```
!pip install -q scikit-learn xgboost lazypredict pandas matplotlib seaborn

```

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```

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt

from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score, f1_score
from lazypredict.Supervised import LazyClassifier
from sklearn.preprocessing import StandardScaler

```

```
!wget https://gist.githubusercontent.com/trantuyen082001/1fc2f5c0ad1507f40e721e6d18b34138/raw/heart.csv -O heart.csv

```

```
--2025-07-04 18:07:49--  https://gist.githubusercontent.com/trantuyen082001/1fc2f5c0ad1507f40e721e6d18b34138/raw/heart.csv
Resolving gist.githubusercontent.com (gist.githubusercontent.com)... 185.199.108.133, 185.199.110.133, 185.199.109.133, ...
Connecting to gist.githubusercontent.com (gist.githubusercontent.com)|185.199.108.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 11019 (11K) [text/plain]
Saving to: ‘heart.csv’

heart.csv           100%[===================>]  10.76K  --.-KB/s    in 0.001s

2025-07-04 18:07:49 (16.2 MB/s) - ‘heart.csv’ saved [11019/11019]
```

```
df = pd.read_csv('heart.csv')
df.head()
```

	age	sex	cp	trtbps	chol	fbs	restecg	thalachh	exng	oldpeak	slp	caa	thall	output
0	63	1	3	145	233	1	0	150	0	2.30	0	0	1	1
1	37	1	2	130	250	0	1	187	0	3.50	0	0	2	1
2	41	0	1	130	204	0	0	172	0	1.40	2	0	2	1
3	56	1	1	120	236	0	1	178	0	0.80	2	0	2	1
4	57	0	0	120	354	0	1	163	1	0.60	2	0	2	1

```
X = df.drop('output', axis=1)
y = df['output']
```

```
scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)
```

```
X_train, X_test, y_train, y_test = train_test_split(
    X_scaled, y, test_size=0.2, random_state=42
)
```

```
clf = LazyClassifier(verbose=0, ignore_warnings=True)
models, predictions = clf.fit(X_train, X_test, y_train, y_test)

```

100% 32/32 [00:02<00:00, 16.56it/s]

```
[LightGBM] [Info] Number of positive: 133, number of negative: 109
[LightGBM] [Info] Auto-choosing row-wise multi-threading, the overhead of testing was 0.000142 seconds.
You can set `force_row_wise=true` to remove the overhead.
And if memory is not enough, you can set `force_col_wise=true`.
[LightGBM] [Info] Total Bins 246
[LightGBM] [Info] Number of data points in the train set: 242, number of used features: 13
[LightGBM] [Info] [binary:BoostFromScore]: pavg=0.549587 -> initscore=0.199001
[LightGBM] [Info] Start training from score 0.199001
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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```

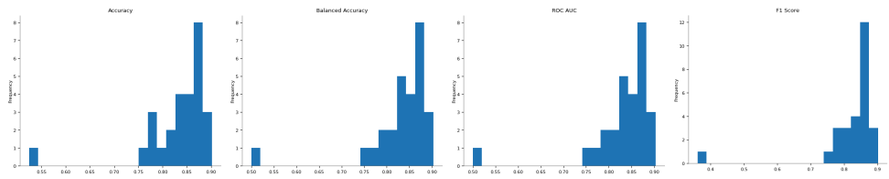
```
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

```
print("\n📊 Model Comparison:\n")
display(models.sort_values(by='Accuracy', ascending=False))
```

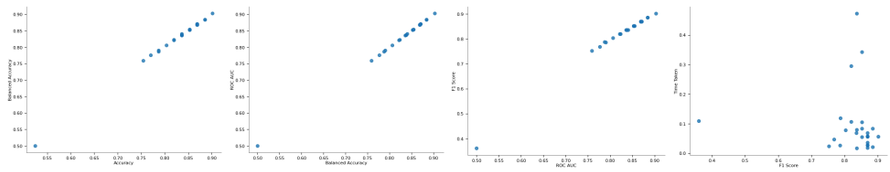
```
📊 Model Comparison:
```

Model	Accuracy	Balanced Accuracy	ROC AUC	F1 Score	Time Taken
KNeighborsClassifier	0.90	0.90	0.90	0.90	0.06
CalibratedClassifierCV	0.89	0.88	0.88	0.89	0.08
RidgeClassifierCV	0.89	0.88	0.88	0.89	0.02
NuSVC	0.87	0.87	0.87	0.87	0.06
SVC	0.87	0.87	0.87	0.87	0.02
GaussianNB	0.87	0.87	0.87	0.87	0.06
BernoulliNB	0.87	0.87	0.87	0.87	0.03
LinearDiscriminantAnalysis	0.87	0.87	0.87	0.87	0.07
LinearSVC	0.87	0.87	0.87	0.87	0.03
RidgeClassifier	0.87	0.87	0.87	0.87	0.04
NearestCentroid	0.87	0.87	0.87	0.87	0.06
LabelPropagation	0.85	0.85	0.85	0.85	0.08
LabelSpreading	0.85	0.85	0.85	0.85	0.06
LogisticRegression	0.85	0.85	0.85	0.85	0.10
ExtraTreesClassifier	0.85	0.85	0.85	0.85	0.34
QuadraticDiscriminantAnalysis	0.84	0.84	0.84	0.84	0.07
LGBMClassifier	0.84	0.84	0.84	0.84	0.08
SGDClassifier	0.84	0.84	0.84	0.84	0.02
RandomForestClassifier	0.84	0.84	0.84	0.84	0.47
AdaBoostClassifier	0.82	0.82	0.82	0.82	0.29
XGBClassifier	0.82	0.82	0.82	0.82	0.11
BaggingClassifier	0.80	0.81	0.81	0.80	0.08
Perceptron	0.79	0.79	0.79	0.79	0.03
ExtraTreeClassifier	0.79	0.79	0.79	0.79	0.12
PassiveAggressiveClassifier	0.77	0.78	0.78	0.77	0.05
DecisionTreeClassifier	0.75	0.76	0.76	0.75	0.02
DummyClassifier	0.52	0.50	0.50	0.36	0.11

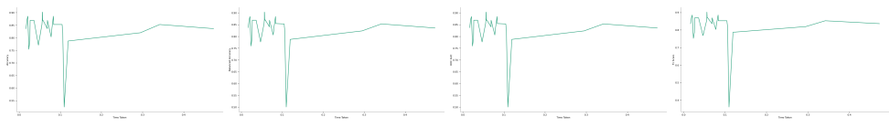
Distributions



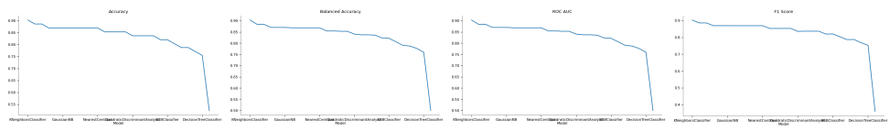
2-d distributions



Time series

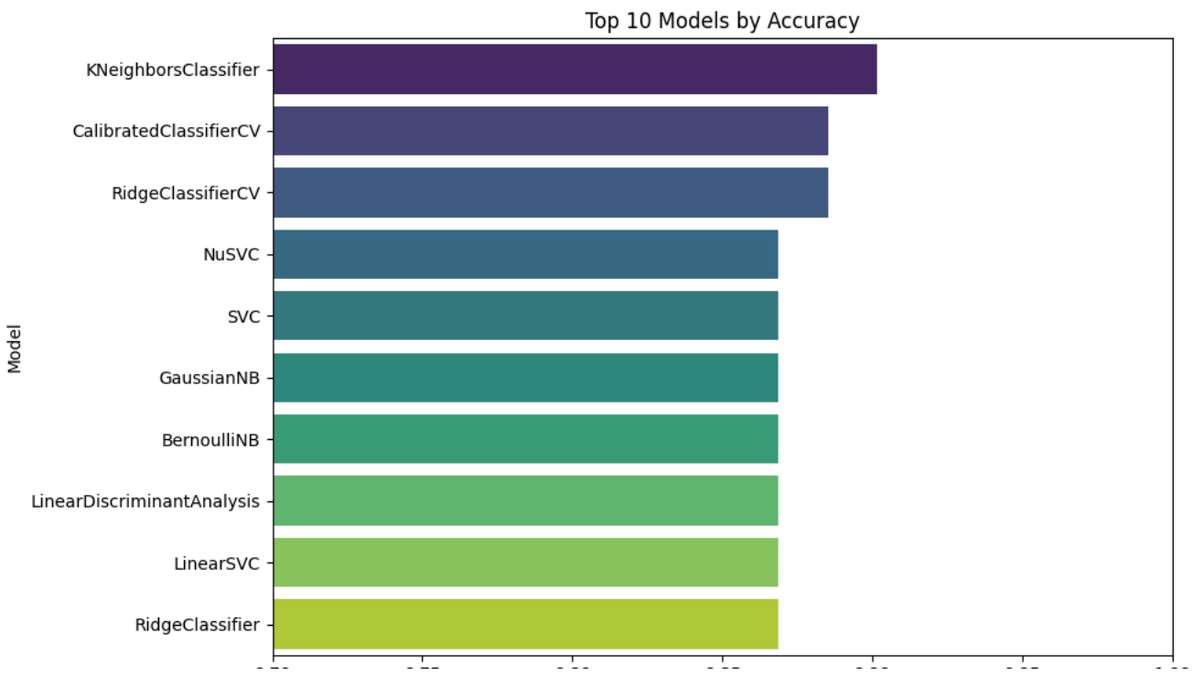


Values




```
top = models.sort_values(by='Accuracy', ascending=False).head(10)
plt.figure(figsize=(10,6))
sns.barplot(x=top.Accuracy, y=top.index, palette="viridis")
plt.title('Top 10 Models by Accuracy')
plt.xlabel('Accuracy')
plt.ylabel('Model')
plt.xlim(0.7,1.0)
plt.tight_layout()
```

```
 9 plt.show()
10
```


Top 10 Models by Accuracy
KNeighborsClassifier
CalibratedClassifierCV
RidgeClassifierCV
NuSVC
SVC
GaussianNB
BernoulliNB
LinearDiscriminantAnalysis
LinearSVC
RidgeClassifier
Model