DISEASE PREDICTION BASED ON SYMPTOMS USING MACHINE LEARNING

HILARIOUS HUMaNS TEAM

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In [4]:
```
#Importing Libraries
from mpl_toolkits.mplot3d import Axes3D
from sklearn.preprocessing import StandardScaler
import matplotlib.pyplot as plt
from tkinter import *
import numpy as np
import pandas as pd
import os
```

In [5]:
```
#List of the symptoms is listed here in list l1.

l1=['back_pain','constipation','abdominal_pain','diarrhoea','mild_fever','yellow_urine',
    'yellowing_of_eyes','acute_liver_failure','fluid_overload','swelling_of_stomach',
    'swelled_lymph_nodes','malaise','blurred_and_distorted_vision','phlegm','throat_irritation',
    'redness_of_eyes','sinus_pressure','runny_nose','congestion','chest_pain','weakness_in_limbs',
    'fast_heart_rate','pain_during_bowel_movements','pain_in_anal_region','bloody_stool',
    'irritation_in_anus','neck_pain','dizziness','cramps','bruising','obesity','swollen_legs',
    'swollen_blood_vessels','puffy_face_and_eyes','enlarged_thyroid','brittle_nails',
    'swollen_extremeties','excessive_hunger','extra_marital_contacts','drying_and_tingling_lips',
    'slurred_speech','knee_pain','hip_joint_pain','muscle_weakness','stiff_neck','swelling_joints',
    'movement_stiffness','spinning_movements','loss_of_balance','unsteadiness',
    'weakness_of_one_body_side','loss_of_smell','bladder_discomfort','foul_smell_of urine',
    'continuous_feel_of_urine','passage_of_gases','internal_itching','toxic_look_(typhos)',
    'depression','irritability','muscle_pain','altered_sensorium','red_spots_over_body','belly_pain'
    'abnormal_menstruation','dischromic _patches','watering_from_eyes','increased_appetite','polyuri
    'rusty_sputum','lack_of_concentration','visual_disturbances','receiving_blood_transfusion',
    'receiving_unsterile_injections','coma','stomach_bleeding','distention_of_abdomen',
    'history_of_alcohol_consumption','fluid_overload','blood_in_sputum','prominent_veins_on_calf',
    'palpitations','painful_walking','pus_filled_pimples','blackheads','scurring','skin_peeling',
    'silver_like_dusting','small_dents_in_nails','inflammatory_nails','blister','red_sore_around_nos
    'yellow_crust_ooze']
```

In [6]:
```
#List of Diseases is listed in list disease.

disease=['Fungal infection', 'Allergy', 'GERD', 'Chronic cholestasis',
       'Drug Reaction', 'Peptic ulcer diseae', 'AIDS', 'Diabetes ',
       'Gastroenteritis', 'Bronchial Asthma', 'Hypertension ', 'Migraine',
       'Cervical spondylosis', 'Paralysis (brain hemorrhage)', 'Jaundice',
       'Malaria', 'Chicken pox', 'Dengue', 'Typhoid', 'hepatitis A',
       'Hepatitis B', 'Hepatitis C', 'Hepatitis D', 'Hepatitis E',
       'Alcoholic hepatitis', 'Tuberculosis', 'Common Cold', 'Pneumonia',
       'Dimorphic hemmorhoids(piles)', 'Heart attack', 'Varicose veins',
       'Hypothyroidism', 'Hyperthyroidism', 'Hypoglycemia',
       'Osteoarthristis', 'Arthritis',
       '(vertigo) Paroymsal  Positional Vertigo', 'Acne',
       'Urinary tract infection', 'Psoriasis', 'Impetigo']

#disease = [df['prognosis'].unique()]
#print(disease)
```

In [7]:
```
l2=[]
for i in range(0,len(l1)):
    l2.append(0)
print(l2)
```

```
[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
```

In [8]:
```
#Reading the training .csv file
df=pd.read_csv("training.csv")
DF= pd.read_csv('training.csv', index_col='prognosis')
#Replace the values in the imported file by pandas by the inbuilt function replace in pandas.

df.replace({'prognosis':{'Fungal infection':0,'Allergy':1,'GERD':2,'Chronic cholestasis':3,'Drug Rea
    'Peptic ulcer diseae':5,'AIDS':6,'Diabetes ':7,'Gastroenteritis':8,'Bronchial Asthma':9,'Hyperte
    'Migraine':11,'Cervical spondylosis':12,
    'Paralysis (brain hemorrhage)':13,'Jaundice':14,'Malaria':15,'Chicken pox':16,'Dengue':17,'Typho
    'Hepatitis B':20,'Hepatitis C':21,'Hepatitis D':22,'Hepatitis E':23,'Alcoholic hepatitis':24,'Tu
    'Common Cold':26,'Pneumonia':27,'Dimorphic hemmorhoids(piles)':28,'Heart attack':29,'Varicose ve
    'Hyperthyroidism':32,'Hypoglycemia':33,'Osteoarthristis':34,'Arthritis':35,
    '(vertigo) Paroymsal  Positional Vertigo':36,'Acne':37,'Urinary tract infection':38,'Psoriasis':
    'Impetigo':40}},inplace=True)
#df.head()
DF.head()
```

Out [8]:

prognosis	itching	skin_rash	nodal_skin_eruptions	continuous_sneezing	shivering	chills	joint_pain	stomach_pain	acidity	ulcers_on_
Fungal infection	1	1	1	0	0	0	0	0	0	0
Fungal infection	0	1	1	0	0	0	0	0	0	0
Fungal infection	1	0	1	0	0	0	0	0	0	0
Fungal infection	1	1	0	0	0	0	0	0	0	0
Fungal infection	1	1	1	0	0	0	0	0	0	0

5 rows × 133 columns

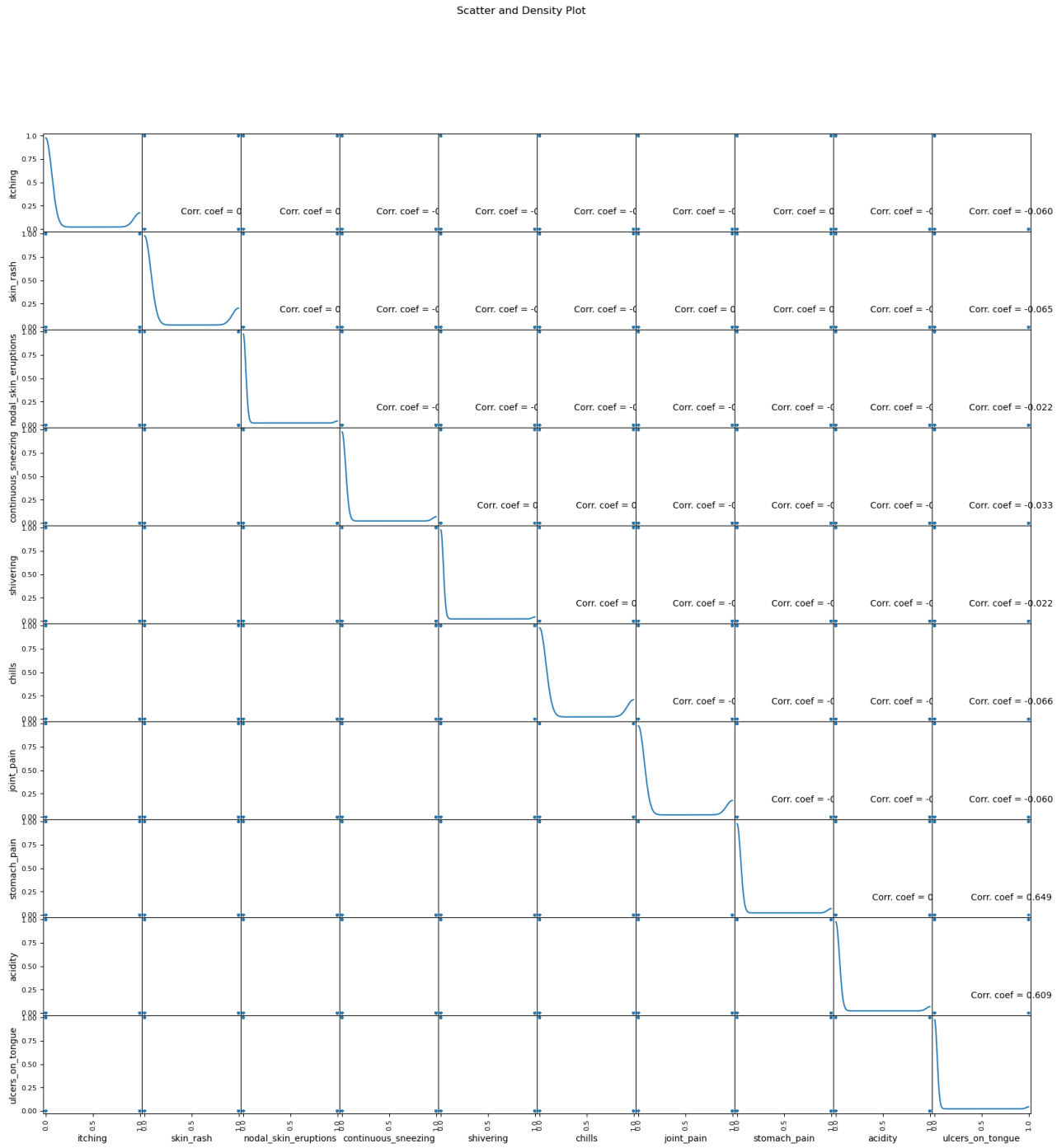
In [9]:
```
# Distribution graphs (histogram/bar graph) of column data
def plotPerColumnDistribution(df1, nGraphShown, nGraphPerRow):
    nunique = df1.nunique()
    df1 = df1[[col for col in df if nunique[col] > 1 and nunique[col] < 50]] # For displaying purpos
    nRow, nCol = df1.shape
    columnNames = list(df1)
    nGraphRow = (nCol + nGraphPerRow - 1) / nGraphPerRow
    plt.figure(num = None, figsize = (6 * nGraphPerRow, 8 * nGraphRow), dpi = 80, facecolor = 'w', e
    for i in range(min(nCol, nGraphShown)):
        plt.subplot(nGraphRow, nGraphPerRow, i + 1)
        columnDf = df.iloc[:, i]
        if (not np.issubdtype(type(columnDf.iloc[0]), np.number)):
            valueCounts = columnDf.value_counts()
            valueCounts.plot.bar()
        else:
            columnDf.hist()
        plt.ylabel('counts')
        plt.xticks(rotation = 90)
        plt.title(f'{columnNames[i]} (column {i})')
    plt.tight_layout(pad = 1.0, w_pad = 1.0, h_pad = 1.0)
    plt.show()
```

In [10]:
```
# Scatter and density plots
def plotScatterMatrix(df1, plotSize, textSize):
    df1 = df1.select_dtypes(include =[np.number]) # keep only numerical columns
    # Remove rows and columns that would lead to df being singular
    df1 = df1.dropna('columns')
    df1 = df1[[col for col in df if df[col].nunique() > 1]] # keep columns where there are more than
    columnNames = list(df)
    if len(columnNames) > 10: # reduce the number of columns for matrix inversion of kernel density
        columnNames = columnNames[:10]
    df1 = df1[columnNames]
    ax = pd.plotting.scatter_matrix(df1, alpha=0.75, figsize=[plotSize, plotSize], diagonal='kde')
    corrs = df1.corr().values
    for i, j in zip(*plt.np.triu_indices_from(ax, k = 1)):
        ax[i, j].annotate('Corr. coef = %.3f' % corrs[i, j], (0.8, 0.2), xycoords='axes fraction', ha
```

```
    plt.suptitle('Scatter and Density Plot')
    plt.show()
```

In [11]:
```
plotScatterMatrix(df, 20, 10)
```

```
C:\Users\madhu sravanthi\AppData\Local\Temp\ipykernel_13304\1304029198.py:5: FutureWarning: In a future version of pandas
all arguments of DataFrame.dropna will be keyword-only.
  df1 = df1.dropna('columns')
```



In [12]:
```
X= df[l1]
y = df[["prognosis"]]
np.ravel(y)
print(X)
```

```
      back_pain  constipation  abdominal_pain  diarrhoea  mild_fever  \
0             0             0               0          0           0
1             0             0               0          0           0
2             0             0               0          0           0
3             0             0               0          0           0
4             0             0               0          0           0
...         ...           ...             ...        ...         ...
4915          0             0               0          0           0
4916          0             0               0          0           0
4917          0             0               0          0           0
4918          0             0               0          0           0
4919          0             0               0          0           0

      yellow_urine  yellowing_of_eyes  acute_liver_failure  fluid_overload  \
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
...            ...                ...                  ...             ...
4915             0                  0                    0               0
```

```
4916                    0                    0                    0              0
4917                    0                    0                    0              0
4918                    0                    0                    0              0
4919                    0                    0                    0              0

      swelling_of_stomach  ...  pus_filled_pimples  blackheads  scurring  \
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
...                   ...  ...                 ...         ...       ...
4915                    0  ...                   0           0         0
4916                    0  ...                   1           1         1
4917                    0  ...                   0           0         0
4918                    0  ...                   0           0         0
4919                    0  ...                   0           0         0

      skin_peeling  silver_like_dusting  small_dents_in_nails  \
0                0                    0                     0
1                0                    0                     0
2                0                    0                     0
3                0                    0                     0
4                0                    0                     0
...            ...                  ...                   ...
4915             0                    0                     0
4916             0                    0                     0
4917             0                    0                     0
4918             1                    1                     1
4919             0                    0                     0

      inflammatory_nails  blister  red_sore_around_nose  yellow_crust_ooze
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
...                  ...      ...                   ...                ...
4915                   0        0                     0                  0
4916                   0        0                     0                  0
4917                   0        0                     0                  0
4918                   1        0                     0                  0
4919                   0        1                     1                  1

[4920 rows x 95 columns]
```

In [13]:

```
print(y)
```

```
      prognosis
0             0
1             0
2             0
3             0
4             0
...         ...
4915         36
4916         37
4917         38
4918         39
4919         40

[4920 rows x 1 columns]
```

In [14]:

```
#Reading the  testing.csv file
tr=pd.read_csv("testing.csv")

#Using inbuilt function replace in pandas for replacing the values

tr.replace({'prognosis':{'Fungal infection':0,'Allergy':1,'GERD':2,'Chronic cholestasis':3,'Drug Rea
    'Peptic ulcer diseae':5,'AIDS':6,'Diabetes ':7,'Gastroenteritis':8,'Bronchial Asthma':9,'Hyperte
    'Migraine':11,'Cervical spondylosis':12,
    'Paralysis (brain hemorrhage)':13,'Jaundice':14,'Malaria':15,'Chicken pox':16,'Dengue':17,'Typho
    'Hepatitis B':20,'Hepatitis C':21,'Hepatitis D':22,'Hepatitis E':23,'Alcoholic hepatitis':24,'Tu
    'Common Cold':26,'Pneumonia':27,'Dimorphic hemmorhoids(piles)':28,'Heart attack':29,'Varicose ve
    'Hyperthyroidism':32,'Hypoglycemia':33,'Osteoarthristis':34,'Arthritis':35,
    '(vertigo) Paroymsal  Positional Vertigo':36,'Acne':37,'Urinary tract infection':38,'Psoriasis':
    'Impetigo':40}},inplace=True)
tr.head()
```

Out [14]:

	itching	skin_rash	nodal_skin_eruptions	continuous_sneezing	shivering	chills	joint_pain	stomach_pain	acidity	ulcers_on_tongue
0	1	1	1	0	0	0	0	0	0	0
1	0	0	0	1	1	1	0	0	0	0
2	0	0	0	0	0	0	0	1	1	1
3	1	0	0	0	0	0	0	0	0	0
4	1	1	0	0	0	0	0	1	0	0

5 rows × 133 columns

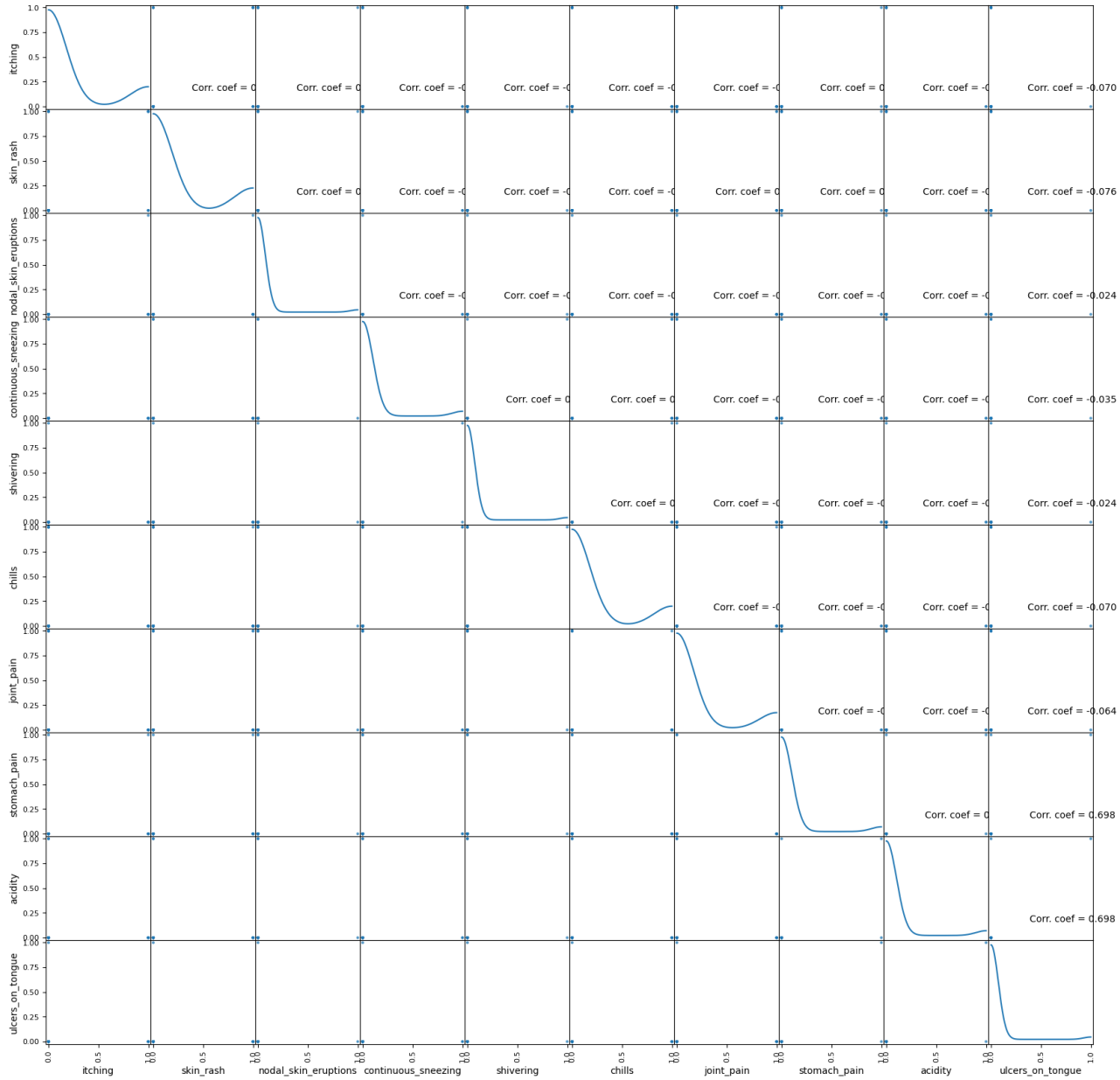
In [15]:

```
plotScatterMatrix(tr, 20, 10)
```

```
C:\Users\madhu sravanthi\AppData\Local\Temp\ipykernel_13304\1304029198.py:5: FutureWarning: In a future version of pandas
all arguments of DataFrame.dropna will be keyword-only.
```

```
df1 = df1.dropna('columns')
```

Scatter and Density Plot



In [16]:
```
X_test= tr[l1]
y_test = tr[["prognosis"]]
np.ravel(y_test)
print(X_test)
```

```
    back_pain  constipation  abdominal_pain  diarrhoea  mild_fever  \
0           0             0               0          0           0
1           0             0               0          0           0
2           0             0               0          0           0
3           0             0               1          0           0
4           0             0               0          0           0
5           0             0               1          0           0
6           0             0               0          0           0
7           0             0               0          0           0
8           0             0               0          1           0
9           0             0               0          0           0
10          0             0               0          0           0
11          0             0               0          0           0
12          1             0               0          0           0
13          0             0               0          0           0
14          0             0               1          0           0
15          0             0               0          1           0
16          0             0               0          0           1
17          1             0               0          0           0
18          0             1               1          1           0
19          0             0               1          1           1
20          0             0               1          0           0
21          0             0               0          0           0
22          0             0               1          0           0
23          0             0               1          0           0
24          0             0               1          0           0
25          0             0               0          0           1
26          0             0               0          0           0
27          0             0               0          0           0
28          0             1               0          0           0
29          0             0               0          0           0
30          0             0               0          0           0
```

```
31          0            0               0          0           0
32          0            0               0          1           0
33          0            0               0          0           0
34          0            0               0          0           0
35          0            0               0          0           0
36          0            0               0          0           0
37          0            0               0          0           0
38          0            0               0          0           0
39          0            0               0          0           0
40          0            0               0          0           0
41          0            0               0          0           0
```

```
    yellow_urine  yellowing_of_eyes  acute_liver_failure  fluid_overload  \
0              0                  0                    0               0
1              0                  0                    0               0
2              0                  0                    0               0
3              0                  1                    0               0
4              0                  0                    0               0
5              0                  0                    0               0
6              0                  0                    0               0
7              0                  0                    0               0
8              0                  0                    0               0
9              0                  0                    0               0
10             0                  0                    0               0
11             0                  0                    0               0
12             0                  0                    0               0
13             0                  0                    0               0
14             0                  0                    0               0
15             0                  0                    0               0
16             0                  0                    0               0
17             0                  0                    0               0
18             0                  0                    0               0
19             0                  1                    0               0
20             1                  1                    0               0
21             0                  1                    0               0
22             0                  1                    0               0
23             0                  1                    1               0
24             0                  0                    0               0
25             0                  1                    0               0
26             0                  0                    0               0
27             0                  0                    0               0
28             0                  0                    0               0
29             0                  0                    0               0
30             0                  0                    0               0
31             0                  0                    0               0
32             0                  0                    0               0
33             0                  0                    0               0
34             0                  0                    0               0
35             0                  0                    0               0
36             0                  0                    0               0
37             0                  0                    0               0
38             0                  0                    0               0
39             0                  0                    0               0
40             0                  0                    0               0
41             0                  0                    0               0
```

```
    swelling_of_stomach  ...  pus_filled_pimples  blackheads  scurring  \
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
5                     0  ...                   0           0         0
6                     0  ...                   0           0         0
7                     0  ...                   0           0         0
8                     0  ...                   0           0         0
9                     0  ...                   0           0         0
10                    0  ...                   0           0         0
11                    0  ...                   0           0         0
12                    0  ...                   0           0         0
13                    0  ...                   0           0         0
14                    0  ...                   0           0         0
15                    0  ...                   0           0         0
16                    0  ...                   0           0         0
17                    0  ...                   0           0         0
18                    0  ...                   0           0         0
19                    0  ...                   0           0         0
20                    0  ...                   0           0         0
21                    0  ...                   0           0         0
22                    0  ...                   0           0         0
23                    0  ...                   0           0         0
24                    1  ...                   0           0         0
25                    0  ...                   0           0         0
26                    0  ...                   0           0         0
27                    0  ...                   0           0         0
28                    0  ...                   0           0         0
29                    0  ...                   0           0         0
30                    0  ...                   0           0         0
31                    0  ...                   0           0         0
32                    0  ...                   0           0         0
33                    0  ...                   0           0         0
34                    0  ...                   0           0         0
35                    0  ...                   0           0         0
36                    0  ...                   0           0         0
37                    0  ...                   1           1         1
38                    0  ...                   0           0         0
39                    0  ...                   0           0         0
40                    0  ...                   0           0         0
41                    0  ...                   0           0         0
```

```
    skin_peeling  silver_like_dusting  small_dents_in_nails  \
0              0                    0                     0
1              0                    0                     0
2              0                    0                     0
3              0                    0                     0
4              0                    0                     0
5              0                    0                     0
6              0                    0                     0
7              0                    0                     0
8              0                    0                     0
9              0                    0                     0
10             0                    0                     0
```

```
11              0                    0                    0
12              0                    0                    0
13              0                    0                    0
14              0                    0                    0
15              0                    0                    0
16              0                    0                    0
17              0                    0                    0
18              0                    0                    0
19              0                    0                    0
20              0                    0                    0
21              0                    0                    0
22              0                    0                    0
23              0                    0                    0
24              0                    0                    0
25              0                    0                    0
26              0                    0                    0
27              0                    0                    0
28              0                    0                    0
29              0                    0                    0
30              0                    0                    0
31              0                    0                    0
32              0                    0                    0
33              0                    0                    0
34              0                    0                    0
35              0                    0                    0
36              0                    0                    0
37              0                    0                    0
38              0                    0                    0
39              1                    1                    1
40              0                    0                    0
41              1                    0                    0
```

```
    inflammatory_nails  blister  red_sore_around_nose  yellow_crust_ooze
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
5                    0        0                     0                  0
6                    0        0                     0                  0
7                    0        0                     0                  0
8                    0        0                     0                  0
9                    0        0                     0                  0
10                   0        0                     0                  0
11                   0        0                     0                  0
12                   0        0                     0                  0
13                   0        0                     0                  0
14                   0        0                     0                  0
15                   0        0                     0                  0
16                   0        0                     0                  0
17                   0        0                     0                  0
18                   0        0                     0                  0
19                   0        0                     0                  0
20                   0        0                     0                  0
21                   0        0                     0                  0
22                   0        0                     0                  0
23                   0        0                     0                  0
24                   0        0                     0                  0
25                   0        0                     0                  0
26                   0        0                     0                  0
27                   0        0                     0                  0
28                   0        0                     0                  0
29                   0        0                     0                  0
30                   0        0                     0                  0
31                   0        0                     0                  0
32                   0        0                     0                  0
33                   0        0                     0                  0
34                   0        0                     0                  0
35                   0        0                     0                  0
36                   0        0                     0                  0
37                   0        0                     0                  0
38                   0        0                     0                  0
39                   1        0                     0                  0
40                   0        1                     1                  1
41                   0        0                     1                  0

[42 rows x 95 columns]
```

In [17]:
```
print(y_test)
```

```
    prognosis
0           0
1           1
2           2
3           3
4           4
5           5
6           6
7           7
8           8
9           9
10         10
11         11
12         12
13         13
14         14
15         15
16         16
17         17
18         18
19         19
20         20
21         21
22         22
23         23
24         24
25         25
26         26
27         27
28         28
29         29
```

```
30          30
31          31
32          32
33          33
34          34
35          35
36          36
37          37
38          38
39          39
40          40
41           0
```

To build the precision of the model, we utilized three distinctive algorithms which are as per the following

- Decision Tree algorithm
- Random Forest algorithm
- KNearestNeighbour algorithm
- Naive Bayes algorithm

In [18]:
```
#list1 = DF['prognosis'].unique()
def scatterplt(disea):
    x = ((DF.loc[disea]).sum())#total sum of symptom reported for given disease
    x.drop(x[x==0].index,inplace=True)#droping symptoms with values 0
    print(x.values)
    y = x.keys()#storing nameof symptoms in y
    print(len(x))
    print(len(y))
    plt.title(disea)
    plt.scatter(y,x.values)
    plt.show()

def scatterinp(sym1,sym2,sym3,sym4,sym5):
    x = [sym1,sym2,sym3,sym4,sym5]#storing input symptoms in y
    y = [0,0,0,0,0]#creating and giving values to the input symptoms
    if(sym1!='Select Here'):
        y[0]=1
    if(sym2!='Select Here'):
        y[1]=1
    if(sym3!='Select Here'):
        y[2]=1
    if(sym4!='Select Here'):
        y[3]=1
    if(sym5!='Select Here'):
        y[4]=1
    print(x)
    print(y)
    plt.scatter(x,y)
    plt.show()
```

Decision Tree Algorithm

In [19]:
```
root = Tk()
pred1=StringVar()
def DecisionTree():
    if len(NameEn.get()) == 0:
        pred1.set(" ")
        comp=messagebox.askokcancel("System","Kindly Fill the Name")
        if comp:
            root.mainloop()
    elif((Symptom1.get()=="Select Here") or (Symptom2.get()=="Select Here")):
        pred1.set(" ")
        sym=messagebox.askokcancel("System","Kindly Fill atleast first two Symptoms")
        if sym:
            root.mainloop()
    else:
        from sklearn import tree

        clf3 = tree.DecisionTreeClassifier()
        clf3 = clf3.fit(X,y)

        from sklearn.metrics import classification_report,confusion_matrix,accuracy_score
        y_pred=clf3.predict(X_test)
        print("Decision Tree")
```

```
        print("Accuracy")
        print(accuracy_score(y_test, y_pred))
        print(accuracy_score(y_test, y_pred,normalize=False))
        print("Confusion matrix")
        conf_matrix=confusion_matrix(y_test,y_pred)
        print(conf_matrix)

        psymptoms = [Symptom1.get(),Symptom2.get(),Symptom3.get(),Symptom4.get(),Symptom5.get()]

        for k in range(0,len(l1)):
            for z in psymptoms:
                if(z==l1[k]):
                    l2[k]=1

        inputtest = [l2]
        predict = clf3.predict(inputtest)
        predicted=predict[0]

        h='no'
        for a in range(0,len(disease)):
            if(predicted == a):
                h='yes'
                break


        if (h=='yes'):
            pred1.set(" ")
            pred1.set(disease[a])
        else:
            pred1.set(" ")
            pred1.set("Not Found")
        #Creating the database if not exists named as database.db and creating table if not exists na
        import sqlite3
        conn = sqlite3.connect('database.db')
        c = conn.cursor()
        c.execute("CREATE TABLE IF NOT EXISTS DecisionTree(Name StringVar,Symtom1 StringVar,Symtom2 S
        c.execute("INSERT INTO DecisionTree(Name,Symtom1,Symtom2,Symtom3,Symtom4,Symtom5,Disease) VAl
        conn.commit()
        c.close()
        conn.close()

        #printing scatter plot of input symptoms
        #printing scatter plot of disease predicted vs its symptoms
        scatterinp(Symptom1.get(),Symptom2.get(),Symptom3.get(),Symptom4.get(),Symptom5.get())
        scatterplt(pred1.get())
```

Random Forest Algorithm

In [20]:

```
pred2=StringVar()
def randomforest():
    if len(NameEn.get()) == 0:
        pred1.set(" ")
        comp=messagebox.askokcancel("System","Kindly Fill the Name")
        if comp:
            root.mainloop()
    elif((Symptom1.get()=="Select Here") or (Symptom2.get()=="Select Here")):
        pred1.set(" ")
        sym=messagebox.askokcancel("System","Kindly Fill atleast first two Symptoms")
        if sym:
            root.mainloop()
    else:
        from sklearn.ensemble import RandomForestClassifier
        clf4 = RandomForestClassifier(n_estimators=100)
        clf4 = clf4.fit(X,np.ravel(y))

        # calculating accuracy
        from sklearn.metrics import classification_report,confusion_matrix,accuracy_score
        y_pred=clf4.predict(X_test)
        print("Random Forest")
```

```
        print("Accuracy")
        print(accuracy_score(y_test, y_pred))
        print(accuracy_score(y_test, y_pred,normalize=False))
        print("Confusion matrix")
        conf_matrix=confusion_matrix(y_test,y_pred)
        print(conf_matrix)

        psymptoms = [Symptom1.get(),Symptom2.get(),Symptom3.get(),Symptom4.get(),Symptom5.get()]

        for k in range(0,len(l1)):
            for z in psymptoms:
                if(z==l1[k]):
                    l2[k]=1

        inputtest = [l2]
        predict = clf4.predict(inputtest)
        predicted=predict[0]

        h='no'
        for a in range(0,len(disease)):
            if(predicted == a):
                h='yes'
                break
        if (h=='yes'):
            pred2.set(" ")
            pred2.set(disease[a])
        else:
            pred2.set(" ")
            pred2.set("Not Found")
         #Creating the database if not exists named as database.db and creating table if not exists
        import sqlite3
        conn = sqlite3.connect('database.db')
        c = conn.cursor()
        c.execute("CREATE TABLE IF NOT EXISTS RandomForest(Name StringVar,Symtom1 StringVar,Symtom2
        c.execute("INSERT INTO RandomForest(Name,Symtom1,Symtom2,Symtom3,Symtom4,Symtom5,Disease) VA
        conn.commit()
        c.close()
        conn.close()
        #printing scatter plot of disease predicted vs its symptoms
        scatterplt(pred2.get())
```

KNearestNeighbour Algorithm

In [21]:

```
pred4=StringVar()
def KNN():
    if len(NameEn.get()) == 0:
        pred1.set(" ")
        comp=messagebox.askokcancel("System","Kindly Fill the Name")
        if comp:
            root.mainloop()
    elif((Symptom1.get()=="Select Here") or (Symptom2.get()=="Select Here")):
        pred1.set(" ")
        sym=messagebox.askokcancel("System","Kindly Fill atleast first two Symptoms")
        if sym:
            root.mainloop()
    else:
        from sklearn.neighbors import KNeighborsClassifier
        knn=KNeighborsClassifier(n_neighbors=5,metric='minkowski',p=2)
        knn=knn.fit(X,np.ravel(y))

        from sklearn.metrics import classification_report,confusion_matrix,accuracy_score
        y_pred=knn.predict(X_test)
        print("kNearest Neighbour")
        print("Accuracy")
        print(accuracy_score(y_test, y_pred))
        print(accuracy_score(y_test, y_pred,normalize=False))
        print("Confusion matrix")
        conf_matrix=confusion_matrix(y_test,y_pred)
        print(conf_matrix)
```

```
        psymptoms = [Symptom1.get(),Symptom2.get(),Symptom3.get(),Symptom4.get(),Symptom5.get()]

        for k in range(0,len(l1)):
            for z in psymptoms:
                if(z==l1[k]):
                    l2[k]=1

        inputtest = [l2]
        predict = knn.predict(inputtest)
        predicted=predict[0]

        h='no'
        for a in range(0,len(disease)):
            if(predicted == a):
                h='yes'
                break


        if (h=='yes'):
            pred4.set(" ")
            pred4.set(disease[a])
        else:
            pred4.set(" ")
            pred4.set("Not Found")
         #Creating the database if not exists named as database.db and creating table if not exists
        import sqlite3
        conn = sqlite3.connect('database.db')
        c = conn.cursor()
        c.execute("CREATE TABLE IF NOT EXISTS KNearestNeighbour(Name StringVar,Symtom1 StringVar,Sym
        c.execute("INSERT INTO KNearestNeighbour(Name,Symtom1,Symtom2,Symtom3,Symtom4,Symtom5,Diseas
        conn.commit()
        c.close()
        conn.close()
        #printing scatter plot of disease predicted vs its symptoms

        scatterplt(pred4.get())
```

Naive Bayes Algorithm

In [24]:

```
pred3=StringVar()
def NaiveBayes():
    if len(NameEn.get()) == 0:
        pred1.set(" ")
        comp=messagebox.askokcancel("System","Kindly Fill the Name")
        if comp:
            root.mainloop()
    elif((Symptom1.get()=="Select Here") or (Symptom2.get()=="Select Here")):
        pred1.set(" ")
        sym=messagebox.askokcancel("System","Kindly Fill atleast first two Symptoms")
        if sym:
            root.mainloop()
    else:
        from sklearn.naive_bayes import GaussianNB
        gnb = GaussianNB()
        gnb=gnb.fit(X,np.ravel(y))

        from sklearn.metrics import classification_report,confusion_matrix,accuracy_score
        y_pred=gnb.predict(X_test)
        print("Naive Bayes")
        print("Accuracy")
        print(accuracy_score(y_test, y_pred))
        print(accuracy_score(y_test, y_pred,normalize=False))
        print("Confusion matrix")
        conf_matrix=confusion_matrix(y_test,y_pred)
        print(conf_matrix)

        psymptoms = [Symptom1.get(),Symptom2.get(),Symptom3.get(),Symptom4.get(),Symptom5.get()]
        for k in range(0,len(l1)):
```

```
            for z in psymptoms:
                if(z==l1[k]):
                    l2[k]=1

        inputtest = [l2]
        predict = gnb.predict(inputtest)
        predicted=predict[0]

        h='no'
        for a in range(0,len(disease)):
            if(predicted == a):
                h='yes'
                break
        if (h=='yes'):
            pred3.set(" ")
            pred3.set(disease[a])
        else:
            pred3.set(" ")
            pred3.set("Not Found")
         #Creating the database if not exists named as database.db and creating table if not exists
        import sqlite3
        conn = sqlite3.connect('database.db')
        c = conn.cursor()
        c.execute("CREATE TABLE IF NOT EXISTS NaiveBayes(Name StringVar,Symtom1 StringVar,Symtom2 St
        c.execute("INSERT INTO NaiveBayes(Name,Symtom1,Symtom2,Symtom3,Symtom4,Symtom5,Disease) VALU
        conn.commit()
        c.close()
        conn.close()
        #printing scatter plot of disease predicted vs its symptoms
        scatterplt(pred3.get())
```

Building Graphical User Interface

In [25]:
```
#Tk class is used to create a root window
root.configure(background='Ivory')
root.title('Smart Disease Predictor System')
root.resizable(0,0)
```

Out [25]: ''

In [26]:
```
Symptom1 = StringVar()
Symptom1.set("Select Here")

Symptom2 = StringVar()
Symptom2.set("Select Here")

Symptom3 = StringVar()
Symptom3.set("Select Here")

Symptom4 = StringVar()
Symptom4.set("Select Here")

Symptom5 = StringVar()
Symptom5.set("Select Here")
Name = StringVar()
```

In [27]:
```
prev_win=None
def Reset():
    global prev_win

    Symptom1.set("Select Here")
    Symptom2.set("Select Here")
    Symptom3.set("Select Here")
    Symptom4.set("Select Here")
    Symptom5.set("Select Here")
    NameEn.delete(first=0,last=100)
    pred1.set(" ")
    pred2.set(" ")
    pred3.set(" ")
    pred4.set(" ")
```

```
    try:
        prev_win.destroy()
        prev_win=None
    except AttributeError:
        pass
```

In [28]:
```
from tkinter import messagebox
def Exit():
    qExit=messagebox.askyesno("System","Do you want to exit the system")

    if qExit:
        root.destroy()
        exit()
```

In [29]:
```
#Headings for the GUI written at the top of GUI
w2 = Label(root, justify=LEFT, text="Disease Predictor using Machine Learning", fg="Red", bg="Ivory"
w2.config(font=("Times",30,"bold italic"))
w2.grid(row=1, column=0, columnspan=2, padx=100)
w2 = Label(root, justify=LEFT, text="Contributors: Madhu,Harsha,Nikitha,Uma shankar,sanjana", fg="Pi
w2.config(font=("Times",30,"bold italic"))
w2.grid(row=2, column=0, columnspan=2, padx=100)
```

In [30]:
```
#Label for the name
NameLb = Label(root, text="Name of the Patient *", fg="Red", bg="Ivory")
NameLb.config(font=("Times",15,"bold italic"))
NameLb.grid(row=6, column=0, pady=15, sticky=W)
```

In [31]:
```
#Creating Labels for the symtoms
S1Lb = Label(root, text="Symptom 1 *", fg="Black", bg="Ivory")
S1Lb.config(font=("Times",15,"bold italic"))
S1Lb.grid(row=7, column=0, pady=10, sticky=W)

S2Lb = Label(root, text="Symptom 2 *", fg="Black", bg="Ivory")
S2Lb.config(font=("Times",15,"bold italic"))
S2Lb.grid(row=8, column=0, pady=10, sticky=W)

S3Lb = Label(root, text="Symptom 3", fg="Black",bg="Ivory")
S3Lb.config(font=("Times",15,"bold italic"))
S3Lb.grid(row=9, column=0, pady=10, sticky=W)

S4Lb = Label(root, text="Symptom 4", fg="Black", bg="Ivory")
S4Lb.config(font=("Times",15,"bold italic"))
S4Lb.grid(row=10, column=0, pady=10, sticky=W)

S5Lb = Label(root, text="Symptom 5", fg="Black", bg="Ivory")
S5Lb.config(font=("Times",15,"bold italic"))
S5Lb.grid(row=11, column=0, pady=10, sticky=W)
```

In [32]:
```
#Labels for the different algorithms
lrLb = Label(root, text="DecisionTree", fg="white", bg="red", width = 20)
lrLb.config(font=("Times",15,"bold italic"))
lrLb.grid(row=15, column=0, pady=10,sticky=W)

destreeLb = Label(root, text="RandomForest", fg="Red", bg="Orange", width = 20)
destreeLb.config(font=("Times",15,"bold italic"))
destreeLb.grid(row=17, column=0, pady=10, sticky=W)

ranfLb = Label(root, text="NaiveBayes", fg="White", bg="green", width = 20)
ranfLb.config(font=("Times",15,"bold italic"))
ranfLb.grid(row=19, column=0, pady=10, sticky=W)

knnLb = Label(root, text="kNearestNeighbour", fg="Red", bg="Sky Blue", width = 20)
knnLb.config(font=("Times",15,"bold italic"))
knnLb.grid(row=21, column=0, pady=10, sticky=W)
OPTIONS = sorted(l1)
```

In [33]:
```
#Taking name as input from user
NameEn = Entry(root, textvariable=Name)
```

```
NameEn.grid(row=6, column=1)

#Taking Symptoms as input from the dropdown from the user
S1 = OptionMenu(root, Symptom1,*OPTIONS)
S1.grid(row=7, column=1)

S2 = OptionMenu(root, Symptom2,*OPTIONS)
S2.grid(row=8, column=1)

S3 = OptionMenu(root, Symptom3,*OPTIONS)
S3.grid(row=9, column=1)

S4 = OptionMenu(root, Symptom4,*OPTIONS)
S4.grid(row=10, column=1)

S5 = OptionMenu(root, Symptom5,*OPTIONS)
S5.grid(row=11, column=1)
```

In [34]:

```
#Buttons for predicting the disease using different algorithms
dst = Button(root, text="Prediction 1", command=DecisionTree,bg="Red",fg="yellow")
dst.config(font=("Times",15,"bold italic"))
dst.grid(row=6, column=3,padx=10)

rnf = Button(root, text="Prediction 2", command=randomforest,bg="Light green",fg="red")
rnf.config(font=("Times",15,"bold italic"))
rnf.grid(row=7, column=3,padx=10)

lr = Button(root, text="Prediction 3", command=NaiveBayes,bg="Blue",fg="white")
lr.config(font=("Times",15,"bold italic"))
lr.grid(row=8, column=3,padx=10)

kn = Button(root, text="Prediction 4", command=KNN,bg="sky blue",fg="red")
kn.config(font=("Times",15,"bold italic"))
kn.grid(row=9, column=3,padx=10)

rs = Button(root,text="Reset Inputs", command=Reset,bg="yellow",fg="purple",width=15)
rs.config(font=("Times",15,"bold italic"))
rs.grid(row=10,column=3,padx=10)

ex = Button(root,text="Exit System", command=Exit,bg="yellow",fg="purple",width=15)
ex.config(font=("Times",15,"bold italic"))
ex.grid(row=11,column=3,padx=10)
```

In [35]:

```
#Showing the output of different aldorithms
t1=Label(root,font=("Times",15,"bold italic"),text="Decision Tree",height=1,bg="Light green"
         ,width=40,fg="red",textvariable=pred1,relief="sunken").grid(row=15, column=1, padx=10)

t2=Label(root,font=("Times",15,"bold italic"),text="Random Forest",height=1,bg="Purple"
         ,width=40,fg="white",textvariable=pred2,relief="sunken").grid(row=17, column=1, padx=10)

t3=Label(root,font=("Times",15,"bold italic"),text="Naive Bayes",height=1,bg="red"
         ,width=40,fg="orange",textvariable=pred3,relief="sunken").grid(row=19, column=1, padx=10)

t4=Label(root,font=("Times",15,"bold italic"),text="kNearest Neighbour",height=1,bg="Blue"
         ,width=40,fg="yellow",textvariable=pred4,relief="sunken").grid(row=21, column=1, padx=10)
```

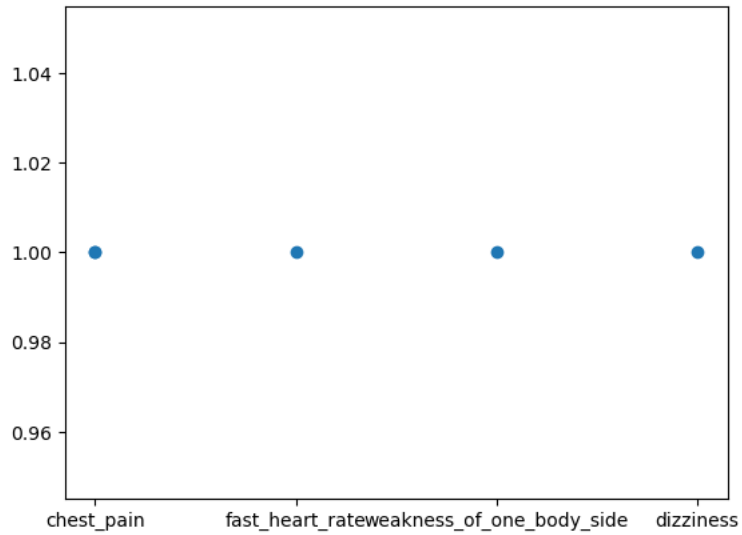
In [ ]:

```
#calling this function because the application is ready to run
root.mainloop()
```

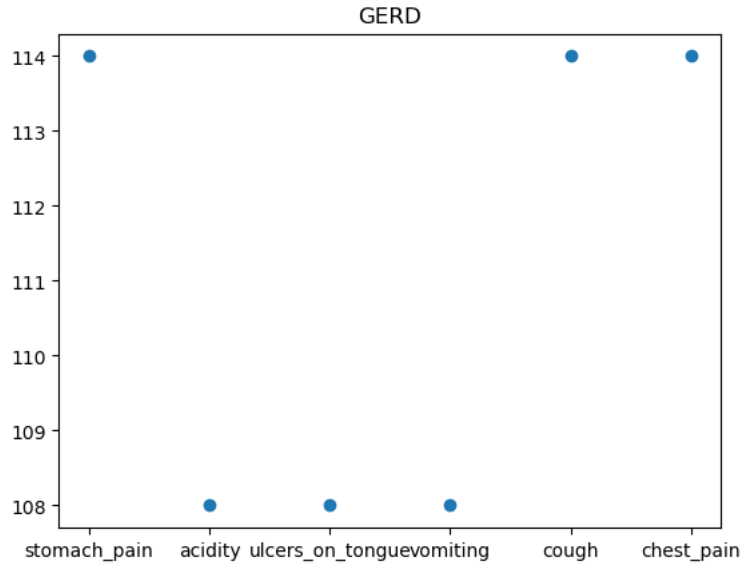
```
Decision Tree
Accuracy
0.9285714285714286
39
Confusion matrix
[[1 0 0 ... 0 1 0]
 [0 1 0 ... 0 0 0]
 [0 0 1 ... 0 0 0]
 ...
 [0 0 0 ... 1 0 0]
 [0 0 0 ... 0 1 0]
 [0 0 0 ... 0 0 1]]
['chest_pain', 'fast_heart_rate', 'weakness_of_one_body_side', 'dizziness', 'chest_pain']
[1, 1, 1, 1, 1]
```

```
C:\Users\madhu sravanthi\anaconda3\lib\site-packages\sklearn\base.py:420: UserWarning: X does not have valid feature
names, but DecisionTreeClassifier was fitted with feature names
```

```
  warnings.warn(
```

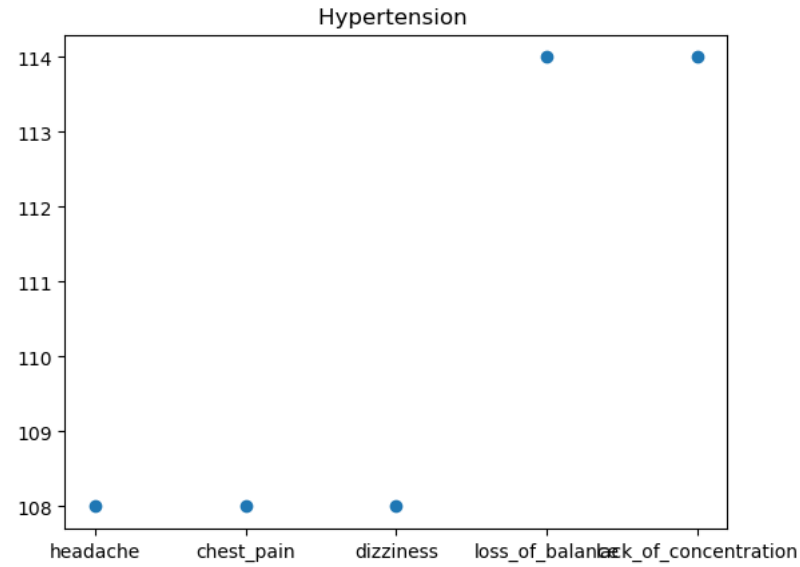



```
[114. 108. 108. 108. 114. 114.]
6
6
```



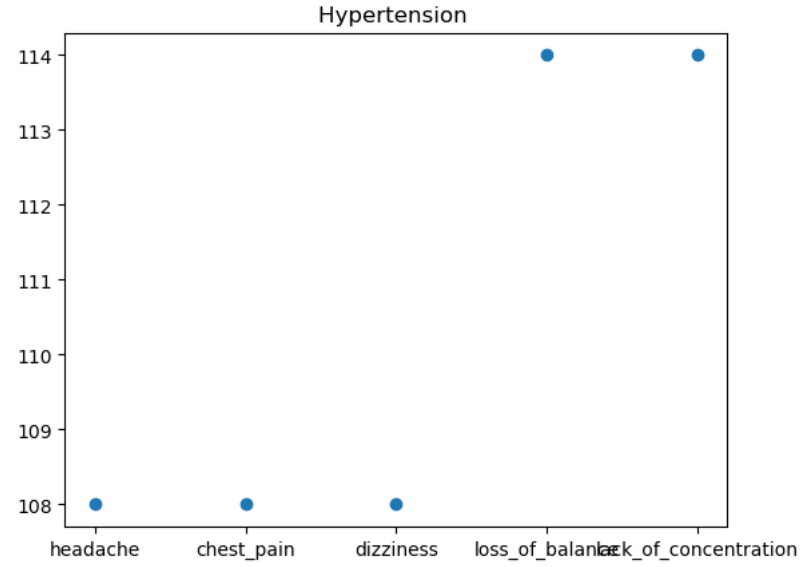

```
Random Forest
Accuracy
0.9285714285714286
39
Confusion matrix
[[1 0 0 ... 0 0 1]
 [0 1 0 ... 0 0 0]
 [0 0 0 ... 0 0 0]
 ...
 [0 0 0 ... 1 0 0]
 [0 0 0 ... 0 1 0]
 [0 0 0 ... 0 0 1]]
[108. 108. 108. 114. 114.]
5
5
```

```
C:\Users\madhu sravanthi\anaconda3\lib\site-packages\sklearn\base.py:420: UserWarning: X does not have valid feature
names, but RandomForestClassifier was fitted with feature names
  warnings.warn(
```



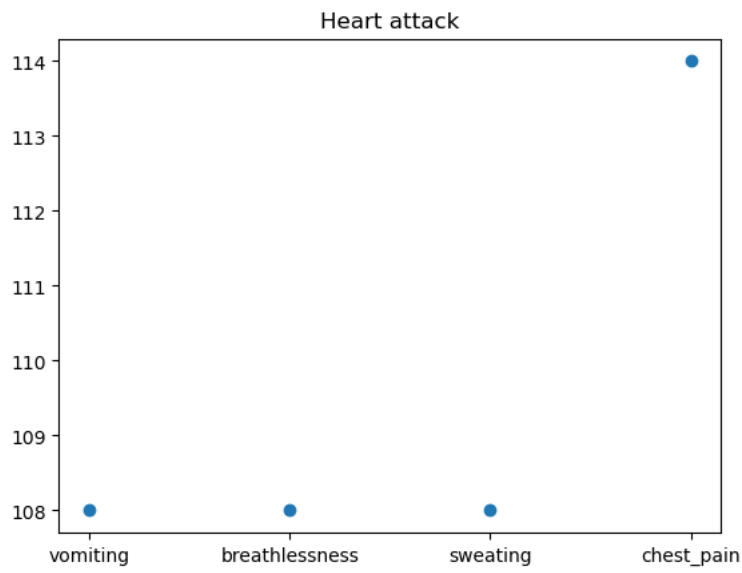

```
Naive Bayes
Accuracy
0.9285714285714286
39
Confusion matrix
[[1 0 0 ... 0 0 0]
 [0 1 0 ... 0 0 0]
 [0 0 1 ... 0 0 0]
 ...
 [0 0 0 ... 1 0 0]
 [0 0 0 ... 0 1 0]
 [0 0 0 ... 0 0 1]]
[108. 108. 108. 114. 114.]
5
5
```

```
C:\Users\madhu sravanthi\anaconda3\lib\site-packages\sklearn\base.py:420: UserWarning: X does not have valid feature
names, but GaussianNB was fitted with feature names
  warnings.warn(
```



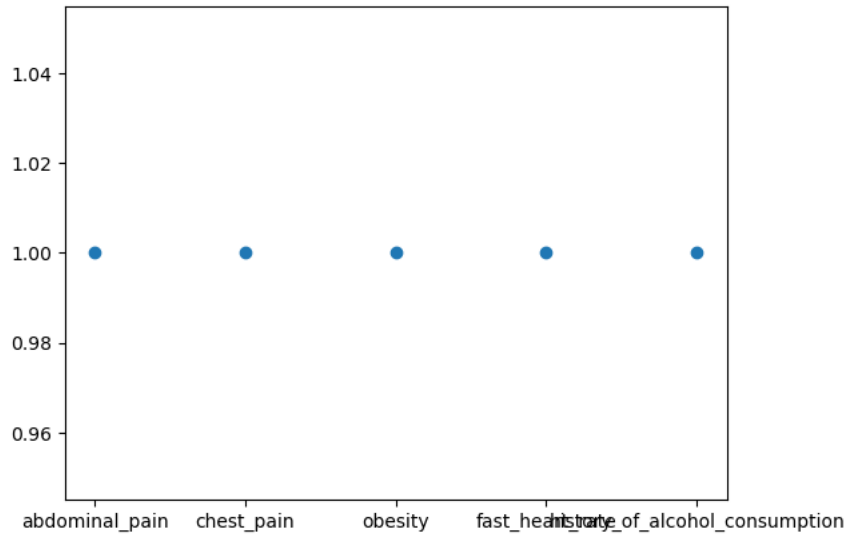

```
kNearest Neighbour
Accuracy
0.9285714285714286
39
Confusion matrix
[[1 0 0 ... 0 0 0]
 [0 1 0 ... 0 0 0]
 [0 0 0 ... 0 0 0]
 ...
 [0 0 0 ... 1 0 0]
 [0 0 0 ... 0 1 0]
 [0 0 0 ... 0 0 1]]
[108. 108. 108. 114.]
4
4
```

```
C:\Users\madhu sravanthi\anaconda3\lib\site-packages\sklearn\base.py:420: UserWarning: X does not have valid feature
names, but KNeighborsClassifier was fitted with feature names
  warnings.warn(
```

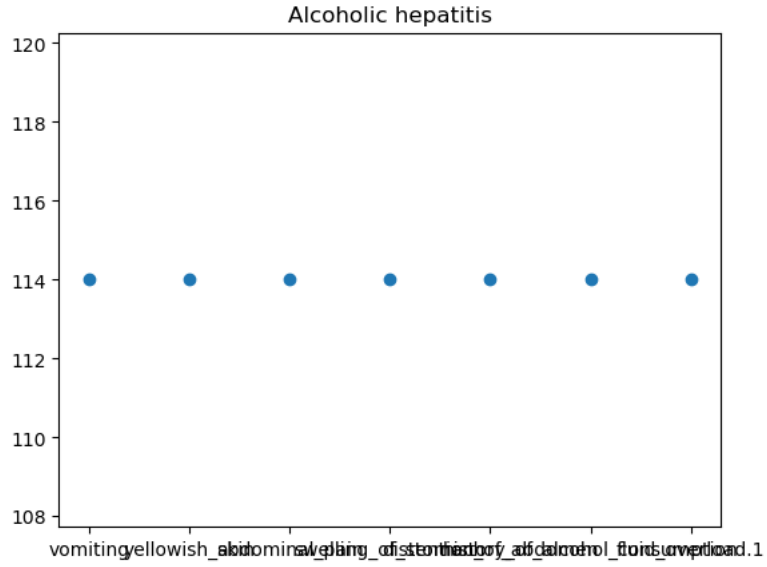



```
Decision Tree
Accuracy
0.9285714285714286
39
Confusion matrix
[[1 0 0 ... 0 0 0]
 [0 1 0 ... 0 0 0]
 [0 0 1 ... 0 0 0]
 ...
 [0 0 0 ... 1 0 0]
 [0 0 0 ... 0 1 0]
 [0 0 0 ... 0 0 1]]
['abdominal_pain', 'chest_pain', 'obesity', 'fast_heart_rate', 'history_of_alcohol_consumption']
[1, 1, 1, 1, 1]
```

```
C:\Users\madhu sravanthi\anaconda3\lib\site-packages\sklearn\base.py:420: UserWarning: X does not have valid feature
names, but DecisionTreeClassifier was fitted with feature names
  warnings.warn(
```

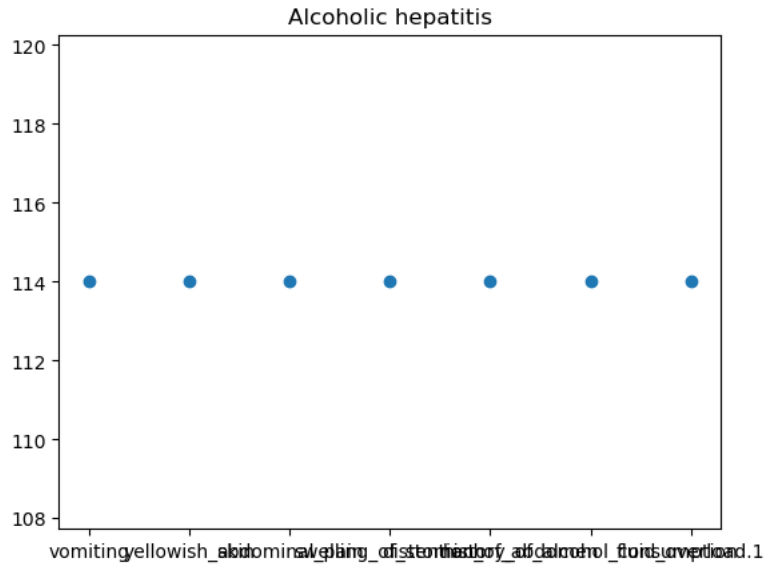



```
[114. 114. 114. 114. 114. 114. 114.]
7
7
```



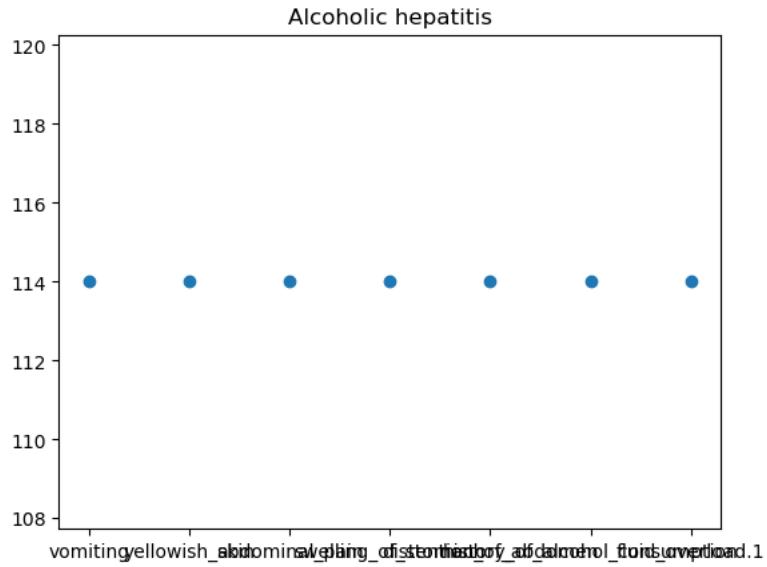
```
Random Forest
Accuracy
0.9285714285714286
39
Confusion matrix
[[1 0 0 ... 0 0 0]
 [0 1 0 ... 0 0 0]
 [0 0 0 ... 0 0 0]
 ...
 [0 0 0 ... 1 0 0]
 [0 0 0 ... 0 1 0]
 [0 0 0 ... 0 0 1]]
[114. 114. 114. 114. 114. 114. 114.]
7
7
```

```
C:\Users\madhu sravanthi\anaconda3\lib\site-packages\sklearn\base.py:420: UserWarning: X does not have valid feature
names, but RandomForestClassifier was fitted with feature names
  warnings.warn(
```




```
Naive Bayes
Accuracy
0.9285714285714286
39
Confusion matrix
[[1 0 0 ... 0 0 0]
 [0 1 0 ... 0 0 0]
 [0 0 1 ... 0 0 0]
 ...
 [0 0 0 ... 1 0 0]
 [0 0 0 ... 0 1 0]
 [0 0 0 ... 0 0 1]]
[114. 114. 114. 114. 114. 114. 114.]
7
7
```

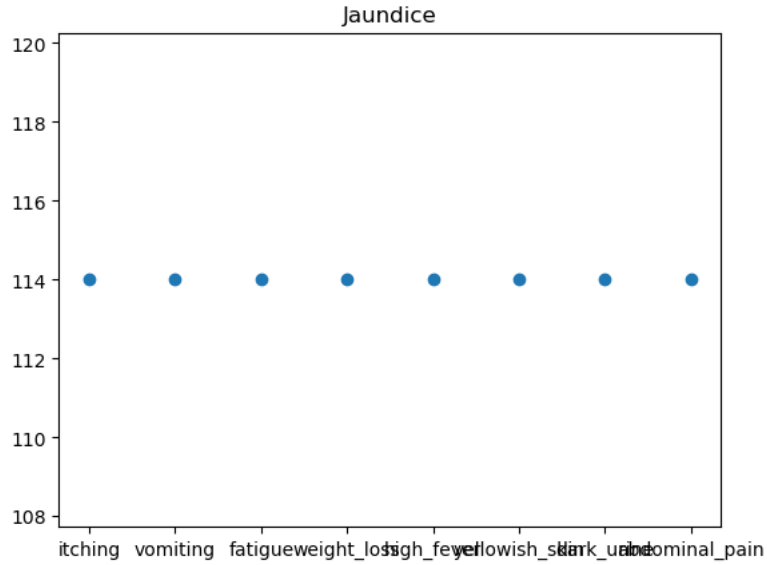
```
C:\Users\madhu sravanthi\anaconda3\lib\site-packages\sklearn\base.py:420: UserWarning: X does not have valid feature
names, but GaussianNB was fitted with feature names
  warnings.warn(
```




```
kNearest Neighbour
Accuracy
0.9285714285714286
39
Confusion matrix
[[1 0 0 ... 0 0 0]
 [0 1 0 ... 0 0 0]
 [0 0 0 ... 0 0 0]
 ...
 [0 0 0 ... 1 0 0]
 [0 0 0 ... 0 1 0]
```

```
 [0 0 0 ... 0 0 1]]
[114. 114. 114. 114. 114. 114. 114. 114.]
8
8
```

```
C:\Users\madhu sravanthi\anaconda3\lib\site-packages\sklearn\base.py:420: UserWarning: X does not have valid feature
names, but KNeighborsClassifier was fitted with feature names
  warnings.warn(
```



In [ ]: