, 0.6358024691358025, 0.5838509316770186], 'avgAccuracy': 0.6044245073230581, 'f1': [0.6106853352716236, 0.5570668212645697, 0.6234567901234568, 0.6368392145326249, 0.593124084025403], 'avgF1': 0.6042344490435356, 'precision': [0.6049382716049383, 0.5679012345679012, 0.6296296296296297, 0.6358024691358025, 0.5838509316770186], 'avgPrecision': 0.6044245073230581, 'recall': [0.6049382716049383, 0.5679012345679012, 0.6296296296296297, 0.6358024691358025, 0.5838509316770186], 'avgRecall': 0.6044245073230581, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}
```

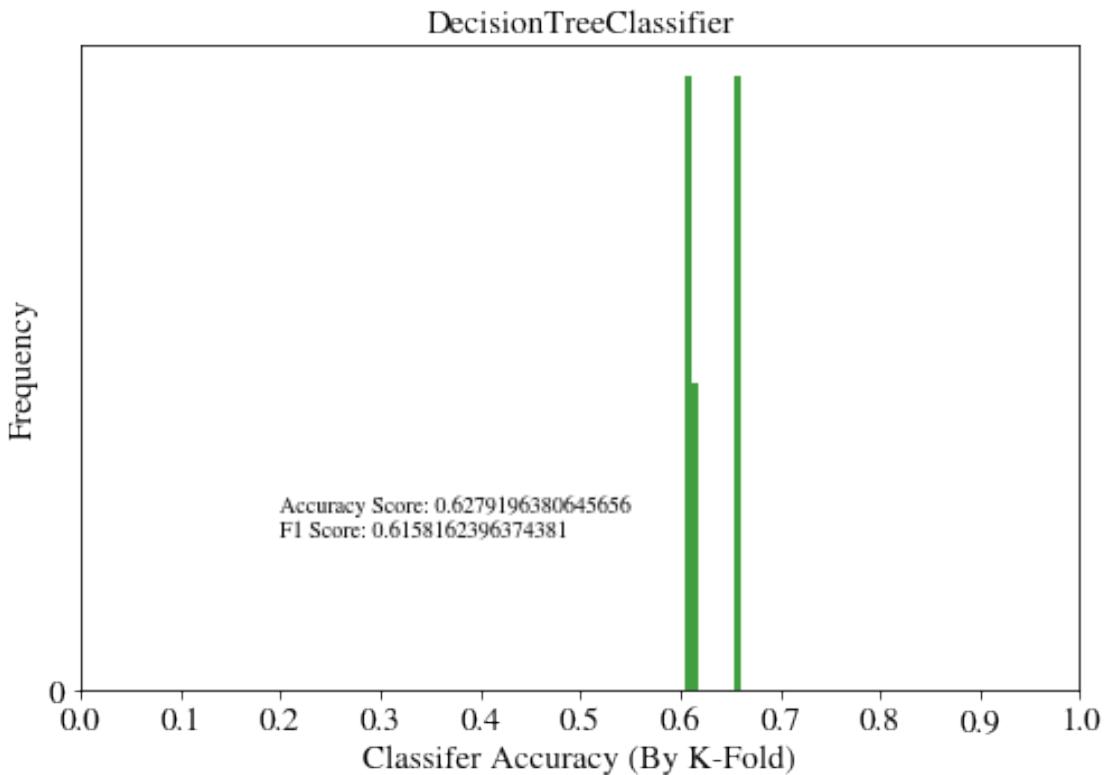
\*\*\*\*\*

Processing Model: AdaBoostClassifier



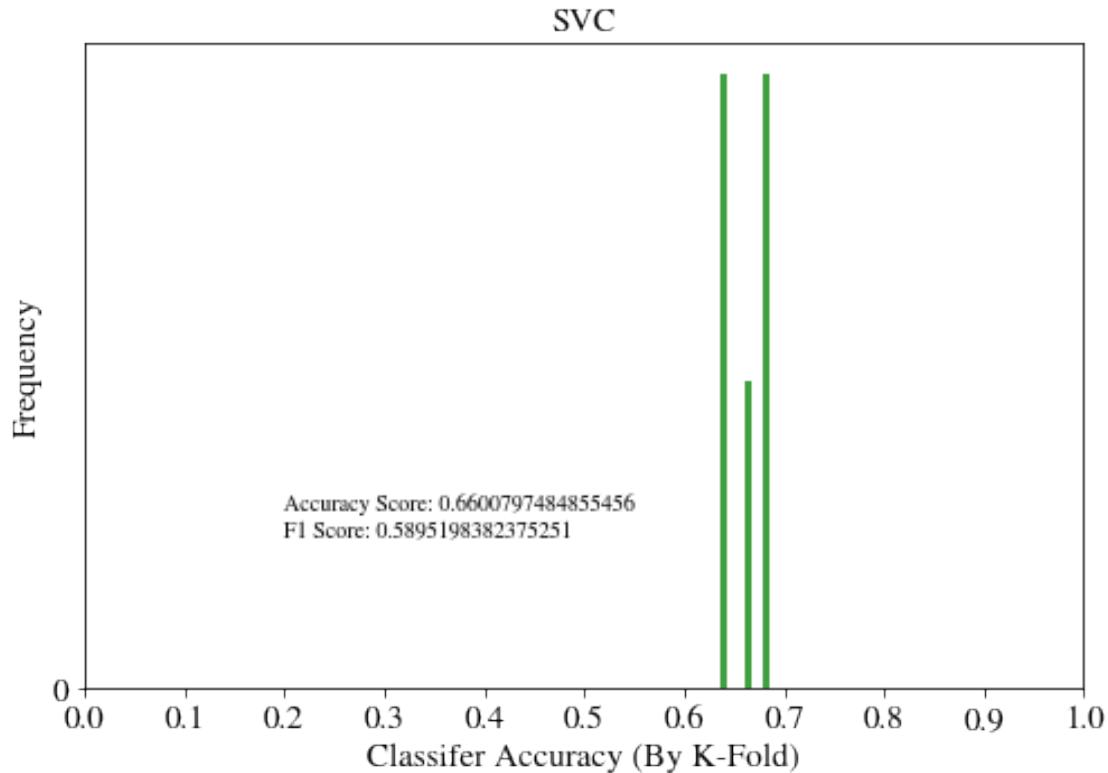
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs',  
'accuracy': [0.6296296296296297, 0.5740740740740741, 0.691358024691358,  
0.6728395061728395, 0.6708074534161491], 'avgAccuracy': 0.6477417375968101,  
'f1': [0.6158427357153329, 0.5570805354232851, 0.6638536063360331,  
0.636239970887414, 0.6330211201019699], 'avgF1': 0.621207593692807, 'precision':  
[0.6296296296296297, 0.5740740740740741, 0.691358024691358, 0.6728395061728395,  
0.6708074534161491], 'avgPrecision': 0.6477417375968101, 'recall':  
[0.6296296296296297, 0.5740740740740741, 0.691358024691358, 0.6728395061728395,  
0.6708074534161491], 'avgRecall': 0.6477417375968101, 'params': [{'algorithm':  
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 50,  
'random_state': None}]}
*****
```

Processing Model: DecisionTreeClassifier



```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs', 'accuracy': [0.6049382716049383, 0.6049382716049383, 0.6604938271604939, 0.654320987654321, 0.6149068322981367], 'avgAccuracy': 0.6279196380645656, 'f1': [0.5856692370236528, 0.6005561153475301, 0.627440549623831, 0.6429515775921004, 0.6224637186000767], 'avgF1': 0.6158162396374381, 'precision': [0.6049382716049383, 0.6049382716049383, 0.6604938271604939, 0.654320987654321, 0.6149068322981367], 'avgPrecision': 0.6279196380645656, 'recall': [0.6049382716049383, 0.6049382716049383, 0.6604938271604939, 0.654320987654321, 0.6149068322981367], 'avgRecall': 0.6279196380645656, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}*****
```

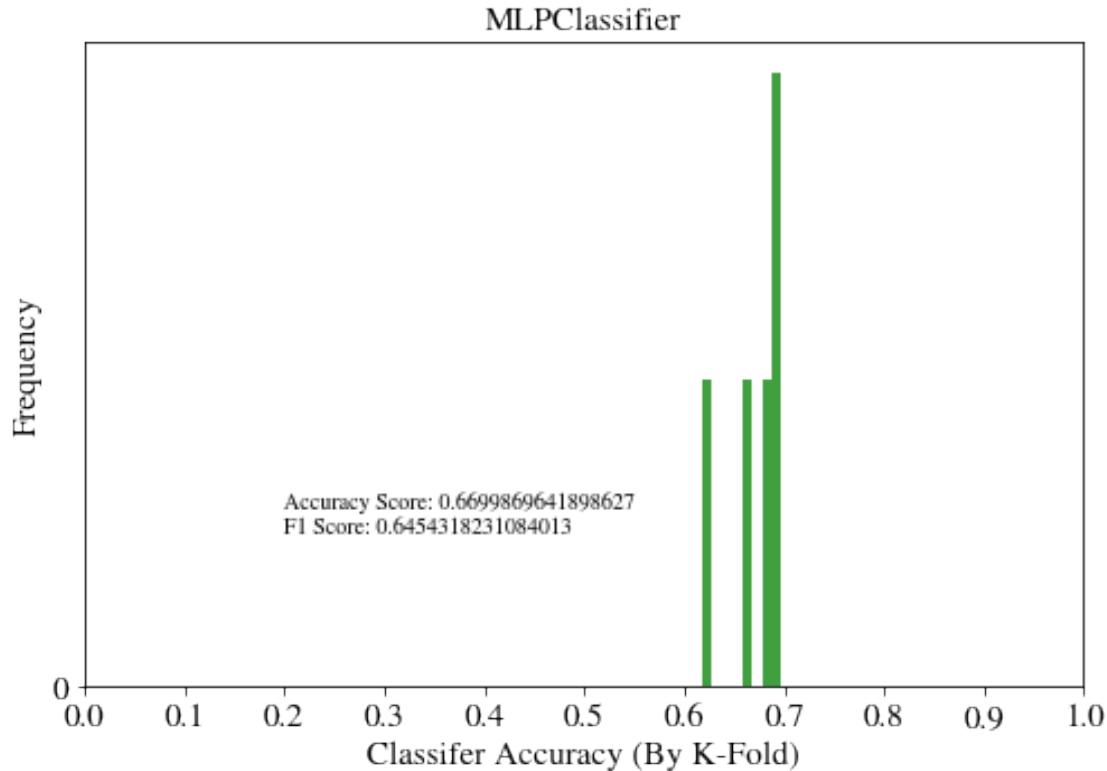
Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs', 'accuracy':
[0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852,
0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1':
[0.5537860082304527, 0.5587625610106229, 0.6001226483969817, 0.6180677396698739,
0.616860233879694], 'avgF1': 0.5895198382375251, 'precision':
[0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852,
0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall':
[0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852,
0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params': [{C: 1.0,
'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0,
'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':
'linear', 'max_iter': -1, 'probability': False, 'random_state': None,
'shrinking': True, 'tol': 0.001, 'verbose': False}]}}
```

```
*****
```

Processing Model: MLPClassifier



```
*****
```

```
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs', 'accuracy':
[0.6604938271604939, 0.6172839506172839, 0.6851851851852, 0.6975308641975309,
0.6894409937888198], 'avgAccuracy': 0.6699869641898627, 'f1':
[0.6418471253812619, 0.5916420442674649, 0.65354622203565, 0.6614359237305492,
0.6786878001270805], 'avgF1': 0.6454318231084013, 'precision':
[0.6604938271604939, 0.6172839506172839, 0.6851851851852, 0.6975308641975309,
0.6894409937888198], 'avgPrecision': 0.6699869641898627, 'recall':
[0.6604938271604939, 0.6172839506172839, 0.6851851851852, 0.6975308641975309,
0.6894409937888198], 'avgRecall': 0.6699869641898627, 'params': [{activation':
'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 1000, 'momentum':
0.9, 'n_iter_no_change': 10, 'random_state': 42, 'solver': 'sgd', 'tol': 0.0001, 'verbose':
False, 'warm_start': False}]}]
```

```

'max_iter': 7000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion, Cryptitis polymorphs', 'accuracy': [0.6604938271604939, 0.6172839506172839, 0.6851851851852, 0.6975308641975309, 0.6894409937888198], 'avgAccuracy': 0.6699869641898627, 'f1': [0.6418471253812619, 0.5916420442674649, 0.65354622203565, 0.6614359237305492, 0.6786878001270805], 'avgF1': 0.6454318231084013, 'precision': [0.6604938271604939, 0.6172839506172839, 0.6851851851852, 0.6975308641975309, 0.6894409937888198], 'avgPrecision': 0.6699869641898627, 'recall': [0.6604938271604939, 0.6172839506172839, 0.6851851851852, 0.6975308641975309, 0.6894409937888198], 'avgRecall': 0.6699869641898627, 'params': [{'activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****

```

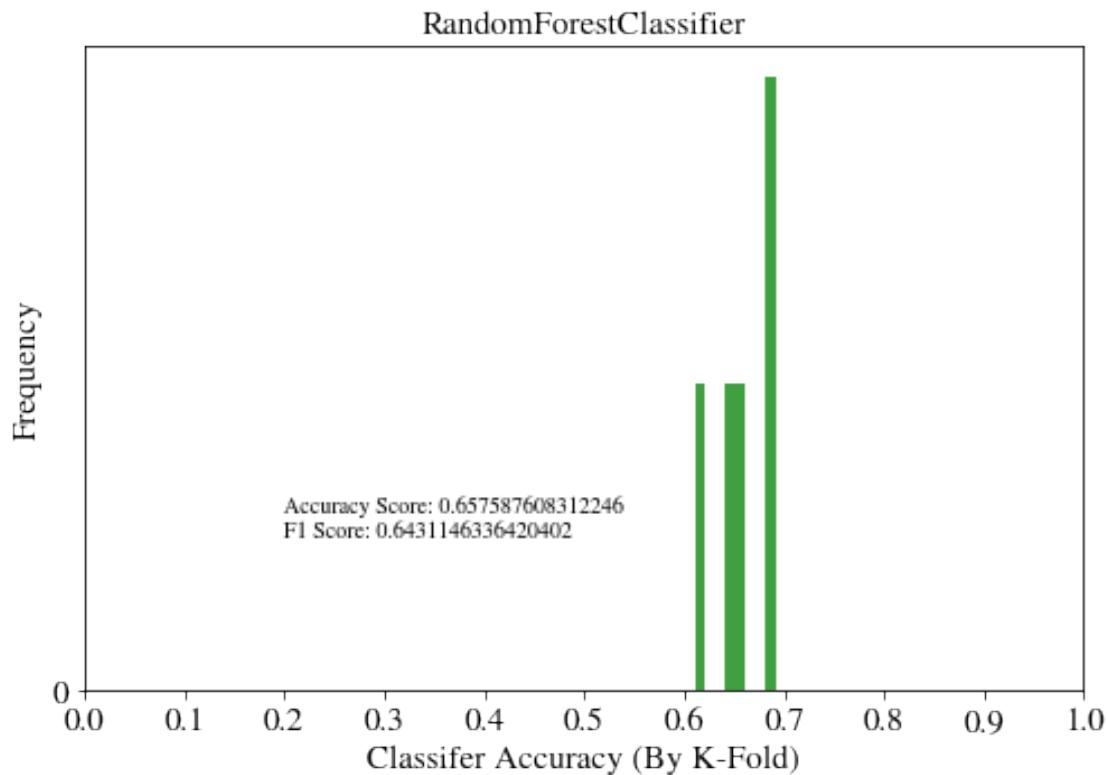
	model	features \			
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...			
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...			
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...			
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...			
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...			
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...			
6	SVC	Active inflammation?, Severity of Crypt Arch, ...			
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...			
	accuracy	f1	precision	recall	\
0	0.651430	0.628582	0.651430	0.651430	
1	0.646492	0.627262	0.646492	0.646492	
2	0.662564	0.636433	0.662564	0.662564	
3	0.604425	0.604234	0.604425	0.604425	
4	0.561276	0.554512	0.561276	0.561276	
5	0.625443	0.611535	0.625443	0.625443	
6	0.660080	0.589520	0.660080	0.660080	
7	0.667510	0.641614	0.667510	0.667510	

```

          params
0  {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1  {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2  {'C': 1, 'class_weight': None, 'dual': False, ...
3      {'priors': None, 'var_smoothing': 1e-09}
4  {'algorithm': 'SAMME.R', 'base_estimator': Non...
5  {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6  {'C': 1.0, 'break_ties': False, 'cache_size': ...
7  {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier



```

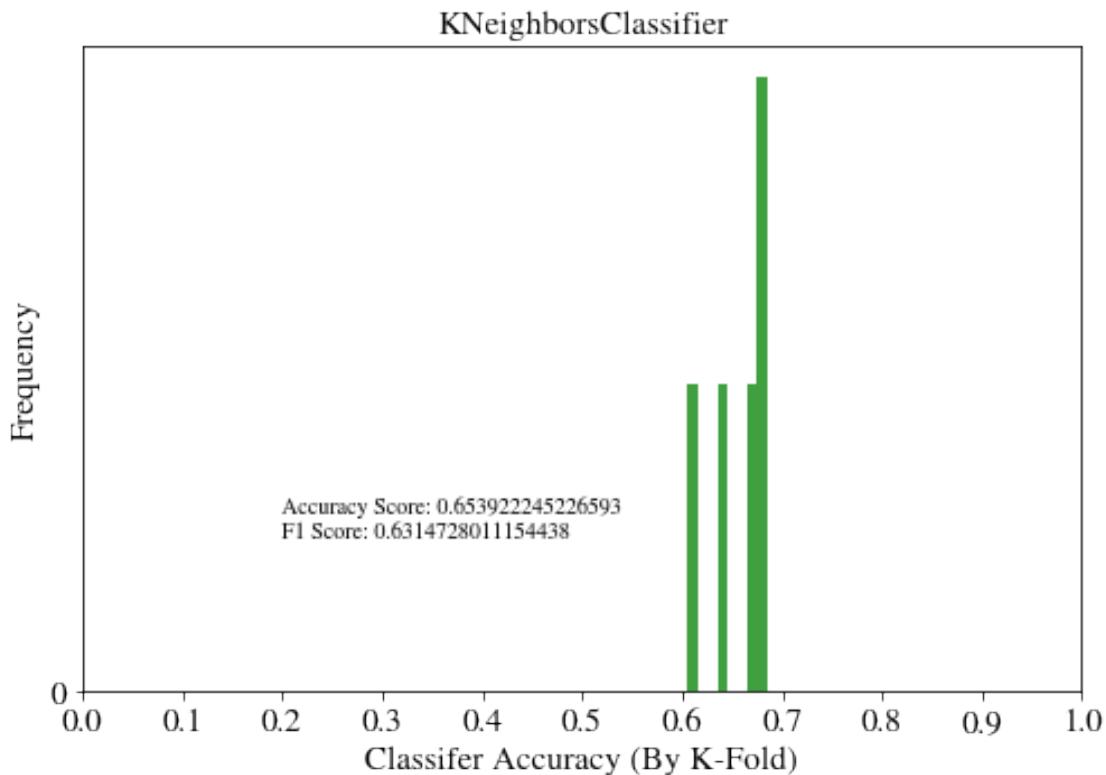
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion', 'accuracy':  
[0.654320987654321, 0.611111111111112, 0.6851851851852, 0.691358024691358,  
0.6459627329192547], 'avgAccuracy': 0.657587608312246, 'f1': [0.627269385017358,
```

```

0.5957480394648117, 0.6718269188558792, 0.6729897445946829, 0.6477390802774696] ,
'avgF1': 0.6431146336420402, 'precision': [0.654320987654321,
0.6111111111111112, 0.6851851851851852, 0.691358024691358, 0.6459627329192547] ,
'avgPrecision': 0.657587608312246, 'recall': [0.654320987654321,
0.6111111111111112, 0.6851851851851852, 0.691358024691358, 0.6459627329192547] ,
'avgRecall': 0.657587608312246, 'params': [{bootstrap': True, 'ccp_alpha': 0.0,
'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features':
'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease':
0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score':
True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



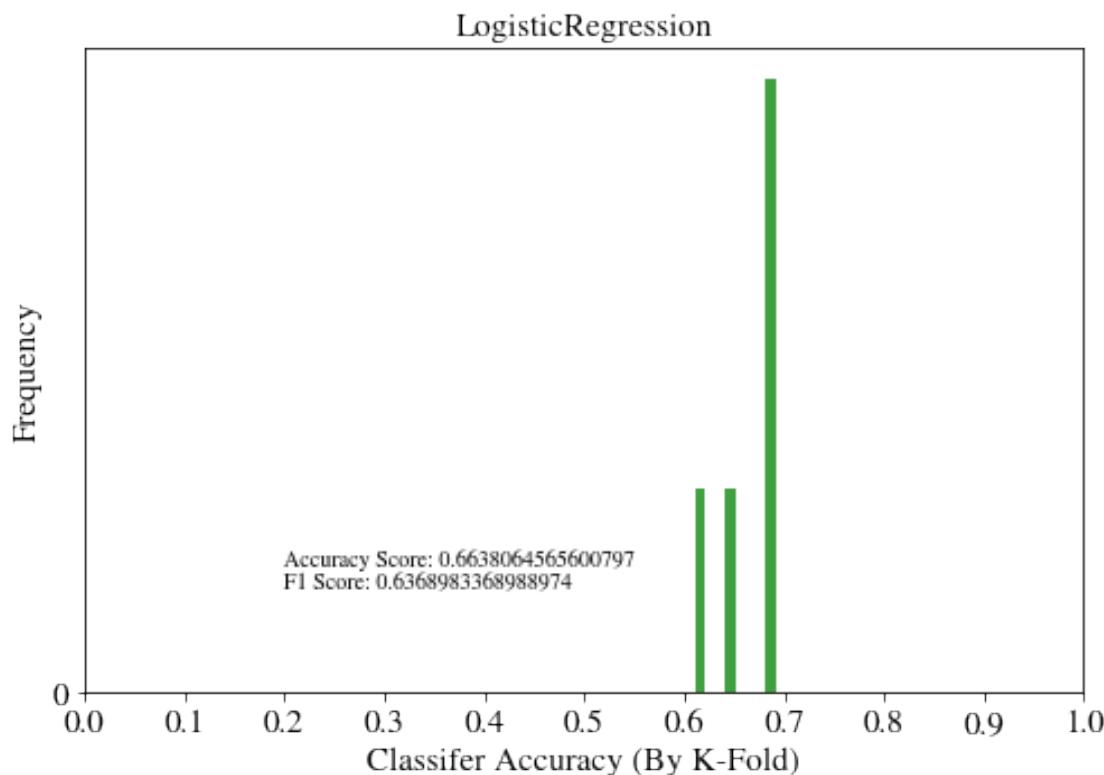
```

*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,
Epithelial changes, Cryptitis extent, Mucin depletion', 'accuracy':

```

```
[0.6358024691358025, 0.6049382716049383, 0.6666666666666666, 0.6851851851851852,
0.6770186335403726], 'avgAccuracy': 0.653922245226593, 'f1': [0.625888046851562,
0.5816896460688556, 0.6384173647609738, 0.6366168810613256, 0.6747520668345018],
'avgF1': 0.6314728011154438, 'precision': [0.6358024691358025,
0.6049382716049383, 0.6666666666666666, 0.6851851851852, 0.6770186335403726],
'avgPrecision': 0.653922245226593, 'recall': [0.6358024691358025,
0.6049382716049383, 0.6666666666666666, 0.6851851851852, 0.6770186335403726],
'avgRecall': 0.653922245226593, 'params': [{"algorithm": "auto", "leaf_size": 30, "metric": "minkowski", "metric_params": None, "n_jobs": -1, "n_neighbors": 16, "p": 2, "weights": "uniform"}]}
*****
```

Processing Model: LogisticRegression



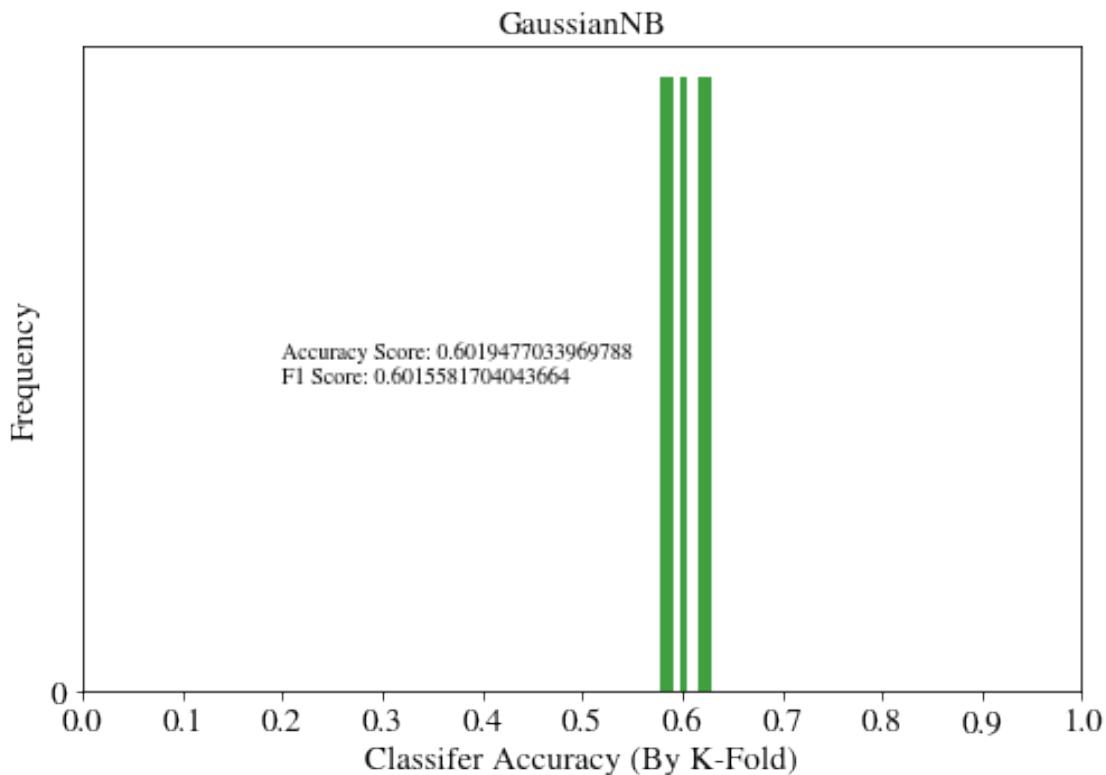
```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion', 'accuracy':
[0.6481481481481, 0.6111111111111112, 0.6851851851852, 0.691358024691358,
```

```

0.6832298136645962], 'avgAccuracy': 0.6638064565600797, 'f1':
[0.6220598745119486, 0.5813482097969886, 0.65354622203565, 0.6567057085575605,
0.6708316695923395], 'avgF1': 0.6368983368988974, 'precision':
[0.6481481481481, 0.611111111111112, 0.6851851851852, 0.691358024691358,
0.6832298136645962], 'avgPrecision': 0.6638064565600797, 'recall':
[0.6481481481481, 0.611111111111112, 0.6851851851852, 0.691358024691358,
0.6832298136645962], 'avgRecall': 0.6638064565600797, 'params': [{C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs':
-1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

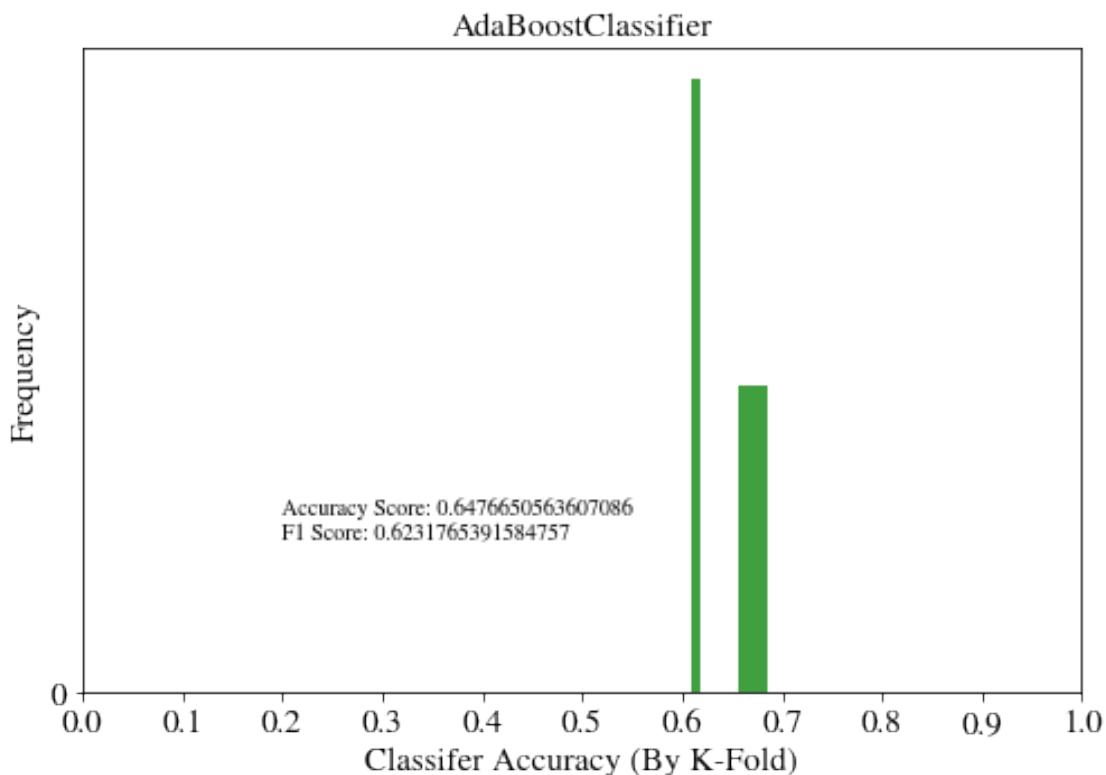
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion', 'accuracy': [0.5987654320987654,
```

```

0.5864197530864198, 0.6296296296296297, 0.6172839506172839, 0.577639751552795],
'avgAccuracy': 0.6019477033969788, 'f1': [0.6023155128419906,
0.5766398411125934, 0.6234567901234568, 0.6176832971128625, 0.5876954108309288],
'avgF1': 0.6015581704043664, 'precision': [0.5987654320987654,
0.5864197530864198, 0.6296296296296297, 0.6172839506172839, 0.577639751552795],
'avgPrecision': 0.6019477033969788, 'recall': [0.5987654320987654,
0.5864197530864198, 0.6296296296296297, 0.6172839506172839, 0.577639751552795],
'avgRecall': 0.6019477033969788, 'params': [{'priors': None, 'var_smoothing':
1e-09}]}]
*****

```

Processing Model: AdaBoostClassifier

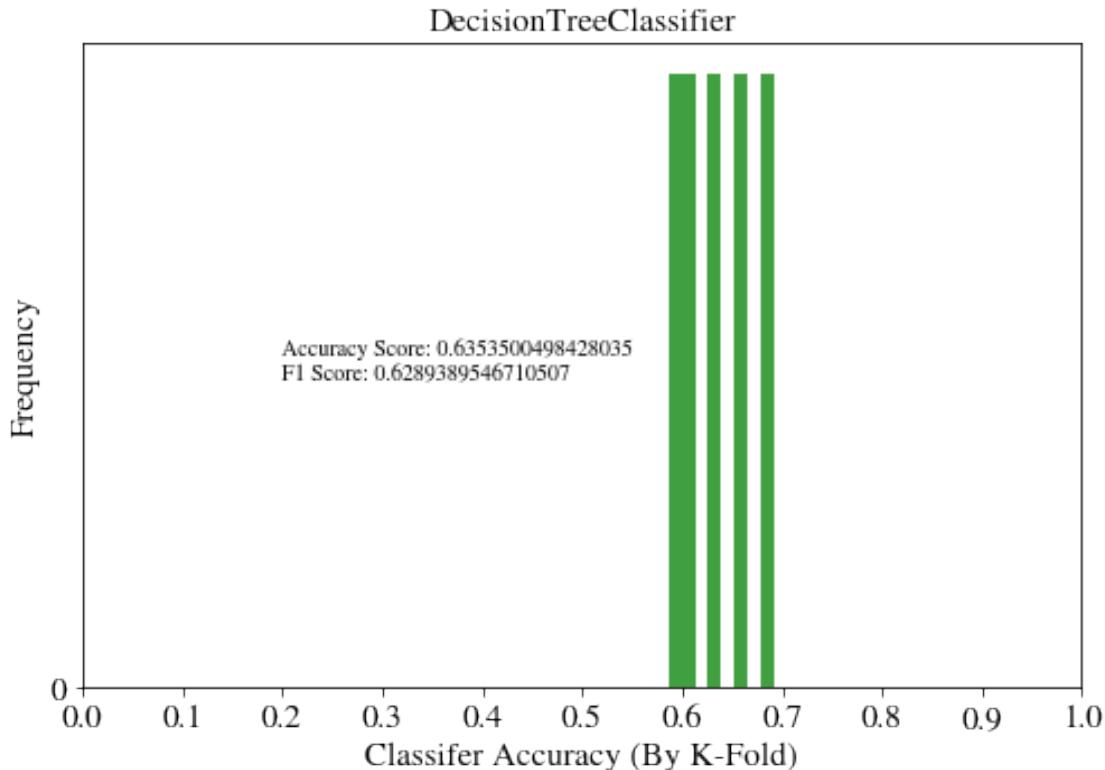


```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion', 'accuracy':  
[0.6604938271604939, 0.6111111111111112, 0.6728395061728395, 0.6851851851851852,  
0.6086956521739131], 'avgAccuracy': 0.6476650563607086, 'f1':
```

```
[0.6429785548143035, 0.562470364585014, 0.6452686872706647, 0.6446818613485281,
0.6204832277738682], 'avgF1': 0.6231765391584757, 'precision':
[0.6604938271604939, 0.6111111111111112, 0.6728395061728395, 0.6851851851852,
0.6086956521739131], 'avgPrecision': 0.6476650563607086, 'recall':
[0.6604938271604939, 0.6111111111111112, 0.6728395061728395, 0.6851851851852,
0.6086956521739131], 'avgRecall': 0.6476650563607086, 'params': [{}'algorithm':
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 20,
'random_state': None}]]}
*****
```

Processing Model: DecisionTreeClassifier



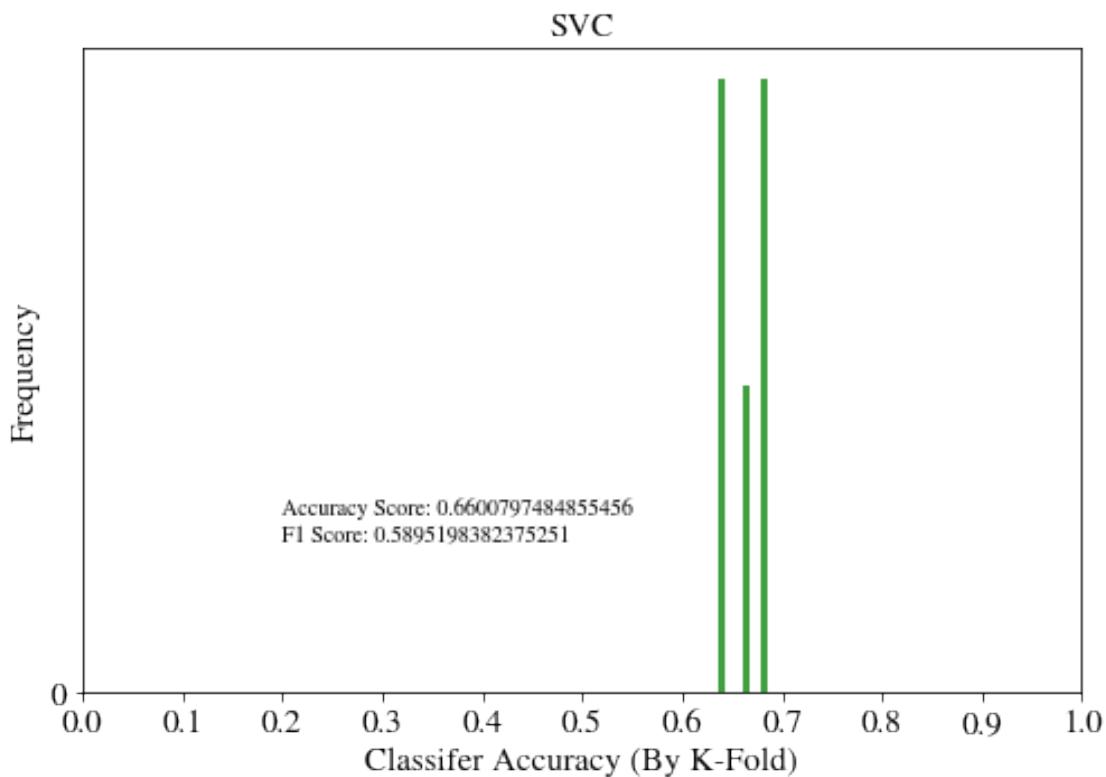
```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes, Cryptitis extent, Mucin depletion', 'accuracy':  
[0.6049382716049383, 0.5864197530864198, 0.6604938271604939, 0.691358024691358,  
0.6335403726708074], 'avgAccuracy': 0.6353500498428035, 'f1':  
[0.5894170518631877, 0.5860132103260539, 0.6506184746364243, 0.6772100866199972,
```

```

0.6414359499095904], 'avgF1': 0.6289389546710507, 'precision':
[0.6049382716049383, 0.5864197530864198, 0.6604938271604939, 0.691358024691358,
0.6335403726708074], 'avgPrecision': 0.6353500498428035, 'recall':
[0.6049382716049383, 0.5864197530864198, 0.6604938271604939, 0.691358024691358,
0.6335403726708074], 'avgRecall': 0.6353500498428035, 'params': [{}{'ccp_alpha':
0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None,
'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]]}
*****

```

Processing Model: SVC



```

*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt
Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in
lamina propria cellularity, Lamina propria polymorphs, Crypt architecture,
Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes,
Cryptitis extent, Mucin depletion', 'accuracy': [0.6358024691358025,
0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255],
'avgAccuracy': 0.6600797484855456, 'f1': [0.5537860082304527,

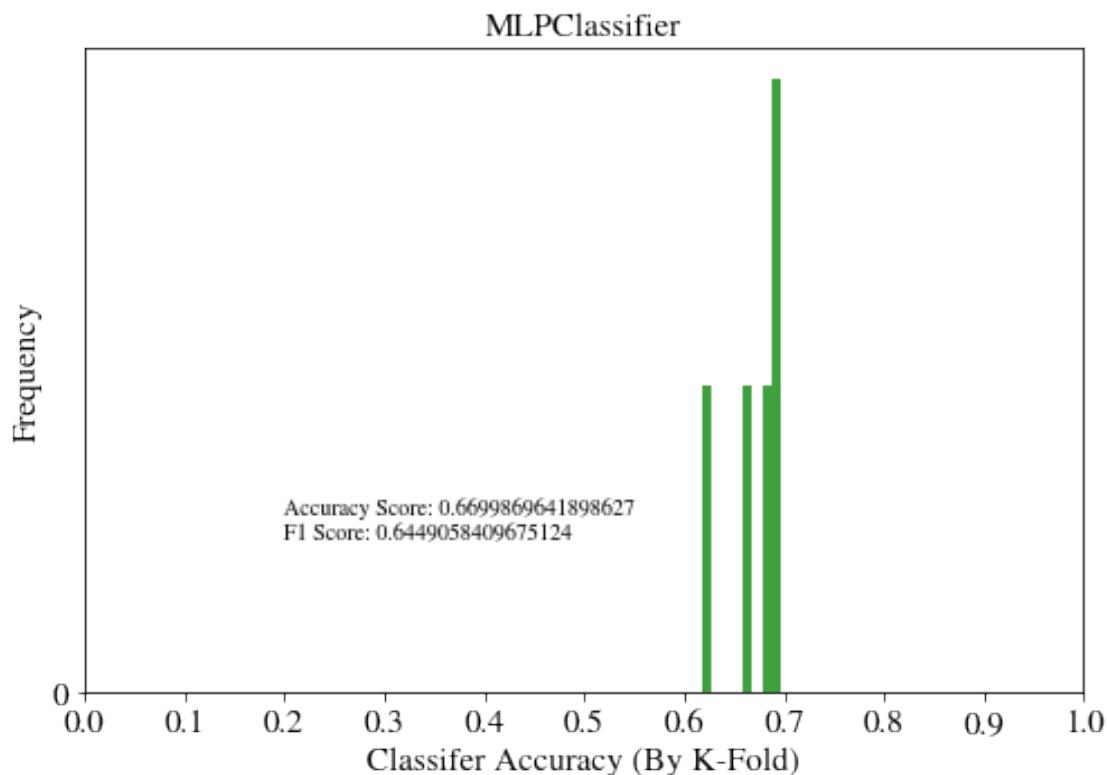
```

```

0.5587625610106229, 0.6001226483969817, 0.6180677396698739, 0.616860233879694],
'avgF1': 0.5895198382375251, 'precision': [0.6358024691358025,
0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255],
'avgPrecision': 0.6600797484855456, 'recall': [0.6358024691358025,
0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255],
'avgRecall': 0.6600797484855456, 'params': [{C': 1.0, 'break_ties': False,
'cache_size': 4000, 'class_weight': None, 'coef0': 0.0,
'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':
'linear', 'max_iter': -1, 'probability': False, 'random_state': None,
'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```

*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent, Mucin depletion', 'accuracy': [0.6604938271604939,
0.6172839506172839, 0.6851851851851852, 0.6975308641975309, 0.6894409937888198],
```

```

'avgAccuracy': 0.6699869641898627, 'f1': [0.6418471253812619,
0.5916420442674649, 0.65354622203565, 0.6614359237305492, 0.6760578894226357],
'avgF1': 0.6449058409675124, 'precision': [0.6604938271604939,
0.6172839506172839, 0.6851851851851852, 0.6975308641975309, 0.6894409937888198],
'avgPrecision': 0.6699869641898627, 'recall': [0.6604938271604939,
0.6172839506172839, 0.6851851851851852, 0.6975308641975309, 0.6894409937888198],
'avgRecall': 0.6699869641898627, 'params': [{'activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent, Mucin depletion', 'accuracy': [0.6604938271604939, 0.6172839506172839, 0.6851851851851852, 0.6975308641975309, 0.6894409937888198], 'avgAccuracy': 0.6699869641898627, 'f1': [0.6418471253812619, 0.5916420442674649, 0.65354622203565, 0.6614359237305492, 0.6760578894226357], 'avgF1': 0.6449058409675124, 'precision': [0.6604938271604939, 0.6172839506172839, 0.6851851851851852, 0.6975308641975309, 0.6894409937888198], 'avgPrecision': 0.6699869641898627, 'recall': [0.6604938271604939, 0.6172839506172839, 0.6851851851851852, 0.6975308641975309, 0.6894409937888198], 'avgRecall': 0.6699869641898627, 'params': [{'activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****

```

	model	features \
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...
6	SVC	Active inflammation?, Severity of Crypt Arch, ...
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...

accuracy	f1	precision	recall \
----------	----	-----------	----------

```

0 0.653876 0.634553 0.653876 0.653876
1 0.645227 0.631349 0.645227 0.645227
2 0.663806 0.636898 0.663806 0.663806
3 0.601948 0.601558 0.601948 0.601948
4 0.557565 0.558108 0.557565 0.557565
5 0.610605 0.608085 0.610605 0.610605
6 0.660080 0.589520 0.660080 0.660080
7 0.669987 0.645432 0.669987 0.669987

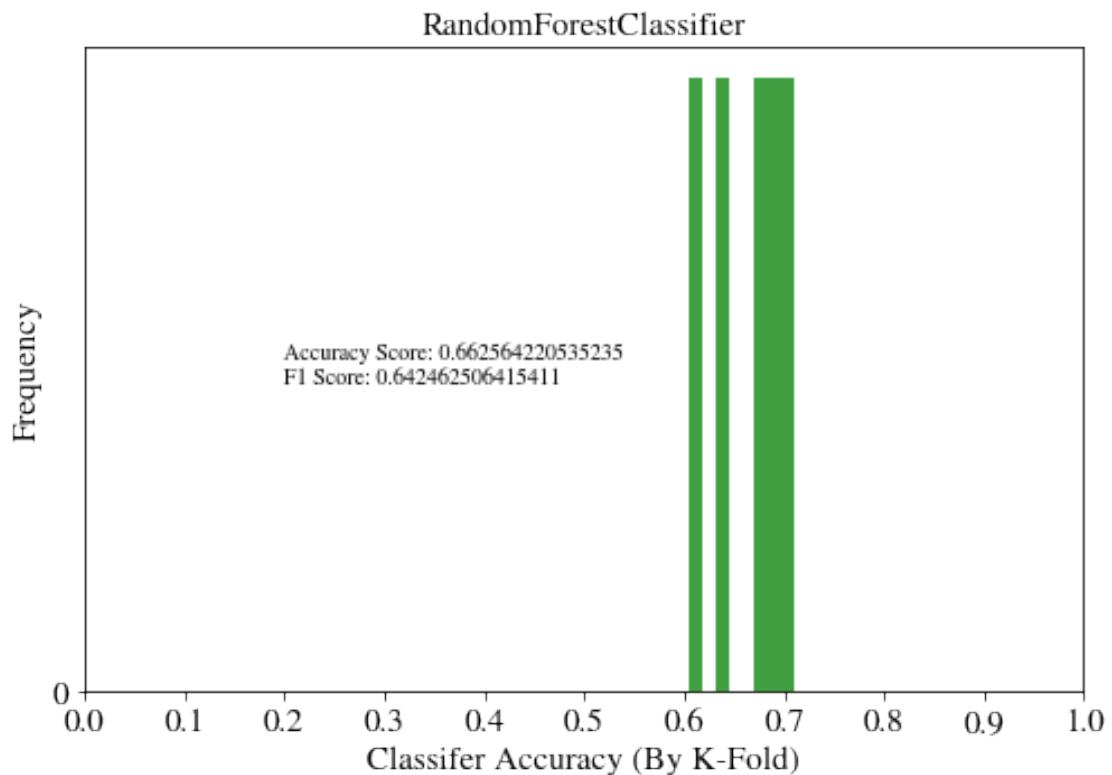
```

```

                                params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3         {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier



```

*****
* RandomForestClassifier

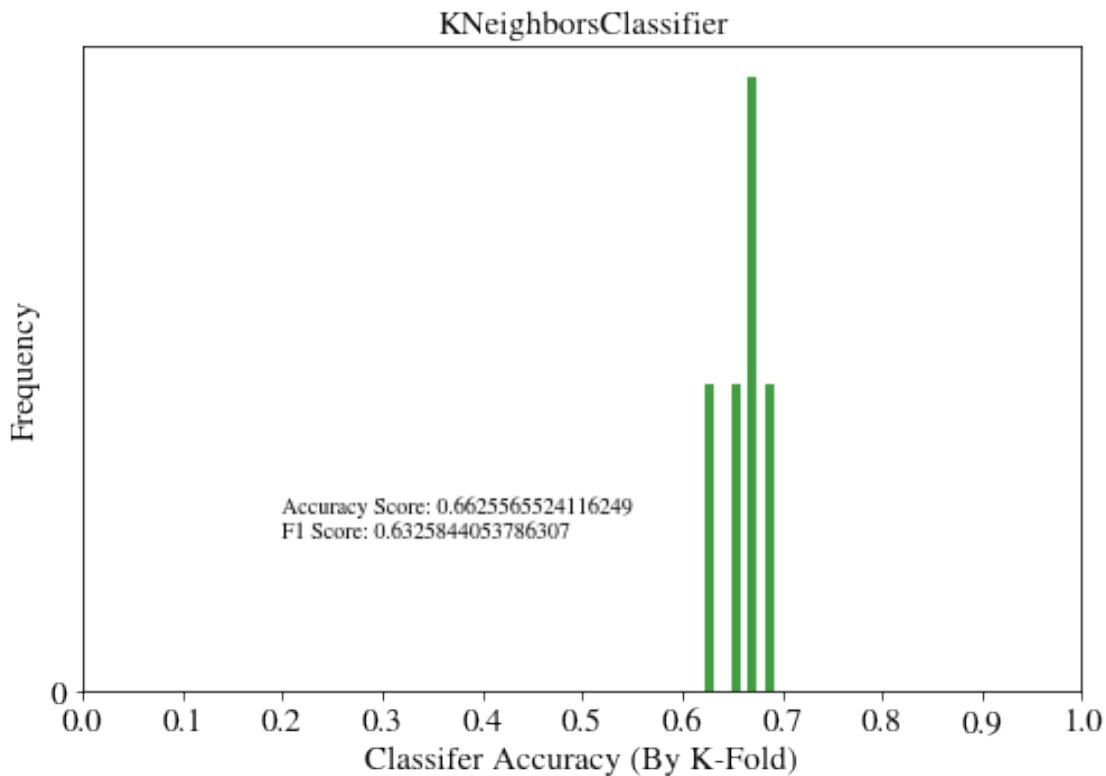
```

```

* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent', 'accuracy': [0.6358024691358025, 0.6049382716049383, 0.6851851851852, 0.7098765432098766, 0.6770186335403726], 'avgAccuracy': 0.662564220535235, 'f1': [0.606709077752292, 0.5863375331589531, 0.6588785046728972, 0.6843764212503418, 0.6760109952425711], 'avgF1': 0.642462506415411, 'precision': [0.6358024691358025, 0.6049382716049383, 0.6851851851852, 0.7098765432098766, 0.6770186335403726], 'avgPrecision': 0.662564220535235, 'recall': [0.6358024691358025, 0.6049382716049383, 0.6851851851852, 0.7098765432098766, 0.6770186335403726], 'avgRecall': 0.662564220535235, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 500, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent', 'accuracy': [0.654320987654321,  

0.6234567901234568, 0.6728395061728395, 0.691358024691358, 0.6708074534161491],  

'avgAccuracy': 0.6625565524116249, 'f1': [0.627269385017358, 0.5909847832328452,  

0.6432898948331047, 0.6409072183040061, 0.6604707455058395], 'avgF1':  

0.6325844053786307, 'precision': [0.654320987654321, 0.6234567901234568,  

0.6728395061728395, 0.691358024691358, 0.6708074534161491], 'avgPrecision':  

0.6625565524116249, 'recall': [0.654320987654321, 0.6234567901234568,  

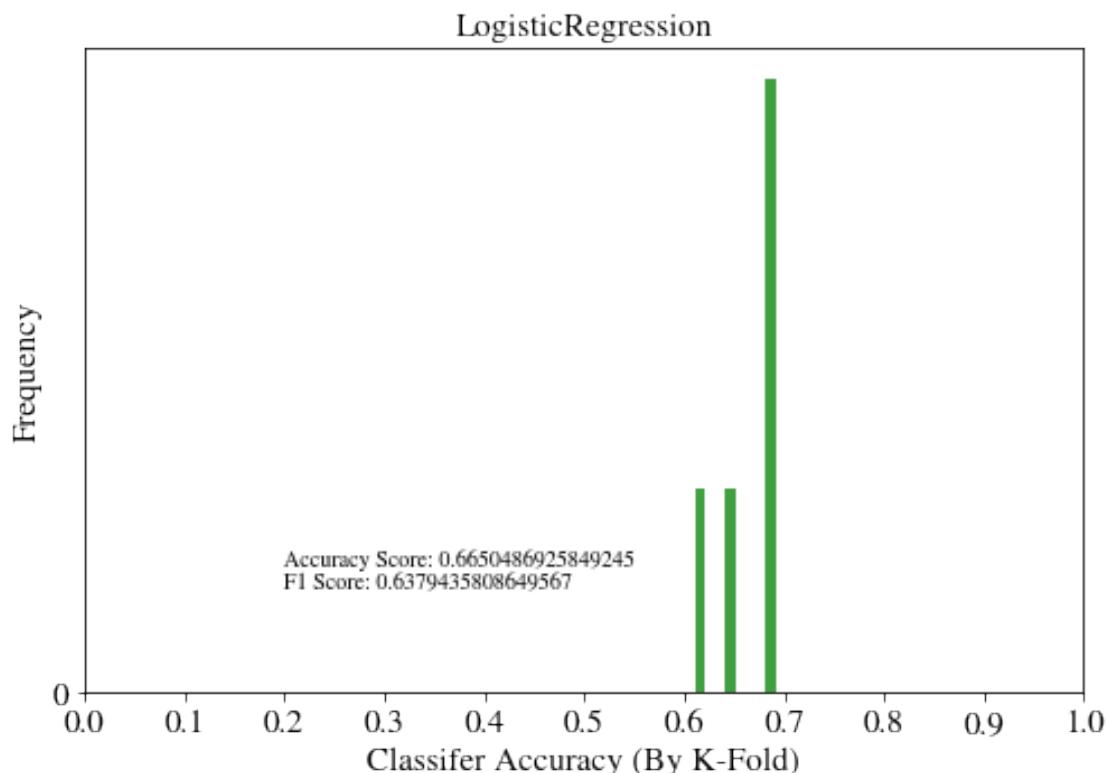
0.6728395061728395, 0.691358024691358, 0.6708074534161491], 'avgRecall':  

0.6625565524116249, 'params': [{'algorithm': 'auto', 'leaf_size': 30, 'metric':  

'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 16, 'p': 2,  

'weights': 'uniform'}]}}
*****
```

Processing Model: LogisticRegression



```
*****
*****
```

```

* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent', 'accuracy': [0.6481481481481,  

0.61111111111112, 0.6851851851852, 0.691358024691358, 0.6894409937888198],  

'avgAccuracy': 0.6650486925849245, 'f1': [0.6220598745119486,  

0.5813482097969886, 0.65354622203565, 0.6567057085575605, 0.6760578894226357],  

'avgF1': 0.6379435808649567, 'precision': [0.6481481481481,  

0.61111111111112, 0.6851851851852, 0.691358024691358, 0.6894409937888198],  

'avgPrecision': 0.6650486925849245, 'recall': [0.6481481481481,  

0.61111111111112, 0.6851851851852, 0.691358024691358, 0.6894409937888198],  

'avgRecall': 0.6650486925849245, 'params': [{'C': 1, 'class_weight': None,  

'dual': False, 'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None,  

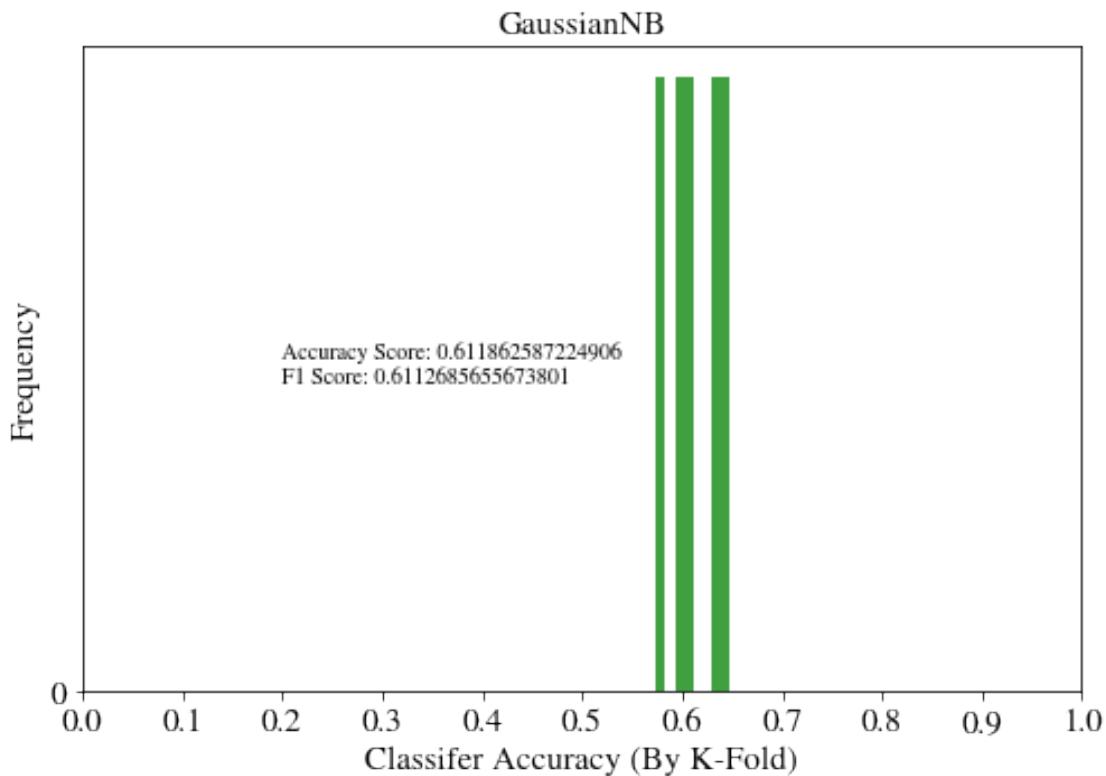
'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs': -1, 'penalty': 'l2',  

'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0,  

'warm_start': False}]}
*****

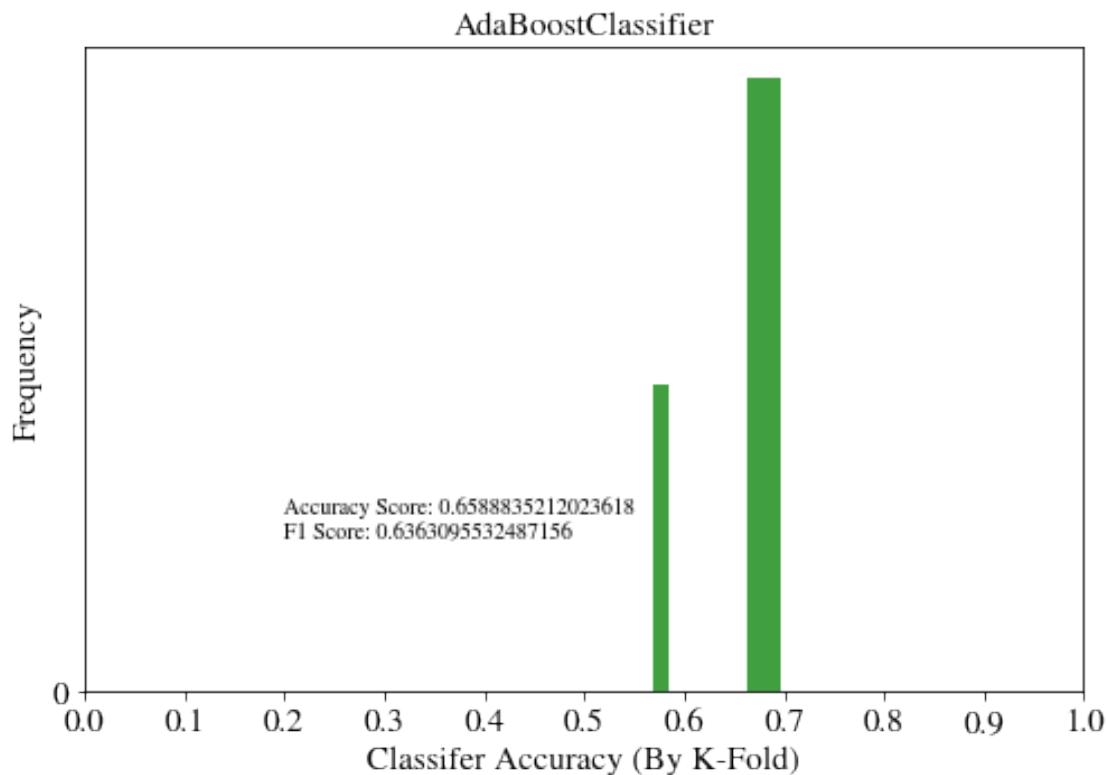
```

Processing Model: GaussianNB



```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent', 'accuracy': [0.5987654320987654, 0.5740740740740741, 0.6481481481481, 0.6296296296296297, 0.6086956521739131], 'avgAccuracy': 0.611862587224906, 'f1': [0.6023155128419906, 0.5621240697878593, 0.6402425817630496, 0.6331430465525587, 0.6185176168914422], 'avgF1': 0.6112685655673801, 'precision': [0.5987654320987654, 0.5740740740740741, 0.6481481481481, 0.6296296296296297, 0.6086956521739131], 'avgPrecision': 0.611862587224906, 'recall': [0.5987654320987654, 0.5740740740740741, 0.6481481481481, 0.6296296296296297, 0.6086956521739131], 'avgRecall': 0.611862587224906, 'params': [{priors': None, 'var_smoothing': 1e-09}]}
*****
```

Processing Model: AdaBoostClassifier



```
*****
* AdaBoostClassifier
* Best Params Result:
```

```

* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  

Epithelial changes, Cryptitis extent', 'accuracy': [0.6666666666666666,  

0.5679012345679012, 0.6851851851852, 0.6790123456790124, 0.6956521739130435],  

'avgAccuracy': 0.6588835212023618, 'f1': [0.6525421020675551,  

0.5591001998496505, 0.6530456650961214, 0.6407887674096675, 0.6760710318205834],  

'avgF1': 0.6363095532487156, 'precision': [0.6666666666666666,  

0.5679012345679012, 0.6851851851852, 0.6790123456790124, 0.6956521739130435],  

'avgPrecision': 0.6588835212023618, 'recall': [0.6666666666666666,  

0.5679012345679012, 0.6851851851852, 0.6790123456790124, 0.6956521739130435],  

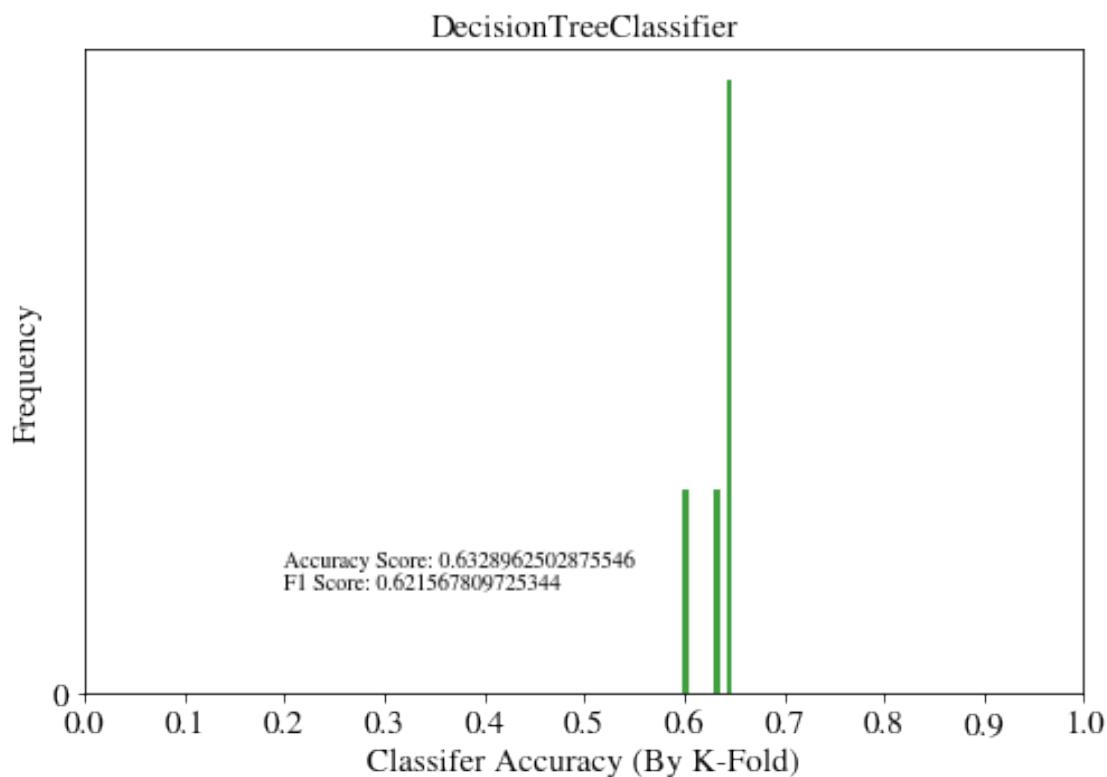
'avgRecall': 0.6588835212023618, 'params': [{'algorithm': 'SAMME.R',  

'base_estimator': None, 'learning_rate': 1, 'n_estimators': 100, 'random_state':  

None}]}
*****

```

Processing Model: DecisionTreeClassifier



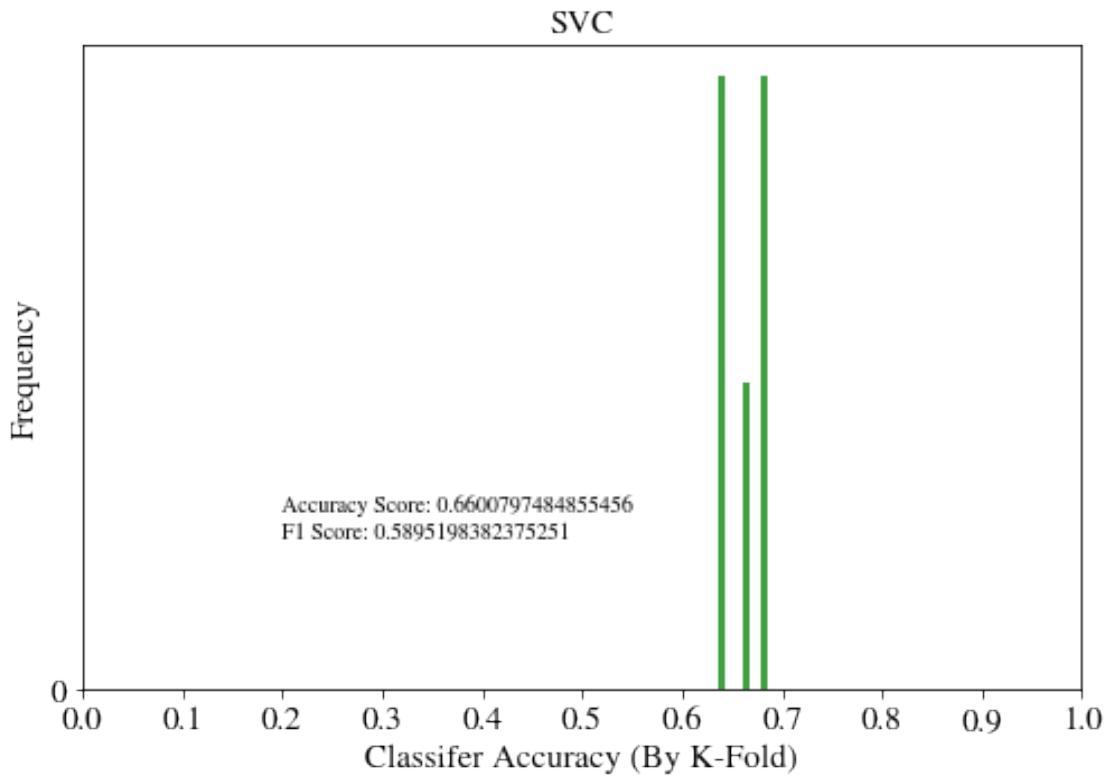
```

*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  


```

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent', 'accuracy': [0.6296296296296297, 0.5987654320987654, 0.6481481481481, 0.6419753086419753, 0.6459627329192547], 'avgAccuracy': 0.6328962502875546, 'f1': [0.6108389978121779, 0.5986168844649107, 0.6245372912397985, 0.6246112219197104, 0.6492346531901224], 'avgF1': 0.621567809725344, 'precision': [0.6296296296296297, 0.5987654320987654, 0.6481481481481, 0.6419753086419753, 0.6459627329192547], 'avgPrecision': 0.6328962502875546, 'recall': [0.6296296296296297, 0.5987654320987654, 0.6481481481481, 0.6419753086419753, 0.6459627329192547], 'avgRecall': 0.6328962502875546, 'params': [{'ccp\_alpha': 0.0, 'class\_weight': None, 'criterion': 'entropy', 'max\_depth': None, 'max\_features': 'sqrt', 'max\_leaf\_nodes': None, 'min\_impurity\_decrease': 0.0, 'min\_impurity\_split': None, 'min\_samples\_leaf': 1, 'min\_samples\_split': 2, 'min\_weight\_fraction\_leaf': 0.0, 'random\_state': None, 'splitter': 'random'}]}
 \*\*\*\*

Processing Model: SVC



\*\*\*\*\*

\* SVC

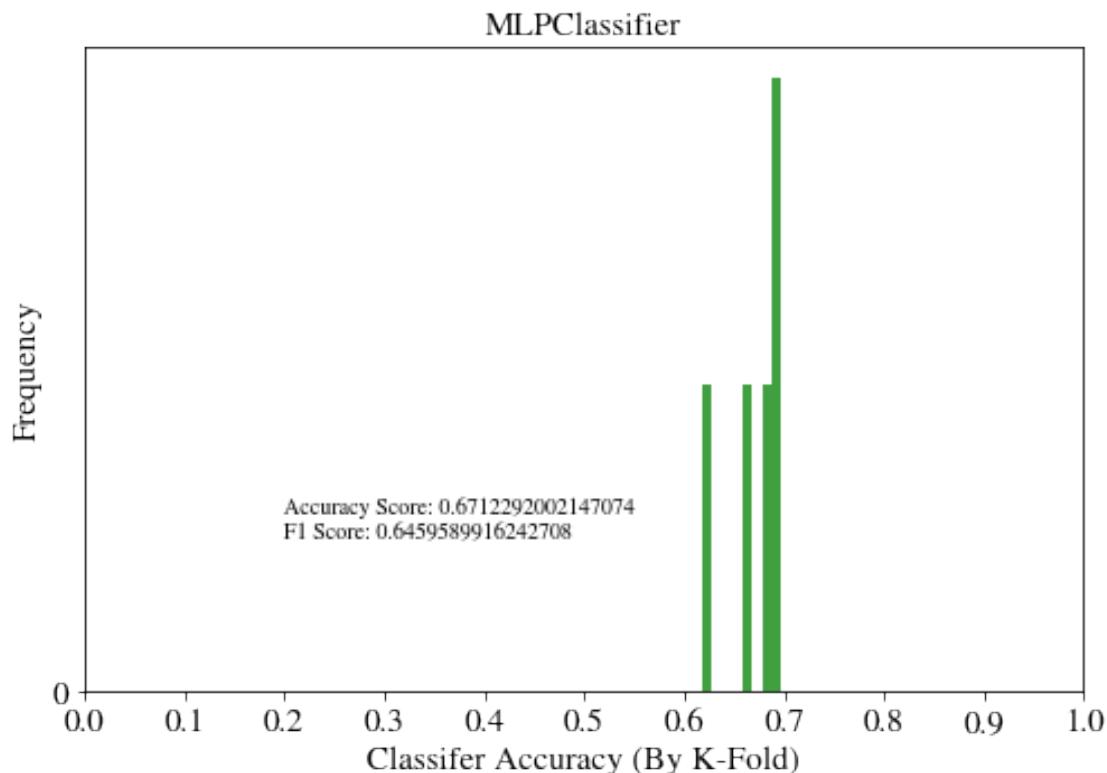
\* Best Params Result:

```

* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes, Cryptitis extent', 'accuracy': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1': [0.5537860082304527, 0.5587625610106229, 0.6001226483969817, 0.6180677396698739, 0.616860233879694], 'avgF1': 0.5895198382375251, 'precision': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****

```

Processing Model: MLPClassifier



```

*****

```

\* MLPClassifier

```

* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent', 'accuracy': [0.6604938271604939, 0.6172839506172839,
0.6851851851852, 0.6975308641975309, 0.6956521739130435], 'avgAccuracy':
0.6712292002147074, 'f1': [0.6418471253812619, 0.5916420442674649,
0.65354622203565, 0.6614359237305492, 0.681323642706428], 'avgF1':
0.6459589916242708, 'precision': [0.6604938271604939, 0.6172839506172839,
0.6851851851852, 0.6975308641975309, 0.6956521739130435], 'avgPrecision':
0.6712292002147074, 'recall': [0.6604938271604939, 0.6172839506172839,
0.6851851851852, 0.6975308641975309, 0.6956521739130435], 'avgRecall':
0.6712292002147074, 'params': [{'activation': 'logistic', 'alpha': 0.0001,
'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False,
'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'constant',
'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5,
'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'verlbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes, Cryptitis extent', 'accuracy': [0.6604938271604939, 0.6172839506172839,
0.6851851851852, 0.6975308641975309, 0.6956521739130435], 'avgAccuracy':
0.6712292002147074, 'f1': [0.6418471253812619, 0.5916420442674649,
0.65354622203565, 0.6614359237305492, 0.681323642706428], 'avgF1':
0.6459589916242708, 'precision': [0.6604938271604939, 0.6172839506172839,
0.6851851851852, 0.6975308641975309, 0.6956521739130435], 'avgPrecision':
0.6712292002147074, 'recall': [0.6604938271604939, 0.6172839506172839,
0.6851851851852, 0.6975308641975309, 0.6956521739130435], 'avgRecall':
0.6712292002147074, 'params': [{'activation': 'logistic', 'alpha': 0.0001,
'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False,
'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'constant',
'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5,
'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'verlbose': False, 'warm_start': False}]}
*****
*****
```

model	features \
0 RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...
1 KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...
2 LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...

```

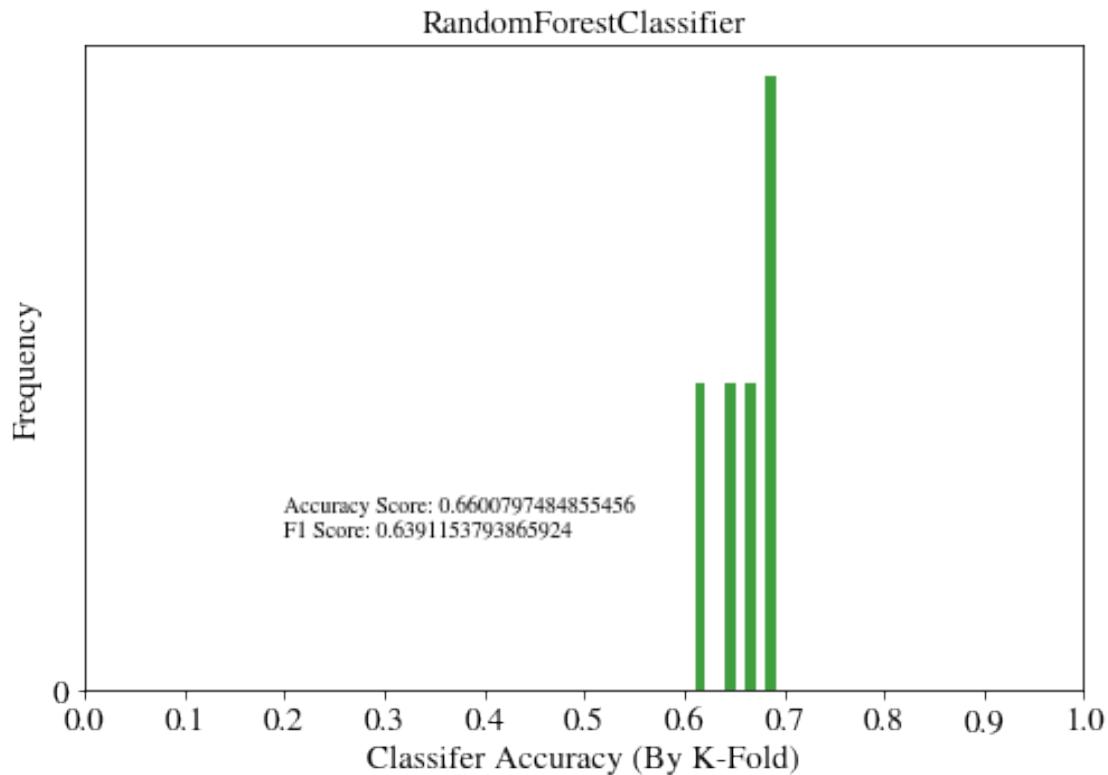
3      GaussianNB  Active inflammation?, Severity of Crypt Arch, ...
4      AdaBoostClassifier  Active inflammation?, Severity of Crypt Arch, ...
5 DecisionTreeClassifier  Active inflammation?, Severity of Crypt Arch, ...
6          SVC  Active inflammation?, Severity of Crypt Arch, ...
7      MLPClassifier  Active inflammation?, Severity of Crypt Arch, ...

    accuracy      f1  precision   recall  \
0  0.655141  0.634238  0.655141  0.655141
1  0.618104  0.589932  0.618104  0.618104
2  0.665049  0.637944  0.665049  0.665049
3  0.611863  0.611269  0.611863  0.611863
4  0.636646  0.622382  0.636646  0.636646
5  0.626700  0.615031  0.626700  0.626700
6  0.660080  0.589520  0.660080  0.660080
7  0.668752  0.643819  0.668752  0.668752

                                params
0  {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1  {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2  {'C': 1, 'class_weight': None, 'dual': False, ...
3      {'priors': None, 'var_smoothing': 1e-09}
4  {'algorithm': 'SAMME.R', 'base_estimator': Non...
5  {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6  {'C': 1.0, 'break_ties': False, 'cache_size': ...
7  {'activation': 'logistic', 'alpha': 0.0001, 'b...

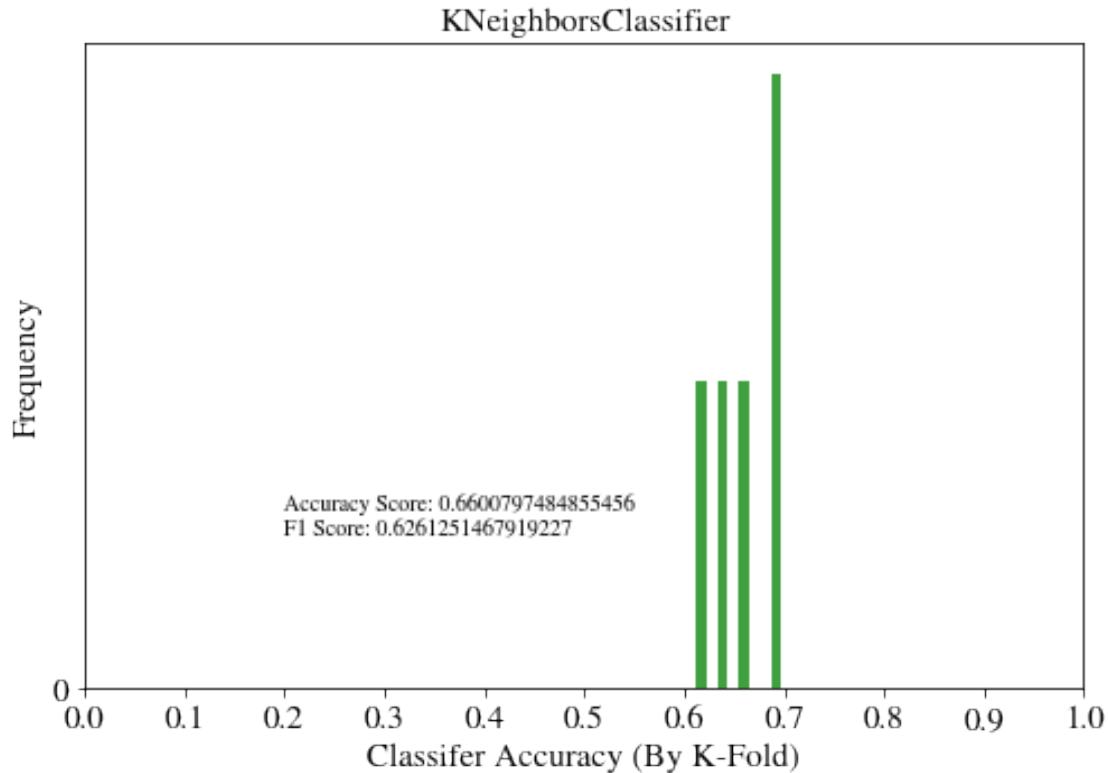
```

Processing Model: RandomForestClassifier



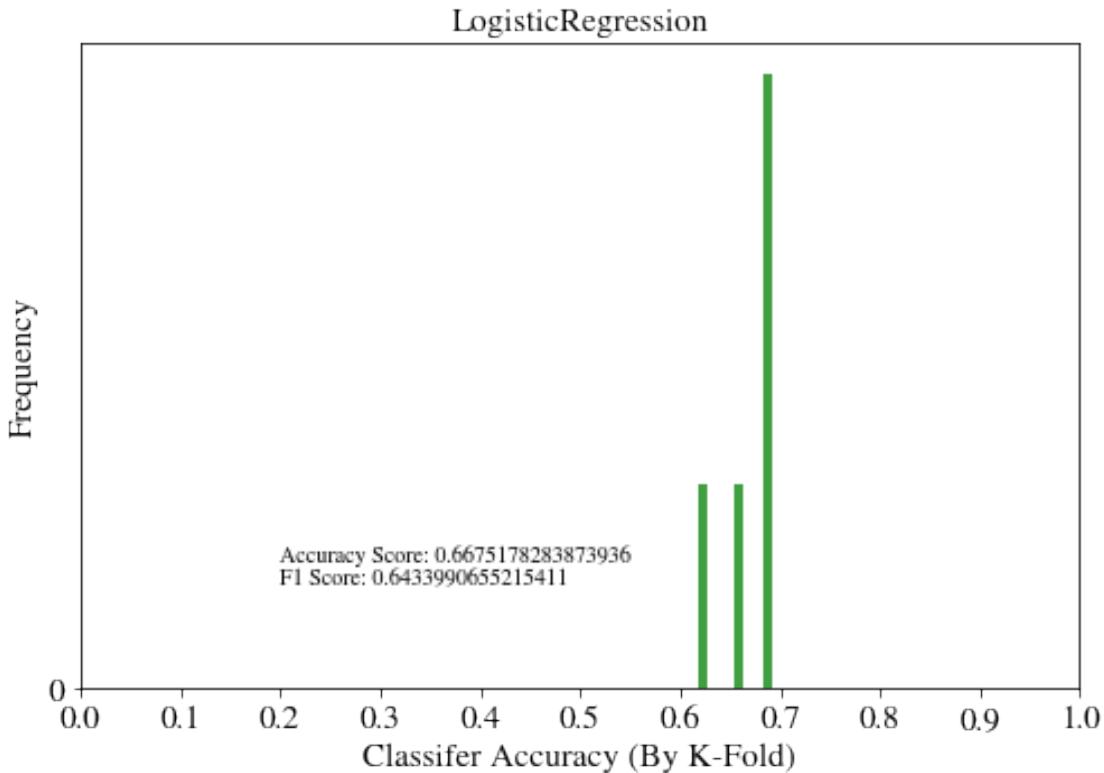
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes', 'accuracy': [0.6481481481481481, 0.6111111111111112, 0.6851851851852, 0.691358024691358, 0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1': [0.6278531809932776, 0.5914528337008957, 0.6530456650961214, 0.6679011635381619, 0.6553240536045052], 'avgF1': 0.6391153793865924, 'precision': [0.6481481481481481, 0.6111111111111112, 0.6851851851852, 0.691358024691358, 0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall': [0.6481481481481481, 0.6111111111111112, 0.6851851851852, 0.691358024691358, 0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
```

Processing Model: KNeighborsClassifier



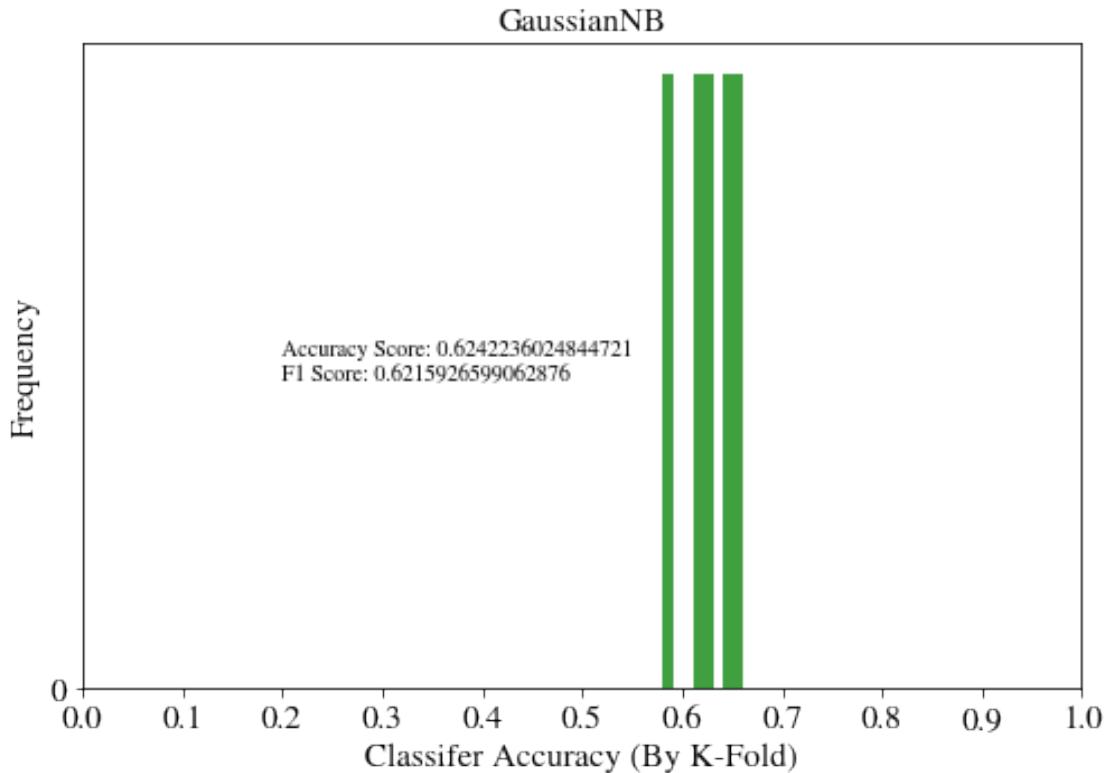
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes', 'accuracy': [0.6358024691358025, 0.6111111111111112,  
0.691358024691358, 0.6975308641975309, 0.6645962732919255], 'avgAccuracy':  
0.6600797484855456, 'f1': [0.5808836402631875, 0.5813482097969886,  
0.658384112492769, 0.6461066731219236, 0.6639030982847446], 'avgF1':  
0.6261251467919227, 'precision': [0.6358024691358025, 0.6111111111111112,  
0.691358024691358, 0.6975308641975309, 0.6645962732919255], 'avgPrecision':  
0.6600797484855456, 'recall': [0.6358024691358025, 0.6111111111111112,  
0.691358024691358, 0.6975308641975309, 0.6645962732919255], 'avgRecall':  
0.6600797484855456, 'params': [{algorithm': 'auto', 'leaf_size': 30, 'metric':  
'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 16, 'p': 2,  
'weights': 'uniform'}]}}
*****
```

Processing Model: LogisticRegression



```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes', 'accuracy': [0.654320987654321, 0.6172839506172839,  
0.6851851851852, 0.691358024691358, 0.6894409937888198], 'avgAccuracy':  
0.6675178283873936, 'f1': [0.6364135526199495, 0.5916420442674649,  
0.65354622203565, 0.6567057085575605, 0.6786878001270805], 'avgF1':  
0.6433990655215411, 'precision': [0.654320987654321, 0.6172839506172839,  
0.6851851851852, 0.691358024691358, 0.6894409937888198], 'avgPrecision':  
0.6675178283873936, 'recall': [0.654320987654321, 0.6172839506172839,  
0.6851851851852, 0.691358024691358, 0.6894409937888198], 'avgRecall':  
0.6675178283873936, 'params': [{C': 1, 'class_weight': None, 'dual': False,  
'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None, 'max_iter':  
100, 'multi_class': 'multinomial', 'n_jobs': -1, 'penalty': 'l2',  
'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0,  
'warm_start': False}]}  
*****
```

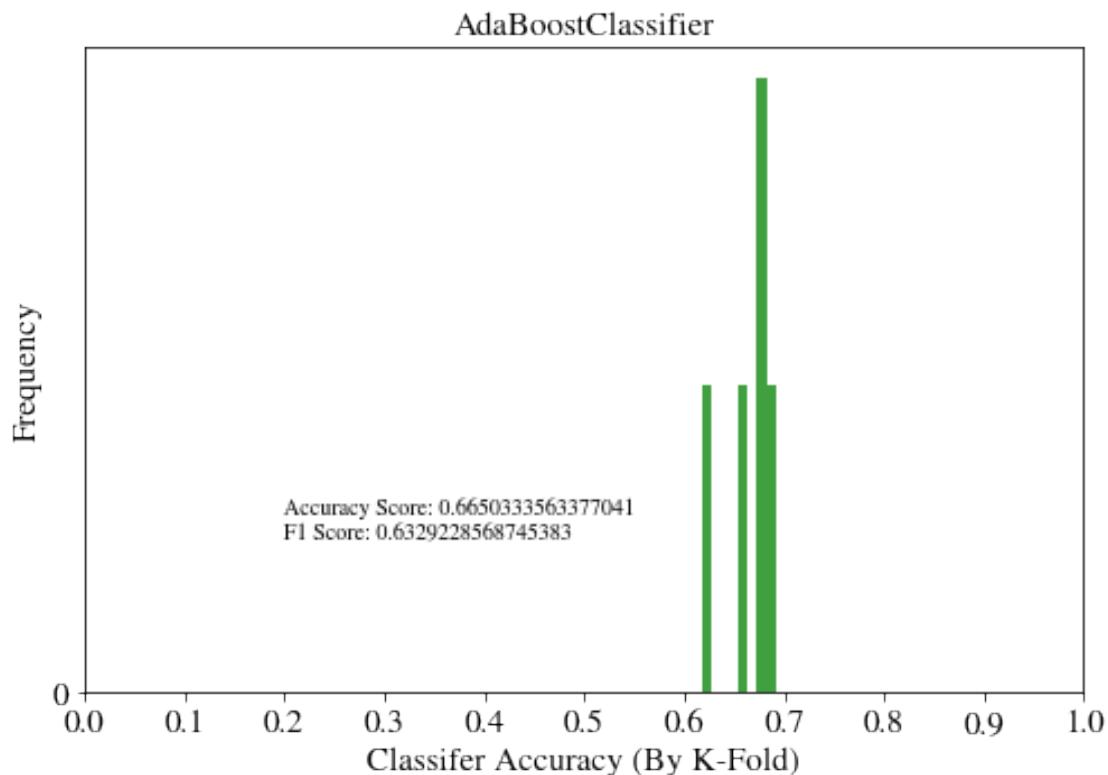
Processing Model: GaussianNB



```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes', 'accuracy': [0.6172839506172839, 0.5802469135802469, 0.6419753086419753, 0.6604938271604939, 0.6211180124223602], 'avgAccuracy': 0.6242236024844721, 'f1': [0.6149403155980189, 0.5675423632954071, 0.6346691781793865, 0.6579802123636537, 0.6328312300949723], 'avgF1': 0.6215926599062876, 'precision': [0.6172839506172839, 0.5802469135802469, 0.6419753086419753, 0.6604938271604939, 0.6211180124223602], 'avgPrecision': 0.6242236024844721, 'recall': [0.6172839506172839, 0.5802469135802469, 0.6419753086419753, 0.6604938271604939, 0.6211180124223602], 'avgRecall': 0.6242236024844721, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}
```

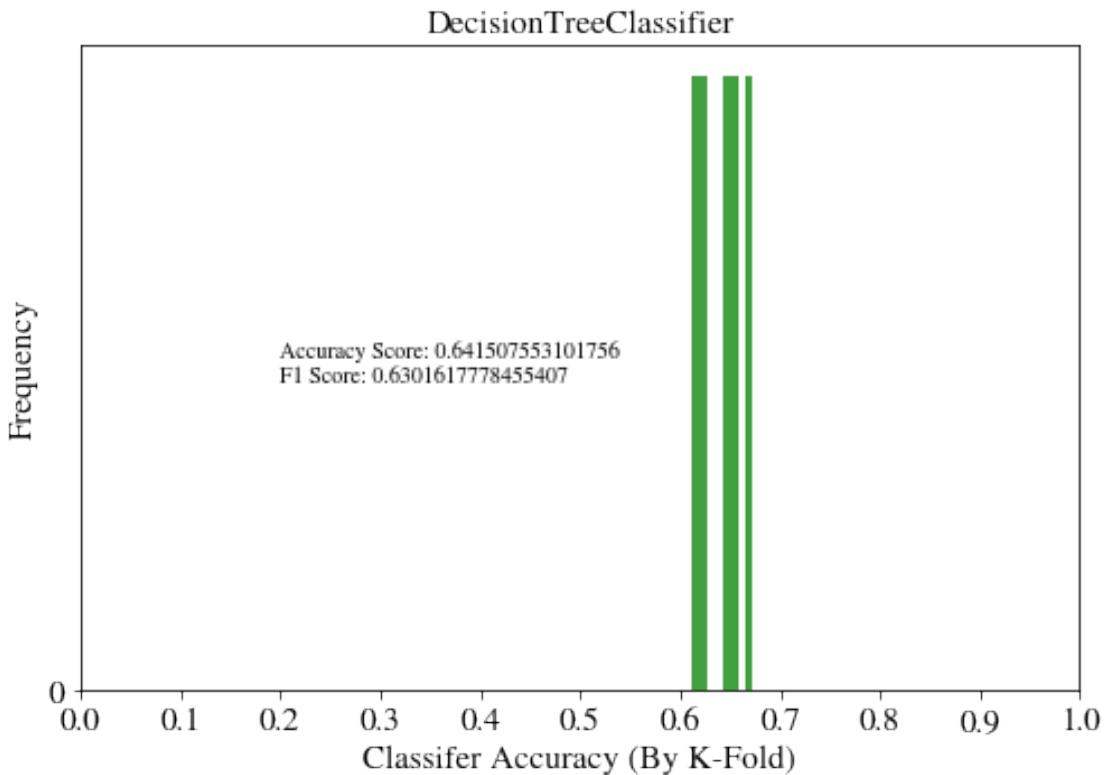
\*\*\*\*\*

Processing Model: AdaBoostClassifier



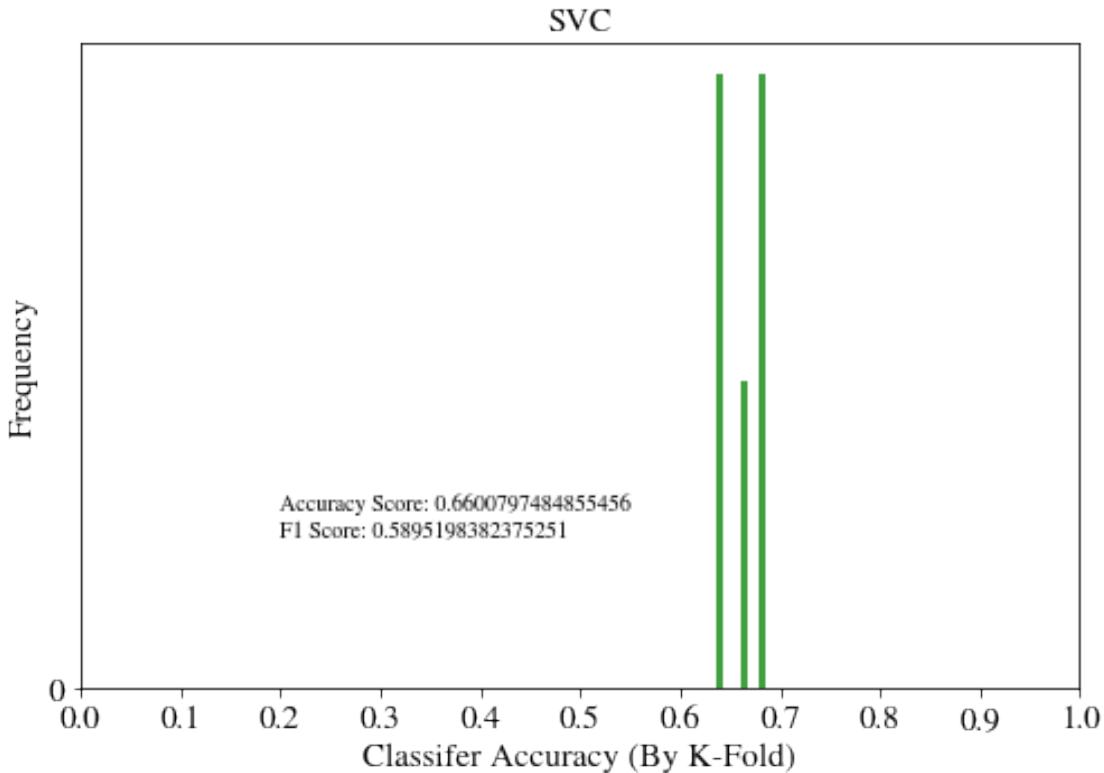
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface,  
Epithelial changes', 'accuracy': [0.6604938271604939, 0.6172839506172839,  
0.6790123456790124, 0.691358024691358, 0.6770186335403726], 'avgAccuracy':  
0.6650333563377041, 'f1': [0.6429785548143035, 0.5742884561203285,  
0.642926116994092, 0.6417539673199425, 0.6626671891240248], 'avgF1':  
0.6329228568745383, 'precision': [0.6604938271604939, 0.6172839506172839,  
0.6790123456790124, 0.691358024691358, 0.6770186335403726], 'avgPrecision':  
0.6650333563377041, 'recall': [0.6604938271604939, 0.6172839506172839,  
0.6790123456790124, 0.691358024691358, 0.6770186335403726], 'avgRecall':  
0.6650333563377041, 'params': [{algorithm': 'SAMME.R', 'base_estimator': None,  
'learning_rate': 1, 'n_estimators': 20, 'random_state': None}]}  
*****
```

Processing Model: DecisionTreeClassifier



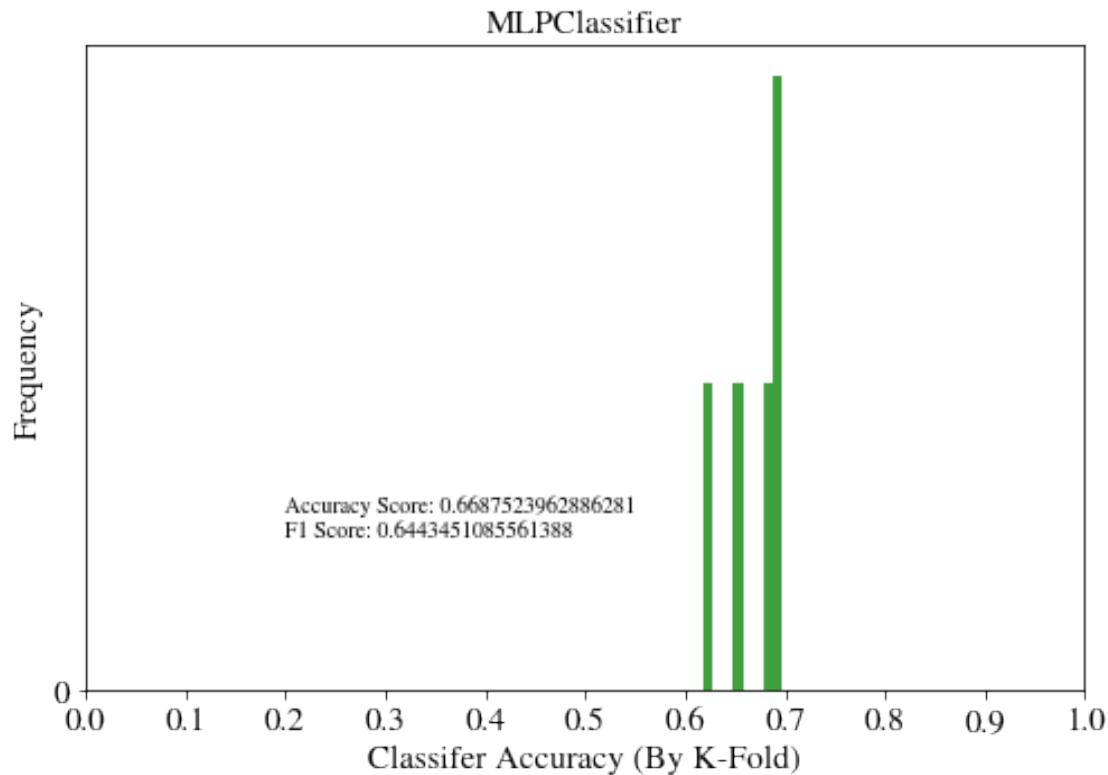
```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes', 'accuracy': [0.6481481481481481, 0.6111111111111112, 0.654320987654321, 0.6728395061728395, 0.6211180124223602], 'avgAccuracy': 0.641507553101756, 'f1': [0.6359396433470508, 0.5995990154425831, 0.6333955955100521, 0.6571150688820176, 0.6247595660459999], 'avgF1': 0.6301617778455407, 'precision': [0.6481481481481481, 0.6111111111111112, 0.654320987654321, 0.6728395061728395, 0.6211180124223602], 'avgPrecision': 0.641507553101756, 'recall': [0.6481481481481481, 0.6111111111111112, 0.654320987654321, 0.6728395061728395, 0.6211180124223602], 'avgRecall': 0.641507553101756, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'sqrt', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****
```

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes', 'accuracy': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1': [0.5537860082304527, 0.5587625610106229, 0.6001226483969817, 0.6180677396698739, 0.616860233879694], 'avgF1': 0.5895198382375251, 'precision': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params': [{C: 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial changes', 'accuracy': [0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.6975308641975309, 0.6894409937888198], 'avgAccuracy': 0.6687523962886281, 'f1': [0.6364135526199495, 0.5916420442674649, 0.65354622203565, 0.6614359237305492, 0.6786878001270805], 'avgF1': 0.6443451085561388, 'precision': [0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.6975308641975309, 0.6894409937888198], 'avgPrecision': 0.6687523962886281, 'recall': [0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.6975308641975309, 0.6894409937888198], 'avgRecall': 0.6687523962886281, 'params': [{'activation': 'identity', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'warm_start': False}]}*****
```

```

'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface, Epithelial
changes', 'accuracy': [0.654320987654321, 0.6172839506172839,
0.6851851851852, 0.6975308641975309, 0.6894409937888198], 'avgAccuracy':
0.6687523962886281, 'f1': [0.6364135526199495, 0.5916420442674649,
0.65354622203565, 0.6614359237305492, 0.6786878001270805], 'avgF1':
0.6443451085561388, 'precision': [0.654320987654321, 0.6172839506172839,
0.6851851851852, 0.6975308641975309, 0.6894409937888198], 'avgPrecision':
0.6687523962886281, 'recall': [0.654320987654321, 0.6172839506172839,
0.6851851851852, 0.6975308641975309, 0.6894409937888198], 'avgRecall':
0.6687523962886281, 'params': [{'activation': 'identity', 'alpha': 0.0001,
'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False,
'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'constant',
'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5,
'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****

```

	model	features	\
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...	
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...	
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...	
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...	
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...	
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...	
6	SVC	Active inflammation?, Severity of Crypt Arch, ...	
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...	

	accuracy	f1	precision	recall	\
0	0.657603	0.637934	0.657603	0.657603	
1	0.620551	0.586551	0.620551	0.620551	
2	0.667518	0.643399	0.667518	0.667518	
3	0.624224	0.621593	0.624224	0.624224	
4	0.637888	0.625485	0.637888	0.637888	
5	0.639054	0.625823	0.639054	0.639054	
6	0.660080	0.589520	0.660080	0.660080	
7	0.668752	0.644486	0.668752	0.668752	

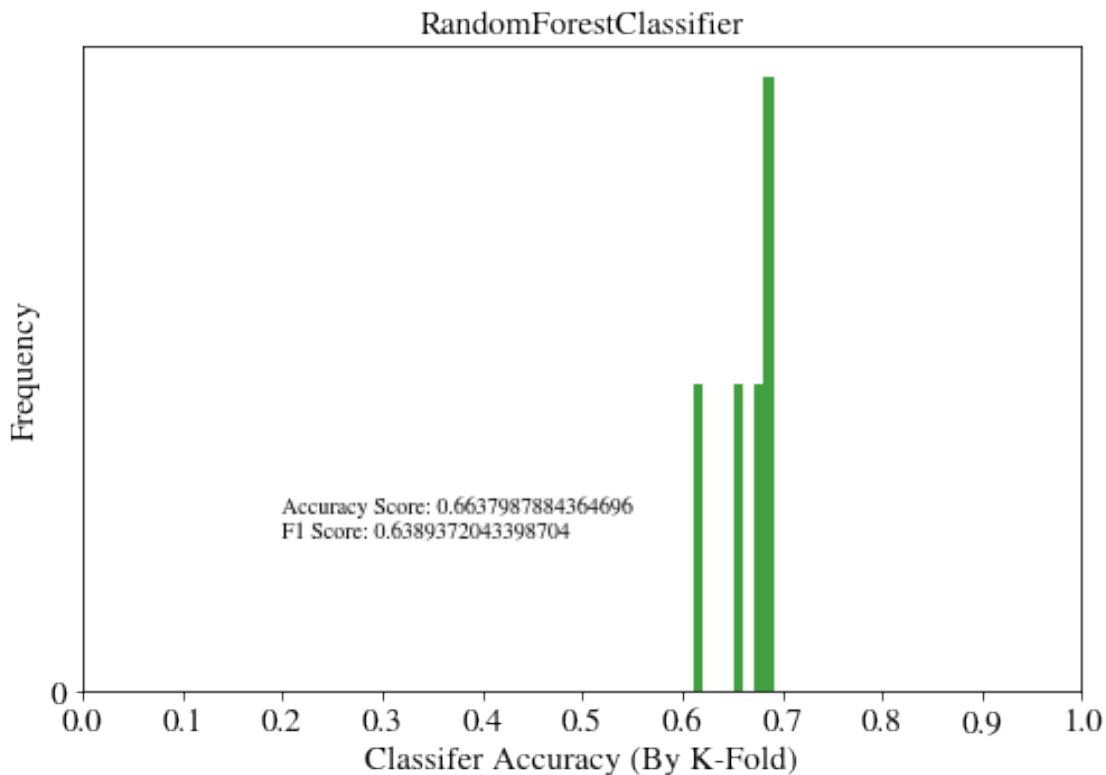
	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...

```

2 {'C': 1, 'class_weight': None, 'dual': False, ...
3         {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier



```

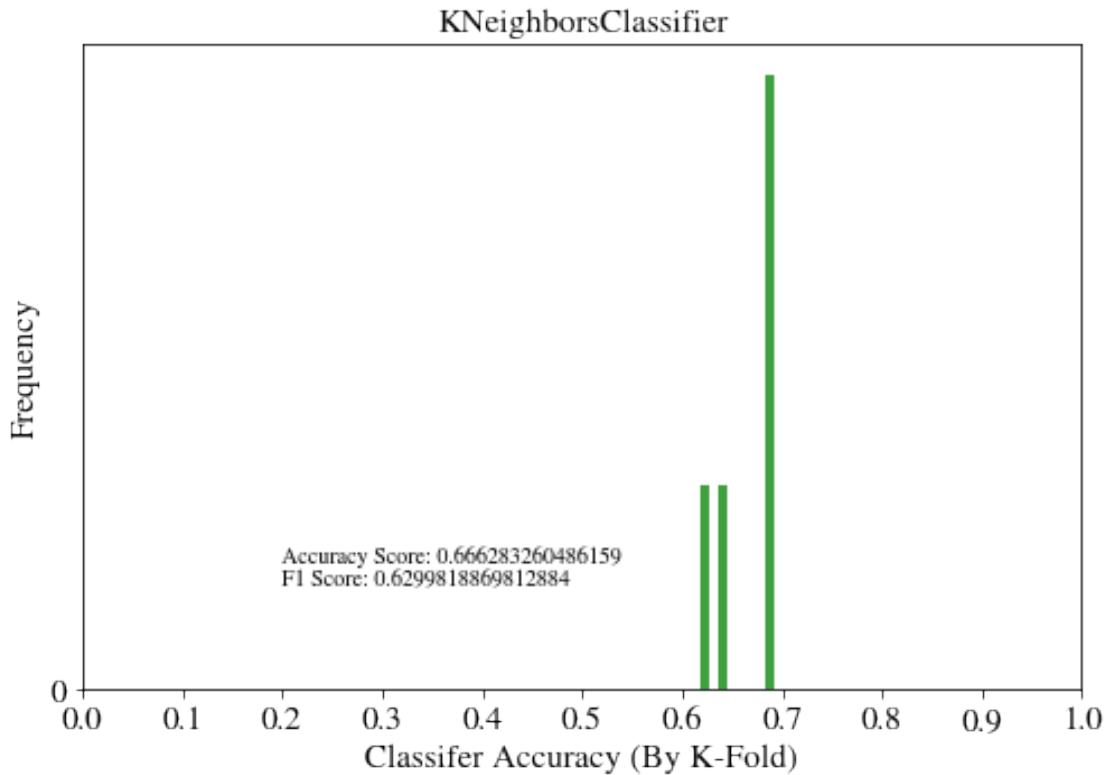
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface',  
'accuracy': [0.654320987654321, 0.6111111111111112, 0.6851851851852,  
0.691358024691358, 0.6770186335403726], 'avgAccuracy': 0.6637987884364696, 'f1':  
[0.6331826776271221, 0.5866697596746655, 0.6530456650961214, 0.6561498713545497,  
0.6656380479468935], 'avgF1': 0.6389372043398704, 'precision':  
[0.654320987654321, 0.6111111111111112, 0.6851851851852, 0.691358024691358,  
0.6770186335403726], 'avgPrecision': 0.6637987884364696, 'recall':  
[0.654320987654321, 0.6111111111111112, 0.6851851851852, 0.691358024691358,
```

```

0.6770186335403726], 'avgRecall': 0.6637987884364696, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



```

*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface', 'accuracy': [0.6419753086419753, 0.6172839506172839, 0.691358024691358, 0.691358024691358, 0.6894409937888198], 'avgAccuracy': 0.666283260486159, 'f1': [0.5671196801660119, 0.5916420442674649, 0.658384112492769, 0.6567057085575605, 0.6760578894226357], 'avgF1': 0.6299818869812884, 'precision': [0.6419753086419753, 0.6172839506172839, 0.691358024691358, 0.691358024691358,

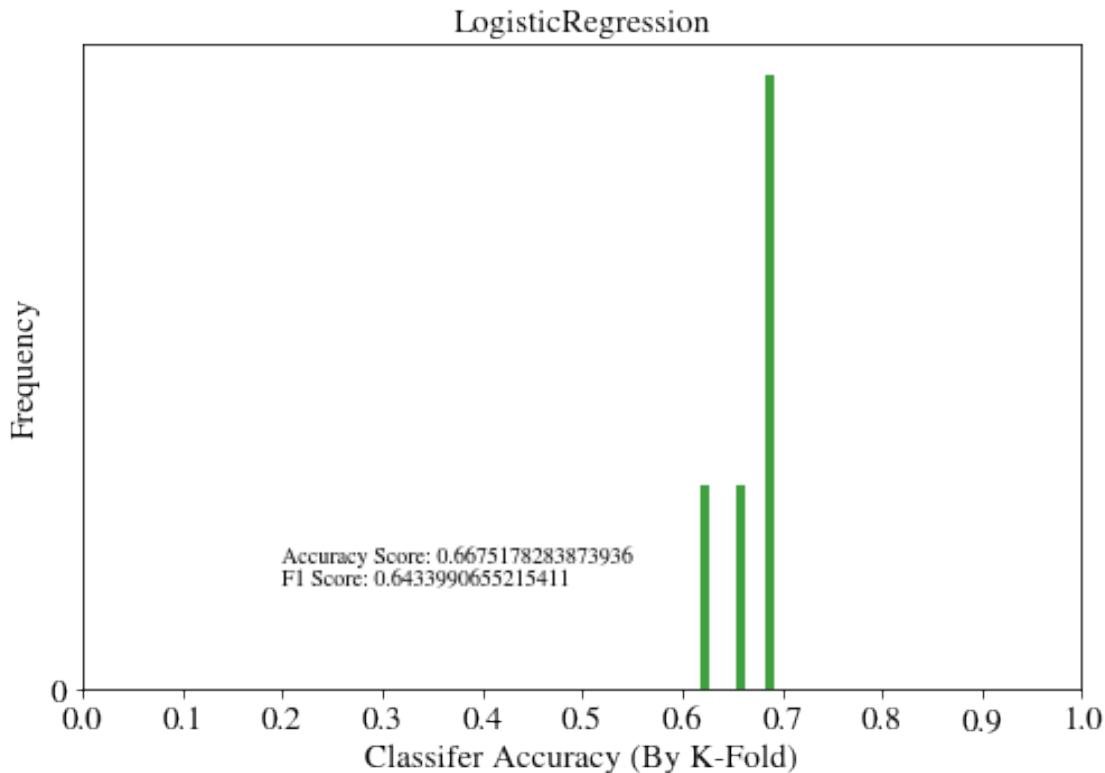
```

```

0.6894409937888198], 'avgPrecision': 0.666283260486159, 'recall':
[0.6419753086419753, 0.6172839506172839, 0.691358024691358, 0.691358024691358,
0.6894409937888198], 'avgRecall': 0.666283260486159, 'params': [{'algorithm':
'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs':
-1, 'n_neighbors': 16, 'p': 2, 'weights': 'uniform'}]}]
*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface',  

'accuracy': [0.654320987654321, 0.6172839506172839, 0.6851851851852,  

0.691358024691358, 0.6894409937888198], 'avgAccuracy': 0.6675178283873936, 'f1':  

[0.6364135526199495, 0.5916420442674649, 0.65354622203565, 0.6567057085575605,  

0.6786878001270805], 'avgF1': 0.6433990655215411, 'precision':  

[0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.691358024691358,  

0.6894409937888198], 'avgPrecision': 0.6675178283873936, 'recall':  

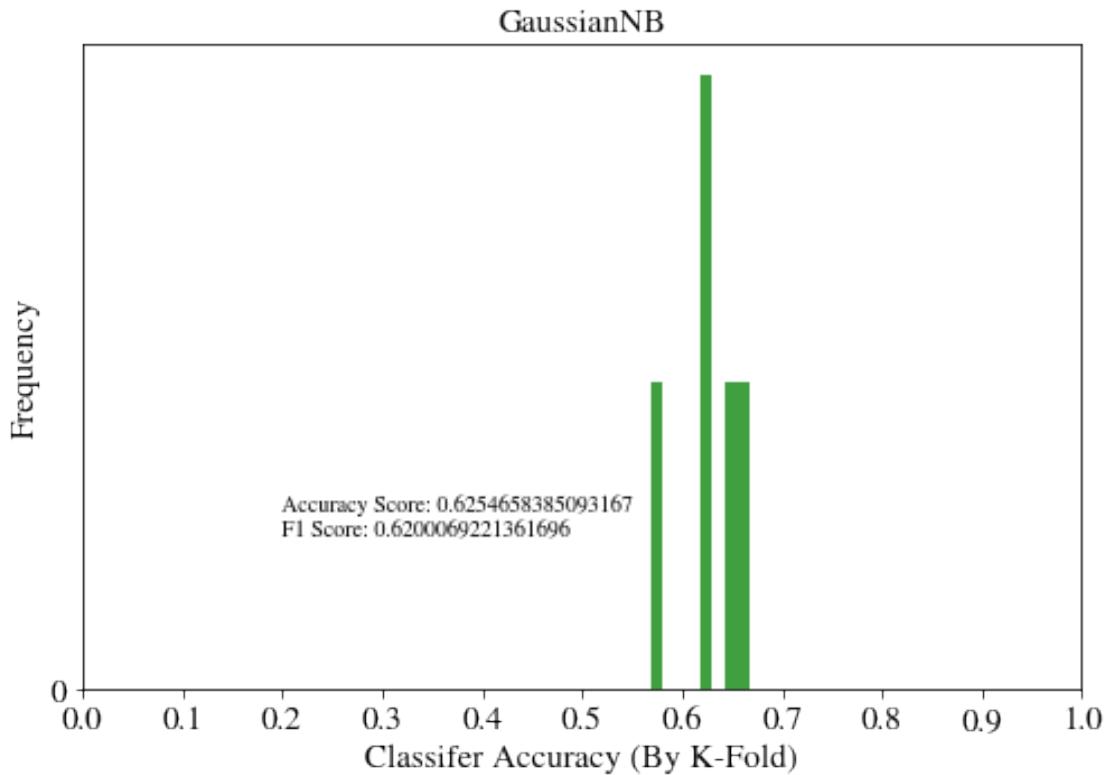
[0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.691358024691358,
```

```

0.6894409937888198], 'avgRecall': 0.6675178283873936, 'params': [{'C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'multinomial', 'n_jobs':
-1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB

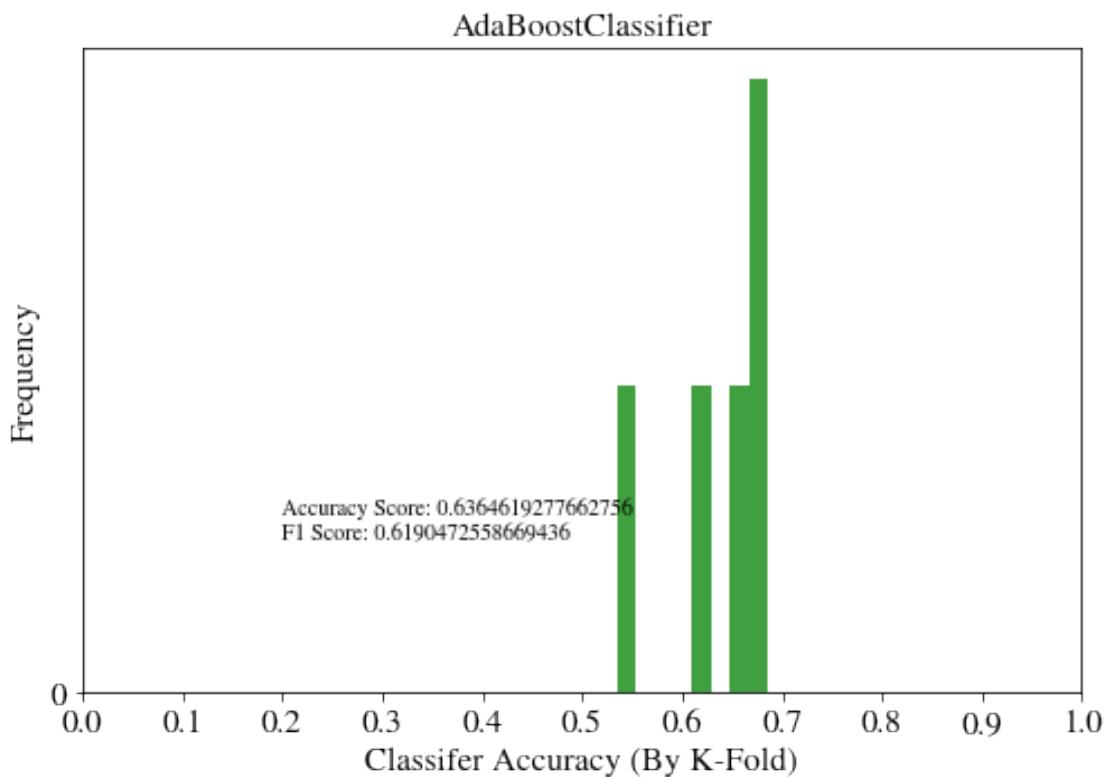


```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface', 'accuracy':
[0.6234567901234568, 0.5679012345679012, 0.6419753086419753, 0.6666666666666666,
0.6273291925465838], 'avgAccuracy': 0.6254658385093167, 'f1':
[0.6254968403096794, 0.5566785226241767, 0.6378600823045267, 0.6492393718843716,
0.6307597935580936], 'avgF1': 0.6200069221361696, 'precision':
[0.6234567901234568, 0.5679012345679012, 0.6419753086419753, 0.6666666666666666,
0.6273291925465838], 'avgPrecision': 0.6254658385093167, 'recall':
[0.6234567901234568, 0.5679012345679012, 0.6419753086419753, 0.6666666666666666,
0.6273291925465838], 'avgRecall': 0.6675178283873936, 'params': [{C: 1,
class_weight: None, dual: False, fit_intercept: True, intercept_scaling:
1, l1_ratio: None, max_iter: 100, multi_class: 'multinomial', n_jobs:
-1, penalty: 'l2', random_state: None, solver: 'newton-cg', tol: 0.0001,
verbose: 0, warm_start: False}]}
*****
```

```
0.6273291925465838], 'avgRecall': 0.6254658385093167, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}}
*****
```

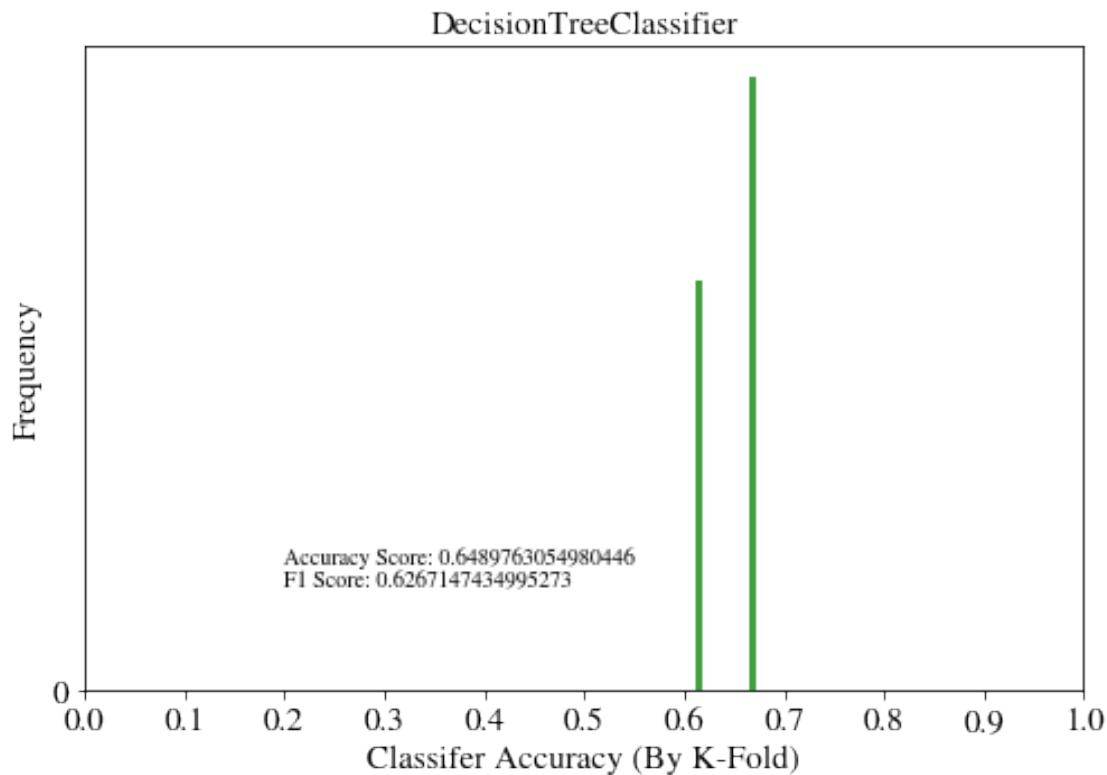
Processing Model: AdaBoostClassifier



```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface', 'accuracy': [0.6604938271604939, 0.6172839506172839, 0.6851851851851852, 0.6851851851852, 0.5341614906832298], 'avgAccuracy': 0.6364619277662756, 'f1': [0.6469965397168462, 0.5916420442674649, 0.65354622203565, 0.6522580260534254, 0.5507934472613317], 'avgF1': 0.6190472558669436, 'precision': [0.6604938271604939, 0.6172839506172839, 0.6851851851851852, 0.6851851851852, 0.5341614906832298], 'avgPrecision': 0.6364619277662756, 'recall': [0.6604938271604939, 0.6172839506172839, 0.6851851851851852, 0.6851851851852, 0.5341614906832298], 'avgRecall': 0.6364619277662756, 'params': [{'algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 50, 'random_state': None}]}}
```

\*\*\*\*\*

Processing Model: DecisionTreeClassifier

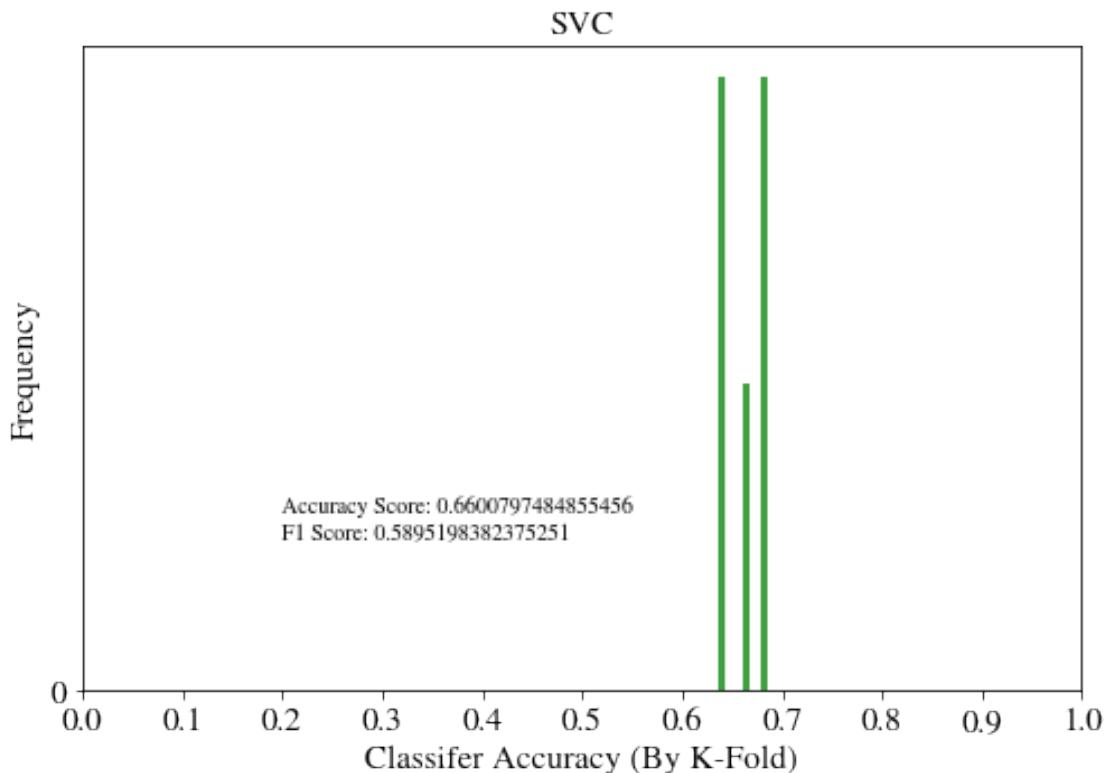


\*\*\*\*\*

```
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface', 'accuracy': [0.6172839506172839, 0.6111111111111112, 0.6728395061728395, 0.6728395061728395, 0.6708074534161491], 'avgAccuracy': 0.6489763054980446, 'f1': [0.601264002755796, 0.5866697596746655, 0.6432898948331047, 0.6418793147282307, 0.6604707455058395], 'avgF1': 0.6267147434995273, 'precision': [0.6172839506172839, 0.6111111111111112, 0.6728395061728395, 0.6728395061728395, 0.6708074534161491], 'avgPrecision': 0.6489763054980446, 'recall': [0.6172839506172839, 0.6111111111111112, 0.6728395061728395, 0.6728395061728395, 0.6708074534161491], 'avgRecall': 0.6489763054980446, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'entropy', 'max_depth': None, 'max_features': 'log2', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None}]}  
*****
```

```
'splitter': 'best'}]]}  
*****
```

Processing Model: SVC

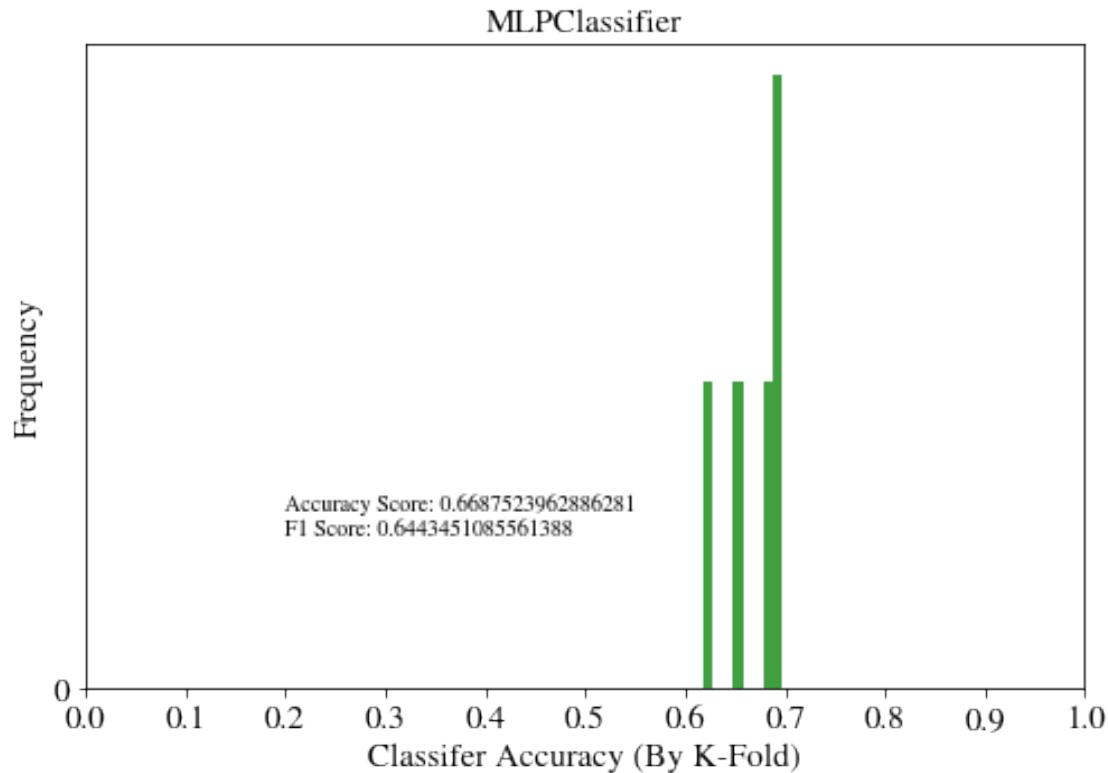


```
*****  
* SVC  
* Best Params Result:  
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface', 'accuracy': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1': [0.5537860082304527, 0.5587625610106229, 0.6001226483969817, 0.6180677396698739, 0.616860233879694], 'avgF1': 0.5895198382375251, 'precision': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None},
```

```
'shrinking': True, 'tol': 0.001, 'verbose': False}]]}
*****

```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?, Mucosal surface', 'accuracy': [0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.6975308641975309, 0.6894409937888198], 'avgAccuracy': 0.6687523962886281, 'f1': [0.6364135526199495, 0.5916420442674649, 0.65354622203565, 0.6614359237305492, 0.6786878001270805], 'avgF1': 0.6443451085561388, 'precision': [0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.6975308641975309, 0.6894409937888198], 'avgPrecision': 0.6687523962886281, 'recall': [0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.6975308641975309, 0.6894409937888198], 'avgRecall': 0.6687523962886281, 'params': [{activation': 'identity', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'constant', 'learning_rate_init': 0.001, 'max_fun': 15000,
```

```

'max_iter': 7000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum':
True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam',
'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start':
False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?, Mucosal surface', 'accuracy':
[0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.6975308641975309,
0.6894409937888198], 'avgAccuracy': 0.6687523962886281, 'f1':
[0.6364135526199495, 0.5916420442674649, 0.65354622203565, 0.6614359237305492,
0.6786878001270805], 'avgF1': 0.6443451085561388, 'precision':
[0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.6975308641975309,
0.6894409937888198], 'avgPrecision': 0.6687523962886281, 'recall':
[0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.6975308641975309,
0.6894409937888198], 'avgRecall': 0.6687523962886281, 'params': [{activation':
'identity', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum':
True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start':
False}]}
*****

```

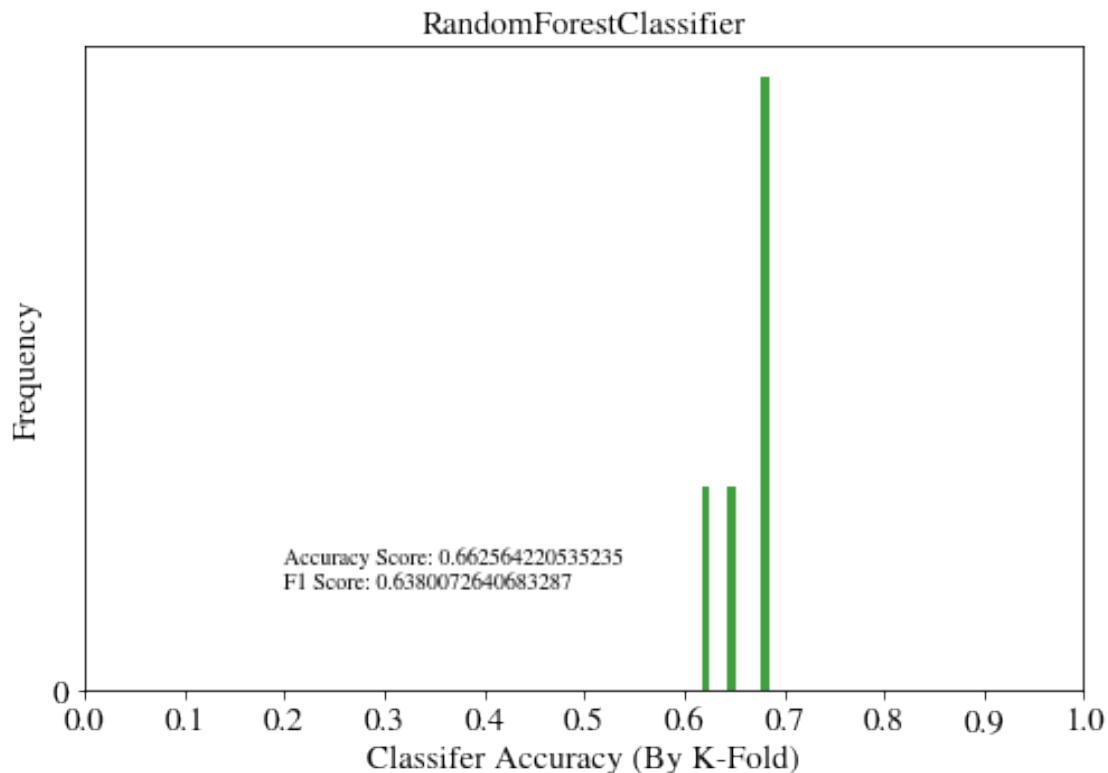
	model	features \			
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...			
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...			
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...			
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...			
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...			
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...			
6	SVC	Active inflammation?, Severity of Crypt Arch, ...			
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...			
	accuracy	f1	precision	recall	\
0	0.661330	0.636786	0.661330	0.661330	
1	0.631700	0.595161	0.631700	0.631700	
2	0.667518	0.643399	0.667518	0.667518	
3	0.625466	0.620007	0.625466	0.625466	
4	0.629016	0.612307	0.629016	0.629016	
5	0.647742	0.625719	0.647742	0.647742	
6	0.660080	0.589520	0.660080	0.660080	
7	0.668752	0.644486	0.668752	0.668752	

```

                                params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3         {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier

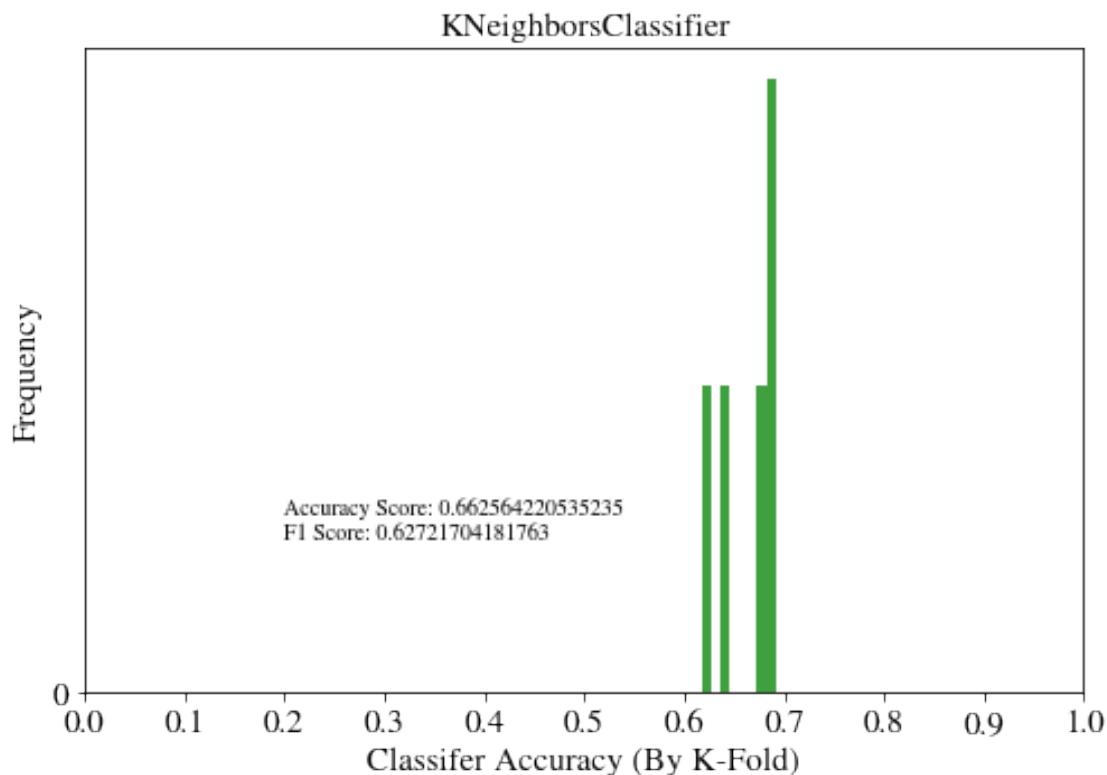


```

*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?', 'accuracy':  
[0.6481481481481, 0.6172839506172839, 0.6851851851852, 0.6851851851852,  
0.6770186335403726], 'avgAccuracy': 0.662564220535235, 'f1':  
[0.6278531809932776, 0.5916420442674649, 0.6530456650961214, 0.6517701533306176,  
0.6657252766541621], 'avgF1': 0.6380072640683287, 'precision':
```

```
[0.6481481481481481, 0.6172839506172839, 0.6851851851851852, 0.6851851851851852,
0.6770186335403726], 'avgPrecision': 0.662564220535235, 'recall':
[0.6481481481481481, 0.6172839506172839, 0.6851851851851852, 0.6851851851851852,
0.6770186335403726], 'avgRecall': 0.662564220535235, 'params': [{bootstrap':
True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth':
None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None,
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200,
'n_jobs': -1, 'oob_score': False, 'random_state': None, 'verbose': 0,
'warm_start': False}]}}
*****
```

Processing Model: KNeighborsClassifier

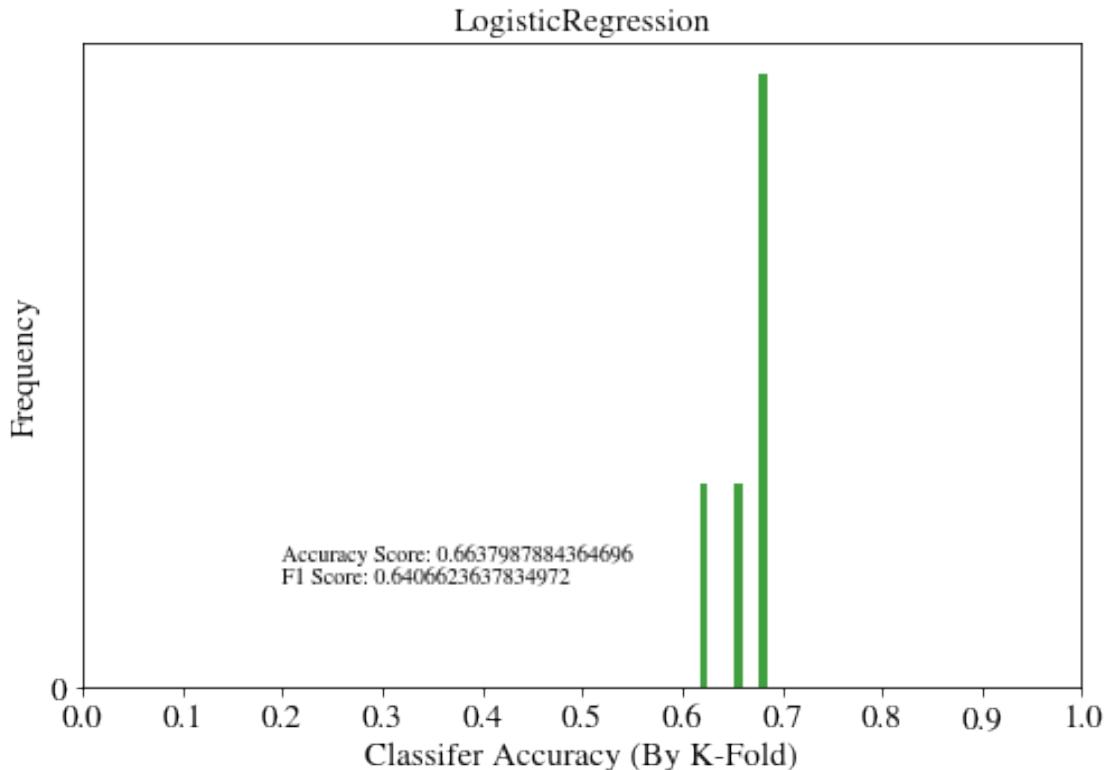


```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,',
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture, Patchy lamina propria cellularity?', 'accuracy':
[0.6419753086419753, 0.6172839506172839, 0.691358024691358, 0.6851851851851852,
0.6770186335403726], 'avgAccuracy': 0.662564220535235, 'f1':
```

```
[0.5680757496203289, 0.5916420442674649, 0.658384112492769, 0.6522580260534254,
0.6657252766541621], 'avgF1': 0.62721704181763, 'precision':
[0.6419753086419753, 0.6172839506172839, 0.691358024691358, 0.6851851851852,
0.6770186335403726], 'avgPrecision': 0.662564220535235, 'recall':
[0.6419753086419753, 0.6172839506172839, 0.691358024691358, 0.6851851851852,
0.6770186335403726], 'avgRecall': 0.662564220535235, 'params': [{}{'algorithm':
'auto', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs':
-1, 'n_neighbors': 16, 'p': 2, 'weights': 'uniform'}]]}
*****

```

Processing Model: LogisticRegression

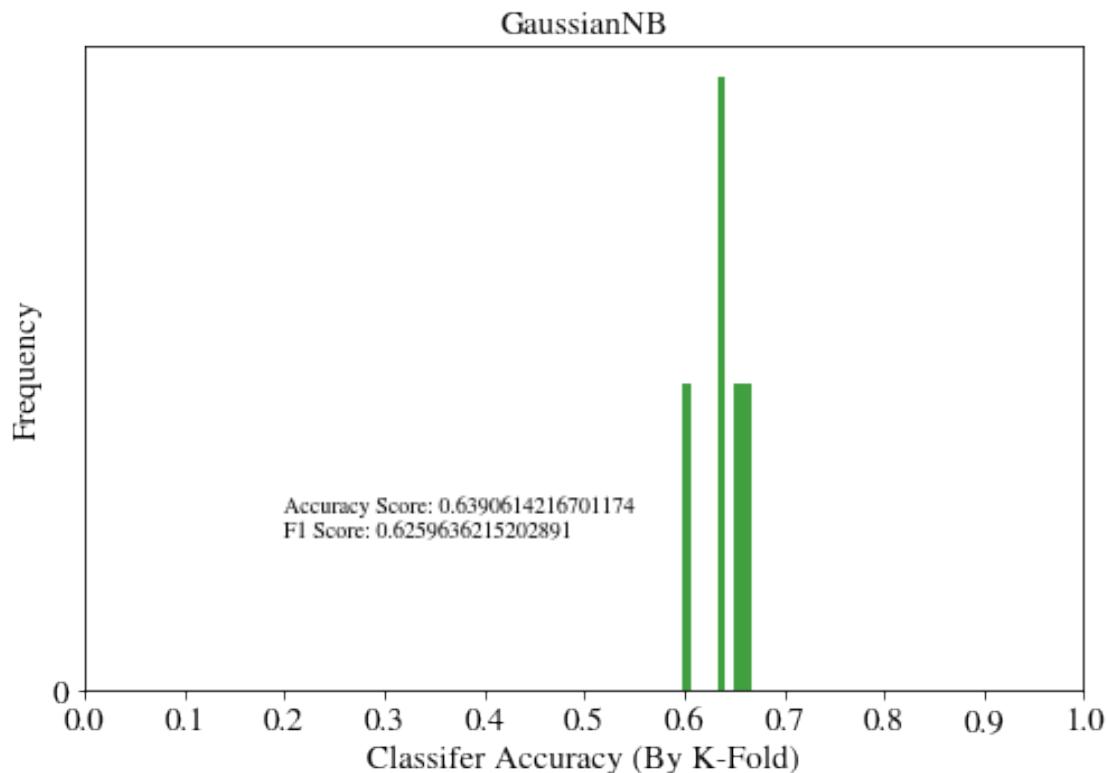


```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?', 'accuracy':
[0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.6851851851852,
0.6770186335403726], 'avgAccuracy': 0.6637987884364696, 'f1':
[0.637536971349645, 0.5916420442674649, 0.65354622203565, 0.6522580260534254,
0.6683285552113006], 'avgF1': 0.6406623637834972, 'precision':
```

```
[0.654320987654321, 0.6172839506172839, 0.6851851851851852, 0.6851851851851852,
0.6770186335403726], 'avgPrecision': 0.6637987884364696, 'recall':
[0.654320987654321, 0.6172839506172839, 0.6851851851851852, 0.6851851851851852,
0.6770186335403726], 'avgRecall': 0.6637987884364696, 'params': [{C': 1,
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'ovr', 'n_jobs': -1,
'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,
'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB

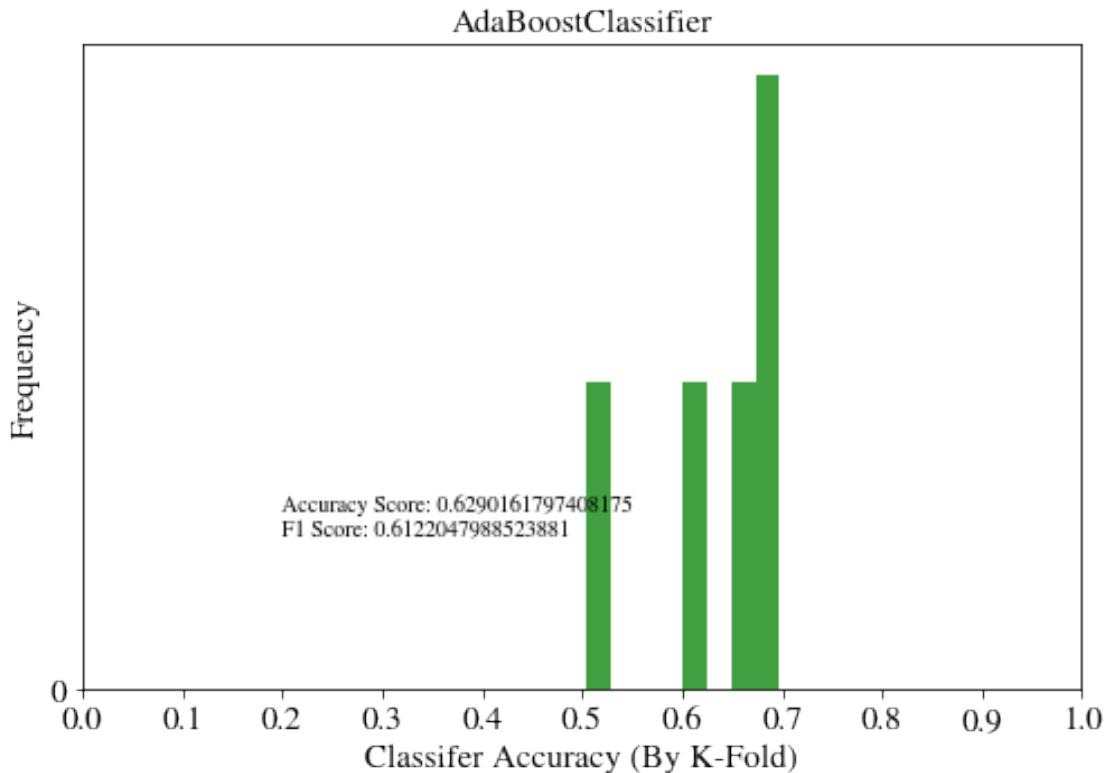


```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?', 'accuracy':
[0.6358024691358025, 0.5987654320987654, 0.654320987654321, 0.6666666666666666,
0.639751552795031], 'avgAccuracy': 0.6390614216701174, 'f1':
[0.6279565287848432, 0.5777481747637021, 0.6376559870711918, 0.6450083556026708,
0.6414490613790377], 'avgF1': 0.6259636215202891, 'precision':
```

```
[0.6358024691358025, 0.5987654320987654, 0.654320987654321, 0.6666666666666666,
0.639751552795031], 'avgPrecision': 0.6390614216701174, 'recall':
[0.6358024691358025, 0.5987654320987654, 0.654320987654321, 0.6666666666666666,
0.639751552795031], 'avgRecall': 0.6390614216701174, 'params': [{'priors': None,
'var_smoothing': 1e-09}]}
*****

```

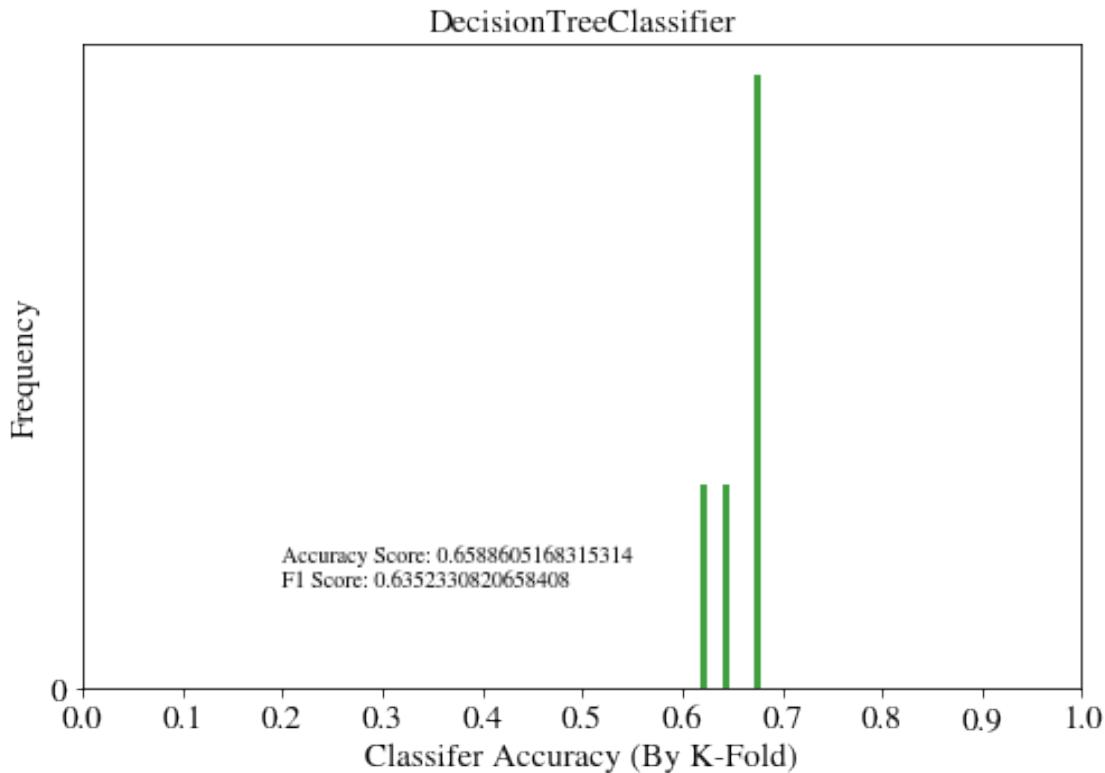
Processing Model: AdaBoostClassifier



```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?', 'accuracy':
[0.654320987654321, 0.611111111111112, 0.6975308641975309, 0.6790123456790124,
0.5031055900621118], 'avgAccuracy': 0.6290161797408175, 'f1':
[0.637536971349645, 0.5866697596746655, 0.6688400306544482, 0.6469561174422286,
0.5210211151409533], 'avgF1': 0.6122047988523881, 'precision':
[0.654320987654321, 0.611111111111112, 0.6975308641975309, 0.6790123456790124,
0.5031055900621118], 'avgPrecision': 0.6290161797408175, 'recall':
[0.654320987654321, 0.611111111111112, 0.6975308641975309, 0.6790123456790124,
```

```
0.5031055900621118], 'avgRecall': 0.6290161797408175, 'params': [{algorithm':  
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 20,  
'random_state': None}]}  
*****
```

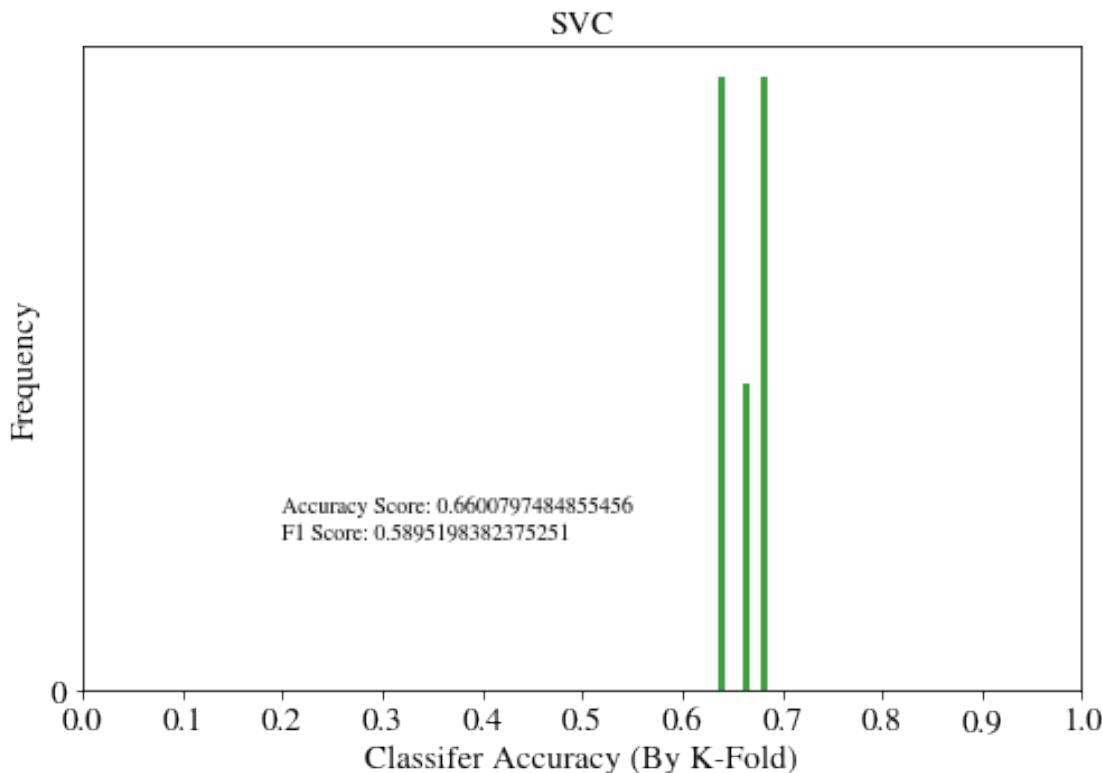
Processing Model: DecisionTreeClassifier



```
*****  
* DecisionTreeClassifier  
* Best Params Result:  
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture, Patchy lamina propria cellularity?', 'accuracy':  
[0.6419753086419753, 0.6172839506172839, 0.6790123456790124, 0.6790123456790124,  
0.6770186335403726], 'avgAccuracy': 0.6588605168315314, 'f1':  
[0.6236772591777753, 0.5916420442674649, 0.6481647127875735, 0.6469561174422286,  
0.6657252766541621], 'avgF1': 0.6352330820658408, 'precision':  
[0.6419753086419753, 0.6172839506172839, 0.6790123456790124, 0.6790123456790124,  
0.6770186335403726], 'avgPrecision': 0.6588605168315314, 'recall':  
[0.6419753086419753, 0.6172839506172839, 0.6790123456790124, 0.6790123456790124,  
0.6770186335403726], 'avgRecall': 0.6588605168315314, 'params': [{'ccp_alpha':  
0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None,
```

```
'max_features': 'auto', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****
*****
```

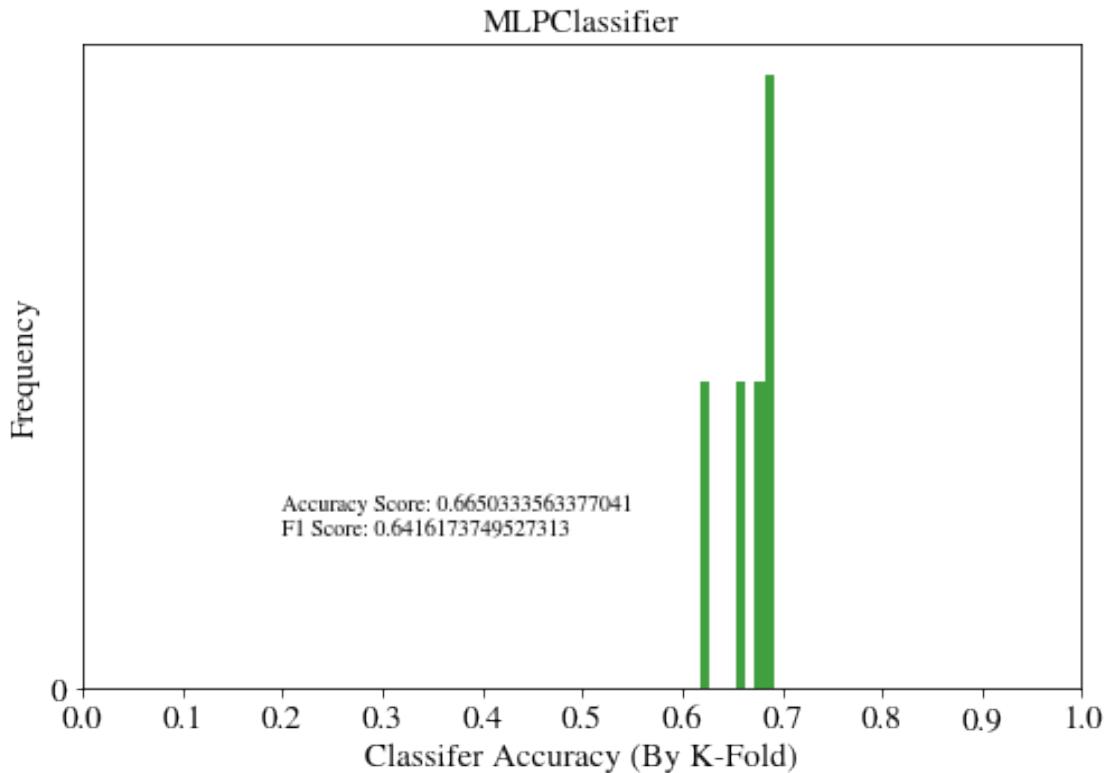
Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture, Patchy lamina propria cellularity?', 'accuracy': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1': [0.5537860082304527, 0.5587625610106229, 0.6001226483969817, 0.6180677396698739, 0.616860233879694], 'avgF1': 0.5895198382375251, 'precision': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'dual': True, 'fit_intercept': True, 'gamma': 'scale', 'kernel': 'rbf', 'max_iter': -1, 'probability': True, 'random_state': None, 'tol': 0.001, 'verbose': 0}], 'support': [1, 1, 1, 1, 1]}]
```

```
'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel':
'linear', 'max_iter': -1, 'probability': False, 'random_state': None,
'shrinking': True, 'tol': 0.001, 'verbose': False}]]}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture, Patchy lamina propria cellularity?', 'accuracy':
[0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.691358024691358,
0.6770186335403726], 'avgAccuracy': 0.6650333563377041, 'f1':
[0.637536971349645, 0.5916420442674649, 0.65354622203565, 0.6570330818995961,
0.6683285552113006], 'avgF1': 0.6416173749527313, 'precision':
[0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.691358024691358,
0.6770186335403726], 'avgPrecision': 0.6650333563377041, 'recall':
[0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.691358024691358,
0.6770186335403726], 'avgRecall': 0.6650333563377041, 'params': [{}{'activation':
'identity', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
```

```

0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,),  

'learning_rate': 'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000,  

'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum':  

True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam',  

'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start':  

False}]}  

*****  

*****  

* Best Performing Model and Params is:  

* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of  

Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal  

increase in lamina propria cellularity, Lamina propria polymorphs, Crypt  

architecture, Patchy lamina propria cellularity?', 'accuracy':  

[0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.691358024691358,  

0.6770186335403726], 'avgAccuracy': 0.6650333563377041, 'f1':  

[0.637536971349645, 0.5916420442674649, 0.65354622203565, 0.6570330818995961,  

0.6683285552113006], 'avgF1': 0.6416173749527313, 'precision':  

[0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.691358024691358,  

0.6770186335403726], 'avgPrecision': 0.6650333563377041, 'recall':  

[0.654320987654321, 0.6172839506172839, 0.6851851851852, 0.691358024691358,  

0.6770186335403726], 'avgRecall': 0.6650333563377041, 'params': [{activation':  

'identity', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':  

0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,),  

'learning_rate': 'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000,  

'max_iter': 5000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum':  

True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam',  

'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start':  

False}]}  

*****

```

	model	features	\
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...	
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...	
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...	
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...	
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...	
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...	
6	SVC	Active inflammation?, Severity of Crypt Arch, ...	
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...	

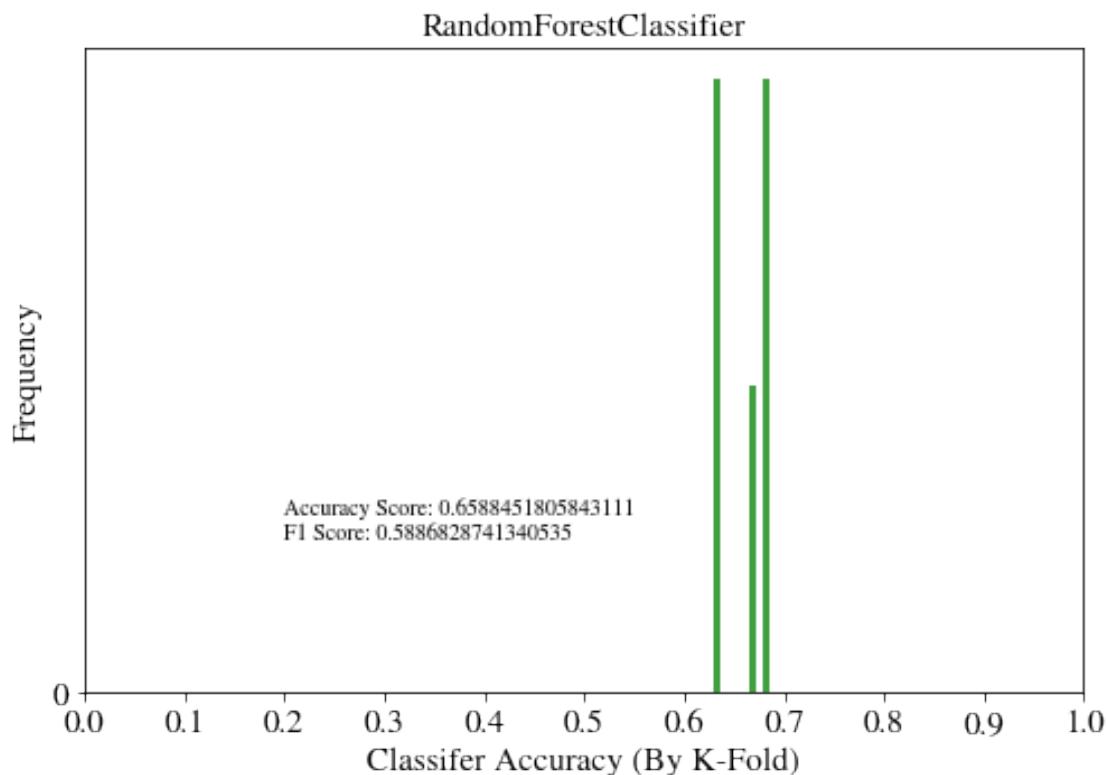
  

	accuracy	f1	precision	recall	\
0	0.658861	0.635233	0.658861	0.658861	
1	0.656391	0.623785	0.656391	0.656391	
2	0.663799	0.640662	0.663799	0.663799	
3	0.639061	0.625964	0.639061	0.639061	
4	0.626547	0.609942	0.626547	0.626547	
5	0.657618	0.634172	0.657618	0.657618	
6	0.660080	0.589520	0.660080	0.660080	

```
7 0.663799 0.640662 0.663799 0.663799
```

```
params
0 {'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1 {'algorithm': 'brute', 'leaf_size': 30, 'metri...
2 {'C': 1, 'class_weight': None, 'dual': False, ...
3     {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...
```

Processing Model: RandomForestClassifier



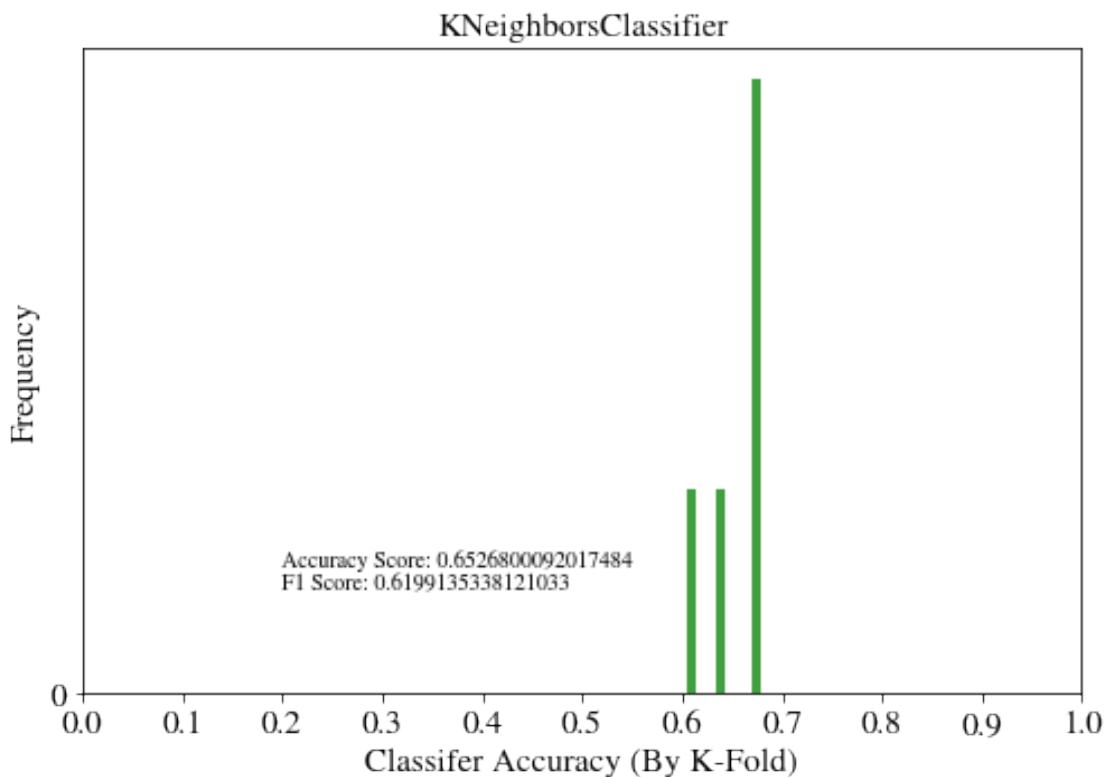
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture', 'accuracy': [0.6296296296296297, 0.6358024691358025,  
0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgAccuracy':  
0.6588451805843111, 'f1': [0.5501995574580724, 0.5587625610106229,
```

```

0.5995242786520045, 0.6180677396698739, 0.616860233879694], 'avgF1':
0.5886828741340535, 'precision': [0.6296296296296297, 0.6358024691358025,
0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgPrecision':
0.6588451805843111, 'recall': [0.6296296296296297, 0.6358024691358025,
0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgRecall':
0.6588451805843111, 'params': {'bootstrap': True, 'ccp_alpha': 0.0,
'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features':
'log2', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease':
0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score':
False, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



```

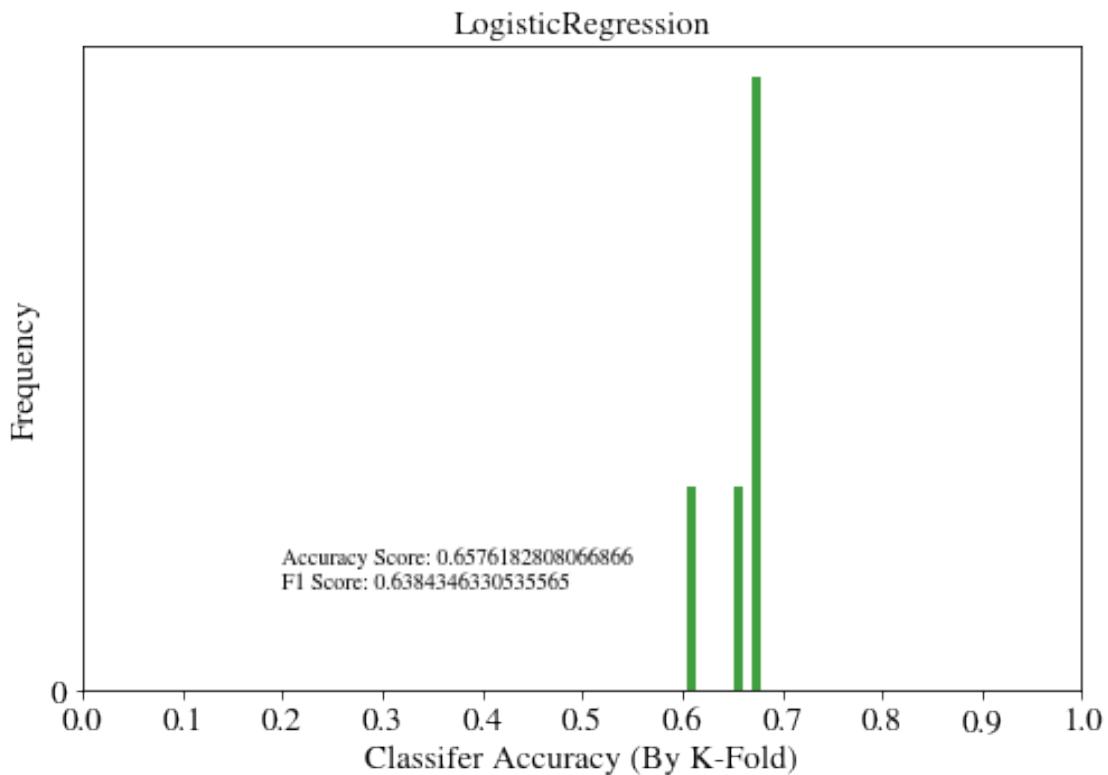
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,',
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,
Crypt architecture', 'accuracy': [0.6358024691358025, 0.6049382716049383,
0.6790123456790124, 0.6728395061728395, 0.6708074534161491], 'avgAccuracy':
```

```

0.6526800092017484, 'f1': [0.5537860082304527, 0.5816896460688556,
0.6551934667725667, 0.6484787823151803, 0.6604197656734612], 'avgF1':
0.6199135338121033, 'precision': [0.6358024691358025, 0.6049382716049383,
0.6790123456790124, 0.6728395061728395, 0.6708074534161491], 'avgPrecision':
0.6526800092017484, 'recall': [0.6358024691358025, 0.6049382716049383,
0.6790123456790124, 0.6728395061728395, 0.6708074534161491], 'avgRecall':
0.6526800092017484, 'params': [{algorithm': 'auto', 'leaf_size': 30, 'metric':
'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 16, 'p': 2,
'weights': 'uniform'}]}
*****

```

Processing Model: LogisticRegression



```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture', 'accuracy': [0.654320987654321, 0.6049382716049383,  

0.6790123456790124, 0.6790123456790124, 0.6708074534161491], 'avgAccuracy':
0.6576182808066866, 'f1': [0.6414635546784833, 0.5816896460688556,  

0.6551934667725667, 0.6534067320744158, 0.6604197656734612], 'avgF1':

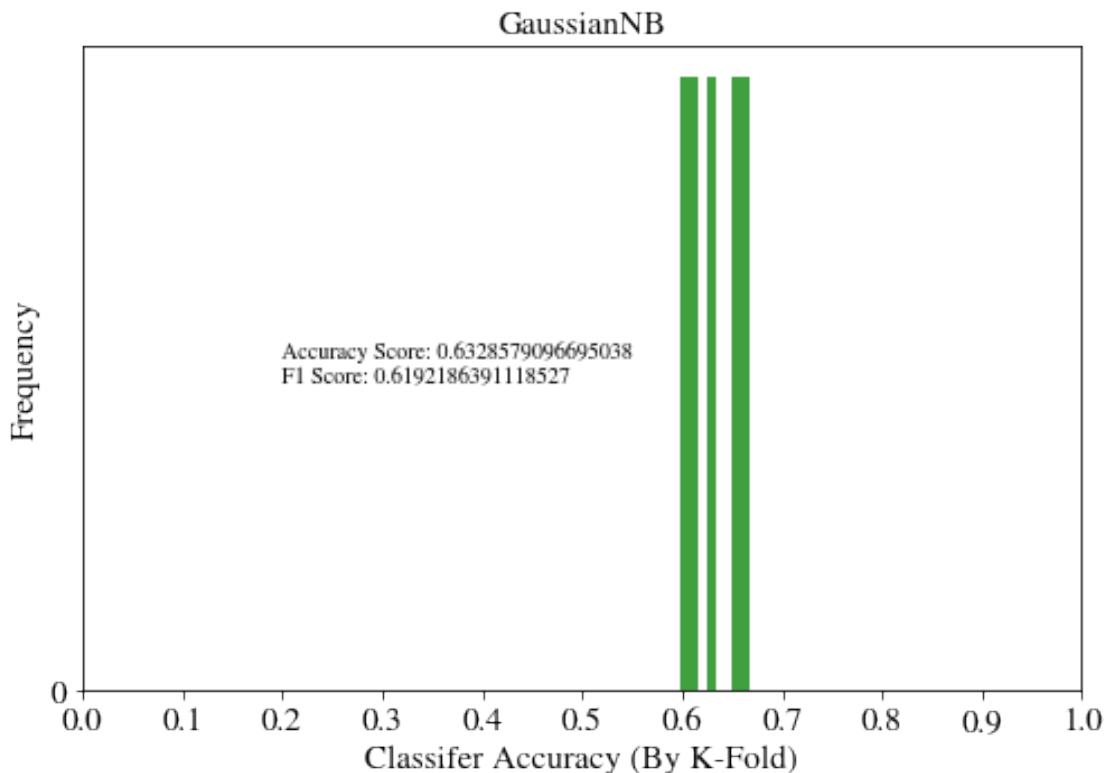
```

```

0.6384346330535565, 'precision': [0.654320987654321, 0.6049382716049383,
0.6790123456790124, 0.6790123456790124, 0.6708074534161491], 'avgPrecision':
0.6576182808066866, 'recall': [0.654320987654321, 0.6049382716049383,
0.6790123456790124, 0.6790123456790124, 0.6708074534161491], 'avgRecall':
0.6576182808066866, 'params': [{C': 1, 'class_weight': None, 'dual': False,
'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None, 'max_iter':
100, 'multi_class': 'ovr', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None,
'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: GaussianNB



```

*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture', 'accuracy': [0.6296296296296297, 0.5987654320987654,
0.654320987654321, 0.6666666666666666, 0.6149068322981367], 'avgAccuracy':
0.6328579096695038, 'f1': [0.6199224869394979, 0.5777481747637021,
0.6373340834516054, 0.6446687468909691, 0.6164197035134888], 'avgF1':
0.6192186391118527, 'precision': [0.6296296296296297, 0.5987654320987654,
```

```

0.654320987654321, 0.6666666666666666, 0.6149068322981367], 'avgPrecision':  

0.6328579096695038, 'recall': [0.6296296296296297, 0.5987654320987654,  

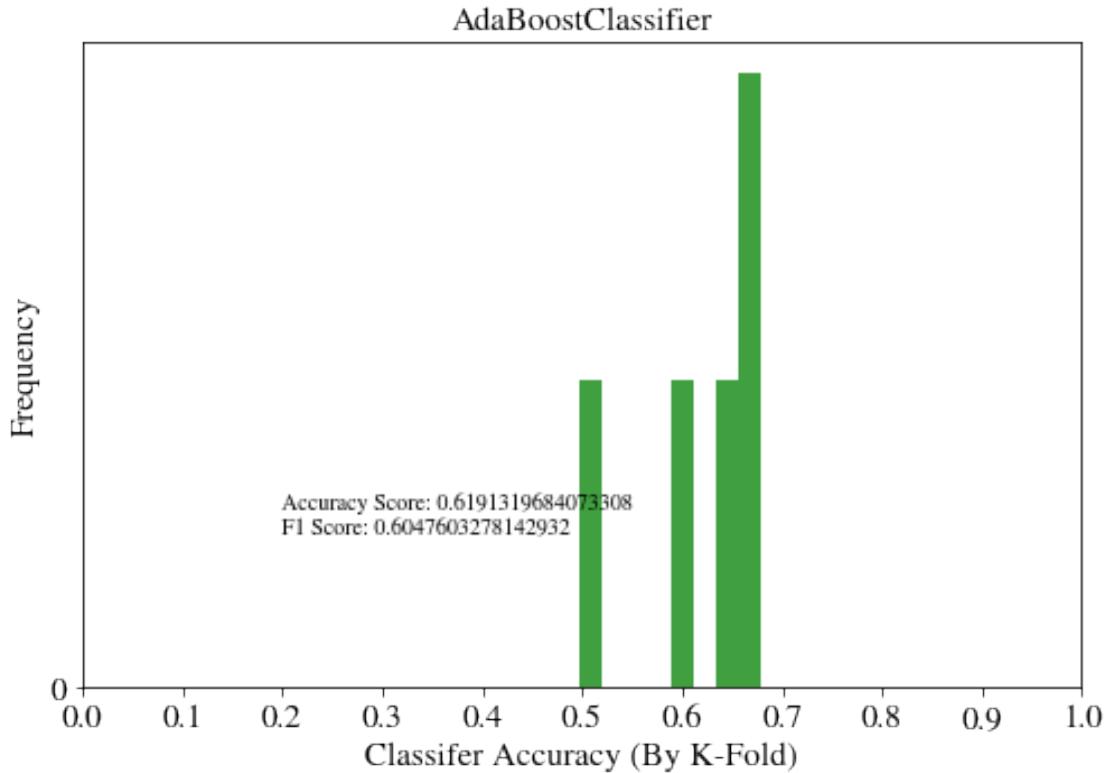
0.654320987654321, 0.6666666666666666, 0.6149068322981367], 'avgRecall':  

0.6328579096695038, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}  

*****

```

Processing Model: AdaBoostClassifier



```

*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  

transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  

Crypt architecture', 'accuracy': [0.6481481481481, 0.5925925925926,  

0.6790123456790124, 0.6790123456790124, 0.4968944099378882], 'avgAccuracy':  

0.6191319684073308, 'f1': [0.6321059386193487, 0.5716955123781968,  

0.6551934667725667, 0.6534067320744158, 0.5113999892269383], 'avgF1':  

0.6047603278142932, 'precision': [0.6481481481481, 0.5925925925926,  

0.6790123456790124, 0.6790123456790124, 0.4968944099378882], 'avgPrecision':  

0.6191319684073308, 'recall': [0.6481481481481, 0.5925925925926,  

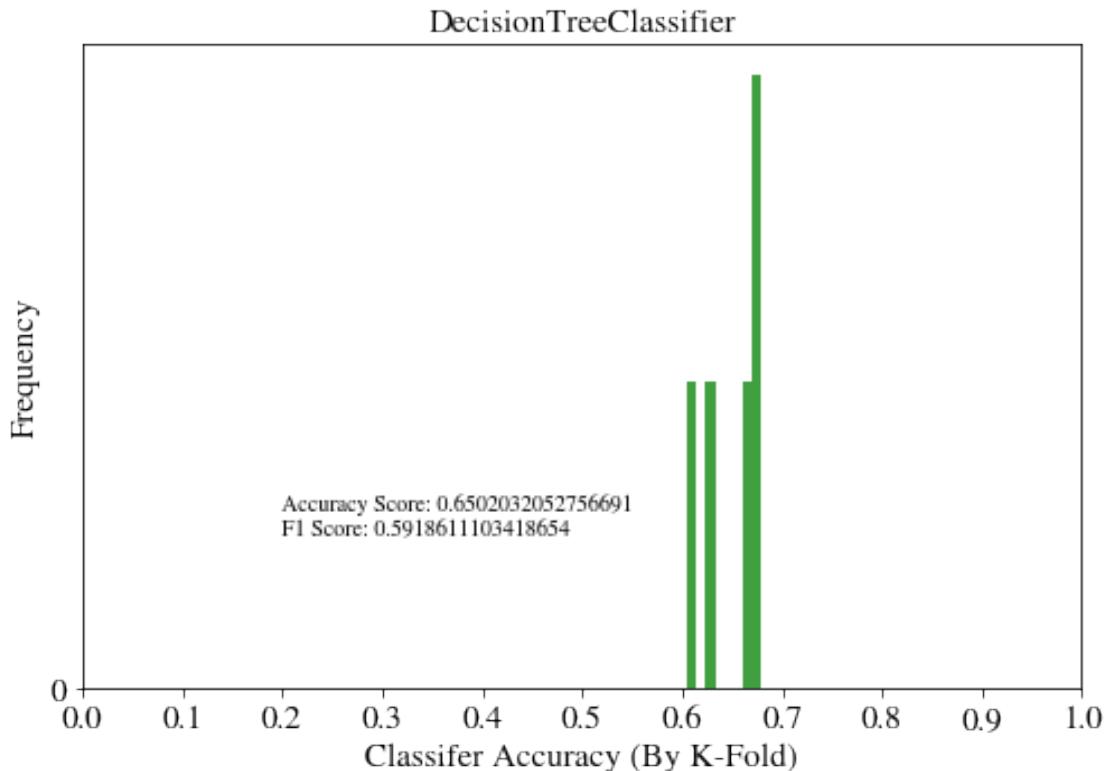
0.6790123456790124, 0.6790123456790124, 0.4968944099378882], 'avgRecall':  

0.6191319684073308, 'params': [{'algorithm': 'SAMME.R', 'base_estimator': None,

```

```
'learning_rate': 1, 'n_estimators': 20, 'random_state': None}]]}  
*****
```

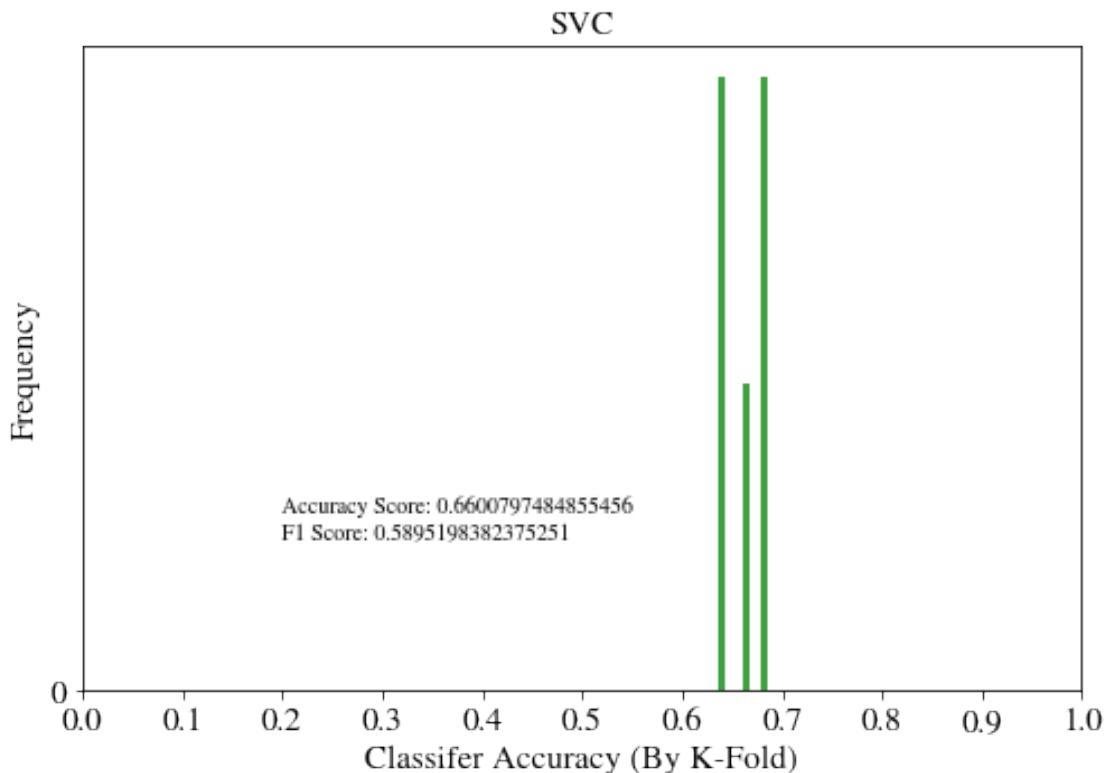
Processing Model: DecisionTreeClassifier



```
*****  
* DecisionTreeClassifier  
* Best Params Result:  
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs,  
Crypt architecture', 'accuracy': [0.6296296296296297, 0.6049382716049383,  
0.6728395061728395, 0.6790123456790124, 0.6645962732919255], 'avgAccuracy':  
0.6502032052756691, 'f1': [0.5501995574580724, 0.5816896460688556,  
0.5960928829554154, 0.6144632313472894, 0.616860233879694], 'avgF1':  
0.5918611103418654, 'precision': [0.6296296296296297, 0.6049382716049383,  
0.6728395061728395, 0.6790123456790124, 0.6645962732919255], 'avgPrecision':  
0.6502032052756691, 'recall': [0.6296296296296297, 0.6049382716049383,  
0.6728395061728395, 0.6790123456790124, 0.6645962732919255], 'avgRecall':  
0.6502032052756691, 'params': [{'ccp_alpha': 0.0, 'class_weight': None,  
'criterion': 'gini', 'max_depth': None, 'max_features': 'auto',  
'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split':  
None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf':
```

```
0.0, 'random_state': None, 'splitter': 'best']]}}
*****
```

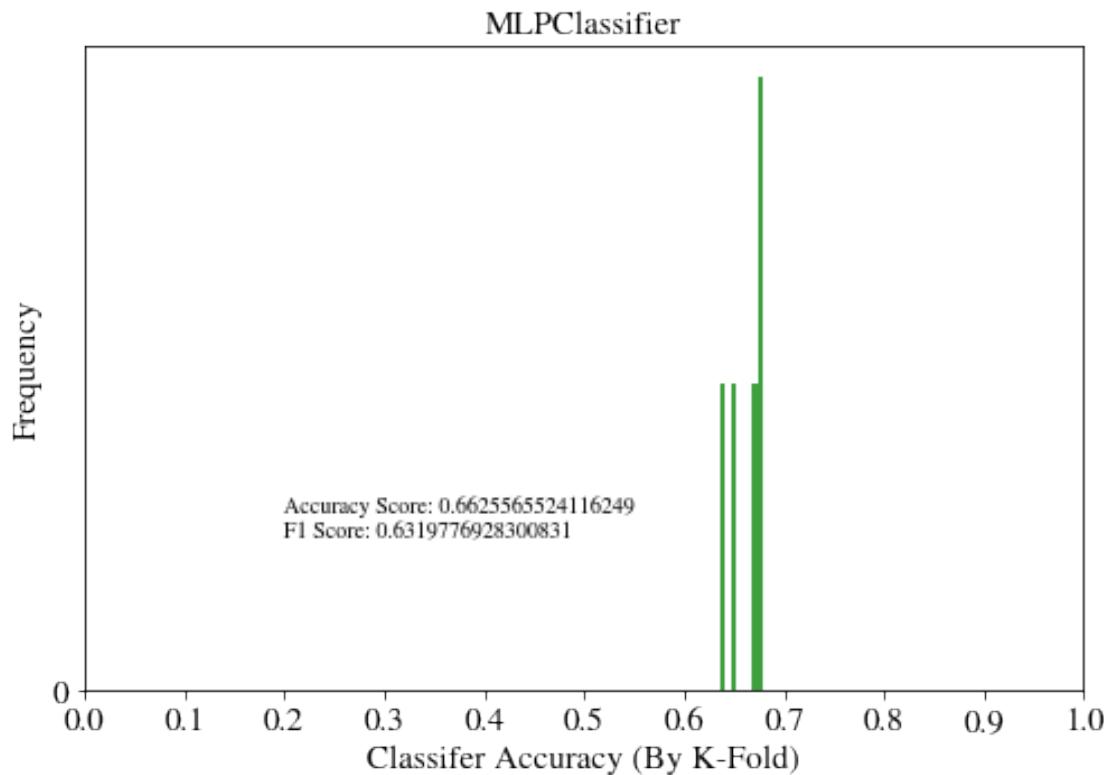
Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs, Crypt architecture', 'accuracy': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1': [0.5537860082304527, 0.5587625610106229, 0.6001226483969817, 0.6180677396698739, 0.616860233879694], 'avgF1': 0.5895198382375251, 'precision': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}}
```

```
*****
```

Processing Model: MLPClassifier



```
*****
```

```
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture', 'accuracy': [0.6481481481481, 0.6358024691358025,
0.6790123456790124, 0.6790123456790124, 0.6708074534161491], 'avgAccuracy':
0.6625565524116249, 'f1': [0.6321059386193487, 0.5587625610106229,
0.6551934667725667, 0.6534067320744158, 0.6604197656734612], 'avgF1':
0.6319776928300831, 'precision': [0.6481481481481, 0.6358024691358025,
0.6790123456790124, 0.6790123456790124, 0.6708074534161491], 'avgPrecision':
0.6625565524116249, 'recall': [0.6481481481481, 0.6358024691358025,
0.6790123456790124, 0.6790123456790124, 0.6708074534161491], 'avgRecall':
0.6625565524116249, 'params': [{activation': 'logistic', 'alpha': 0.0001,
'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False,
'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'invscaling',
'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5,
```

```

'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs, Crypt
architecture', 'accuracy': [0.6481481481481481, 0.6358024691358025,
0.6790123456790124, 0.6790123456790124, 0.6708074534161491], 'avgAccuracy':
0.6625565524116249, 'f1': [0.6321059386193487, 0.5587625610106229,
0.6551934667725667, 0.6534067320744158, 0.6604197656734612], 'avgF1':
0.6319776928300831, 'precision': [0.6481481481481481, 0.6358024691358025,
0.6790123456790124, 0.6790123456790124, 0.6708074534161491], 'avgPrecision':
0.6625565524116249, 'recall': [0.6481481481481481, 0.6358024691358025,
0.6790123456790124, 0.6790123456790124, 0.6708074534161491], 'avgRecall':
0.6625565524116249, 'params': [{activation': 'logistic', 'alpha': 0.0001,
'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False,
'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'invscaling',
'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5,
'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****

```

	model	features	\
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...	
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...	
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...	
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...	
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...	
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...	
6	SVC	Active inflammation?, Severity of Crypt Arch, ...	
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...	

	accuracy	f1	precision	recall	\
0	0.652672	0.593299	0.652672	0.652672	
1	0.639100	0.610503	0.639100	0.639100	
2	0.657618	0.638435	0.657618	0.657618	
3	0.632858	0.619219	0.632858	0.632858	
4	0.619132	0.605554	0.619132	0.619132	
5	0.650203	0.591861	0.650203	0.650203	
6	0.660080	0.589520	0.660080	0.660080	
7	0.655149	0.613831	0.655149	0.655149	

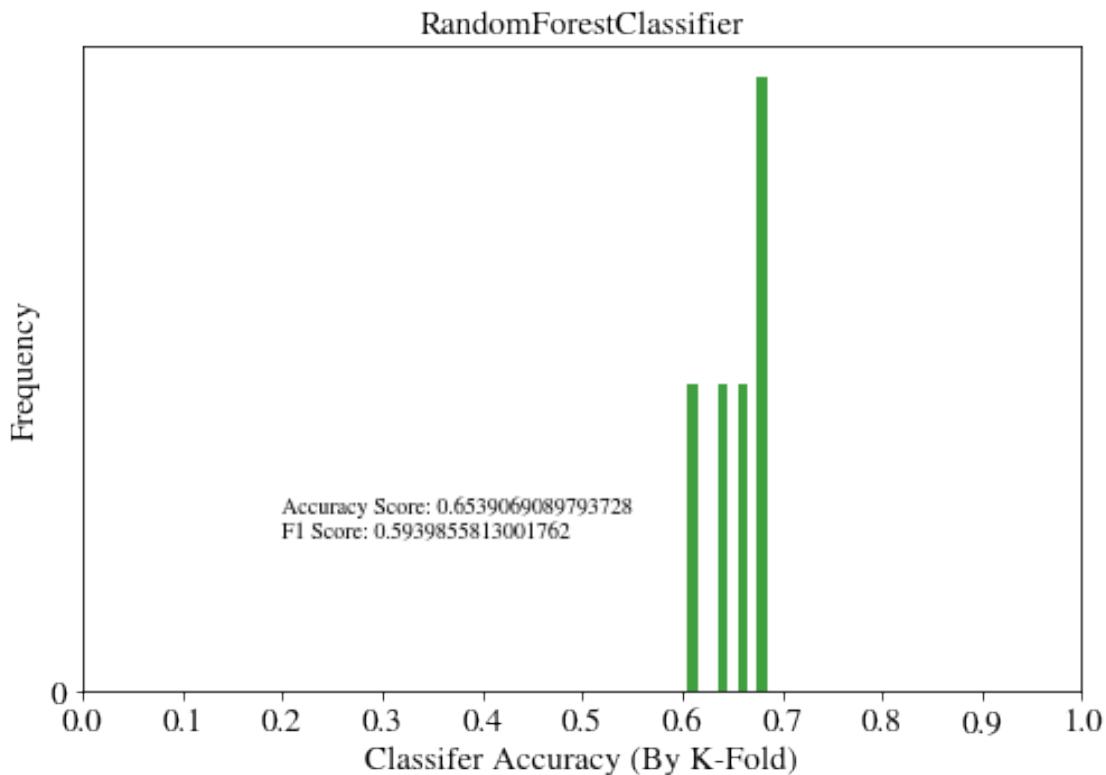
	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...

```

2 {'C': 1, 'class_weight': None, 'dual': False, ...
3         {'priors': None, 'var_smoothing': 1e-09}
4 {'algorithm': 'SAMME.R', 'base_estimator': Non...
5 {'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6 {'C': 1.0, 'break_ties': False, 'cache_size': ...
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...

```

Processing Model: RandomForestClassifier



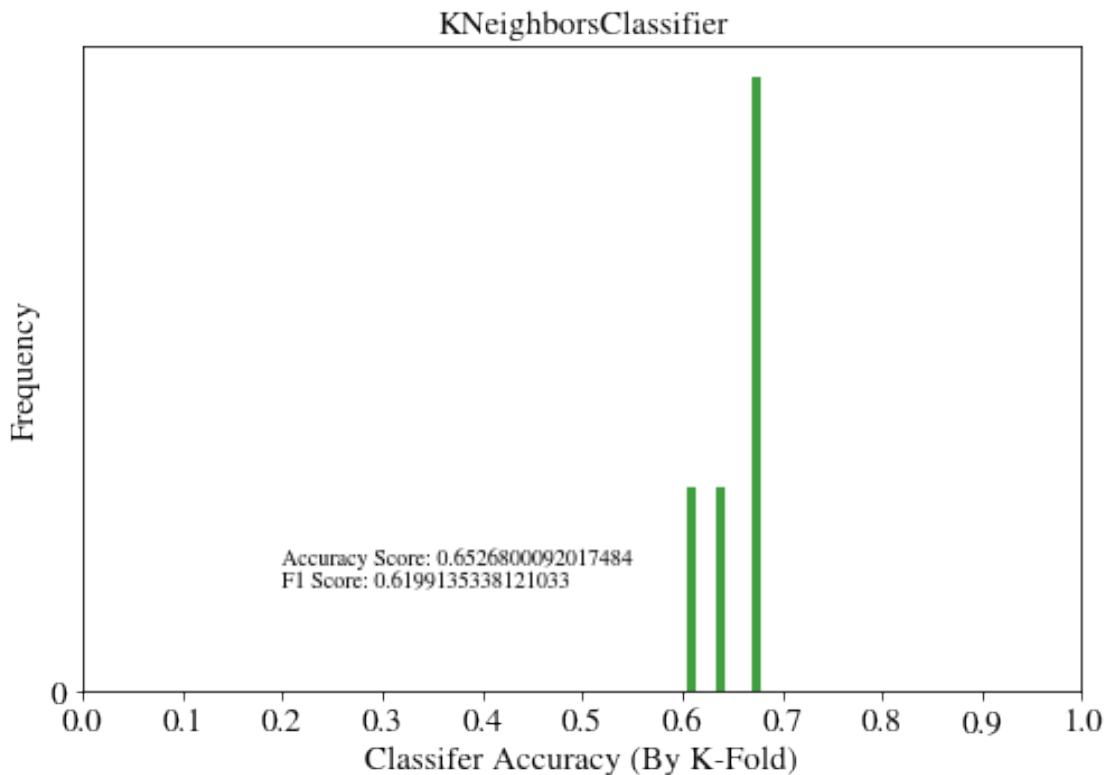
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs',  
'accuracy': [0.6358024691358025, 0.6049382716049383, 0.6790123456790124,  
0.6851851851852, 0.6645962732919255], 'avgAccuracy': 0.6539069089793728,  
'f1': [0.5537860082304527, 0.5816896460688556, 0.5995242786520045,  
0.6180677396698739, 0.616860233879694], 'avgF1': 0.5939855813001762,  
'precision': [0.6358024691358025, 0.6049382716049383, 0.6790123456790124,  
0.6851851851852, 0.6645962732919255], 'avgPrecision': 0.6539069089793728,  
'recall': [0.6358024691358025, 0.6049382716049383, 0.6790123456790124,  
0.6851851851852, 0.6645962732919255], 'avgRecall': 0.6539069089793728,
```

```

'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None,
'criterion': 'gini', 'max_depth': None, 'max_features': 'sqrt',
'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0,
'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,
'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': True,
'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

Processing Model: KNeighborsClassifier



```

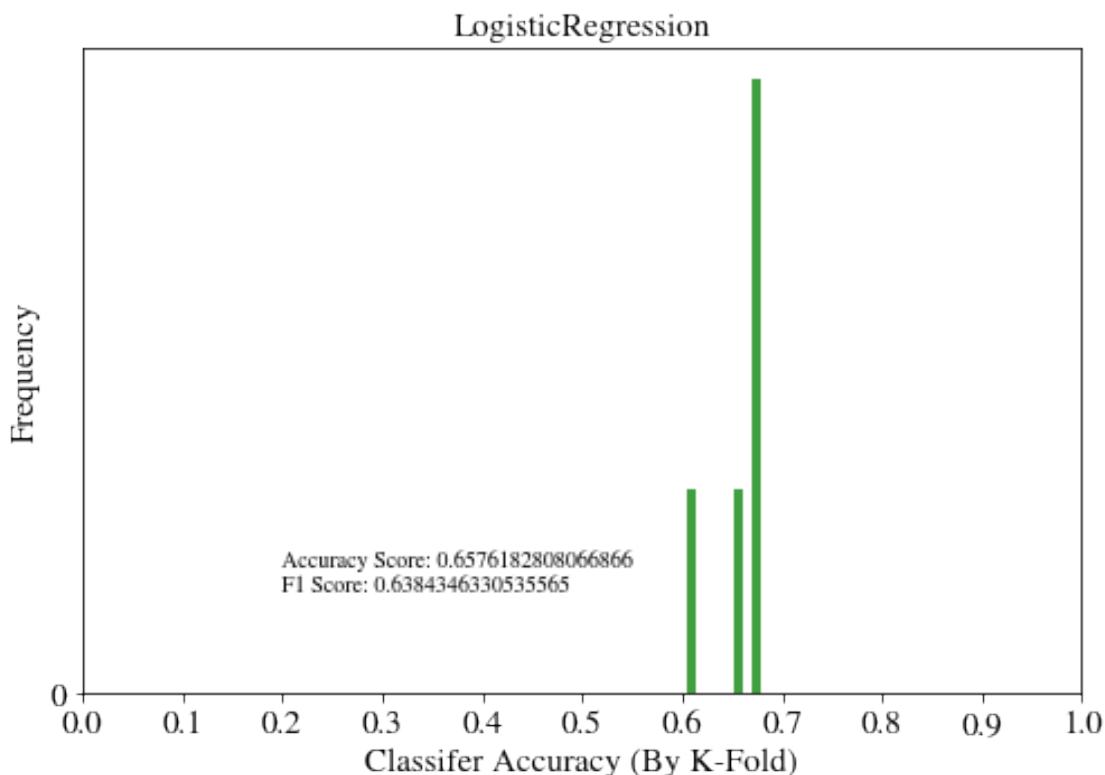
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs', 'accuracy': [0.6358024691358025, 0.6049382716049383, 0.6790123456790124, 0.6728395061728395, 0.6708074534161491], 'avgAccuracy': 0.6526800092017484, 'f1': [0.5537860082304527, 0.5816896460688556, 0.6551934667725667, 0.6484787823151803, 0.6604197656734612], 'avgF1': 0.6199135338121033, 'precision': [0.6358024691358025, 0.6049382716049383, 0.6790123456790124, 0.6728395061728395, 0.6708074534161491], 'avgPrecision': 0.6526800092017484, 'recall': [0.6358024691358025, 0.6049382716049383, 0.6790123456790124, 0.6728395061728395, 0.6708074534161491]}
*****
```

```

0.6728395061728395, 0.6708074534161491], 'avgRecall': 0.6526800092017484,
'params': [{}{'algorithm': 'auto', 'leaf_size': 30, 'metric': 'minkowski',
'metric_params': None, 'n_jobs': -1, 'n_neighbors': 16, 'p': 2, 'weights':
'uniform'}]}
*****

```

Processing Model: LogisticRegression

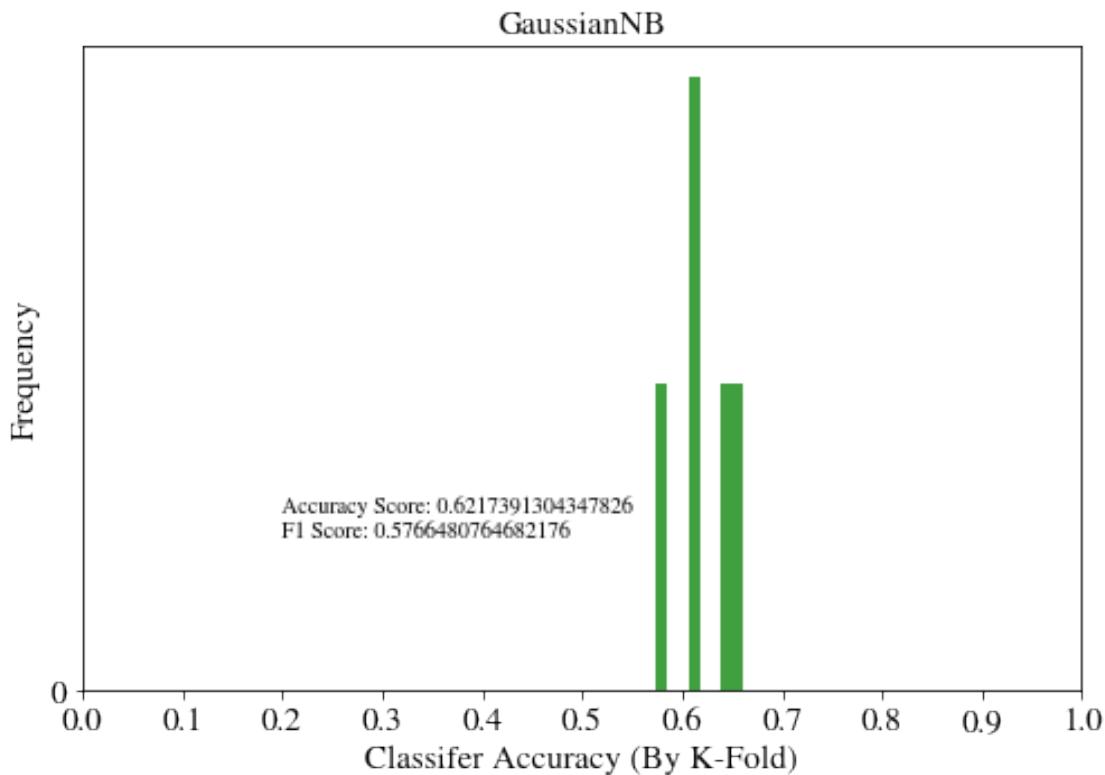


```

*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs',  
'accuracy': [0.654320987654321, 0.6049382716049383, 0.6790123456790124,  
0.6790123456790124, 0.6708074534161491], 'avgAccuracy': 0.6576182808066866,  
'f1': [0.6414635546784833, 0.5816896460688556, 0.6551934667725667,  
0.6534067320744158, 0.6604197656734612], 'avgF1': 0.6384346330535565,  
'precision': [0.654320987654321, 0.6049382716049383, 0.6790123456790124,  
0.6790123456790124, 0.6708074534161491], 'avgPrecision': 0.6576182808066866,  
'recall': [0.654320987654321, 0.6049382716049383, 0.6790123456790124,  
0.6790123456790124, 0.6708074534161491], 'avgRecall': 0.6576182808066866,  
'params': [{}{'C': 1, 'class_weight': None, 'dual': False, 'fit_intercept': True,  
'intercept_scaling': 1, 'max_iter': 100, 'multi_class': 'ovr', 'n_jobs': -1,  
'penalty': 'l2', 'random_state': None, 'solver': 'liblinear', 'tol': 0.001,  
'verbose': 0, 'warm_start': False}]}
*****
```

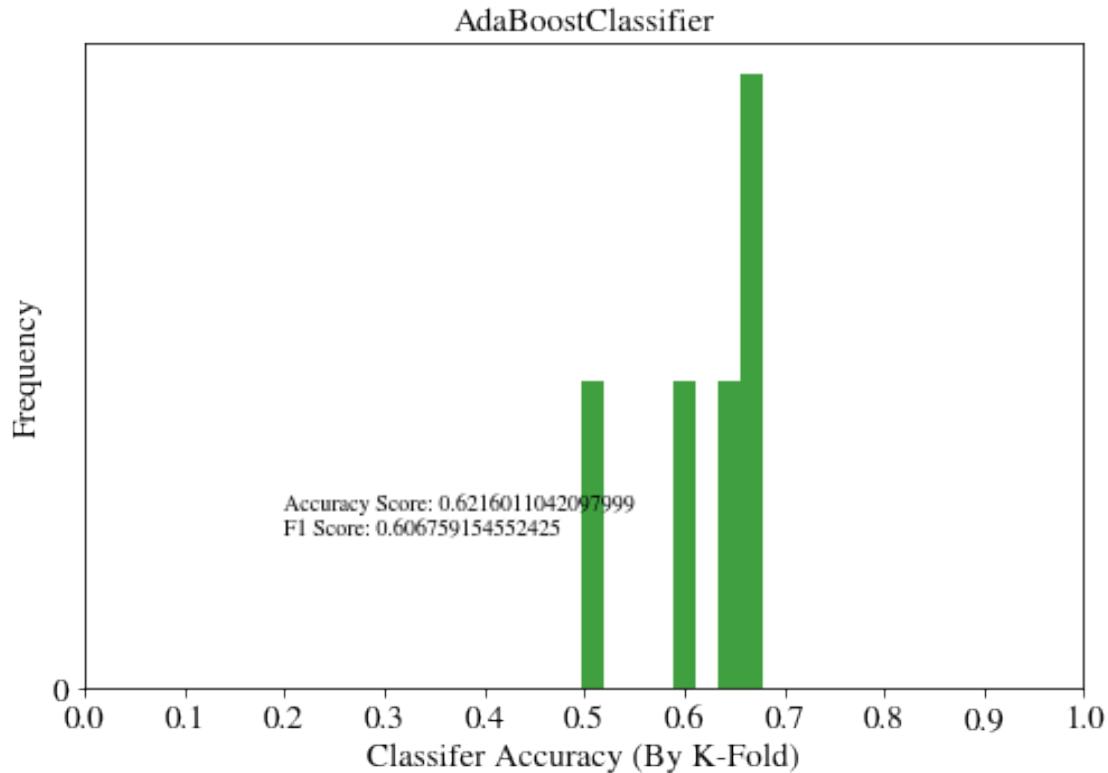
```
'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class':  
'multinomial', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver':  
'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}  
*****
```

Processing Model: GaussianNB



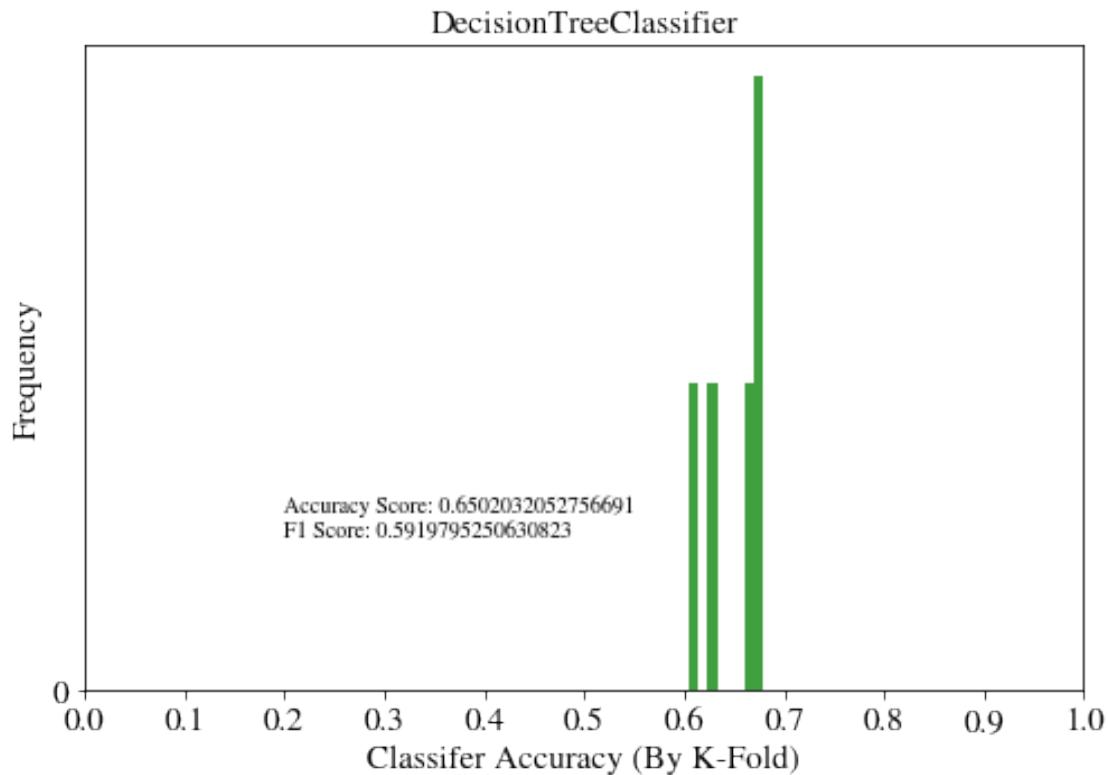
```
*****  
* GaussianNB  
* Best Params Result:  
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of  
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal  
increase in lamina propria cellularity, Lamina propria polymorphs', 'accuracy':  
[0.6172839506172839, 0.5740740740740741, 0.6604938271604939, 0.6481481481481,  
0.6086956521739131], 'avgAccuracy': 0.6217391304347826, 'f1':  
[0.5427342983147387, 0.5582499971163939, 0.5973420129098672, 0.6035396894220424,  
0.5813743845780459], 'avgF1': 0.5766480764682176, 'precision':  
[0.6172839506172839, 0.5740740740740741, 0.6604938271604939, 0.6481481481481,  
0.6086956521739131], 'avgPrecision': 0.6217391304347826, 'recall':  
[0.6172839506172839, 0.5740740740740741, 0.6604938271604939, 0.6481481481481,  
0.6086956521739131], 'avgRecall': 0.6217391304347826, 'params': [{'priors':  
None, 'var_smoothing': 1e-09}]}  
*****
```

Processing Model: AdaBoostClassifier



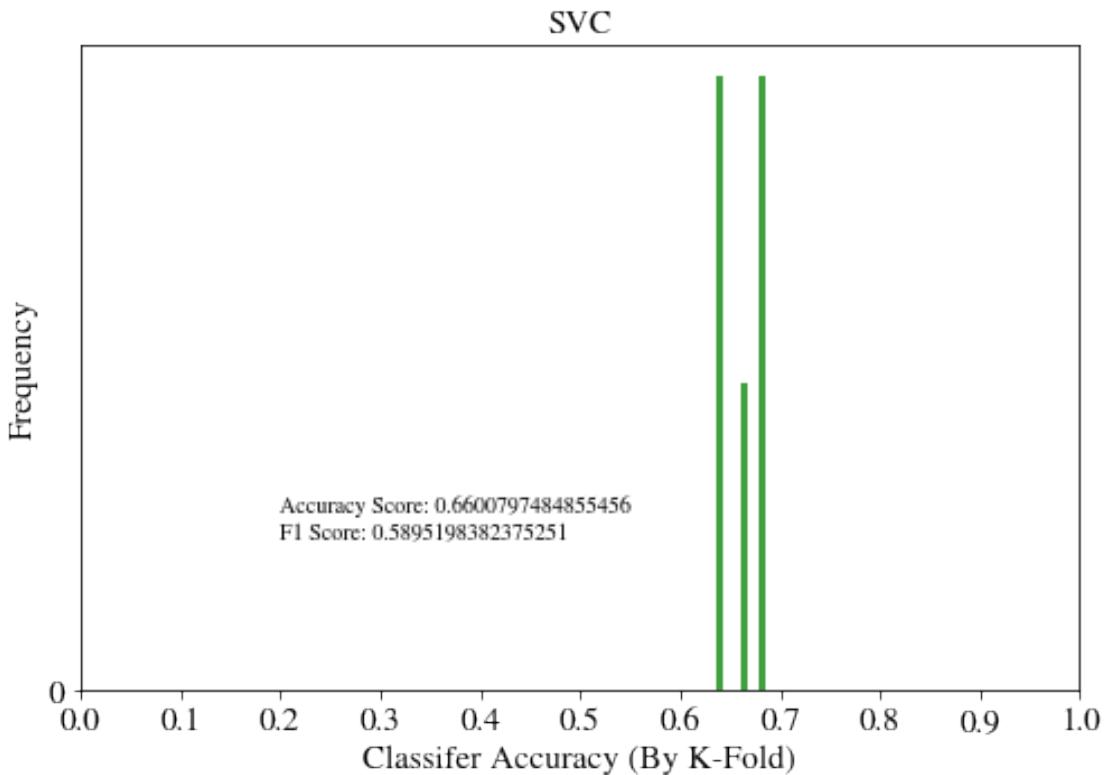
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs',  
'accuracy': [0.6481481481481, 0.6049382716049383, 0.6790123456790124,  
0.6790123456790124, 0.4968944099378882], 'avgAccuracy': 0.6216011042097999,  
'f1': [0.6321059386193487, 0.5816896460688556, 0.6551934667725667,  
0.6534067320744158, 0.5113999892269383], 'avgF1': 0.606759154552425,  
'precision': [0.6481481481481, 0.6049382716049383, 0.6790123456790124,  
0.6790123456790124, 0.4968944099378882], 'avgPrecision': 0.6216011042097999,  
'recall': [0.6481481481481, 0.6049382716049383, 0.6790123456790124,  
0.6790123456790124, 0.4968944099378882], 'avgRecall': 0.6216011042097999,  
'params': [{algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1,  
'n_estimators': 20, 'random_state': None}]}  
*****
```

Processing Model: DecisionTreeClassifier



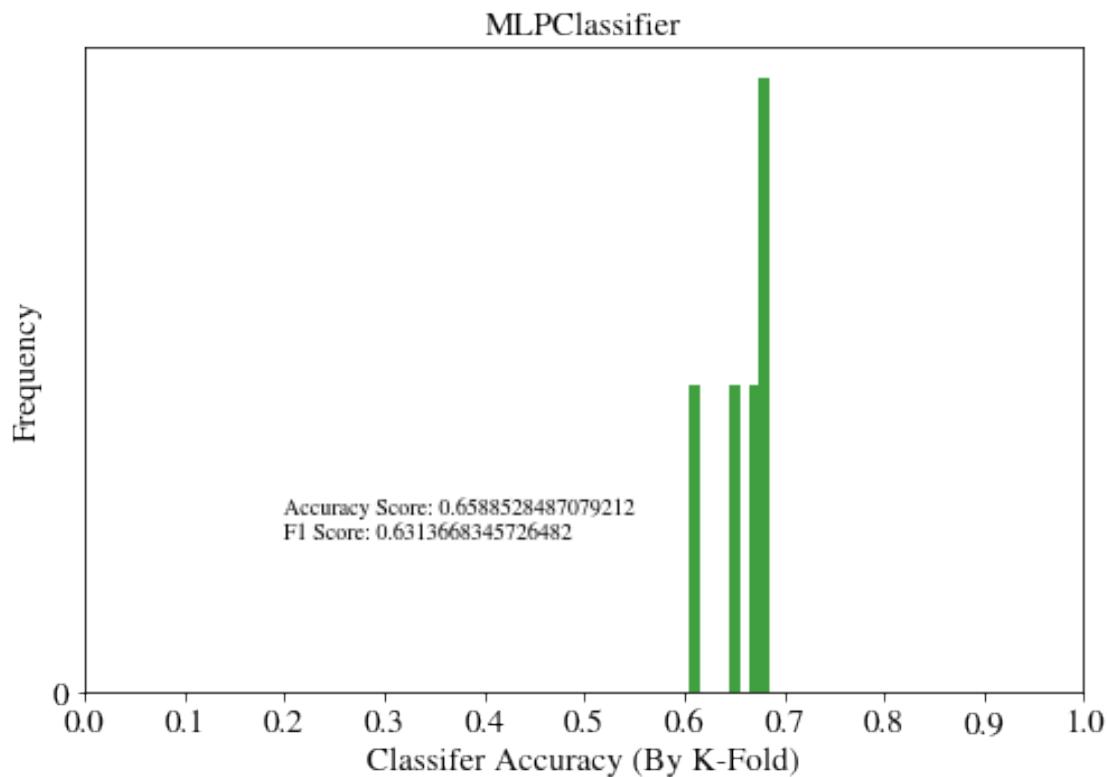
```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity, Lamina propria polymorphs',  
'accuracy': [0.6296296296296297, 0.6049382716049383, 0.6728395061728395,  
0.6790123456790124, 0.6645962732919255], 'avgAccuracy': 0.6502032052756691,  
'f1': [0.5501995574580724, 0.5816896460688556, 0.5966849565614997,  
0.6144632313472894, 0.616860233879694], 'avgF1': 0.5919795250630823,  
'precision': [0.6296296296296297, 0.6049382716049383, 0.6728395061728395,  
0.6790123456790124, 0.6645962732919255], 'avgPrecision': 0.6502032052756691,  
'recall': [0.6296296296296297, 0.6049382716049383, 0.6728395061728395,  
0.6790123456790124, 0.6645962732919255], 'avgRecall': 0.6502032052756691,  
'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini',  
'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None,  
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,  
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None,  
'splitter': 'best'}]}}
*****
```

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs', 'accuracy': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1': [0.5537860082304527, 0.5587625610106229, 0.6001226483969817, 0.6180677396698739, 0.616860233879694], 'avgF1': 0.5895198382375251, 'precision': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity, Lamina propria polymorphs', 'accuracy':
[0.654320987654321, 0.6049382716049383, 0.6790123456790124, 0.6851851851852,
0.6708074534161491], 'avgAccuracy': 0.6588528487079212, 'f1':
[0.6414635546784833, 0.5816896460688556, 0.6551934667725667, 0.6180677396698739,
0.6604197656734612], 'avgF1': 0.6313668345726482, 'precision':
[0.654320987654321, 0.6049382716049383, 0.6790123456790124, 0.6851851851852,
0.6708074534161491], 'avgPrecision': 0.6588528487079212, 'recall':
[0.654320987654321, 0.6049382716049383, 0.6790123456790124, 0.6851851851852,
0.6708074534161491], 'avgRecall': 0.6588528487079212, 'params': [{activation':
'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 7000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state':
None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose':
False, 'warm_start': False}]]}
*****
```

```
*****
* Best Performing Model and Params is:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity, Lamina propria polymorphs', 'accuracy': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1': [0.5537860082304527, 0.5587625610106229, 0.6001226483969817, 0.6180677396698739, 0.616860233879694], 'avgF1': 0.5895198382375251, 'precision': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****
```

	model	features	\
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...	
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...	
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...	
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...	
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...	
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...	
6	SVC	Active inflammation?, Severity of Crypt Arch, ...	
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...	

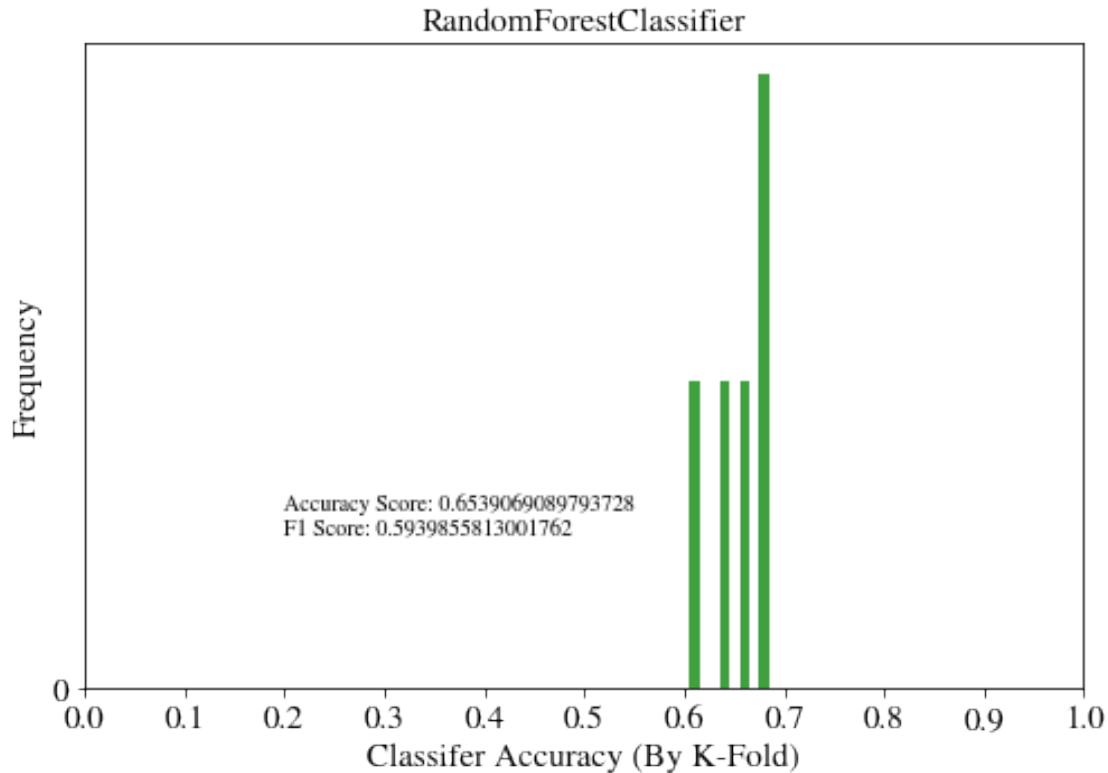
  

	accuracy	f1	precision	recall	\
0	0.650203	0.591861	0.650203	0.650203	
1	0.642803	0.627058	0.642803	0.642803	
2	0.657618	0.638435	0.657618	0.657618	
3	0.621739	0.576648	0.621739	0.621739	
4	0.617897	0.603682	0.617897	0.617897	
5	0.650203	0.591980	0.650203	0.650203	
6	0.660080	0.589520	0.660080	0.660080	
7	0.655149	0.612623	0.655149	0.655149	

	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	{'C': 1, 'class_weight': None, 'dual': False, ...
3	{'priors': None, 'var_smoothing': 1e-09}
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...

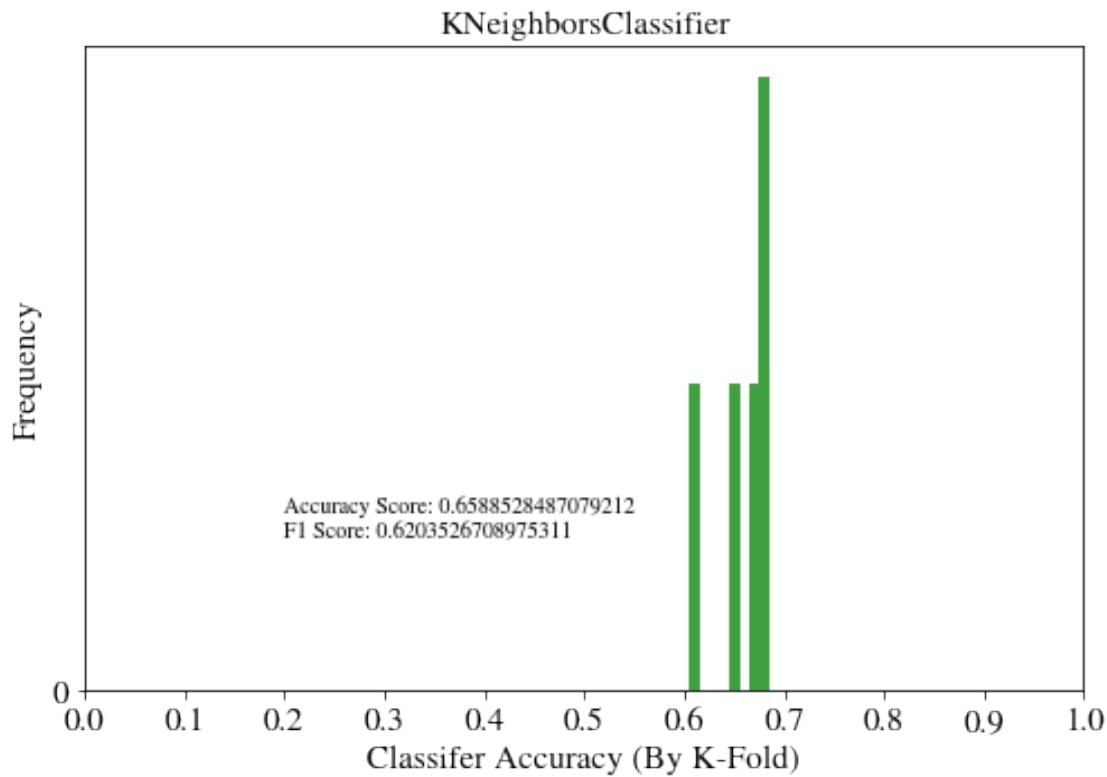
Processing Model: RandomForestClassifier



```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity', 'accuracy':  
[0.6358024691358025, 0.6049382716049383, 0.6790123456790124, 0.6851851851851852,  
0.6645962732919255], 'avgAccuracy': 0.6539069089793728, 'f1':  
[0.5537860082304527, 0.5816896460688556, 0.5995242786520045, 0.6180677396698739,  
0.616860233879694], 'avgF1': 0.5939855813001762, 'precision':  
[0.6358024691358025, 0.6049382716049383, 0.6790123456790124, 0.6851851851851852,  
0.6645962732919255], 'avgPrecision': 0.6539069089793728, 'recall':  
[0.6358024691358025, 0.6049382716049383, 0.6790123456790124, 0.6851851851851852,  
0.6645962732919255], 'avgRecall': 0.6539069089793728, 'params': [{}'bootstrap':  
True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth':  
None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None,  
'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1,  
'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200,  
'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0,  
'warm_start': False}]}}
```

```
*****
```

Processing Model: KNeighborsClassifier

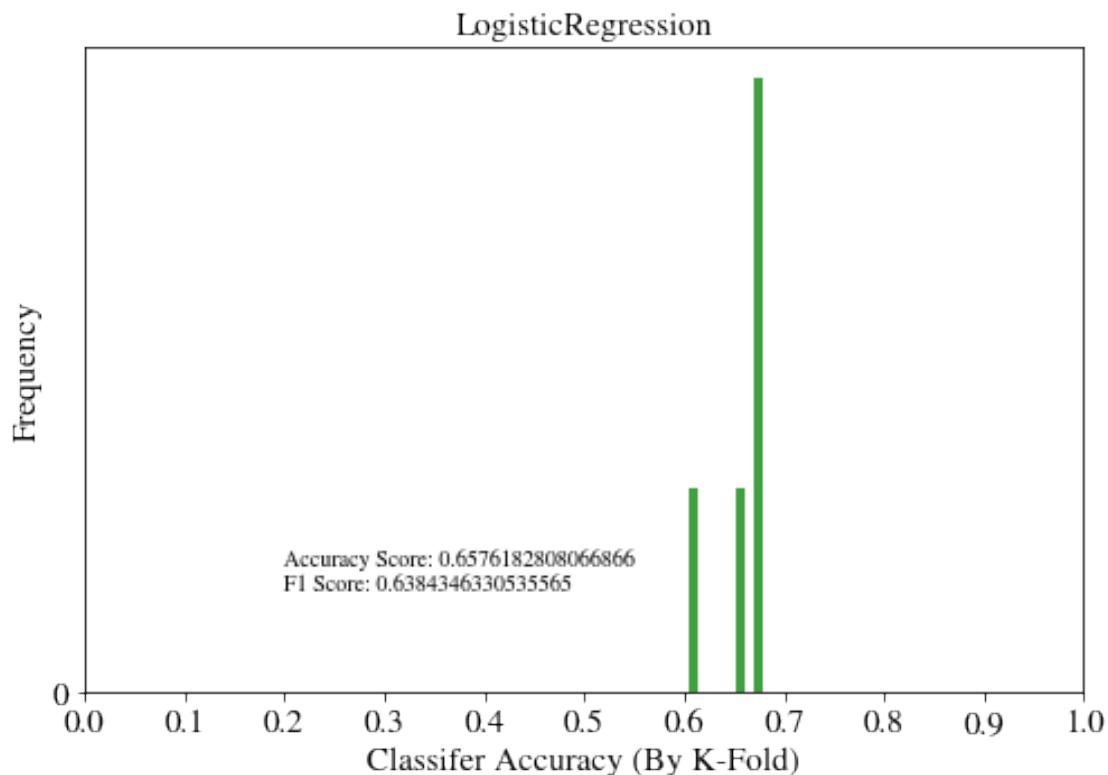


```
*****
```

```
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity', 'accuracy': [0.654320987654321, 0.6049382716049383, 0.6790123456790124, 0.6851851851851852, 0.6708074534161491], 'avgAccuracy': 0.6588528487079212, 'f1': [0.6414635546784833, 0.5816896460688556, 0.6001226483969817, 0.6180677396698739, 0.6604197656734612], 'avgF1': 0.6203526708975311, 'precision': [0.654320987654321, 0.6049382716049383, 0.6790123456790124, 0.6851851851851852, 0.6708074534161491], 'avgPrecision': 0.6588528487079212, 'recall': [0.654320987654321, 0.6049382716049383, 0.6790123456790124, 0.6851851851851852, 0.6708074534161491], 'avgRecall': 0.6588528487079212, 'params': [{algorith': 'brute', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 16, 'p': 2, 'weights': 'distance'}]}
```

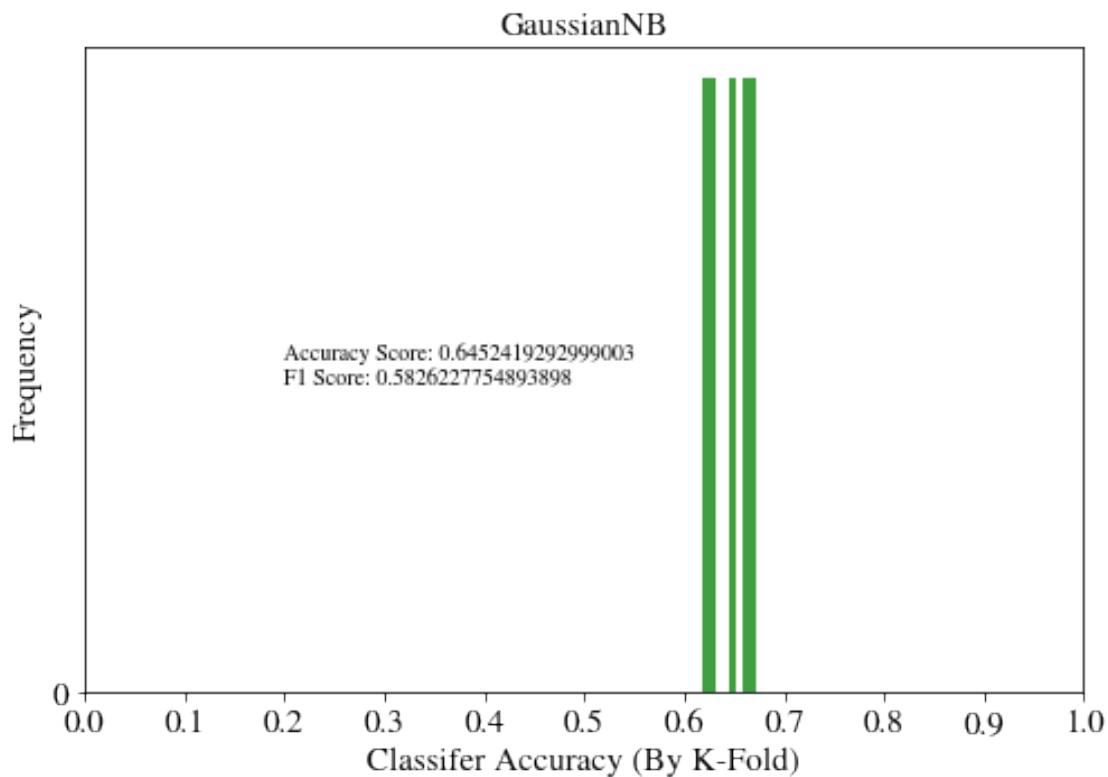
```
*****
```

Processing Model: LogisticRegression



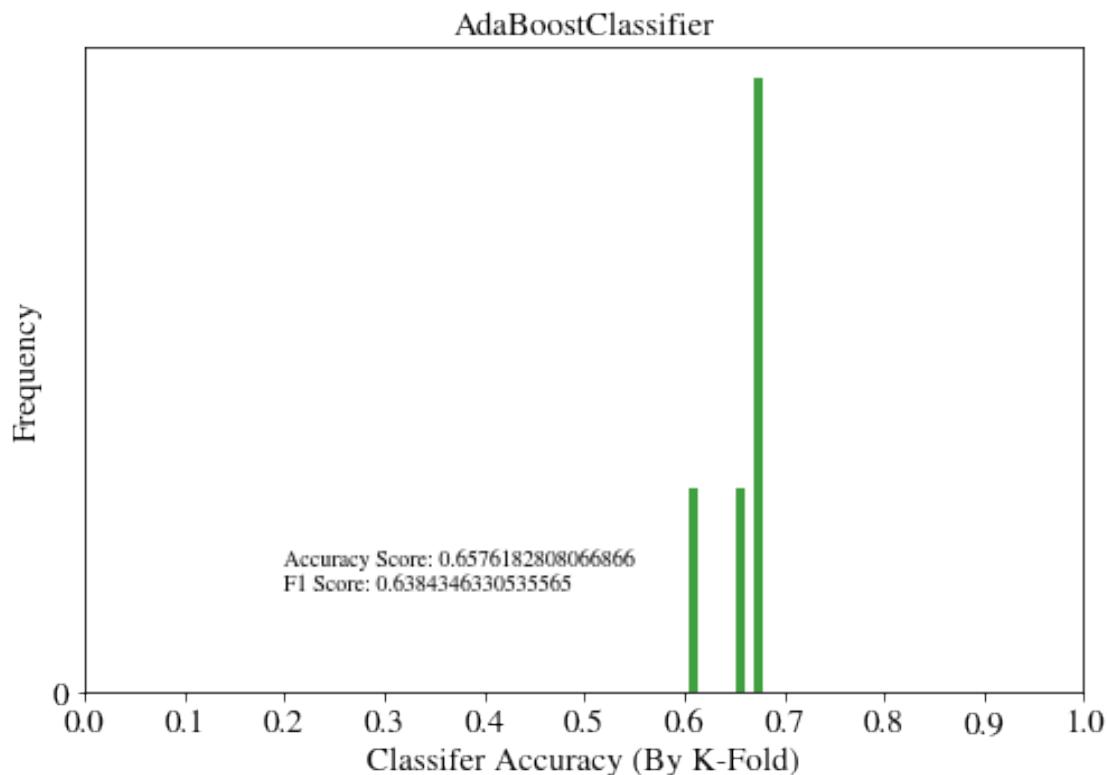
```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity', 'accuracy':  
[0.654320987654321, 0.6049382716049383, 0.6790123456790124, 0.6790123456790124,  
0.6708074534161491], 'avgAccuracy': 0.6576182808066866, 'f1':  
[0.6414635546784833, 0.5816896460688556, 0.6551934667725667, 0.6534067320744158,  
0.6604197656734612], 'avgF1': 0.6384346330535565, 'precision':  
[0.654320987654321, 0.6049382716049383, 0.6790123456790124, 0.6790123456790124,  
0.6708074534161491], 'avgPrecision': 0.6576182808066866, 'recall':  
[0.654320987654321, 0.6049382716049383, 0.6790123456790124, 0.6790123456790124,  
0.6708074534161491], 'avgRecall': 0.6576182808066866, 'params': [{C': 1,  
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':  
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'ovr', 'n_jobs': -1,  
'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,  
'verbose': 0, 'warm_start': False}]}
*****
```

Processing Model: GaussianNB



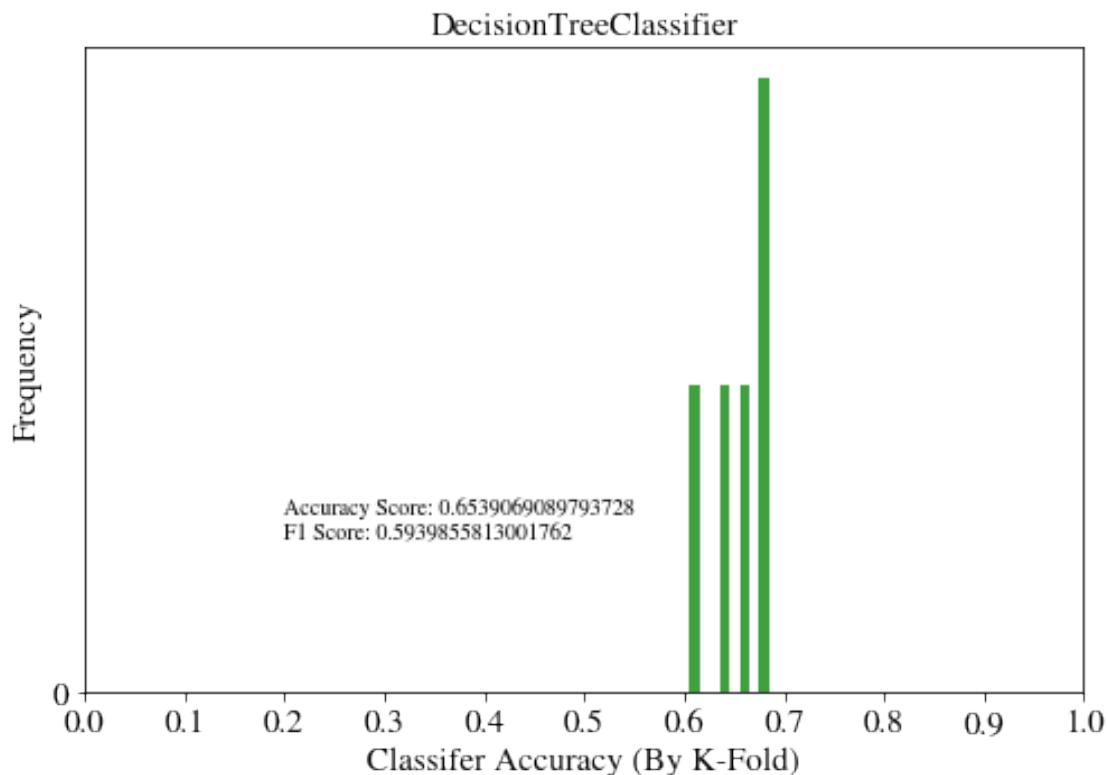
```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity', 'accuracy': [0.6172839506172839,
0.6296296296296297, 0.6604938271604939, 0.6728395061728395, 0.6459627329192547],
'avgAccuracy': 0.6452419292999003, 'f1': [0.5427342983147387,
0.5565999544138609, 0.5973420129098672, 0.6100850764408623, 0.6063525353676196],
'avgF1': 0.5826227754893898, 'precision': [0.6172839506172839,
0.6296296296296297, 0.6604938271604939, 0.6728395061728395, 0.6459627329192547],
'avgPrecision': 0.6452419292999003, 'recall': [0.6172839506172839,
0.6296296296296297, 0.6604938271604939, 0.6728395061728395, 0.6459627329192547],
'avgRecall': 0.6452419292999003, 'params': [{'priors': None, 'var_smoothing':
1e-09}]}
*****
```

Processing Model: AdaBoostClassifier



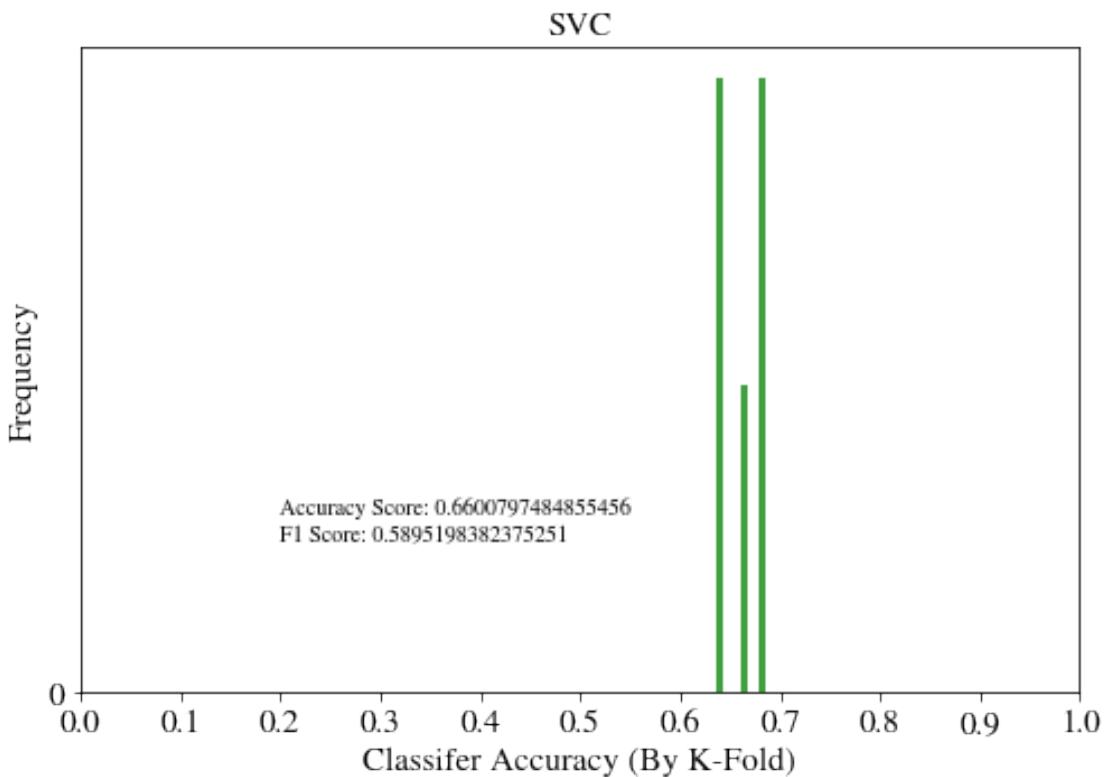
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?, Marked &  
transmucosal increase in lamina propria cellularity', 'accuracy':  
[0.654320987654321, 0.6049382716049383, 0.6790123456790124, 0.6790123456790124,  
0.6708074534161491], 'avgAccuracy': 0.6576182808066866, 'f1':  
[0.6414635546784833, 0.5816896460688556, 0.6551934667725667, 0.6534067320744158,  
0.6604197656734612], 'avgF1': 0.6384346330535565, 'precision':  
[0.654320987654321, 0.6049382716049383, 0.6790123456790124, 0.6790123456790124,  
0.6708074534161491], 'avgPrecision': 0.6576182808066866, 'recall':  
[0.654320987654321, 0.6049382716049383, 0.6790123456790124, 0.6790123456790124,  
0.6708074534161491], 'avgRecall': 0.6576182808066866, 'params': [{'algorithm':  
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 20,  
'random_state': None}]}
*****
```

Processing Model: DecisionTreeClassifier



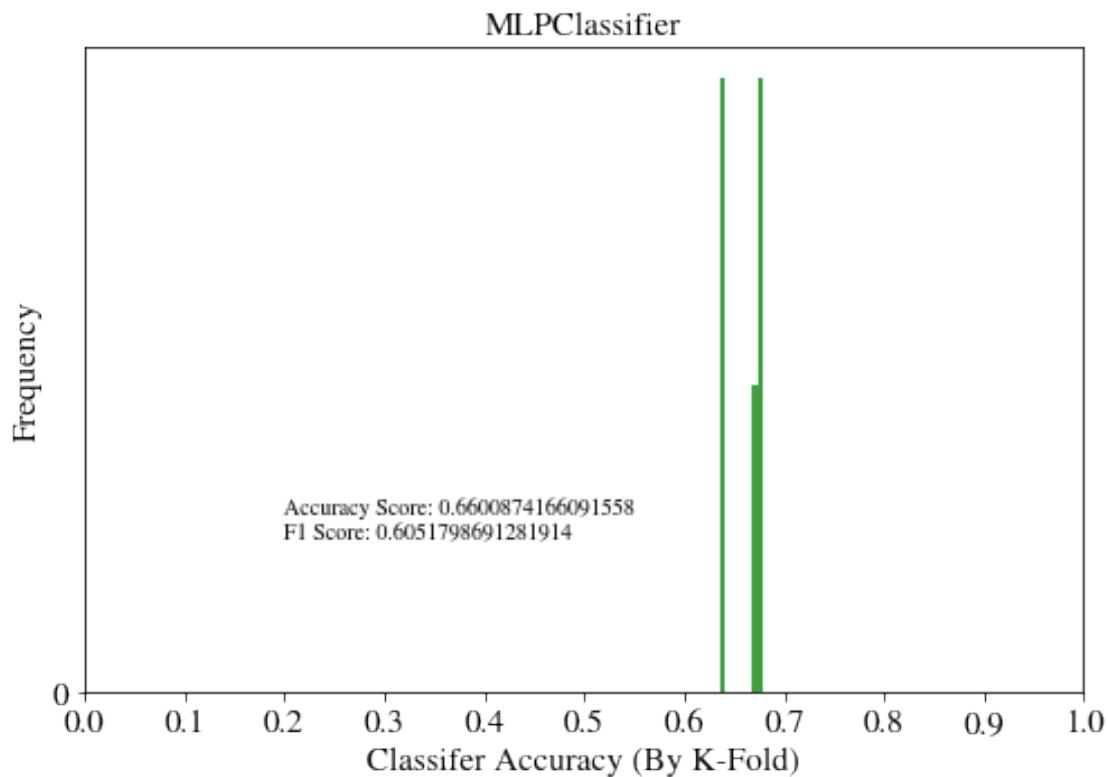
```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity', 'accuracy': [0.6358024691358025, 0.6049382716049383, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgAccuracy': 0.6539069089793728, 'f1': [0.5537860082304527, 0.5816896460688556, 0.5995242786520045, 0.6180677396698739, 0.616860233879694], 'avgF1': 0.5939855813001762, 'precision': [0.6358024691358025, 0.6049382716049383, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgPrecision': 0.6539069089793728, 'recall': [0.6358024691358025, 0.6049382716049383, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgRecall': 0.6539069089793728, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****
```

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity', 'accuracy': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1': [0.5537860082304527, 0.5587625610106229, 0.6001226483969817, 0.6180677396698739, 0.616860233879694], 'avgF1': 0.5895198382375251, 'precision': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params': [{C: 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal
increase in lamina propria cellularity', 'accuracy': [0.6358024691358025,
0.6358024691358025, 0.6790123456790124, 0.6790123456790124, 0.6708074534161491],
'avgAccuracy': 0.6600874166091558, 'f1': [0.5537860082304527,
0.5587625610106229, 0.5995242786520045, 0.6534067320744158, 0.6604197656734612],
'avgF1': 0.6051798691281914, 'precision': [0.6358024691358025,
0.6358024691358025, 0.6790123456790124, 0.6790123456790124, 0.6708074534161491],
'avgPrecision': 0.6600874166091558, 'recall': [0.6358024691358025,
0.6358024691358025, 0.6790123456790124, 0.6790123456790124, 0.6708074534161491],
'avgRecall': 0.6600874166091558, 'params': [{'activation': 'logistic', 'alpha':
0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping':
False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 9000,
'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t':
0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'verification_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
```

```

* Best Performing Model and Params is:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?, Marked & transmucosal increase in lamina propria cellularity', 'accuracy': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6790123456790124, 0.6708074534161491], 'avgAccuracy': 0.6600874166091558, 'f1': [0.5537860082304527, 0.5587625610106229, 0.5995242786520045, 0.6534067320744158, 0.6604197656734612], 'avgF1': 0.6051798691281914, 'precision': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6790123456790124, 0.6708074534161491], 'avgPrecision': 0.6600874166091558, 'recall': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6790123456790124, 0.6708074534161491], 'avgRecall': 0.6600874166091558, 'params': [{activation': 'logistic', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'adaptive', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 9000, 'momentum': 0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****

```

	model	features	\
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...	
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...	
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...	
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...	
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...	
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...	
6	SVC	Active inflammation?, Severity of Crypt Arch, ...	
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...	

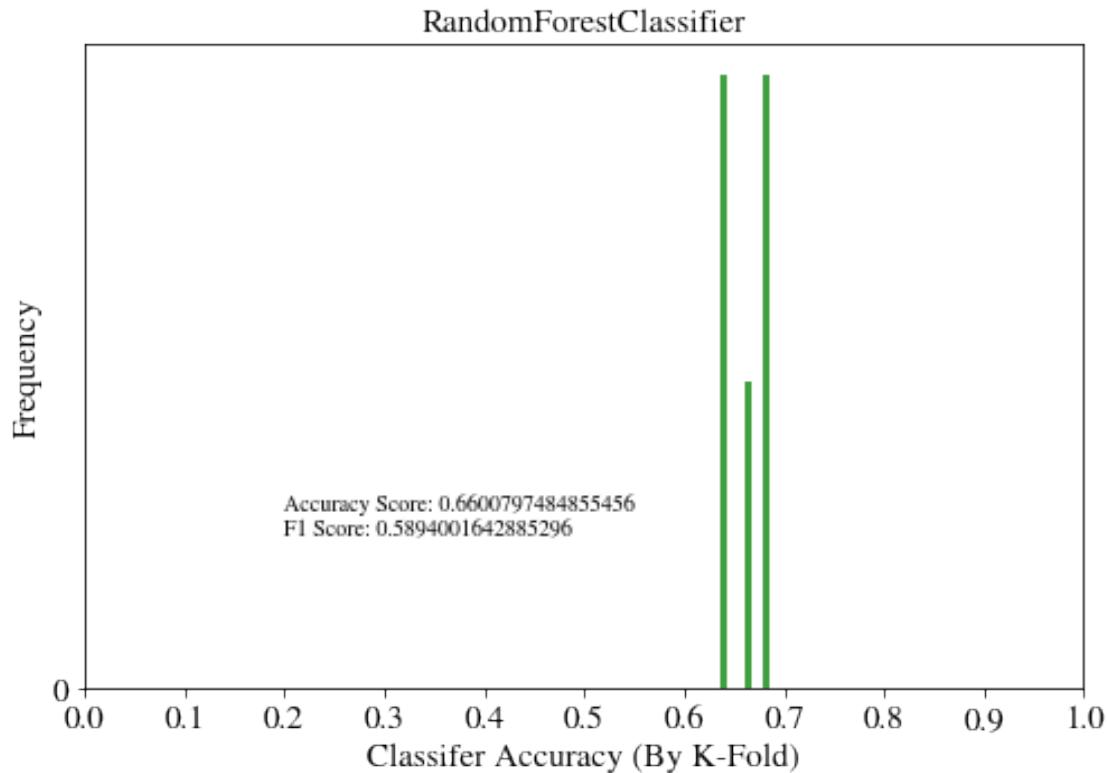
	accuracy	f1	precision	recall	\
0	0.653907	0.593986	0.653907	0.653907	
1	0.650211	0.599573	0.650211	0.650211	
2	0.657618	0.638435	0.657618	0.657618	
3	0.645242	0.582623	0.645242	0.645242	
4	0.657618	0.638435	0.657618	0.657618	
5	0.653907	0.593986	0.653907	0.653907	
6	0.660080	0.589520	0.660080	0.660080	
7	0.660087	0.605180	0.660087	0.660087	

	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...}
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	{'C': 1, 'class_weight': None, 'dual': False, ...}
3	{'priors': None, 'var_smoothing': 1e-09}
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...}
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...}

```
7 {'activation': 'logistic', 'alpha': 0.0001, 'b...
```

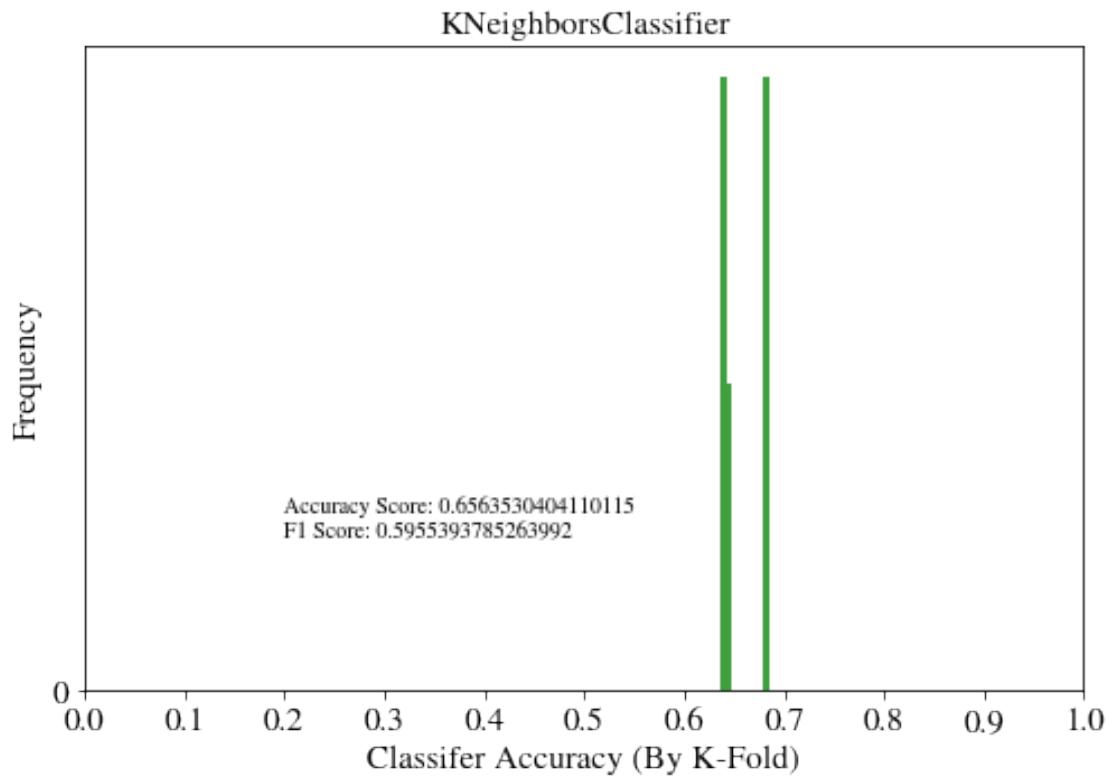
Processing Model: RandomForestClassifier



```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?', 'accuracy': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1': [0.5537860082304527, 0.5587625610106229, 0.5995242786520045, 0.6180677396698739, 0.616860233879694], 'avgF1': 0.5894001642885296, 'precision': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
```

\*\*\*\*\*

Processing Model: KNeighborsClassifier

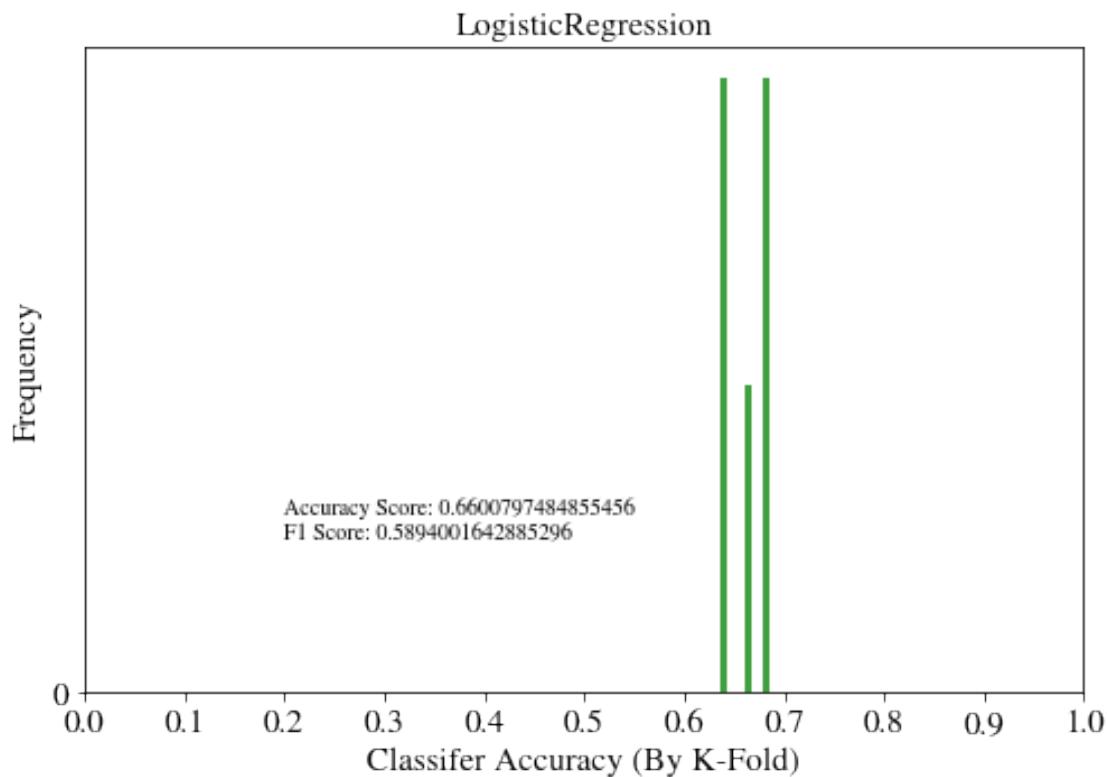


\*\*\*\*\*

```
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?', 'accuracy': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6459627329192547], 'avgAccuracy': 0.6563530404110115, 'f1': [0.5537860082304527, 0.5587625610106229, 0.5995242786520045, 0.6180677396698739, 0.6475563050690416], 'avgF1': 0.5955393785263992, 'precision': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6459627329192547], 'avgPrecision': 0.6563530404110115, 'recall': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6459627329192547], 'avgRecall': 0.6563530404110115, 'params': [{'algorithm': 'brute', 'leaf_size': 30, 'metric': 'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 17, 'p': 2, 'weights': 'uniform'}]}
```

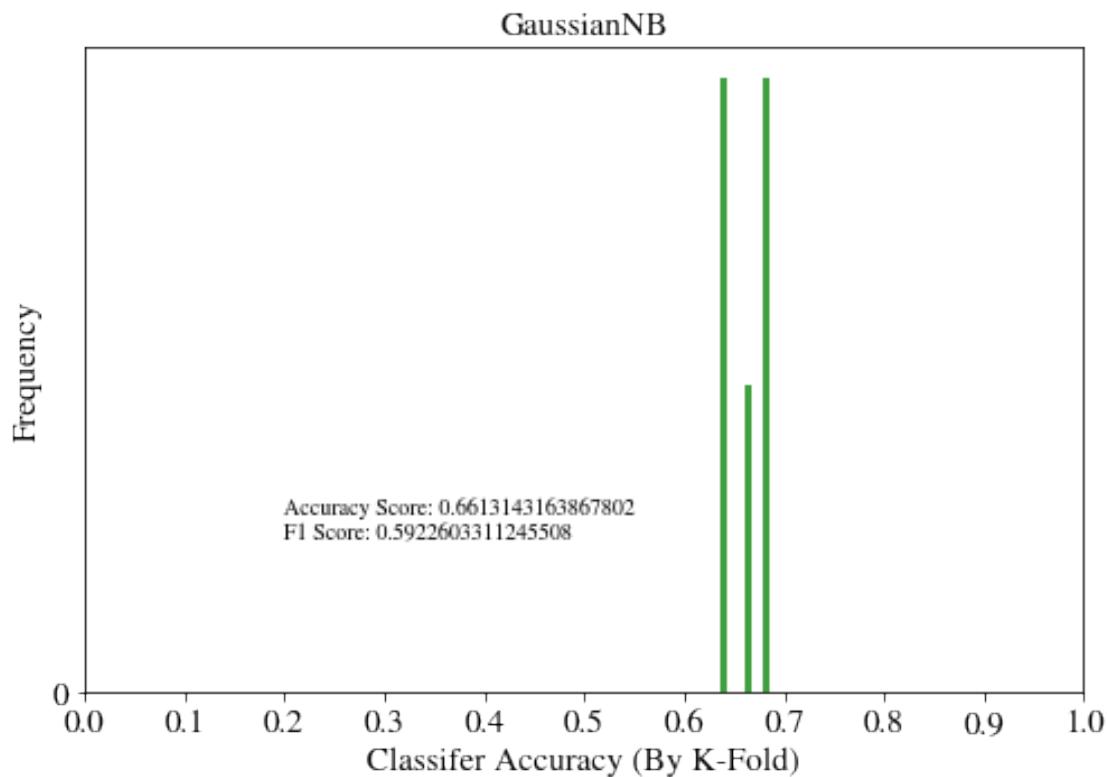
\*\*\*\*\*

Processing Model: LogisticRegression



```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?', 'accuracy':  
[0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852,  
0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1':  
[0.5537860082304527, 0.5587625610106229, 0.5995242786520045, 0.6180677396698739,  
0.616860233879694], 'avgF1': 0.5894001642885296, 'precision':  
[0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852,  
0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall':  
[0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852,  
0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params': [{C': 1,  
'class_weight': None, 'dual': False, 'fit_intercept': True, 'intercept_scaling':  
1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'ovr', 'n_jobs': -1,  
'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg', 'tol': 0.0001,  
'verbose': 0, 'warm_start': False}]}
*****
```

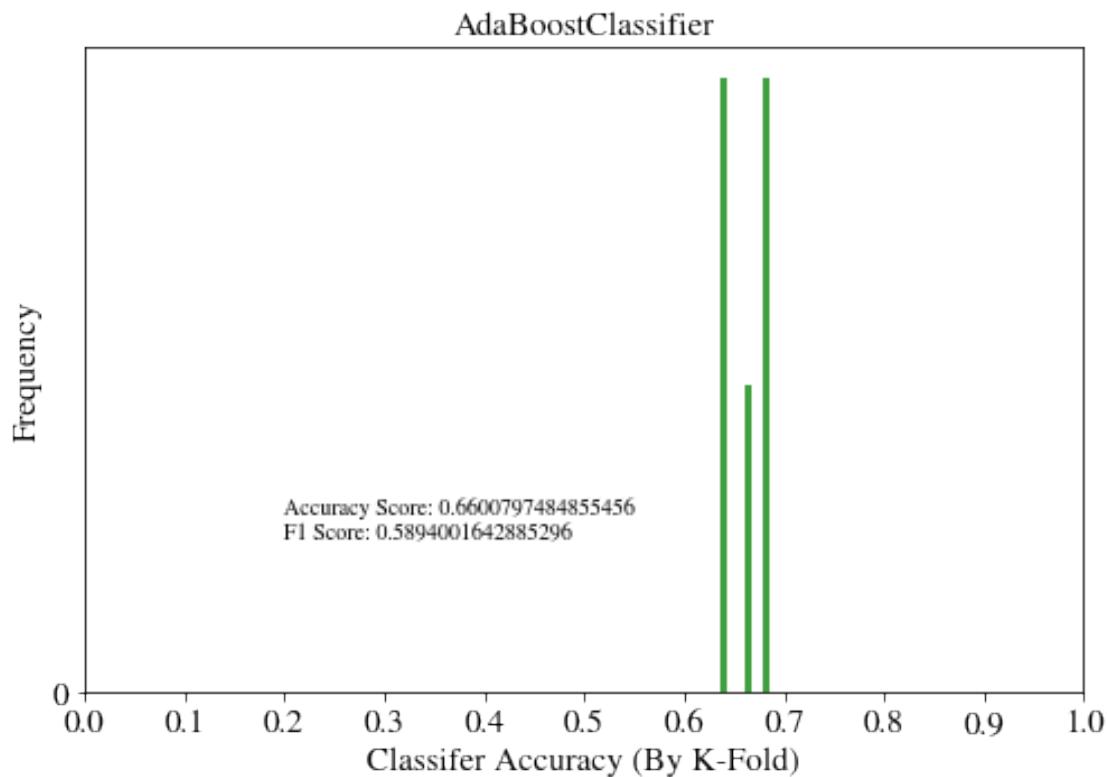
Processing Model: GaussianNB



```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?', 'accuracy':
[0.6358024691358025, 0.6358024691358025, 0.6851851851852, 0.6851851851852,
0.6645962732919255], 'avgAccuracy': 0.6613143163867802, 'f1':
[0.5537860082304527, 0.5587625610106229, 0.6138251128321103, 0.6180677396698739,
0.616860233879694], 'avgF1': 0.5922603311245508, 'precision':
[0.6358024691358025, 0.6358024691358025, 0.6851851851852, 0.6851851851852,
0.6645962732919255], 'avgPrecision': 0.6613143163867802, 'recall':
[0.6358024691358025, 0.6358024691358025, 0.6851851851852, 0.6851851851852,
0.6645962732919255], 'avgRecall': 0.6613143163867802, 'params': [{'priors':
None, 'var_smoothing': 1e-09}]}
```

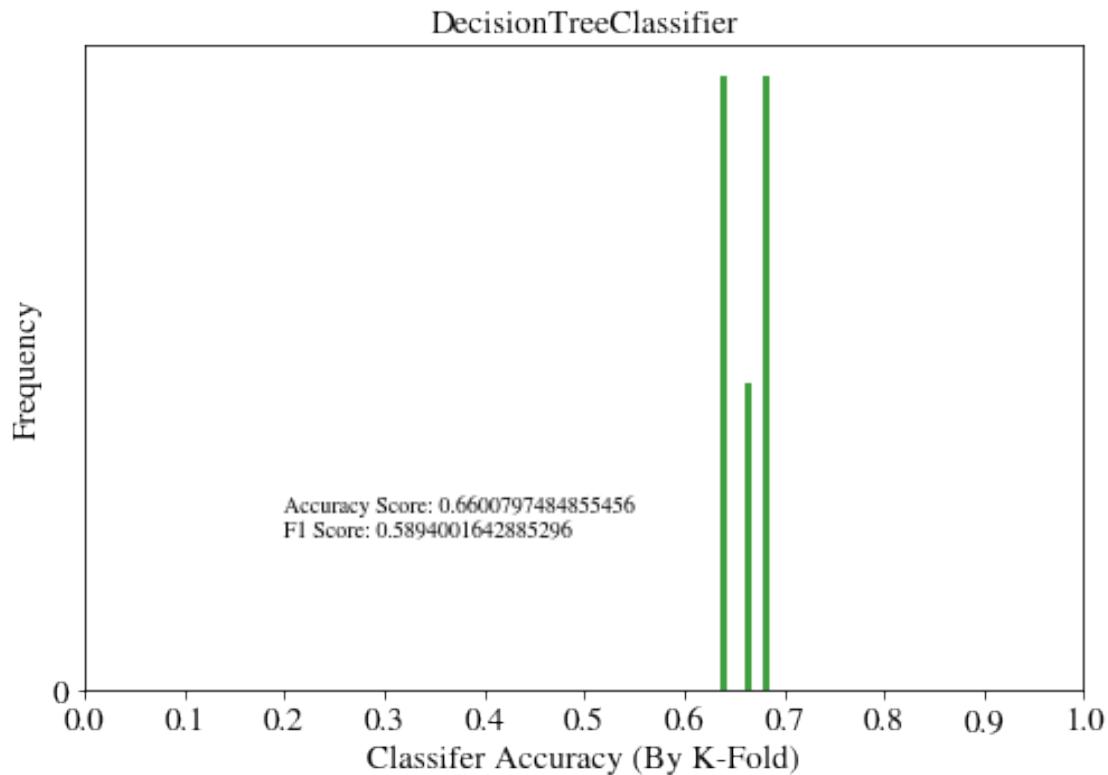
\*\*\*\*\*

Processing Model: AdaBoostClassifier



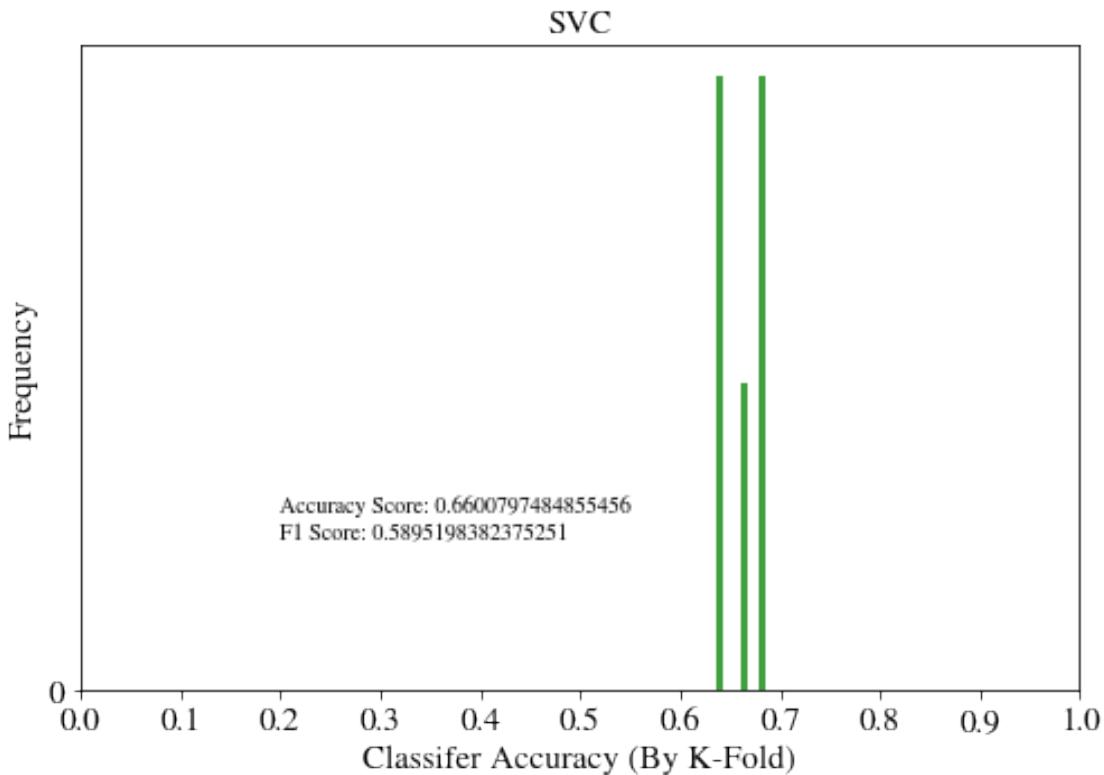
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch, Increased lamina propria cellularity?', 'accuracy':  
[0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852,  
0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1':  
[0.5537860082304527, 0.5587625610106229, 0.5995242786520045, 0.6180677396698739,  
0.616860233879694], 'avgF1': 0.5894001642885296, 'precision':  
[0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852,  
0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall':  
[0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852,  
0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params': [{algorith':  
'SAMME.R', 'base_estimator': None, 'learning_rate': 1, 'n_estimators': 20,  
'random_state': None}]}
*****
```

Processing Model: DecisionTreeClassifier



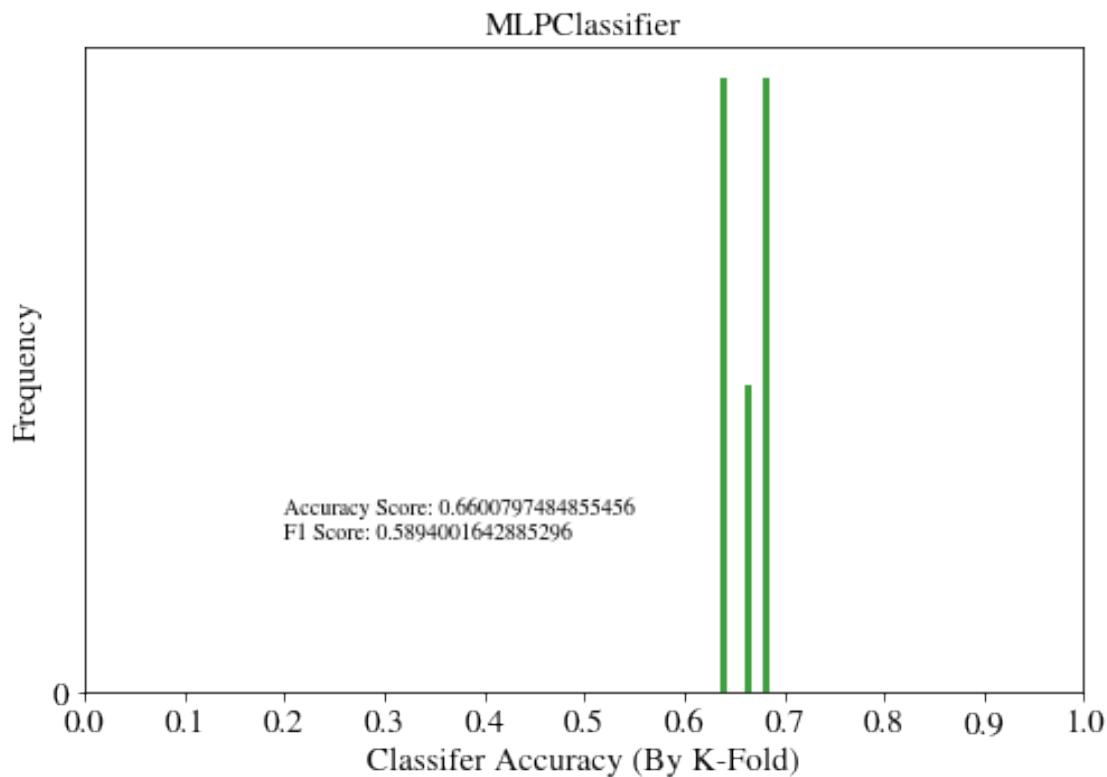
```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?', 'accuracy': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1': [0.5537860082304527, 0.5587625610106229, 0.5995242786520045, 0.6180677396698739, 0.616860233879694], 'avgF1': 0.5894001642885296, 'precision': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852, 0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params': [{'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}
*****
```

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch, Increased lamina propria cellularity?', 'accuracy': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1': [0.5537860082304527, 0.5587625610106229, 0.6001226483969817, 0.6180677396698739, 0.616860233879694], 'avgF1': 0.5895198382375251, 'precision': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall': [0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851852, 0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?', 'accuracy':
[0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852,
0.6645962732919255], 'avgAccuracy': 0.6600797484855456, 'f1':
[0.5537860082304527, 0.5587625610106229, 0.5995242786520045, 0.6180677396698739,
0.616860233879694], 'avgF1': 0.5894001642885296, 'precision':
[0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852,
0.6645962732919255], 'avgPrecision': 0.6600797484855456, 'recall':
[0.6358024691358025, 0.6358024691358025, 0.6790123456790124, 0.6851851851851852,
0.6645962732919255], 'avgRecall': 0.6600797484855456, 'params':
[{'activation': 'identity', 'alpha': 0.0001, 'batch_size': 'auto', 'beta_1': 0.9, 'beta_2':
0.999, 'early_stopping': False, 'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate':
'constant', 'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5, 'random_state':
None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001, 'validation_fraction': 0.1, 'verbose':
False}]]}
*****
*****
```

```

* Best Performing Model and Params is:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch, Increased lamina propria cellularity?', 'accuracy':
[0.6358024691358025, 0.6358024691358025, 0.6851851851852, 0.6851851851852,
0.6645962732919255], 'avgAccuracy': 0.6613143163867802, 'f1':
[0.5537860082304527, 0.5587625610106229, 0.6138251128321103, 0.6180677396698739,
0.616860233879694], 'avgF1': 0.5922603311245508, 'precision':
[0.6358024691358025, 0.6358024691358025, 0.6851851851852, 0.6851851851852,
0.6645962732919255], 'avgPrecision': 0.6613143163867802, 'recall':
[0.6358024691358025, 0.6358024691358025, 0.6851851851852, 0.6851851851852,
0.6645962732919255], 'avgRecall': 0.6613143163867802, 'params': [{'priors':
None, 'var_smoothing': 1e-09}]}
*****

```

	model	features	\
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch, ...	
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch, ...	
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch, ...	
3	GaussianNB	Active inflammation?, Severity of Crypt Arch, ...	
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch, ...	
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch, ...	
6	SVC	Active inflammation?, Severity of Crypt Arch, ...	
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch, ...	

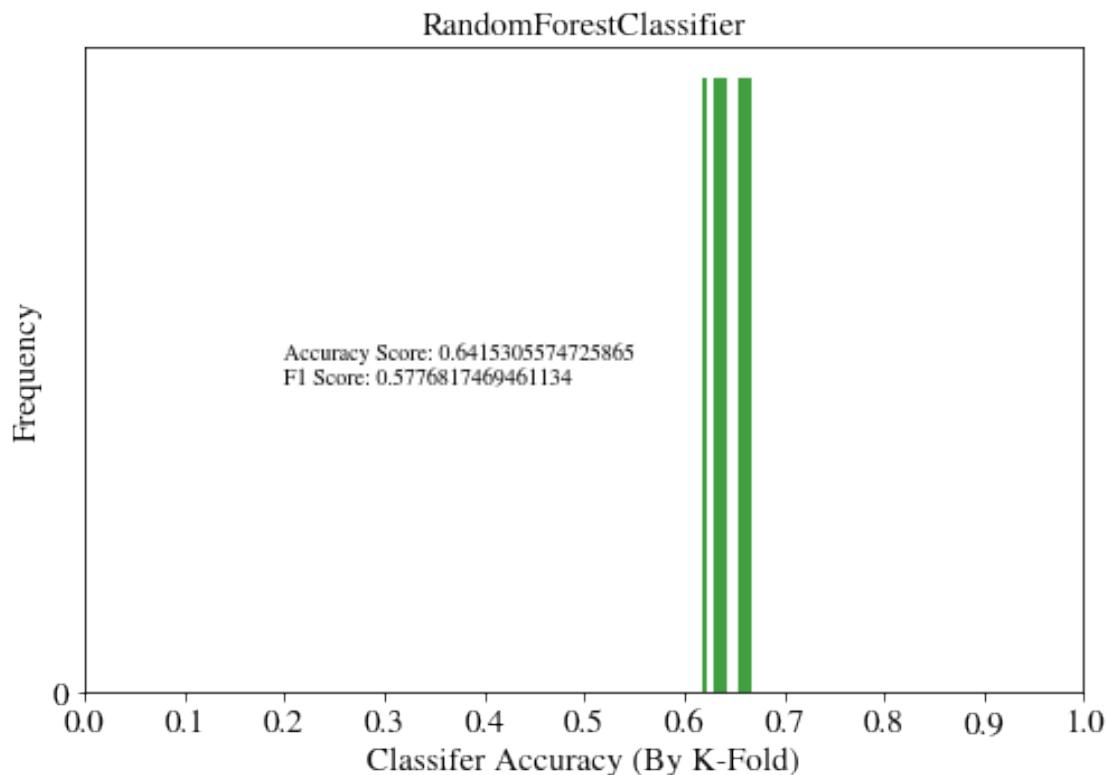
  

	accuracy	f1	precision	recall	\
0	0.660080	0.589400	0.660080	0.660080	
1	0.656353	0.595539	0.656353	0.656353	
2	0.660080	0.589400	0.660080	0.660080	
3	0.661314	0.592260	0.661314	0.661314	
4	0.660080	0.589400	0.660080	0.660080	
5	0.660080	0.589400	0.660080	0.660080	
6	0.660080	0.589520	0.660080	0.660080	
7	0.660080	0.589400	0.660080	0.660080	

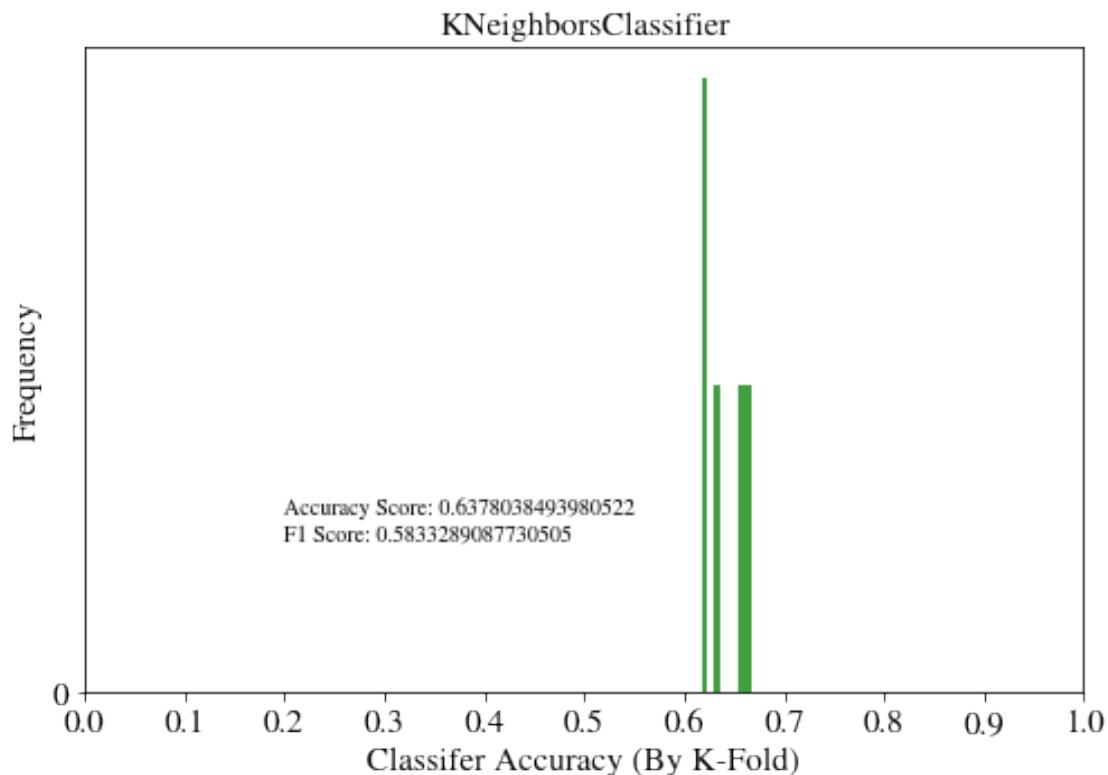
	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...
2	{'C': 1, 'class_weight': None, 'dual': False, ...
3	{'priors': None, 'var_smoothing': 1e-09}
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...

Processing Model: RandomForestClassifier



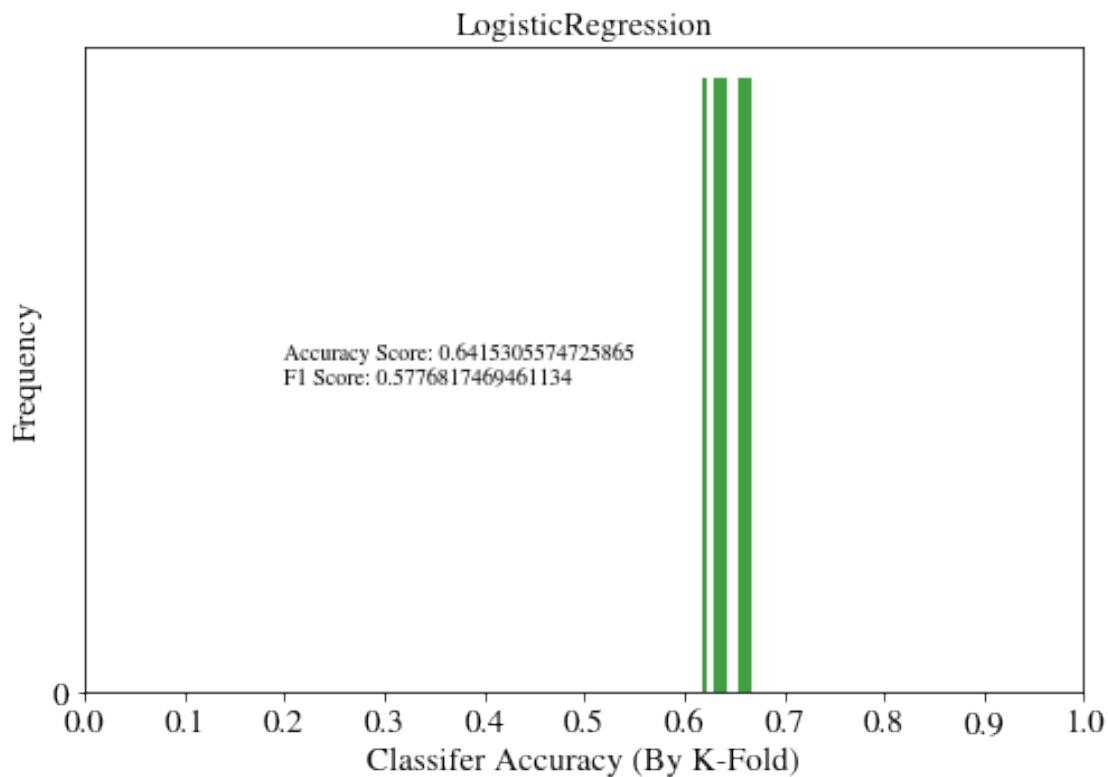
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?, Severity of Crypt Arch', 'accuracy': [0.6172839506172839, 0.6296296296296297, 0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgAccuracy': 0.6415305574725865, 'f1': [0.5427342983147387, 0.5565999544138609, 0.5828997041118252, 0.6049325418652977, 0.6012422360248447], 'avgF1': 0.5776817469461134, 'precision': [0.6172839506172839, 0.6296296296296297, 0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgPrecision': 0.6415305574725865, 'recall': [0.6172839506172839, 0.6296296296296297, 0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgRecall': 0.6415305574725865, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
```

Processing Model: KNeighborsClassifier



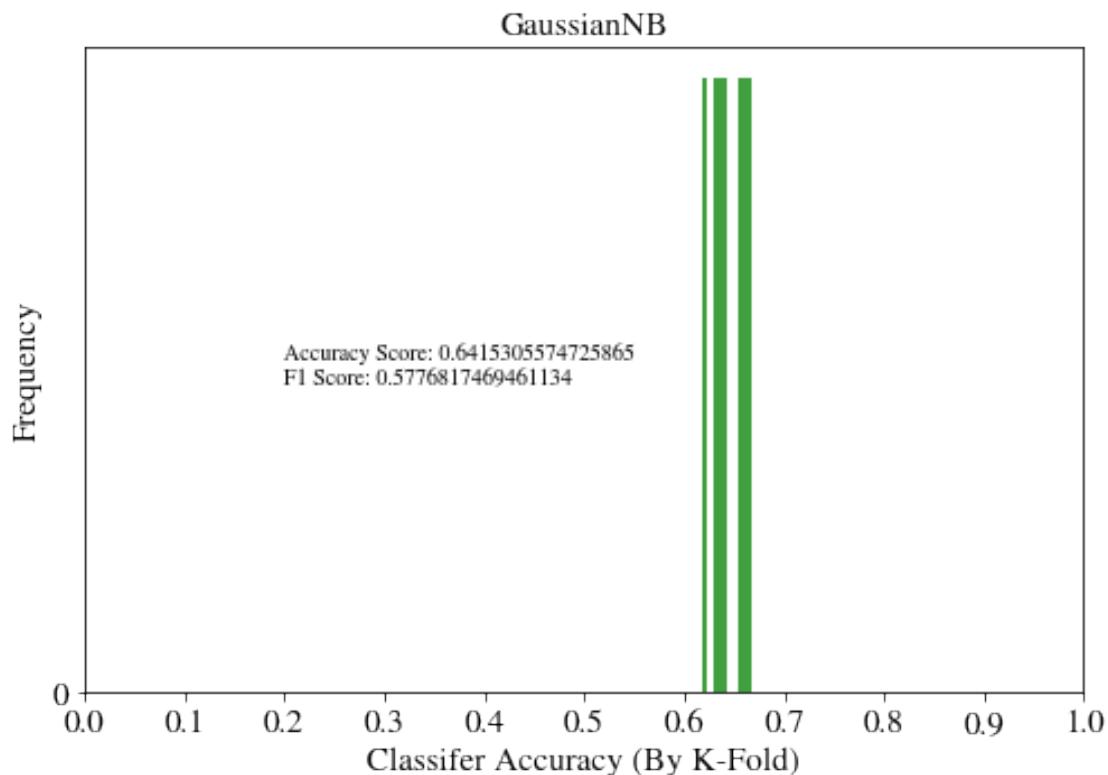
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch', 'accuracy': [0.6172839506172839, 0.6296296296296297,  
0.654320987654321, 0.6666666666666666, 0.6211180124223602], 'avgAccuracy':  
0.6378038493980522, 'f1': [0.5427342983147387, 0.5565999544138609,  
0.5828997041118252, 0.6049325418652977, 0.6294780451595303], 'avgF1':  
0.5833289087730505, 'precision': [0.6172839506172839, 0.6296296296296297,  
0.654320987654321, 0.6666666666666666, 0.6211180124223602], 'avgPrecision':  
0.6378038493980522, 'recall': [0.6172839506172839, 0.6296296296296297,  
0.654320987654321, 0.6666666666666666, 0.6211180124223602], 'avgRecall':  
0.6378038493980522, 'params': [{algorithm': 'brute', 'leaf_size': 30, 'metric':  
'minkowski', 'metric_params': None, 'n_jobs': -1, 'n_neighbors': 17, 'p': 2,  
'weights': 'distance'}]}}
*****
```

Processing Model: LogisticRegression



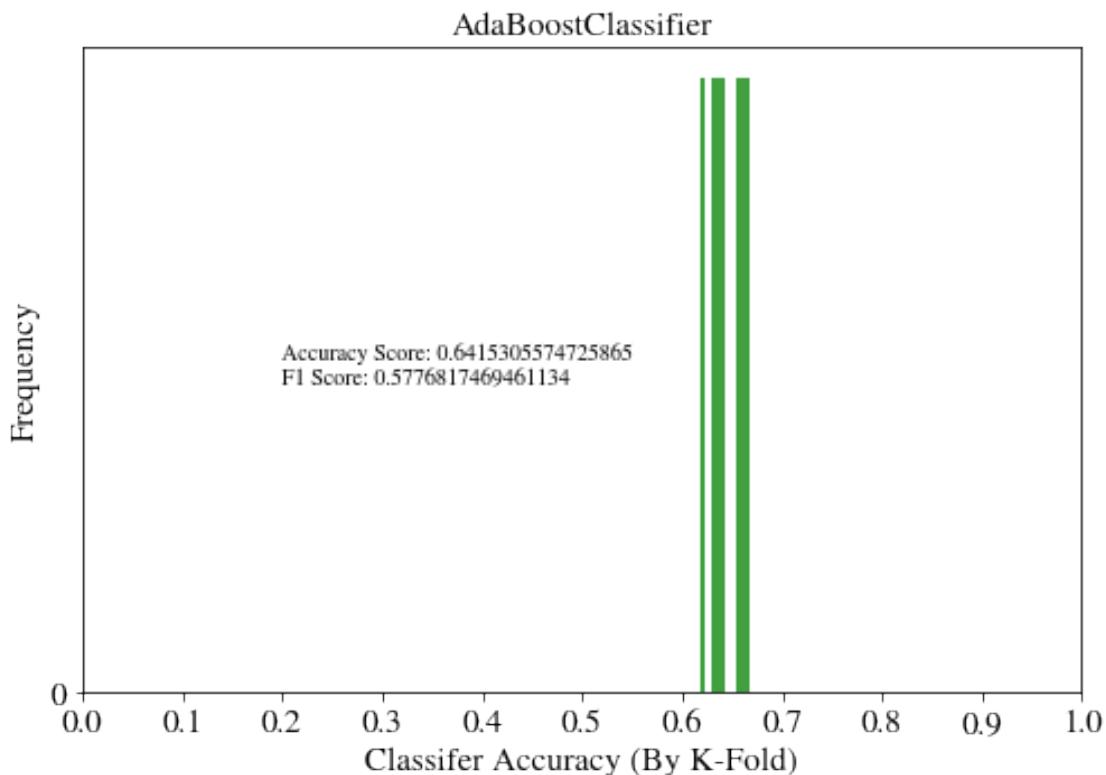
```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?,  
Severity of Crypt Arch', 'accuracy': [0.6172839506172839, 0.6296296296296297,  
0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgAccuracy':  
0.6415305574725865, 'f1': [0.5427342983147387, 0.5565999544138609,  
0.5828997041118252, 0.6049325418652977, 0.6012422360248447], 'avgF1':  
0.5776817469461134, 'precision': [0.6172839506172839, 0.6296296296296297,  
0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgPrecision':  
0.6415305574725865, 'recall': [0.6172839506172839, 0.6296296296296297,  
0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgRecall':  
0.6415305574725865, 'params': [{'C': 1, 'class_weight': None, 'dual': False,  
'fit_intercept': True, 'intercept_scaling': 1, 'l1_ratio': None, 'max_iter':  
100, 'multi_class': 'ovr', 'n_jobs': -1, 'penalty': 'l2', 'random_state': None,  
'solver': 'newton-cg', 'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}
*****
```

Processing Model: GaussianNB



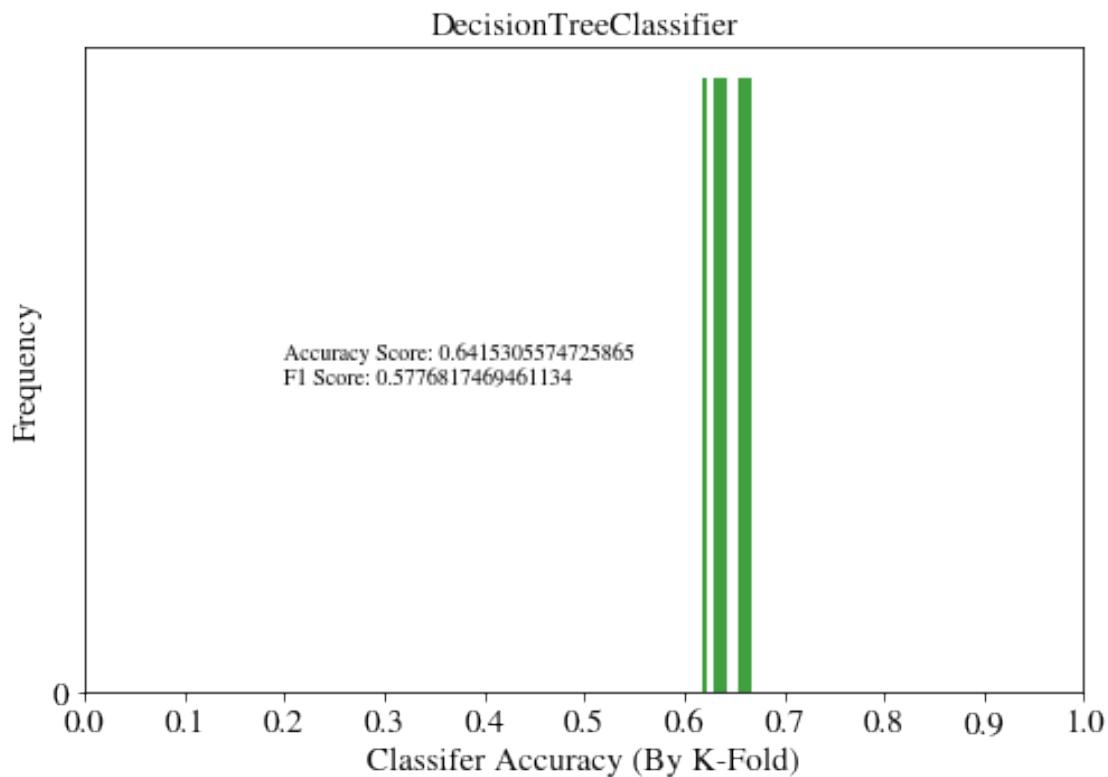
```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?, Severity of
Crypt Arch', 'accuracy': [0.6172839506172839, 0.6296296296296297,
0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgAccuracy':
0.6415305574725865, 'f1': [0.5427342983147387, 0.5565999544138609,
0.5828997041118252, 0.6049325418652977, 0.6012422360248447], 'avgF1':
0.5776817469461134, 'precision': [0.6172839506172839, 0.6296296296296297,
0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgPrecision':
0.6415305574725865, 'recall': [0.6172839506172839, 0.6296296296296297,
0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgRecall':
0.6415305574725865, 'params': [{'priors': None, 'var_smoothing': 1e-09}]}
*****
```

Processing Model: AdaBoostClassifier



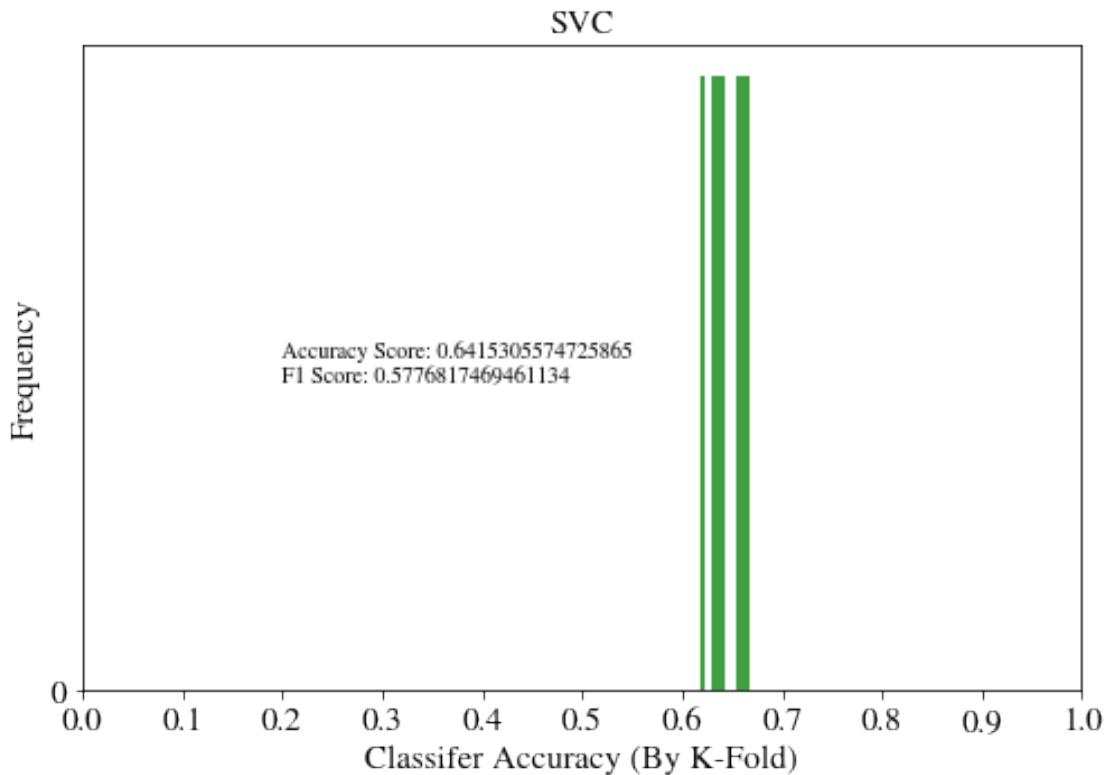
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch', 'accuracy': [0.6172839506172839, 0.6296296296296297,  
0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgAccuracy':  
0.6415305574725865, 'f1': [0.5427342983147387, 0.5565999544138609,  
0.5828997041118252, 0.6049325418652977, 0.6012422360248447], 'avgF1':  
0.5776817469461134, 'precision': [0.6172839506172839, 0.6296296296296297,  
0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgPrecision':  
0.6415305574725865, 'recall': [0.6172839506172839, 0.6296296296296297,  
0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgRecall':  
0.6415305574725865, 'params': [{'algorithm': 'SAMME.R', 'base_estimator': None,  
'learning_rate': 1, 'n_estimators': 20, 'random_state': None}]}
*****
```

Processing Model: DecisionTreeClassifier



```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?,  
Severity of Crypt Arch', 'accuracy': [0.6172839506172839, 0.6296296296296297,  
0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgAccuracy':  
0.6415305574725865, 'f1': [0.5427342983147387, 0.5565999544138609,  
0.5828997041118252, 0.6049325418652977, 0.6012422360248447], 'avgF1':  
0.5776817469461134, 'precision': [0.6172839506172839, 0.6296296296296297,  
0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgPrecision':  
0.6415305574725865, 'recall': [0.6172839506172839, 0.6296296296296297,  
0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgRecall':  
0.6415305574725865, 'params': [{'ccp_alpha': 0.0, 'class_weight': None,  
'criterion': 'gini', 'max_depth': None, 'max_features': 'auto',  
'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split':  
None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf':  
0.0, 'random_state': None, 'splitter': 'best'}]}
*****
```

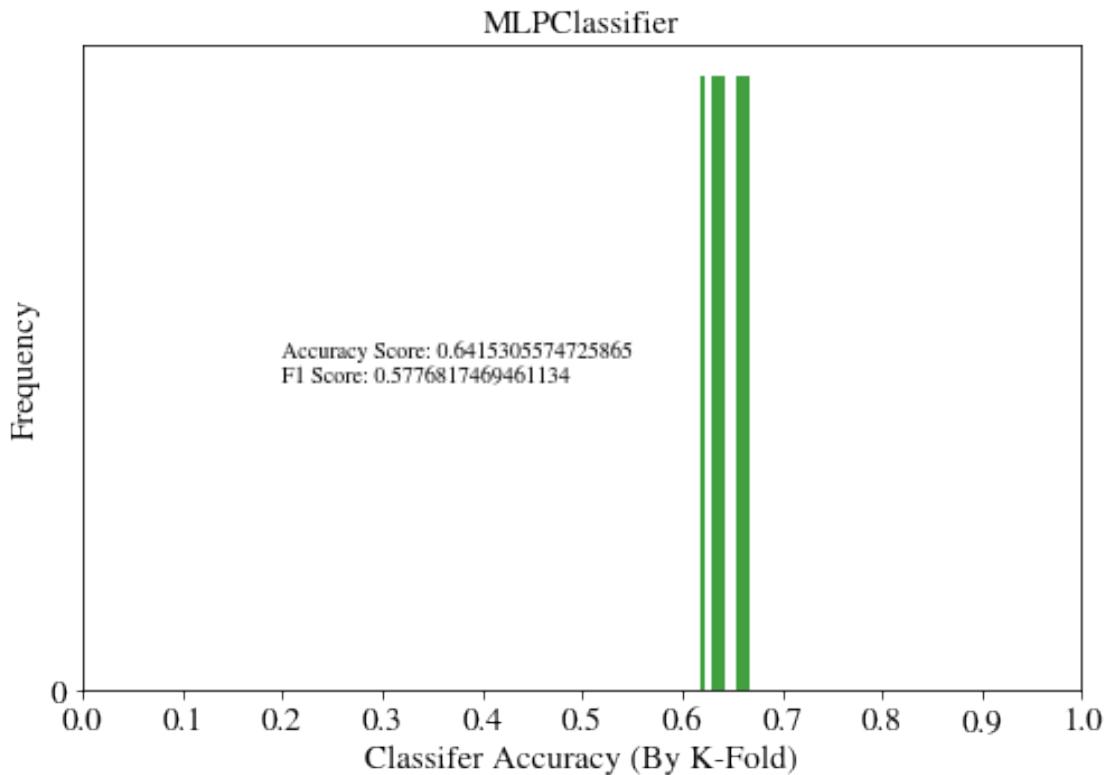
Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?, Severity of Crypt Arch', 'accuracy': [0.6172839506172839, 0.6296296296296297, 0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgAccuracy': 0.6415305574725865, 'f1': [0.5427342983147387, 0.5565999544138609, 0.5828997041118252, 0.6049325418652977, 0.6012422360248447], 'avgF1': 0.5776817469461134, 'precision': [0.6172839506172839, 0.6296296296296297, 0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgPrecision': 0.6415305574725865, 'recall': [0.6172839506172839, 0.6296296296296297, 0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgRecall': 0.6415305574725865, 'params': [{'C': 1.0, 'break_ties': False, 'cache_size': 4000, 'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree': 3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False, 'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
```

\*\*\*\*\*

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?, Severity of
Crypt Arch', 'accuracy': [0.6172839506172839, 0.6296296296296297,
0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgAccuracy':
0.6415305574725865, 'f1': [0.5427342983147387, 0.5565999544138609,
0.5828997041118252, 0.6049325418652977, 0.6012422360248447], 'avgF1':
0.5776817469461134, 'precision': [0.6172839506172839, 0.6296296296296297,
0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgPrecision':
0.6415305574725865, 'recall': [0.6172839506172839, 0.6296296296296297,
0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgRecall':
0.6415305574725865, 'params': [{'activation': 'identity', 'alpha': 0.0001,
'batch_size': 'auto', 'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False,
'epsilon': 1e-08, 'hidden_layer_sizes': (100,), 'learning_rate': 'constant',
'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum':
0.9, 'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5,
'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
'verification_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
```

```

* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?,  

Severity of Crypt Arch', 'accuracy': [0.6172839506172839, 0.6296296296296297,  

0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgAccuracy':  

0.6415305574725865, 'f1': [0.5427342983147387, 0.5565999544138609,  

0.5828997041118252, 0.6049325418652977, 0.6012422360248447], 'avgF1':  

0.5776817469461134, 'precision': [0.6172839506172839, 0.6296296296296297,  

0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgPrecision':  

0.6415305574725865, 'recall': [0.6172839506172839, 0.6296296296296297,  

0.654320987654321, 0.6666666666666666, 0.639751552795031], 'avgRecall':  

0.6415305574725865, 'params': [{bootstrap': True, 'ccp_alpha': 0.0,  

'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features':  

'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease':  

0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2,  

'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score':  

True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

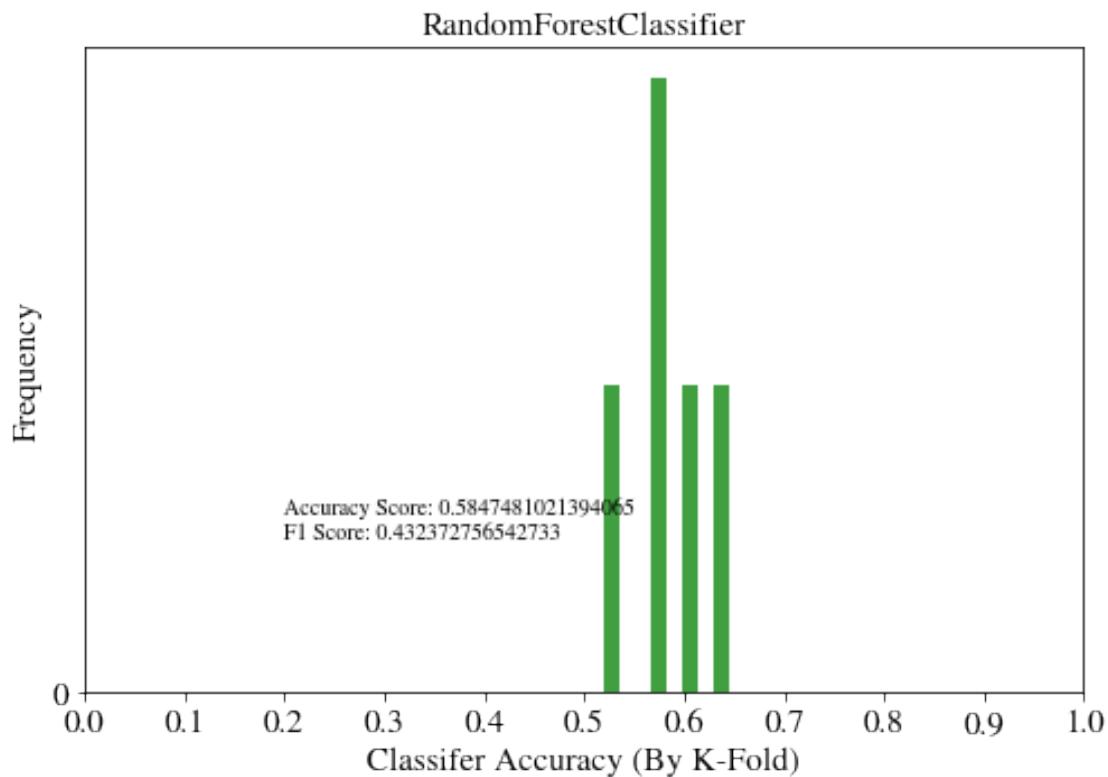
```

	model	features	\
0	RandomForestClassifier	Active inflammation?, Severity of Crypt Arch	
1	KNeighborsClassifier	Active inflammation?, Severity of Crypt Arch	
2	LogisticRegression	Active inflammation?, Severity of Crypt Arch	
3	GaussianNB	Active inflammation?, Severity of Crypt Arch	
4	AdaBoostClassifier	Active inflammation?, Severity of Crypt Arch	
5	DecisionTreeClassifier	Active inflammation?, Severity of Crypt Arch	
6	SVC	Active inflammation?, Severity of Crypt Arch	
7	MLPClassifier	Active inflammation?, Severity of Crypt Arch	

	accuracy	f1	precision	recall	\
0	0.641531	0.577682	0.641531	0.641531	
1	0.637804	0.583329	0.637804	0.637804	
2	0.641531	0.577682	0.641531	0.641531	
3	0.641531	0.577682	0.641531	0.641531	
4	0.641531	0.577682	0.641531	0.641531	
5	0.641531	0.577682	0.641531	0.641531	
6	0.641531	0.577682	0.641531	0.641531	
7	0.641531	0.577682	0.641531	0.641531	

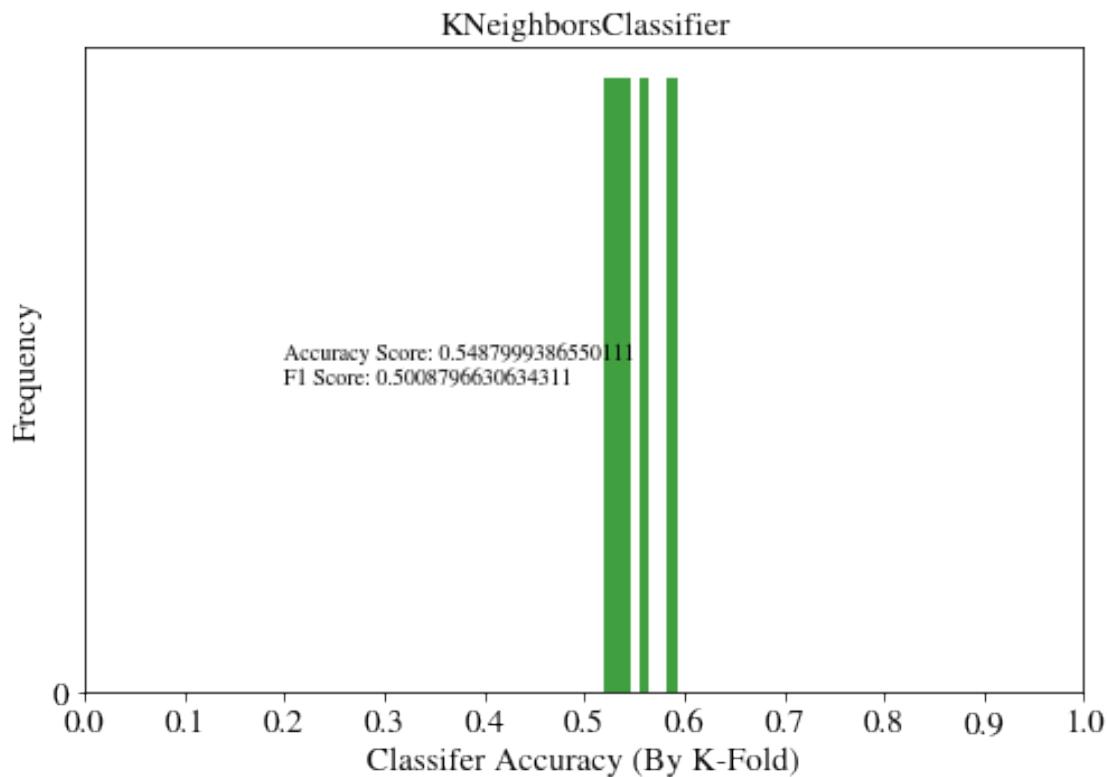
	params
0	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...}
1	{'algorithm': 'brute', 'leaf_size': 30, 'metri...}
2	{'C': 1, 'class_weight': None, 'dual': False, ...}
3	{'priors': None, 'var_smoothing': 1e-09}
4	{'algorithm': 'SAMME.R', 'base_estimator': Non...}
5	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...}
6	{'C': 1.0, 'break_ties': False, 'cache_size': ...}
7	{'activation': 'logistic', 'alpha': 0.0001, 'b...}

Processing Model: RandomForestClassifier



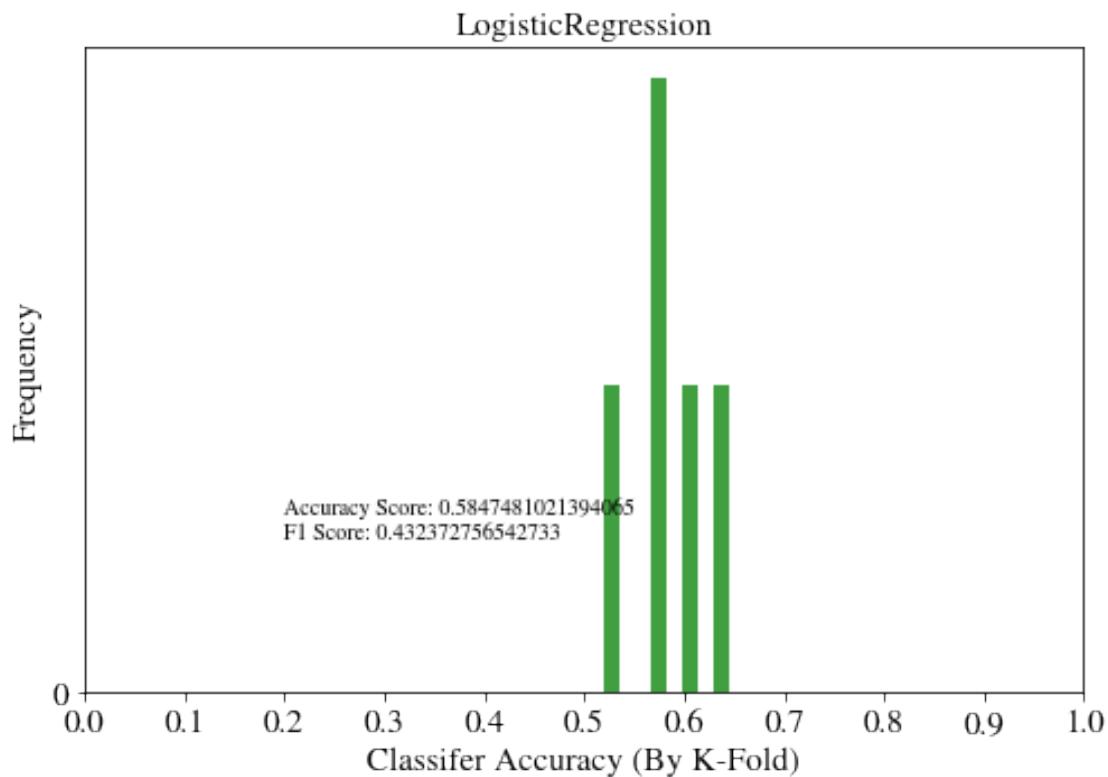
```
*****
* RandomForestClassifier
* Best Params Result:
* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?', 'accuracy': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185, 0.5987654320987654, 0.6459627329192547], 'avgAccuracy': 0.5847481021394065, 'f1': [0.42611882716049393, 0.42611882716049393, 0.3541102077687443, 0.4484961151627818, 0.5070198054611509], 'avgF1': 0.432372756542733, 'precision': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185, 0.5987654320987654, 0.6459627329192547], 'avgPrecision': 0.5847481021394065, 'recall': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185, 0.5987654320987654, 0.6459627329192547], 'avgRecall': 0.5847481021394065, 'params': [{'bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****
```

Processing Model: KNeighborsClassifier



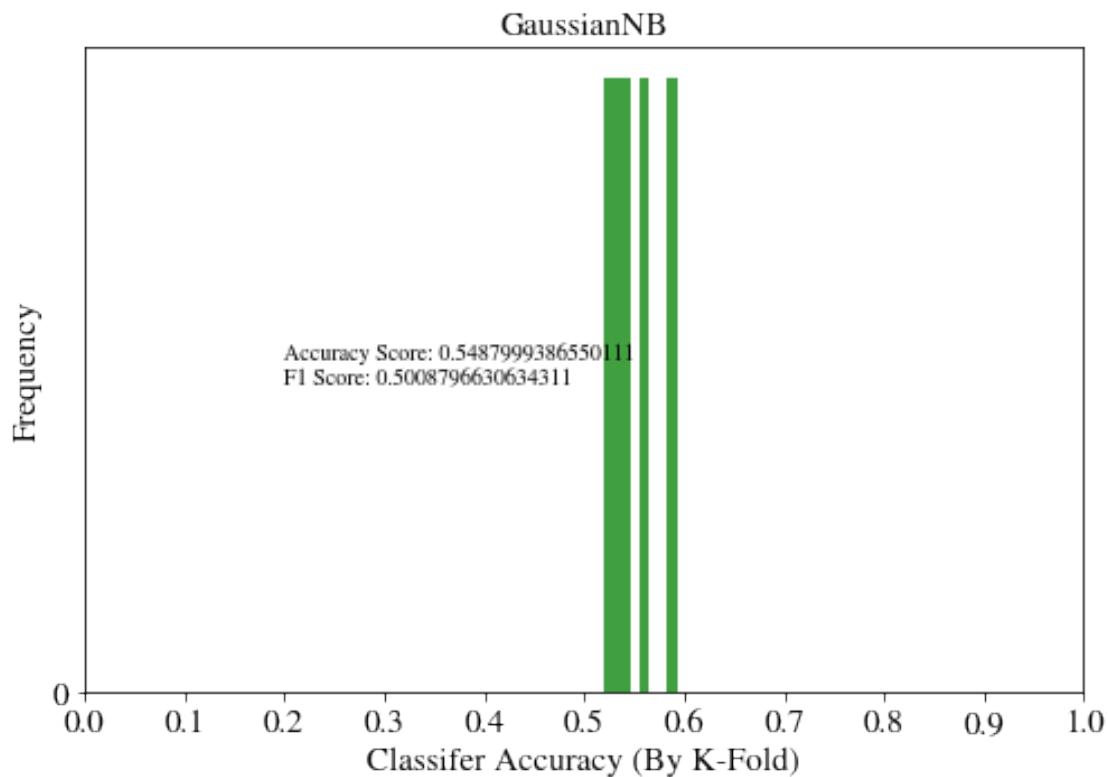
```
*****
* KNeighborsClassifier
* Best Params Result:
* {'classifier': 'KNeighborsClassifier', 'features': 'Active inflammation?',
  'accuracy': [0.5185185185185, 0.5432098765432098, 0.5925925925925926,
  0.5617283950617284, 0.5279503105590062], 'avgAccuracy': 0.5487999386550111,
  'f1': [0.46569973862147257, 0.48879520074950505, 0.5292718976929504,
  0.5161573230789988, 0.5044741551742288], 'avgF1': 0.5008796630634311,
  'precision': [0.5185185185185, 0.5432098765432098, 0.5925925925925926,
  0.5617283950617284, 0.5279503105590062], 'avgPrecision': 0.5487999386550111,
  'recall': [0.5185185185185, 0.5432098765432098, 0.5925925925925926,
  0.5617283950617284, 0.5279503105590062], 'avgRecall': 0.5487999386550111,
  'params': [{`algorithm': 'brute', 'leaf_size': 30, 'metric': 'minkowski',
  'metric_params': None, 'n_jobs': -1, 'n_neighbors': 12, 'p': 2, 'weights':
  'uniform'}]}
*****
```

Processing Model: LogisticRegression



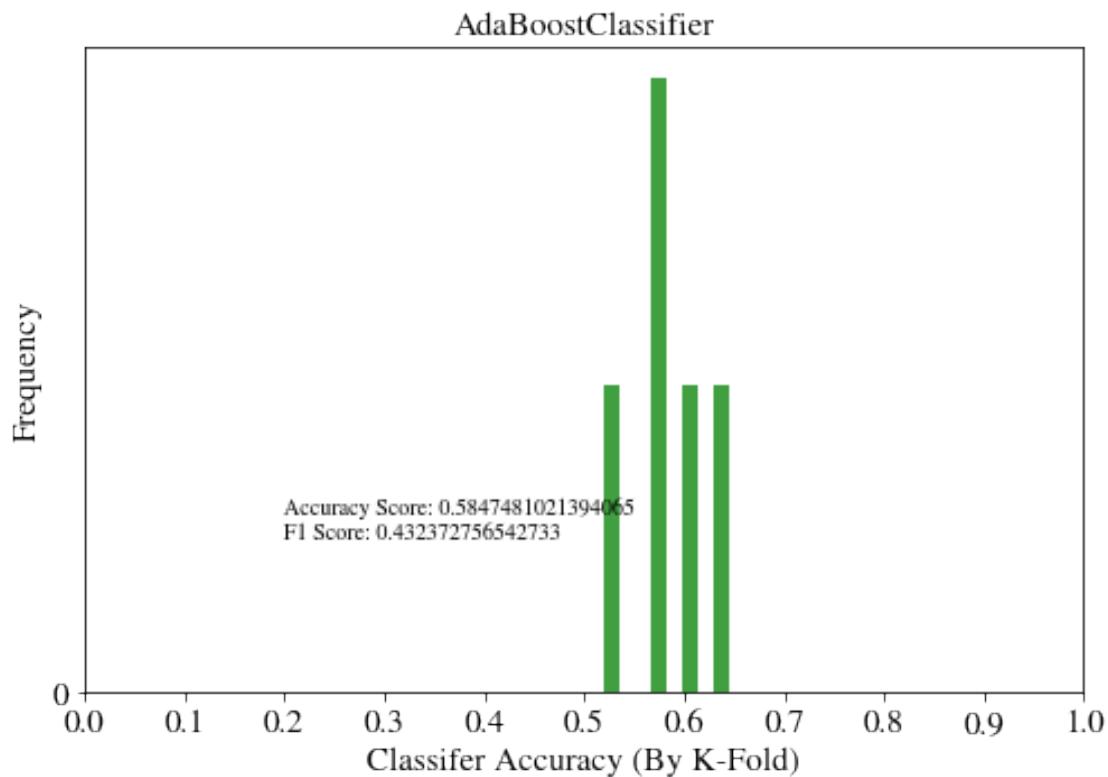
```
*****
* LogisticRegression
* Best Params Result:
* {'classifier': 'LogisticRegression', 'features': 'Active inflammation?',
  'accuracy': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185,
  0.5987654320987654, 0.6459627329192547], 'avgAccuracy': 0.5847481021394065,
  'f1': [0.42611882716049393, 0.42611882716049393, 0.3541102077687443,
  0.4484961151627818, 0.5070198054611509], 'avgF1': 0.432372756542733,
  'precision': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185,
  0.5987654320987654, 0.6459627329192547], 'avgPrecision': 0.5847481021394065,
  'recall': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185,
  0.5987654320987654, 0.6459627329192547], 'avgRecall': 0.5847481021394065,
  'params': [{C: 0.0001, 'class_weight': None, 'dual': False, 'fit_intercept': True,
  'intercept_scaling': 1, 'l1_ratio': None, 'max_iter': 100, 'multi_class': 'ovr',
  'n_jobs': -1, 'penalty': 'l2', 'random_state': None, 'solver': 'newton-cg',
  'tol': 0.0001, 'verbose': 0, 'warm_start': False}]}
*****
```

Processing Model: GaussianNB



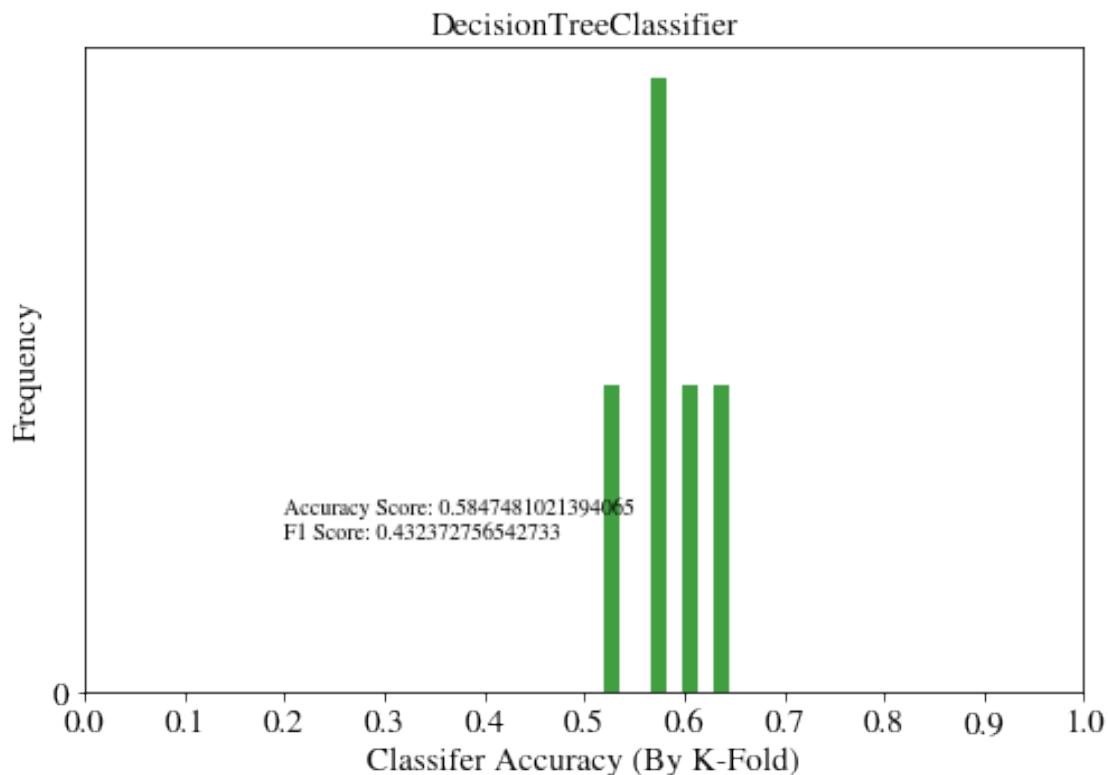
```
*****
* GaussianNB
* Best Params Result:
* {'classifier': 'GaussianNB', 'features': 'Active inflammation?', 'accuracy':
[0.5185185185185, 0.5432098765432098, 0.5925925925925926, 0.5617283950617284,
0.5279503105590062], 'avgAccuracy': 0.5487999386550111, 'f1':
[0.46569973862147257, 0.48879520074950505, 0.5292718976929504,
0.5161573230789988, 0.5044741551742288], 'avgF1': 0.5008796630634311,
'precision': [0.5185185185185, 0.5432098765432098, 0.5925925925925926,
0.5617283950617284, 0.5279503105590062], 'avgPrecision': 0.5487999386550111,
'recall': [0.5185185185185, 0.5432098765432098, 0.5925925925925926,
0.5617283950617284, 0.5279503105590062], 'avgRecall': 0.5487999386550111,
'params': [{'priors': None, 'var_smoothing': 1e-09}]}}
*****
```

Processing Model: AdaBoostClassifier



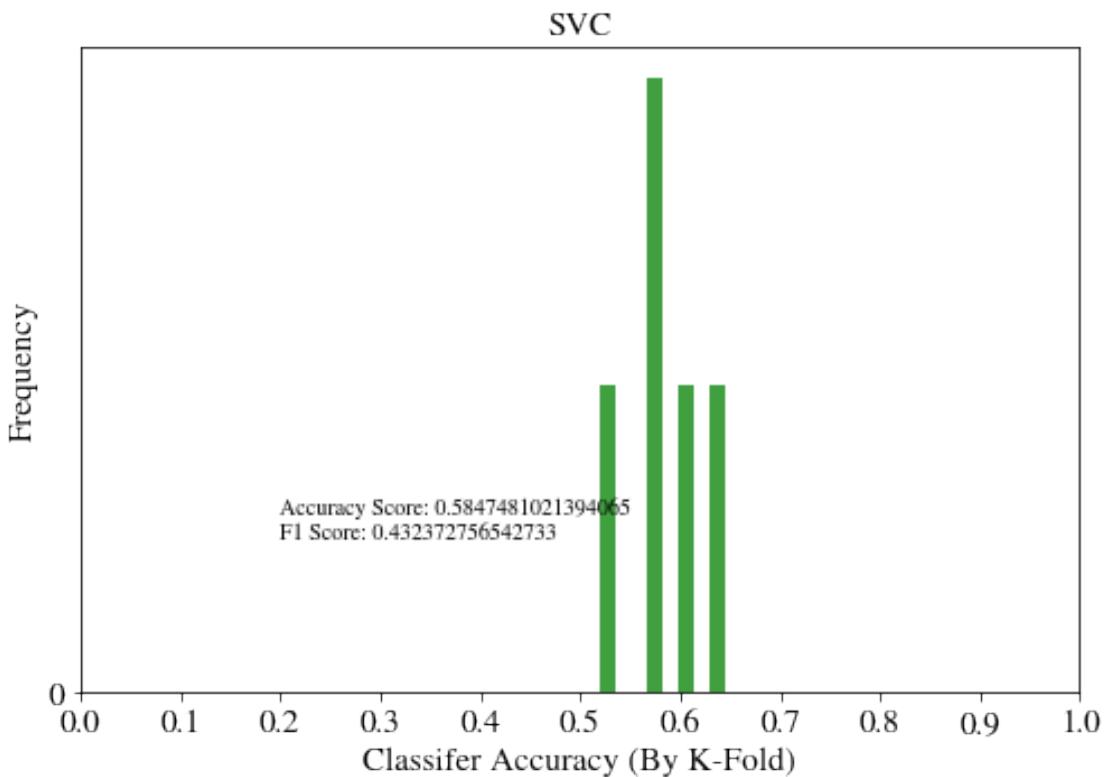
```
*****
* AdaBoostClassifier
* Best Params Result:
* {'classifier': 'AdaBoostClassifier', 'features': 'Active inflammation?',
  'accuracy': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185,
  0.5987654320987654, 0.6459627329192547], 'avgAccuracy': 0.5847481021394065,
  'f1': [0.42611882716049393, 0.42611882716049393, 0.3541102077687443,
  0.4484961151627818, 0.5070198054611509], 'avgF1': 0.432372756542733,
  'precision': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185,
  0.5987654320987654, 0.6459627329192547], 'avgPrecision': 0.5847481021394065,
  'recall': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185,
  0.5987654320987654, 0.6459627329192547], 'avgRecall': 0.5847481021394065,
  'params': [{algorithm': 'SAMME.R', 'base_estimator': None, 'learning_rate': 1,
  'n_estimators': 20, 'random_state': None}]}
*****
```

Processing Model: DecisionTreeClassifier



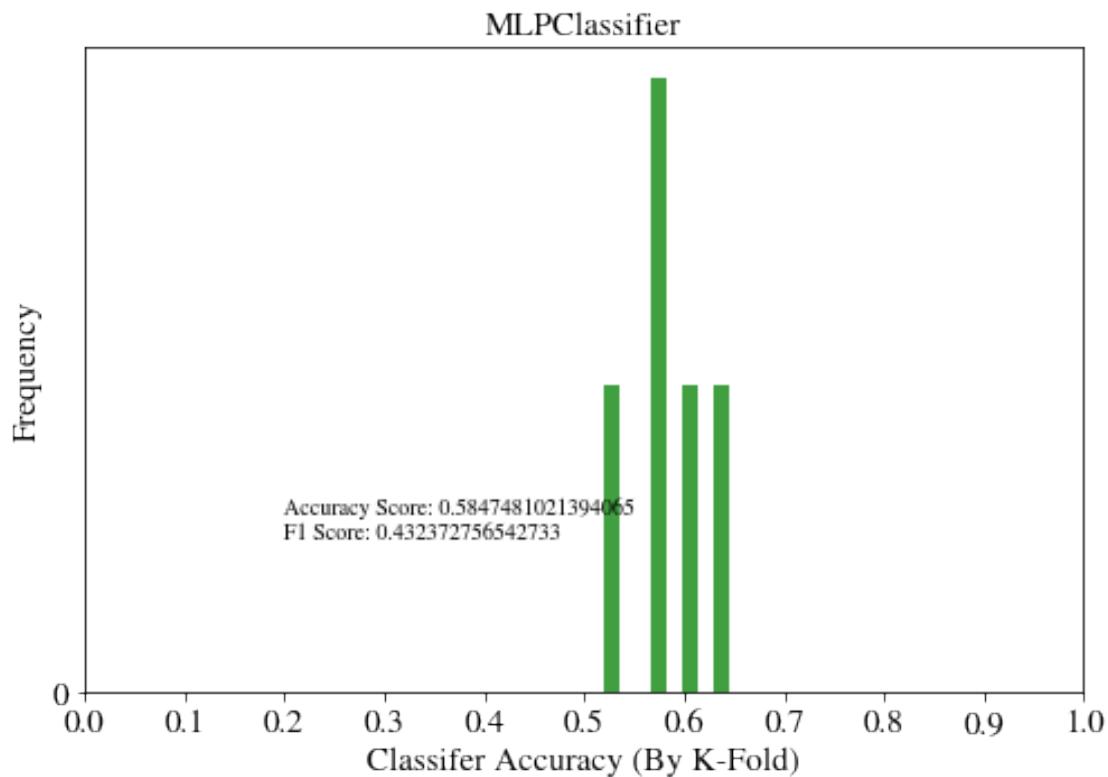
```
*****
* DecisionTreeClassifier
* Best Params Result:
* {'classifier': 'DecisionTreeClassifier', 'features': 'Active inflammation?', 'accuracy': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185, 0.5987654320987654, 0.6459627329192547], 'avgAccuracy': 0.5847481021394065, 'f1': [0.42611882716049393, 0.42611882716049393, 0.3541102077687443, 0.4484961151627818, 0.5070198054611509], 'avgF1': 0.432372756542733, 'precision': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185, 0.5987654320987654, 0.6459627329192547], 'avgPrecision': 0.5847481021394065, 'recall': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185, 0.5987654320987654, 0.6459627329192547], 'avgRecall': 0.5847481021394065, 'params': [{"ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'random_state': None, 'splitter': 'best'}]}}
*****
```

Processing Model: SVC



```
*****
* SVC
* Best Params Result:
* {'classifier': 'SVC', 'features': 'Active inflammation?', 'accuracy':
[0.5802469135802469, 0.5802469135802469, 0.5185185185185, 0.5987654320987654,
0.6459627329192547], 'avgAccuracy': 0.5847481021394065, 'f1':
[0.42611882716049393, 0.42611882716049393, 0.3541102077687443,
0.4484961151627818, 0.5070198054611509], 'avgF1': 0.432372756542733,
'precision': [0.5802469135802469, 0.5802469135802469, 0.5185185185185,
0.5987654320987654, 0.6459627329192547], 'avgPrecision': 0.5847481021394065,
'recall': [0.5802469135802469, 0.5802469135802469, 0.5185185185185,
0.5987654320987654, 0.6459627329192547], 'avgRecall': 0.5847481021394065,
'params': [{C': 0.0001, 'break_ties': False, 'cache_size': 4000,
'class_weight': None, 'coef0': 0.0, 'decision_function_shape': 'ovr', 'degree':
3, 'gamma': 'scale', 'kernel': 'linear', 'max_iter': -1, 'probability': False,
'random_state': None, 'shrinking': True, 'tol': 0.001, 'verbose': False}]}
*****
```

Processing Model: MLPClassifier



```
*****
* MLPClassifier
* Best Params Result:
* {'classifier': 'MLPClassifier', 'features': 'Active inflammation?',
  'accuracy': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185,
  0.5987654320987654, 0.6459627329192547], 'avgAccuracy': 0.5847481021394065,
  'f1': [0.42611882716049393, 0.42611882716049393, 0.3541102077687443,
  0.4484961151627818, 0.5070198054611509], 'avgF1': 0.432372756542733,
  'precision': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185,
  0.5987654320987654, 0.6459627329192547], 'avgPrecision': 0.5847481021394065,
  'recall': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185,
  0.5987654320987654, 0.6459627329192547], 'avgRecall': 0.5847481021394065,
  'params': [{"activation': 'identity', 'alpha': 0.0001, 'batch_size': 'auto',
  'beta_1': 0.9, 'beta_2': 0.999, 'early_stopping': False, 'epsilon': 1e-08,
  'hidden_layer_sizes': (100,), 'learning_rate': 'constant',
  'learning_rate_init': 0.001, 'max_fun': 15000, 'max_iter': 5000, 'momentum': 0.9,
  'n_iter_no_change': 10, 'nesterovs_momentum': True, 'power_t': 0.5,
  'random_state': None, 'shuffle': True, 'solver': 'adam', 'tol': 0.0001,
  'validation_fraction': 0.1, 'verbose': False, 'warm_start': False}]}
*****
*****
* Best Performing Model and Params is:
```

```

* {'classifier': 'RandomForestClassifier', 'features': 'Active inflammation?', 'accuracy': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185, 0.5987654320987654, 0.6459627329192547], 'avgAccuracy': 0.5847481021394065, 'f1': [0.42611882716049393, 0.42611882716049393, 0.3541102077687443, 0.4484961151627818, 0.5070198054611509], 'avgF1': 0.432372756542733, 'precision': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185, 0.5987654320987654, 0.6459627329192547], 'avgPrecision': 0.5847481021394065, 'recall': [0.5802469135802469, 0.5802469135802469, 0.5185185185185185, 0.5987654320987654, 0.6459627329192547], 'avgRecall': 0.5847481021394065, 'params': [{bootstrap': True, 'ccp_alpha': 0.0, 'class_weight': None, 'criterion': 'gini', 'max_depth': None, 'max_features': 'auto', 'max_leaf_nodes': None, 'max_samples': None, 'min_impurity_decrease': 0.0, 'min_impurity_split': None, 'min_samples_leaf': 1, 'min_samples_split': 2, 'min_weight_fraction_leaf': 0.0, 'n_estimators': 200, 'n_jobs': -1, 'oob_score': True, 'random_state': None, 'verbose': 0, 'warm_start': False}]}
*****

```

	model	features	accuracy	f1	\
0	RandomForestClassifier	Active inflammation?	0.584748	0.432373	
1	KNeighborsClassifier	Active inflammation?	0.548800	0.500880	
2	LogisticRegression	Active inflammation?	0.584748	0.432373	
3	GaussianNB	Active inflammation?	0.548800	0.500880	
4	AdaBoostClassifier	Active inflammation?	0.584748	0.432373	
5	DecisionTreeClassifier	Active inflammation?	0.584748	0.432373	
6	SVC	Active inflammation?	0.584748	0.432373	
7	MLPClassifier	Active inflammation?	0.561146	0.431864	

	precision	recall	params
0	0.584748	0.584748	{'bootstrap': True, 'ccp_alpha': 0.0, 'class_w...}
1	0.548800	0.548800	{'algorithm': 'brute', 'leaf_size': 30, 'metri...}
2	0.584748	0.584748	{'C': 1, 'class_weight': None, 'dual': False, ...}
3	0.548800	0.548800	{'priors': None, 'var_smoothing': 1e-09}
4	0.584748	0.584748	{'algorithm': 'SAMME.R', 'base_estimator': Non...}
5	0.584748	0.584748	{'ccp_alpha': 0.0, 'class_weight': None, 'crit...}
6	0.584748	0.584748	{'C': 1.0, 'break_ties': False, 'cache_size': ...}
7	0.561146	0.561146	{'activation': 'logistic', 'alpha': 0.0001, 'b...}

```

[ ]: # MSMOTE Dataset
X3 = pd.concat([X_msm, X_test_ord])#.to_numpy()
y3 = pd.concat([y_msm, y_test_ord]).to_numpy()
#data = (X, y, n_folds)

print('*****')
print('Starting MSMOTE data set....')
print('*****')

for i in range(1, 0, -1):

```

```
col = []
col = df[:i]
nX3 = X3.loc[:, col]
nX3 = nX3.to_numpy()
data = (nX3, y3, n_folds)
hyper_search(modelDictionary, modelParamsDictionary, data3, col)
```

[ ]:

[ ]:

[ ]:

### 0.7.2 Creation of novel ML Models

[ ]:

[ ]:

[ ]:

[ ]:

[ ]:

### 0.7.3 Running Models

[ ]:

[ ]:

[ ]:

[ ]:

## 0.8 ## Results/Discussion

### 0.8.1 Results

[ ]:

[ ]:

[ ]:

[ ]:

[ ]:

### **0.8.2 Statistics**

- [ ]:
- [ ]:
- [ ]:
- [ ]:
- [ ]:

### **0.8.3 Visualizations**

- [ ]:
- [ ]:
- [ ]:
- [ ]:
- [ ]:

### **0.8.4 Discussion**

- [ ]:
- [ ]:
- [ ]:
- [ ]:
- [ ]:
- [ ]:

### **0.8.5 Conclusions**

- [ ]:
- [ ]:
- [ ]:
- [ ]:
- [ ]: