In [1]:

```
import numpy as np
import pandas as pd
```

In [2]:

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

Out[2]:

	SlNo	RollNumber	StudenNamet	Age	Spo2(%)	BPM	harerate	Spo2(88-98%)	condition
0	1	20VV1F0003	Kanakam Akanksha	22	94.8	172	Normal	Normal	healthy
1	2	20VV1F0004	Kotla Bhavani Sankar	27	97.8	156	Normal	Normal	healthy
2	3	20VV1F0005	Kotturu Saikumar	17	97.8	98	ST	Normal	sick
3	4	20VV1F0006	Lavanya Manchipilli	26	98.2	108	Normal	Normal	healthy
4	5	20VV1F0007	Leelasri Chitrothu	18	97.7	122	Normal	Normal	healthy

In [3]:

```
df.isnull().sum()
```

Out[3]:

```
SlNo            0
RollNumber      0
 StudenNamet    0
Age             0
Spo2(%)         0
BPM             0
harerate        0
Spo2(88-98%)    0
condition       0
dtype: int64
```

In [4]:

```
df.shape
```

Out[4]:

```
(950, 9)
```

In [5]:

```
from sklearn import preprocessing
le = preprocessing.LabelEncoder()
```

In [6]:

```
df['harerate']= le.fit_transform(df['harerate'])
df['Spo2(88-98%)']= le.fit_transform(df['Spo2(88-98%)'])
```

In [7]:

```
df
```

Out[7]:

	SlNo	RollNumber	StudenNamet	Age	Spo2(%)	BPM	harerate	Spo2(88-98%)	condition
0	1	20VV1F0003	Kanakam Akanksha	22	94.80	172	1	0	healthy
1	2	20VV1F0004	Kotla Bhavani Sankar	27	97.80	156	1	0	healthy
2	3	20VV1F0005	Kotturu Saikumar	17	97.80	98	2	0	sick
3	4	20VV1F0006	Lavanya Manchipilli	26	98.20	108	1	0	healthy
4	5	20VV1F0007	Leelasri Chitrothu	18	97.70	122	1	0	healthy
...	...	...	...	...	...	...	...	...	...
945	946	24	Sailaja Devireddy	30	97.04	144	1	0	healthy
946	947	18331A05F8	Tirumalaraju Vijayarama Mohith Varma	19	95.04	163	1	0	healthy
947	948	196D5A0206	Kilani Gnaneswari	20	96.64	169	1	0	healthy
948	949	18X91A0454	Revu .Meghana	26	97.92	150	1	0	healthy
949	950	19X95A0405	Somala Bhavani	32	99.16	166	0	0	sick

950 rows × 9 columns

In [8]:

```
le.classes_
```

Out[8]:

```
array(['Normal', 'high'], dtype=object)
```

In [9]:

```
X = df[['Spo2(%)','BPM']]
Y = df['condition']
```

In [10]:

```
X
```

Out[10]:

	Spo2(%)	BPM
0	94.80	172
1	97.80	156
2	97.80	98
3	98.20	108
4	97.70	122
...	...	...
945	97.04	144
946	95.04	163
947	96.64	169
948	97.92	150
949	99.16	166

950 rows × 2 columns

In [11]:

```
Y
```

Out[11]:

```
0      healthy
1      healthy
2         sick
3      healthy
4      healthy
        ...   
945    healthy
946    healthy
947    healthy
948    healthy
949       sick
Name: condition, Length: 950, dtype: object
```

In [12]:

```
from sklearn.model_selection import train_test_split
```

In [13]:

```
x_train, x_test, y_train, y_test = train_test_split(X,Y,test_size=0.25,random_state=55)
```

KNN classifier

In [14]:

```
from sklearn.neighbors import KNeighborsClassifier
```

In [15]:

```
knn = KNeighborsClassifier(n_neighbors=3)
```

In [16]:

```
knn.fit(x_train, y_train)
```

Out[16]:

```
KNeighborsClassifier(n_neighbors=3)
```

In [17]:

```
y_predict1 = knn.predict(x_test)
y_predict1
```

Out[17]:

```
array(['sick', 'healthy', 'healthy', 'healthy', 'healthy', 'healthy',
       'sick', 'sick', 'healthy', 'healthy', 'healthy', 'healthy', 'sick',
       'healthy', 'sick', 'healthy', 'healthy', 'sick', 'healthy',
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       'healthy', 'sick', 'healthy', 'healthy', 'healthy', 'sick', 'sick',
       'sick', 'sick', 'sick', 'healthy', 'sick', 'sick'], dtype=object)
```

In [18]:

```
x_test.head(2)
```

Out[18]:

	Spo2(%)	BPM
439	97.94	116
294	95.92	127

In [19]:

```
knn.predict([[94,172]])
```

```
C:\Users\stars\anaconda3\lib\site-packages\sklearn\base.py:450: UserWarning:
X does not have valid feature names, but KNeighborsClassifier was fitted wit
h feature names
  warnings.warn(
```

Out[19]:

```
array(['healthy'], dtype=object)
```

naivy_bayes

In [20]:

```
from sklearn.naive_bayes import GaussianNB
gnb = GaussianNB()
```

In [21]:

```
gnb.fit(x_train,y_train)
```

Out[21]:

```
GaussianNB()
```

In [22]:

```
y_pred = gnb.fit(x_train, y_train).predict(x_test)
y_pred
```

Out[22]:

```
array(['sick', 'healthy', 'healthy', 'healthy', 'sick', 'healthy',
       'healthy', 'healthy', 'sick', 'sick', 'healthy', 'healthy', 'sick',
       'sick', 'healthy', 'healthy', 'healthy', 'sick', 'healthy',
       'healthy', 'healthy', 'healthy', 'healthy', 'healthy', 'sick',
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       'healthy', 'healthy', 'sick', 'healthy', 'healthy', 'healthy',
       'sick', 'healthy', 'healthy'], dtype='<U7')
```

In [23]:

```
print("Number of mislabeled points out of a total %d points : %d"
...       % (x_test.shape[0], (y_test != y_pred).sum()))
```

```
Number of mislabeled points out of a total 238 points : 109
```

In [24]:

```
from sklearn.svm import SVC
```

In [25]:

```
sv1 = SVC(kernel='linear')
```

In [26]:

```
sv1.fit(X, Y)
```

Out[26]:

```
SVC(kernel='linear')
```

In [27]:

```
y_predict1 = sv1.predict(X)
y_predict1
```

Out[27]:

```
array(['healthy', 'healthy', 'healthy', 'healthy', 'healthy', 'healthy',
       'healthy', 'healthy', 'healthy', 'healthy', 'healthy', 'healthy',
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       'healthy', 'healthy', 'healthy', 'healthy', 'healthy', 'healthy',
       'healthy', 'healthy', 'healthy', 'healthy', 'healthy', 'healthy',
       'healthy', 'healthy'], dtype=object)
```

In [28]:

```
sv1.predict([[194,172]])
```

```
C:\Users\stars\anaconda3\lib\site-packages\sklearn\base.py:450: UserWarning:
X does not have valid feature names, but SVC was fitted with feature names
  warnings.warn(
```

Out[28]:

```
array(['sick'], dtype=object)
```

Decision Tree

In [29]:

```
from sklearn.metrics import confusion_matrix, accuracy_score
```

In [30]:

```
from sklearn.tree import DecisionTreeClassifier
dcl1 = DecisionTreeClassifier(criterion='gini',
                              max_depth = 2)
```

In [31]:

```
dcl1.fit(x_train, y_train)
```

Out[31]:

```
DecisionTreeClassifier(max_depth=2)
```

In [32]:

```
confusion_matrix(Y, y_predict1)
```

Out[32]:

```
array([[514,   0],
       [436,   0]], dtype=int64)
```

In [33]:

```
accuracy_score(Y, y_predict1)
```

Out[33]:

```
0.5410526315789473
```

In [34]:

```
dcl1.predict([[194,172]])
```

```
C:\Users\stars\anaconda3\lib\site-packages\sklearn\base.py:450: UserWarning:
X does not have valid feature names, but DecisionTreeClassifier was fitted w
ith feature names
  warnings.warn(
```

Out[34]:

```
array(['sick'], dtype=object)
```

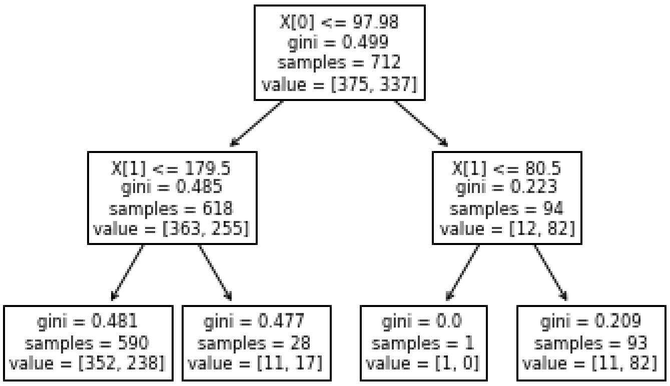
Explonaory data analysis

In [35]:

```
from sklearn import tree
import matplotlib.pyplot as plt
```

In [36]:

```
tree.plot_tree(dcl1)
plt.show()
```



In [37]:

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

In [38]:

```
X
```

Out[38]:

	Spo2(%)	BPM
0	94.80	172
1	97.80	156
2	97.80	98
3	98.20	108
4	97.70	122
...	...	...
945	97.04	144
946	95.04	163
947	96.64	169
948	97.92	150
949	99.16	166

950 rows × 2 columns

In [39]:

```
x2=pd.DataFrame(X)
x2
```

Out[39]:

	Spo2(%)	BPM
0	94.80	172
1	97.80	156
2	97.80	98
3	98.20	108
4	97.70	122
...	...	...
945	97.04	144
946	95.04	163
947	96.64	169
948	97.92	150
949	99.16	166

950 rows × 2 columns

In [40]:

```
l1=x2['Spo2(%)'].tolist()
l2=x2['BPM'].tolist()
X1=l1+l2
X1=pd.DataFrame(X1)
X1
```

Out[40]:

	0
0	94.8
1	97.8
2	97.8
3	98.2
4	97.7
...	...
1895	144.0
1896	163.0
1897	169.0
1898	150.0
1899	166.0

1900 rows × 1 columns

In [41]:

```
plt.subplots(figsize=(4,6))
sns.countplot(Y, data=X1)
plt.xlabel("condition")
plt.title("health monitoring")
plt.show()
```

```
C:\Users\stars\anaconda3\lib\site-packages\seaborn\_decorators.py:36: Futu
reWarning: Pass the following variable as a keyword arg: x. From version
0.12, the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or misinterp
retation.
  warnings.warn(
```

In [ ]:

In [ ]: