```
In [1]:
           import pandas as pd
           import numpy as np
           import pickle
           import warnings
           warnings.filterwarnings("ignore")
In [2]:
           data=pd.read_csv(r"C:\Users\reshma_koduri\OneDrive\Documents\Healthcare Diagnosis an
In [3]:
           data
Out[3]:
                                                                                        Chronic
                                                                     Running
                                    Breathing
                                                        Dry
                                                               Sore
                User_id Age Sex
                                                                               Asthma
                                                                                           Lung
                                                                                                ... Gastroint
                                     Problem
                                                      Cough
                                                              throat
                                                                        Nose
                                                                                        Disease
             0
                      1
                           77
                                Μ
                                          Yes
                                                 Yes
                                                         Yes
                                                                 Yes
                                                                          Yes
                                                                                   No
                                                                                             No
             1
                      2
                           38
                                 F
                                          Yes
                                                 Yes
                                                         Yes
                                                                 Yes
                                                                          No
                                                                                   Yes
                                                                                            Yes
             2
                      3
                           75
                                 F
                                          Yes
                                                 Yes
                                                         Yes
                                                                 Yes
                                                                          Yes
                                                                                   Yes
                                                                                            Yes
             3
                                 F
                                                                          No
                      4
                           84
                                          Yes
                                                 Yes
                                                         Yes
                                                                 No
                                                                                   Yes
                                                                                             No
                      5
             4
                           66
                                M
                                          Yes
                                                 Yes
                                                         Yes
                                                                 Yes
                                                                          Yes
                                                                                   No
                                                                                            Yes
                                 F
          5429
                   5430
                          68
                                          Yes
                                                 Yes
                                                         No
                                                                 Yes
                                                                          Yes
                                                                                   Yes
                                                                                            Yes
          5430
                   5431
                          22
                                          Yes
                                                 Yes
                                                         Yes
                                                                 No
                                                                          Yes
                                                                                   Yes
                                                                                             No
          5431
                   5432
                           78
                                 F
                                          Yes
                                                 Yes
                                                         Yes
                                                                 No
                                                                          No
                                                                                   No
                                                                                             No
          5432
                   5433
                           55
                                          Yes
                                                 Yes
                                                         Yes
                                                                 No
                                                                          Yes
                                                                                   No
                                M
                                                                                             No
          5433
                   5434
                           33
                                M
                                          Yes
                                                 Yes
                                                         Yes
                                                                 No
                                                                          Yes
                                                                                   Yes
                                                                                             No
         5434 rows × 25 columns
In [4]:
           data.describe()
Out[4]:
                     User_id
                                     Age
          count
                 5434.000000 5434.000000
          mean
                 2717.500000
                                50.550975
            std
                 1568.805012
                                23.310484
                    1.000000
                                11.000000
            min
           25%
                 1359.250000
                                30.000000
           50%
                 2717.500000
                                50.000000
           75%
                 4075.750000
                                71.000000
                 5434.000000
                                90.000000
           max
```

```
In [5]:
         data.shape
        (5434, 25)
Out[5]:
In [6]:
         data.info()
        <class 'pandas.core.frame.DataFrame'>
        RangeIndex: 5434 entries, 0 to 5433
        Data columns (total 25 columns):
         #
             Column
                                                     Non-Null Count Dtype
             -----
                                                     -----
        ---
         0
             User_id
                                                     5434 non-null
                                                                   int64
         1
             Age
                                                     5434 non-null int64
         2
             Sex
                                                     5434 non-null object
         3
             Breathing Problem
                                                     5434 non-null object
         4
             Fever
                                                     5434 non-null object
         5
             Dry Cough
                                                     5434 non-null object
         6
             Sore throat
                                                     5434 non-null
                                                                   object
         7
             Running Nose
                                                     5434 non-null
                                                                    object
         8
                                                     5434 non-null
                                                                    object
             Asthma
         9
             Chronic Lung Disease
                                                     5434 non-null
                                                                    object
                                                     5434 non-null
         10 Headache
                                                                    object
         11 Heart Disease
                                                     5434 non-null
                                                                    object
         12 Diabetes
                                                     5434 non-null
                                                                    object
         13 Hyper Tension
                                                     5434 non-null
                                                                    object
         14 Fatigue
                                                     5434 non-null
                                                                    object
         15 Gastrointestinal
                                                     5434 non-null
                                                                    object
         16 Abroad travel
                                                     5434 non-null
                                                                    object
         17 Contact with COVID Patient
                                                                    object
                                                     5434 non-null
         18 Attended Large Gathering
                                                     5434 non-null
                                                                    object
         19 Visited Public Exposed Places
                                                     5434 non-null
                                                                    object
         20 Family working in Public Exposed Places 5434 non-null
                                                                    object
         21 Wearing Masks
                                                     5434 non-null
                                                                    object
         22 Sanitization from Market
                                                     5434 non-null
                                                                    object
         23 COVID-19
                                                     5434 non-null
                                                                    object
         24 SARS-Cov-2 exam result
                                                     5434 non-null
                                                                    object
        dtypes: int64(2), object(23)
        memory usage: 1.0+ MB
In [7]:
         data.head(10)
```

Out[7]:

	User_id	Age	Sex	Breathing Problem	Fever	Dry Cough	Sore throat	Running Nose	Asthma	Chronic Lung Disease	•••	Gastrointesti
0	1	77	М	Yes	Yes	Yes	Yes	Yes	No	No		
1	2	38	F	Yes	Yes	Yes	Yes	No	Yes	Yes		
2	3	75	F	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
3	4	84	F	Yes	Yes	Yes	No	No	Yes	No		
4	5	66	М	Yes	Yes	Yes	Yes	Yes	No	Yes		
5	6	25	М	Yes	Yes	Yes	No	No	No	No		
6	7	80	F	Yes	Yes	Yes	No	No	No	Yes		

	User_id	Age	Sex	Breathing Problem	Fever	Dry Cough	Sore throat	Running Nose	Asthma	Chronic Lung Disease	•••	Gastrointesti
7	8	71	F	Yes	Yes	Yes	No	Yes	Yes	No		
8	9	67	F	Yes	Yes	Yes	No	Yes	No	Yes		
9	10	73	F	Yes	Yes	Yes	No	No	Yes	No		

10 rows × 25 columns

```
In [8]: data.tail(5)
```

Out[8]:

	User_id	Age	Sex	Breathing Problem	Fever	Dry Cough	Sore throat	Running Nose	Asthma	Chronic Lung Disease	•••	Gastroint
5429	5430	68	F	Yes	Yes	No	Yes	Yes	Yes	Yes		
5430	5431	22	F	Yes	Yes	Yes	No	Yes	Yes	No		
5431	5432	78	F	Yes	Yes	Yes	No	No	No	No		
5432	5433	55	М	Yes	Yes	Yes	No	Yes	No	No		
5433	5434	33	М	Yes	Yes	Yes	No	Yes	Yes	No		

5 rows × 25 columns

```
In [9]:
         data.isna().sum()
        User_id
                                                     0
Out[9]:
                                                     0
        Age
                                                     0
        Sex
        Breathing Problem
                                                     0
                                                     0
        Fever
        Dry Cough
                                                     0
        Sore throat
                                                     0
        Running Nose
                                                     0
        Asthma
        Chronic Lung Disease
                                                     0
        Headache
                                                     0
        Heart Disease
        Diabetes
                                                     0
        Hyper Tension
                                                     0
        Fatigue
                                                     0
        Gastrointestinal
                                                     0
        Abroad travel
                                                     0
        Contact with COVID Patient
                                                     0
        Attended Large Gathering
                                                     0
        Visited Public Exposed Places
                                                     0
        Family working in Public Exposed Places
```

```
2/3/25, 12:55 PM
                                                    Healthcare Diagnosis and Risk Prediction
                Wearing Masks
                Sanitization from Market
                                                                 0
                COVID-19
                                                                 0
                SARS-Cov-2 exam result
                                                                 0
                dtype: int64
     In [10]:
                 data.groupby(['COVID-19']).count()
     Out[10]:
                                                                                                 Chronic
                                                                 Dry
                                             Breathing
                                                                        Sore Running
                                                                                        Asthma
                         User_id
                                 Age
                                        Sex
                                                                                                   Lung
                                                                                                         ... Fatig
                                               Problem
                                                               Cough
                                                                      throat
                                                                                 Nose
                                                                                                 Disease
                COVID-
                    19
                                                                1051
                           1051 1051 1051
                                                  1051
                                                         1051
                                                                        1051
                                                                                  1051
                                                                                          1051
                                                                                                   1051 ...
                                                                                                               10
                    No
                    Yes
                           4383 4383
                                       4383
                                                  4383
                                                         4383
                                                                4383
                                                                        4383
                                                                                  4383
                                                                                          4383
                                                                                                   4383
                                                                                                               43
               2 rows × 24 columns
     In [11]:
                 data.groupby(['SARS-Cov-2 exam result']).count()
     Out[11]:
                                                                                                  Chronic
                                                                         Sore
                                                                               Running
                                              Breathing
                                                                  Dry
                          User_id
                                                         Fever
                                                                                         Asthma
                                                                                                          ... Fati
                                  Age
                                         Sex
                                                                                                    Lung
                                                                Cough
                                                Problem
                                                                       throat
                                                                                  Nose
                                                                                                  Disease
                  SARS-
                   Cov-2
                   exam
                   result
                            1051 1051 1051
                                                   1051
                                                          1051
                                                                  1051
                                                                         1051
                                                                                   1051
                                                                                           1051
                                                                                                    1051
                negative
                                                                                                                1
                positive
                            4383 4383 4383
                                                   4383
                                                          4383
                                                                  4383
                                                                         4383
                                                                                   4383
                                                                                           4383
                                                                                                    4383
                                                                                                                4
```

In [12]: data.groupby(['Contact with COVID Patient']).count() Out[12]:

```
User_id Age Sex Breathing Dry Sore Running Asthma Lung ... Fatig

Chronic

Chronic

Chronic

Cough throat Nose

Disease
```

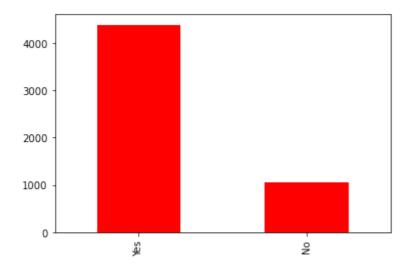
Contac
with
COVID
Patien

No	2708	2708	2708	2708	2708	2708	2708	2708	2708	2708	27
Yes	2726	2726	2726	2726	2726	2726	2726	2726	2726	2726	27

2 rows × 24 columns

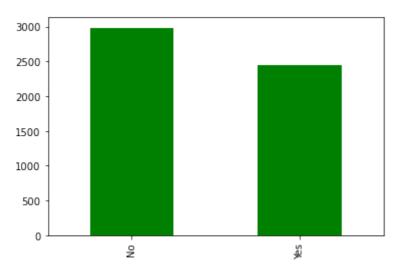


Out[13]: <AxesSubplot:>



```
In [14]:
    data['Abroad travel'].value_counts().head(10).plot(kind='bar',color='g')
```

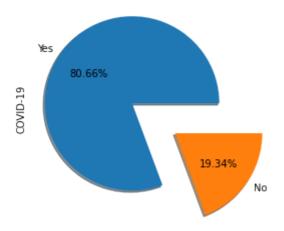
Out[14]: <AxesSubplot:>



In [15]: data["COVID-19"].value_counts().plot.pie(explode=[0.1,0.5],autopct='%1.2f%%',shadow=
 plt.title('Percentage of COVID Positive')

Out[15]: Text(0.5, 1.0, 'Percentage of COVID Positive')

Percentage of COVID Positive



Out[16]:

	User_id	Age	Sex	Breathing Problem	Fever	Dry Cough		Running Nose	Heart Disease	Hyper Tension	Abroad travel	COn CC Pat
0	1	77	М	Yes	Yes	Yes	Yes	Yes	No	Yes	No	
1	2	38	F	Yes	Yes	Yes	Yes	No	No	No	No	
2	3	75	F	Yes	Yes	Yes	Yes	Yes	No	No	Yes	
3	4	84	F	Yes	Yes	Yes	No	No	Yes	No	Yes	
4	5	66	М	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	
•••	•••	•••			•••		•••				•••	
5429	5430	68	F	Yes	Yes	No	Yes	Yes	No	No	No	
5430	5431	22	F	Yes	Yes	Yes	No	Yes	No	Yes	No	
5431	5432	78	F	Yes	Yes	Yes	No	No	Yes	Yes	No	
5432	5433	55	М	Yes	Yes	Yes	No	Yes	Yes	No	No	
5433	5434	33	М	Yes	Yes	Yes	No	Yes	No	Yes	No	

5434 rows × 19 columns

In [17]: data1.head(10)

Out[17]:

	U	ser_id	Age	Sex	Breathing Problem	Fever	Dry Cough	Sore throat	Running Nose	Heart Disease		Abroad travel	Contac wit COVII Patien
	0	1	77	М	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Ye
	1	2	38	F	Yes	Yes	Yes	Yes	No	No	No	No	N
	2	3	75	F	Yes	Yes	Yes	Yes	Yes	No	No	Yes	N
	3	4	84	F	Yes	Yes	Yes	No	No	Yes	No	Yes	N
	4	5	66	М	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Ye
	5	6	25	М	Yes	Yes	Yes	No	No	Yes	Yes	No	N
	6	7	80	F	Yes	Yes	Yes	No	No	Yes	Yes	No	N
	7	8	71	F	Yes	Yes	Yes	No	Yes	No	Yes	Yes	N
	8	9	67	F	Yes	Yes	Yes	No	Yes	No	No	Yes	Ye
	9	10	73	F	Yes	Yes	Yes	No	No	No	Yes	No	N
	dat	a1['He a1['Dr a1['Sc a1['Hy a1['At a1['At a1['At a1['We a1['V: a1['Sa a1['Fa a1['Sc a1['Sc a1['Sc a1['Sc a1['Sc a1['Sc	eart ory Coore to proad ontactend earing issite aniti amily OVID-ARS-Co	Diseaugh'] hroat Tensi trav t wit ed La g Mas d Pub zatio work 19']=	se']=data1 ase']=data1['D c']=data1['D c']=data1[con']=data vel']=data ch COVID P arge Gathe sks']=data plic Expos on from Ma king in Pu edata1['CO exam resu L['Sex'].m	1['Heary Cou'Sore 1['Hypp 1['Abratient ring'] 1['Wea ed Pla rket'] blic E VID-19 lt']=d	rt Dise gh'].ma throat' er Tens oad tra ']=data =data1[ring Ma ces']=d =data1[xposed '].map(ata1['S	ase'].r p({'Yes'].map(- ion'].r vel'].r 1['Cont 'Attend sks'].r ata1['\ 'Sanit: Places {'Yes' ARS-Cov	map({'Yes s':1,'No' {'Yes':1, map({'Yes map({'Yes tact with ded Large map({'Yes Visited F ization f ']=data1[:1,'No':6	s':1,'No :0}) 'No':0} s':1,'No s':1,'No cOVID c Gather s':1,'No Public E From Mar ['Family b])	':0})) ':0}) ':0}) Patient' ing'].ma ':0}) xposed P ket'].ma working	p({'Yes' laces']. p({'Yes' in Publ	:1,'No map({ :1,'No ic Exp
n [19]:	dat	a1.hea	ad()										
n [19]: ut[19]:	dat	a1.hea	ad()										Conta

	User_id	Age	Sex	Breathing Problem	Fever		Sore throat	Running Nose	Heart Disease		Abroad travel	Contact with COVID Patient
0	1	77	0	1	1	1	1	1	0	1	0	1
1	2	38	1	1	1	1	1	0	0	0	0	(
2	3	75	1	1	1	1	1	1	0	0	1	C
3	4	84	1	1	1	1	0	0	1	0	1	C
4	5	66	0	1	1	1	1	1	1	1	0	1

In [20]:

data1.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5434 entries, 0 to 5433
Data columns (total 19 columns):

#	Column	Non-Null Count	Dtype
0	User_id	5434 non-null	int64
1	Age	5434 non-null	int64
2	Sex	5434 non-null	int64
3	Breathing Problem	5434 non-null	int64
4	Fever	5434 non-null	int64
5	Dry Cough	5434 non-null	int64
6	Sore throat	5434 non-null	int64
7	Running Nose	5434 non-null	int64
8	Heart Disease	5434 non-null	int64
9	Hyper Tension	5434 non-null	int64
10	Abroad travel	5434 non-null	int64
11	Contact with COVID Patient	5434 non-null	int64
12	Attended Large Gathering	5434 non-null	int64
13	Visited Public Exposed Places	5434 non-null	int64
14	Family working in Public Exposed Places	5434 non-null	int64
15	Wearing Masks	5434 non-null	int64
16	Sanitization from Market	5434 non-null	int64
17	COVID-19	5434 non-null	int64
18	SARS-Cov-2 exam result	5434 non-null	int64
dtyp	es: int64(19)		

In [21]:

cor_mat=data1.corr()
cor_mat

memory usage: 806.7 KB

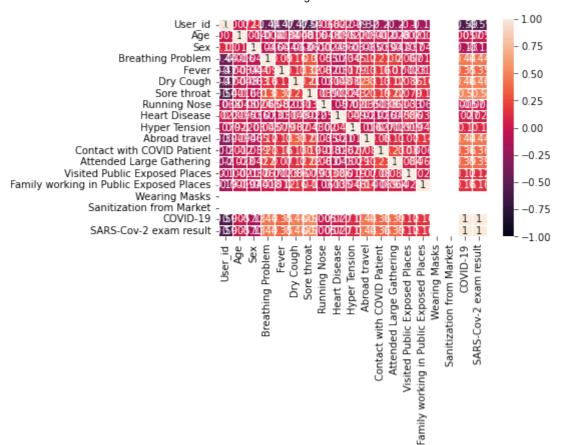
Out[21]:

	User_id	Age	Sex	Breathing Problem	Fever	Dry Cough	Sore throat	Running Nose	
User_id	1.000000	0.007204	0.107722	-0.437417	-0.468600	-0.472480	-0.542537	-0.068410	
Age	0.007204	1.000000	0.014471	-0.005952	-0.003358	-0.004772	0.001613	0.004827	(
Sex	0.107722	0.014471	1.000000	-0.045609	-0.044236	-0.063379	-0.060719	-0.002378	-(
Breathing Problem	-0.437417	-0.005952	-0.045609	1.000000	0.089903	0.159562	0.303768	0.055190	-(
Fever	-0.468600	-0.003358	-0.044236	0.089903	1.000000	0.127580	0.322235	0.081758	-(
Dry Cough	-0.472480	-0.004772	-0.063379	0.159562	0.127580	1.000000	0.213907	-0.030763	(
Sore throat	-0.542537	0.001613	-0.060719	0.303768	0.322235	0.213907	1.000000	0.039450	(
Running Nose	-0.068410	0.004827	-0.002378	0.055190	0.081758	-0.030763	0.039450	1.000000	-(
Heart Disease	0.021612	0.009481	-0.036354	-0.073366	-0.031462	0.047566	0.002177	-0.056750	1
Hyper Tension	-0.078966	0.022155	-0.029676	0.045256	0.079001	0.081989	0.042811	-0.020445	(

	User_id	Age	Sex	Breathing Problem	Fever	Dry Cough	Sore throat	Running Nose	
Abroad travel	-0.318820	0.009418	-0.064556	0.117795	0.128726	0.331418	0.205986	0.034526	-(
Contact with COVID Patient	-0.201967	0.012475	-0.038712	0.214634	0.164704	0.128330	0.189251	0.003776	-(
Attended Large Gathering	-0.203309	-0.028315	-0.042247	0.200304	0.070490	0.117963	0.216438	0.061099	-(
Visited Public Exposed Places	-0.104390	-0.002145	-0.036582	0.066688	0.002252	0.086176	0.079055	0.032568	(
Family working in Public Exposed Places	-0.194553	-0.000966	-0.044399	0.018295	0.012102	0.163102	0.104378	-0.061323	(
Wearing Masks	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
Sanitization from Market	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
COVID-19	-0.588240	0.005679	-0.130817	0.443764	0.352891	0.464292	0.502848	-0.005657	(
SARS-Cov- 2 exam result	-0.588240	0.005679	-0.130817	0.443764	0.352891	0.464292	0.502848	-0.005657	(

```
import seaborn as sns
sns.heatmap(cor_mat, vmax=1, vmin=-1, annot=True, linewidths=.5, cmap='rocket')
```

Out[22]: <AxesSubplot:>



Disease Diagnosis

Out[24]:

	User_id	Age	Sex	Breathing Problem	Fever	Dry Cough	Sore throat	_	Heart Disease	Hyper Tension	Abroad travel	Con CC Pat
0	1	77	0	1	1	1	1	1	0	1	0	
1	2	38	1	1	1	1	1	0	0	0	0	
2	3	75	1	1	1	1	1	1	0	0	1	
3	4	84	1	1	1	1	0	0	1	0	1	
4	5	66	0	1	1	1	1	1	1	1	0	
•••												
5429	5430	68	1	1	1	0	1	1	0	0	0	
5430	5431	22	1	1	1	1	0	1	0	1	0	
5431	5432	78	1	1	1	1	0	0	1	1	0	
5432	5433	55	0	1	1	1	0	1	1	0	0	

		User_id	Age	Sex	Breathing Problem	Fever	Dry Cough	Sore throat	Running Nose	Heart Disease		Abroad travel	CC Pat
	5433	5434	33	0	1	1	1	0	1	0	1	0	
	5434 rd	ows × 18	3 colu	mns									
In [25]:	у												
Out[25]:	0 1 2 3	1 1 1											
	5429 5430 5431 5432 5433 Name:	1 1 0 0 0 COVID-	19, L	ength	n: 5434, d	dtype:	int64						
In [26]:	<pre>from sklearn.model_selection import train_test_split x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.30,random_state=42)</pre>												
In [27]:					x_test.sh			shape,	y_test.s	shape)			
		, ,		·	ressi		,						
In [28]:	<pre>from sklearn.linear_model import LogisticRegression classifier=LogisticRegression() classifier.fit(x_train, y_train)</pre>												
Out[28]:		isticRe ticReg	•										
In [29]:	y_pre		ssifi	er.pr	redict(x_t	cest)							
Out[29]:	array	([1, 0,	1, .	, 1	l, 1, 1],	dtype	=int64)						
In [30]:					import co est,y_pred		on_matri	x					
Out[30]:	array	([[316 [0			dtype=int	t64)							

Con

```
from sklearn.metrics import accuracy_score
accuracy_score(y_test,y_pred1)

Out[31]:
1.0
```

Random Forest Classification

```
In [32]:
          from sklearn.model selection import GridSearchCV
          from sklearn.ensemble import RandomForestClassifier
          cls=RandomForestClassifier()
          n_estimators=[25,50,75,100,125,150,175,200]
          criterion=['gini','entropy']
          max_depth=[3,5,10]
          parameters={'n_estimators': n_estimators,'criterion':criterion,'max_depth':max_depth
          RFC_cls = GridSearchCV(cls, parameters)
          RFC_cls.fit(x_train,y_train)
                       GridSearchCV
Out[32]:
          ▶ estimator: RandomForestClassifier
                ▶ RandomForestClassifier
In [33]:
          RFC_cls.best_params_
          {'criterion': 'gini', 'max_depth': 3, 'n_estimators': 25}
Out[33]:
In [34]:
          cls=RandomForestClassifier(n_estimators=25,criterion='gini',max_depth=3)
          cls.fit(x_train,y_train)
Out[34]:
                          RandomForestClassifier
         RandomForestClassifier(max_depth=3, n_estimators=25)
In [35]:
          y_pred2=cls.predict(x_test)
          y_pred2
         array([1, 0, 1, ..., 1, 1, 1], dtype=int64)
Out[35]:
In [36]:
          from sklearn.metrics import confusion_matrix
          confusion_matrix(y_test,y_pred2)
         array([[ 316,
Out[36]:
                    0, 1315]], dtype=int64)
In [37]:
          from sklearn.metrics import accuracy score
          accuracy_score(y_test,y_pred2)
Out[37]:
```

DecisionTree Classification

```
In [38]:
          from sklearn.tree import DecisionTreeClassifier
In [39]:
          cls=DecisionTreeClassifier()
In [40]:
          cls.fit(x_train,y_train)
Out[40]:
         ▼ DecisionTreeClassifier
         DecisionTreeClassifier()
In [41]:
          y_pred3=cls.predict(x_test)
          y pred3
         array([1, 0, 1, ..., 1, 1, 1], dtype=int64)
Out[41]:
In [42]:
          from sklearn.metrics import confusion_matrix
          confusion_matrix(y_test,y_pred3)
         array([[ 316,
                         0],
Out[42]:
                [ 0, 1315]], dtype=int64)
In [43]:
          from sklearn.metrics import accuracy_score
          accuracy_score(y_test,y_pred3)
Out[43]:
In [44]:
          from prettytable import PrettyTable
          table=PrettyTable()
          table.field names = ["TEST SIZE","0.30"]
          table.add_row(["Logistic Regression",1.0])
          table.add_row(["Random Forest classification",1.0])
          table.add_row(["DecisionTree Classification",1.0])
          print(table)
          -----+
                   TEST SIZE
               Logistic Regression | 1.0 |
           Random Forest classification | 1.0
         | DecisionTree Classification | 1.0
```

Patient Risk Prediction

```
In [45]:
    new = x_test.iloc[0]
    a = np.asarray(new)
    a = a.reshape(1,-1)
    p = cls.predict(a)
```

```
if (p[0] == 1):
    print("Person is affected by Covid 19 and is at risk of dying")
else:
    print("Great! the results are negative and you don't have to worry")
```

Person is affected by Covid 19 and is at risk of dying

```
In [47]:
          import tkinter as tk
          from tkinter import ttk
          import pandas as pd
          def load_data_from_csv(file_path):
              try:
                  df = pd.read csv(r"C:\Users\reshma koduri\OneDrive\Documents\Healthcare Diag
                  return df
              except Exception as e:
                  print(f"Error loading CSV file: {e}")
                  return None
          def predict_risk():
              global data df
              if data df is None:
                  prediction_label.config(text="Error: Data not loaded.")
                  return
              input_features = {
                  'Fever': fever_var.get(),
                  'Dry Cough': dry_cough_var.get(),
                  'Sore throat': sore_throat_var.get(),
                  'Running Nose': running_nose_var.get(),
                  'Heart Disease': heart_disease_var.get(),
                  'Hyper Tension': hyper_tension_var.get(),
                  'Abroad travel': abroad_travel_var.get(),
                  'Contact with COVID Patient': covid_contact_var.get(),
                   'Attended Large Gathering': large_gathering_var.get(),
                  'Visited Public Exposed Places': exposed_places_var.get(),
                  'Family working in Public Exposed Places': family_exposed_var.get(),
                  'Wearing Masks': masks_var.get(),
                  'Sanitization from Market': sanitization_var.get()
              }
              try:
                  if input_features['Wearing Masks'] == 1 or input_features['Sanitization fro
                      predicted risk = "Low"
                  else:
                      features_for_prediction = data_df[['Fever', 'Dry Cough', 'Sore throat',
                                                          'Heart Disease', 'Hyper Tension', 'Ab
                                                          'Contact with COVID Patient', 'Attend
                                                          'Visited Public Exposed Places', 'Fam
                                                          'Wearing Masks', 'Sanitization from M
                      input df = pd.DataFrame([input features])
                      df_concat = pd.concat([features_for_prediction, input_df], ignore_index=
                      if df_concat.iloc[-1].any():
                          predicted risk = "High"
                      else:
                          predicted risk = "Low"
                  prediction_label.config(text=f"Predicted Risk: {predicted_risk}")
              except Exception as e:
                  print(f"Error predicting risk: {e}")
                  prediction_label.config(text="Error predicting risk.")
          file path = r"C:\Users\reshma koduri\OneDrive\Documents\Healthcare Diagnosis and Ris
          data_df = load_data_from_csv(file_path)
```

```
if data_df is None:
   exit()
root = tk.Tk()
root.title("COVID-19 Risk Prediction")
fever_var = tk.IntVar()
dry_cough_var = tk.IntVar()
sore throat var = tk.IntVar()
running_nose_var = tk.IntVar()
heart_disease_var = tk.IntVar()
hyper_tension_var = tk.IntVar()
abroad_travel_var = tk.IntVar()
covid_contact_var = tk.IntVar()
large gathering var = tk.IntVar()
exposed_places_var = tk.IntVar()
family_exposed_var = tk.IntVar()
masks_var = tk.IntVar()
sanitization_var = tk.IntVar()
fever_check = ttk.Checkbutton(root, text="Fever", variable=fever_var)
fever_check.pack()
dry cough check = ttk.Checkbutton(root, text="Dry Cough", variable=dry_cough_var)
dry_cough_check.pack()
sore_throat_check = ttk.Checkbutton(root, text="Sore throat", variable=sore_throat_v
sore_throat_check.pack()
running_nose_check = ttk.Checkbutton(root, text="Running Nose", variable=running_nos
running nose check.pack()
heart disease check = ttk.Checkbutton(root, text="Heart Disease", variable=heart dis
heart_disease_check.pack()
hyper_tension_check = ttk.Checkbutton(root, text="Hyper Tension", variable=hyper_ten
hyper_tension_check.pack()
abroad travel check = ttk.Checkbutton(root, text="Abroad travel", variable=abroad tr
abroad travel check.pack()
covid contact check = ttk.Checkbutton(root, text="Contact with COVID Patient", varia
covid contact check.pack()
large_gathering_check = ttk.Checkbutton(root, text="Attended Large Gathering", varia
large_gathering_check.pack()
exposed places check = ttk.Checkbutton(root, text="Visited Public Exposed Places", v
exposed places check.pack()
family exposed check = ttk.Checkbutton(root, text="Family working in Public Exposed
family exposed check.pack()
masks_check = ttk.Checkbutton(root, text="Wearing Masks", variable=masks_var)
masks check.pack()
sanitization check = ttk.Checkbutton(root, text="Sanitization from Market", variable
sanitization check.pack()
predict button = ttk.Button(root, text="Predict Risk", command=predict risk)
predict button.pack()
prediction_label = ttk.Label(root, text="")
```

```
prediction_label.pack()
root.mainloop()
```

Medical Image Analysis

```
In [48]:
          import numpy as np
          import pandas as pd
          import matplotlib.pyplot as plt
          import seaborn as sns
          import cv2
          import os
          from sklearn.model_selection import train_test_split
          from tensorflow.keras.models import Sequential
          from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense, Dropout
          from tensorflow.keras.preprocessing.image import ImageDataGenerator
In [49]:
          for dirname, _, filenames in os.walk(r"C:\Users\reshma_koduri\OneDrive\Documents\Hea
              for filename in filenames:
                  print(os.path.join(dirname, filename))
         nal-Jour-p3-89%0.png
```

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```
In [52]:
          import os
          data_dir =(r"C:\Users\reshma_koduri\OneDrive\Documents\Healthcare Diagnosis and Risk
          categories = ['Covid', 'NonCovid']
          data = []
          labels = []
          for category in categories:
              path = os.path.join(data_dir, category)
              class_num = categories.index(category)
              for img in os.listdir(path):
                  try:
                      img_array = cv2.imread(os.path.join(path, img), cv2.IMREAD_GRAYSCALE)
                      resized_array = cv2.resize(img_array, (224, 224))
                      data.append(resized array)
                      labels.append(class_num)
                  except Exception as e:
                      pass
In [53]:
          print(f"Number of images loaded: {len(data)}")
          print(f"Number of labels loaded: {len(labels)}")
         Number of images loaded: 746
         Number of labels loaded: 746
In [54]:
          data = np.array(data).reshape(-1, 224, 224, 1)
          data = data / 255.0
          labels = np.array(labels)
In [55]:
          x_train, x_test, y_train, y_test = train_test_split(data, labels, test_size=0.2, ran
In [56]:
          model = Sequential([
              Conv2D(32, (3, 3), activation='relu', input_shape=(224, 224, 1)),
              MaxPooling2D((2, 2)),
              Conv2D(64, (3, 3), activation='relu'),
              MaxPooling2D((2, 2)),
              Conv2D(128, (3, 3), activation='relu'),
              MaxPooling2D((2, 2)),
              Flatten(),
              Dense(128, activation='relu'),
              Dropout(0.5),
              Dense(2, activation='softmax')
          ])
In [57]:
          model.compile(optimizer='adam', loss='sparse categorical crossentropy', metrics=['ac
In [58]:
          datagen = ImageDataGenerator(
              rotation range=20,
              zoom range=0.15,
              width shift range=0.2,
              height_shift_range=0.2,
              shear range=0.15,
              horizontal_flip=True,
```

```
fill mode="nearest"
          datagen.fit(x_train)
In [59]:
         history = model.fit(datagen.flow(x_train, y_train, batch_size=32), epochs=20, valida
         Epoch 1/20
                                  - 21s 902ms/step - accuracy: 0.5104 - loss: 1.4690 - val acc
         19/19 -
         uracy: 0.5333 - val_loss: 0.7181
         Epoch 2/20
         19/19 -
                                  - 16s 789ms/step - accuracy: 0.5499 - loss: 0.7072 - val_acc
         uracy: 0.5333 - val_loss: 0.6398
         19/19 -
                               ----- 18s 892ms/step - accuracy: 0.5568 - loss: 0.6767 - val acc
         uracy: 0.5600 - val_loss: 0.6663
         Epoch 4/20
         19/19
                             ———— 17s 818ms/step - accuracy: 0.5970 - loss: 0.6666 - val_acc
         uracy: 0.6333 - val_loss: 0.6215
                                  - 17s 833ms/step - accuracy: 0.5397 - loss: 0.6776 - val_acc
         19/19 -
         uracy: 0.5600 - val loss: 0.6648
         Epoch 6/20
         19/19 -
                               ----- 16s 801ms/step - accuracy: 0.5536 - loss: 0.6874 - val_acc
         uracy: 0.5400 - val_loss: 0.6304
         Epoch 7/20
         19/19 -
                                --- 17s 837ms/step - accuracy: 0.5638 - loss: 0.6567 - val_acc
         uracy: 0.6733 - val_loss: 0.6201
         Epoch 8/20
                            18s 905ms/step - accuracy: 0.6123 - loss: 0.6531 - val_acc
         19/19 -
         uracy: 0.5733 - val loss: 0.6236
         Epoch 9/20
         19/19 -
                                  — 17s 834ms/step - accuracy: 0.5330 - loss: 0.6759 - val acc
         uracy: 0.6400 - val_loss: 0.6188
         Epoch 10/20
         19/19 -
                              ----- 17s 832ms/step - accuracy: 0.5906 - loss: 0.6711 - val_acc
         uracy: 0.6533 - val_loss: 0.6228
         Epoch 11/20
         19/19 -----
                              17s 833ms/step - accuracy: 0.5970 - loss: 0.6570 - val acc
         uracy: 0.7200 - val loss: 0.5972
         Epoch 12/20
         19/19 •
                                   - 22s 1s/step - accuracy: 0.6388 - loss: 0.6482 - val accura
         cy: 0.6600 - val loss: 0.6086
         Epoch 13/20
         19/19 -
                                  - 26s 1s/step - accuracy: 0.6120 - loss: 0.6440 - val_accura
         cy: 0.5667 - val_loss: 0.6524
         Epoch 14/20
         19/19 -
                                  - 21s 1s/step - accuracy: 0.5899 - loss: 0.6700 - val accura
         cy: 0.7067 - val loss: 0.5993
         Epoch 15/20
         19/19
                                  - 19s 917ms/step - accuracy: 0.6421 - loss: 0.6498 - val_acc
         uracy: 0.6667 - val_loss: 0.5882
         Epoch 16/20
         19/19 -
                                  — 20s 908ms/step - accuracy: 0.6443 - loss: 0.6638 - val_acc
         uracy: 0.6867 - val loss: 0.6138
         Epoch 17/20
                                  - 19s 907ms/step - accuracy: 0.6143 - loss: 0.6385 - val_acc
         19/19 -
         uracy: 0.6933 - val loss: 0.6129
         Epoch 18/20
                                   - 19s 922ms/step - accuracy: 0.5673 - loss: 0.6736 - val_acc
         19/19 •
         uracy: 0.6467 - val loss: 0.5822
         Epoch 19/20
                                —— 19s 916ms/step - accuracy: 0.6111 - loss: 0.6349 - val_acc
         19/19 -
```

uracy: 0.6467 - val_loss: 0.5758

```
Epoch 20/20
                                     • 19s 884ms/step - accuracy: 0.6314 - loss: 0.6355 - val_acc
          19/19
         uracy: 0.6733 - val_loss: 0.5682
In [60]:
          model.evaluate(x_test, y_test)
                                  - 1s 238ms/step - accuracy: 0.6780 - loss: 0.5613
          [0.5682364702224731, 0.6733333468437195]
Out[60]:
In [61]:
          plt.plot(history.history['accuracy'], label='accuracy')
          plt.plot(history.history['val_accuracy'], label = 'val_accuracy')
          plt.xlabel('Epoch')
          plt.ylabel('Accuracy')
          plt.ylim([0, 1])
          plt.legend(loc='lower right')
          plt.show()
            1.0
            0.8
            0.6
          Accuracy
           0.4
            0.2
                                                      accuracy
                                                      val accuracy
            0.0
                0.0
                      2.5
                            5.0
                                  7.5
                                       10.0
                                             12.5
                                                   15.0
                                                         17.5
                                      Epoch
In [62]:
          model.save('covid19 model.keras')
In [64]:
          from tensorflow.keras.models import load model
          model = load_model('covid19_model.keras')
          # Predict on a new image
          new image = cv2.imread(r"C:\Users\reshma koduri\OneDrive\Documents\Healthcare Diagno
          new_image = cv2.resize(new_image, (224, 224))
          new_image = np.array(new_image).reshape(-1, 224, 224, 1)
          new_image = new_image / 255.0
          prediction = model.predict(new_image)
          print("Prediction:", categories[np.argmax(prediction)])
          1/1
                                   0s 238ms/step
         Prediction: NonCovid
In [65]:
          from tensorflow.keras.models import load model
          model = load model('covid19 model.keras')
          # Predict on a new image
          new_image = cv2.imread(r"C:\Users\reshma_koduri\OneDrive\Documents\Healthcare Diagno
          new_image = cv2.resize(new_image, (224, 224))
          new_image = np.array(new_image).reshape(-1, 224, 224, 1)
          new_image = new_image / 255.0
```

```
prediction = model.predict(new_image)
print("Prediction:", categories[np.argmax(prediction)])
```

1/1 Os 142ms/step

Prediction: Covid

Drug Discovery

Out[66]:		Id	Gen	Smile	Source	Score	P_value	Conne
	0	1	0	COc1cccc(NC(=O)Cc2ccc(NC(=O)N3CCCC3)cc2)c1	generated	99.9	0.003320	-0.
	1	2	0	C=CCNC(=O)CNc1cccc(C(=O)N(C)CCc2ccccc2)c1	generated	99.9	0.003384	-0.
	2	3	0	CC(=O)Nc1ccc(S(=O)(=O)Nc2ccc(C)c(C)c2)cc1	training	99.9	0.003397	-0.
	3	4	0	CCOC(=O)C1 = C(C(=O)OCC)C(c2cccc(CI)c2)NC(=O)N1	generated	99.9	0.003427	-0.
	4	5	0	NC(=O)c1ccc(NC(=O)C(CC(=O)O)NC(=O)c2cc(-c3cccc	generated	99.9	0.003468	-0.
	•••							
	1172	1173	0	$ \begin{aligned} CCCC1(CCc2ccccc2)CC(O) &= C(C(CC)c2cccc(NS(=O)\\ &= O \end{aligned} $	manual	99.9	1.000000	0.
	1173	1174	0	O=C1Nc2ccc(CI)cc2C(C#CC2CC2)(C(F)(F)F)O1	manual	99.9	1.000000	0.
	1174	1175	0	CC(C) (C)NC(=O)C1CN(Cc2cccnc2)CCN1CC(O)CC(Cc1cc	manual	99.9	1.000000	0.
	1175	1176	0	CCOP(=O) (COc1ccc(CC(NC(=O)OC2COC3OCCC23)C(O)CN	manual	99.9	1.000000	0.
	1176	1177	0	$\begin{aligned} COC(=O) NC(C(=O) NCCCCC(CO) N(CC(C) C) S(=O) \\ (=O) c 1 c \end{aligned}$	manual	99.9	1.000000	0.

1177 rows × 8 columns

```
In [67]:
          drug['P value'].unique()
         array([0.00331968, 0.00338356, 0.00339726, 0.00342658, 0.0034682 ,
                0.00353087, 0.00355484, 0.00357524, 0.00358432, 0.00363285,
                0.0037343 , 0.00389023, 0.00396885, 0.0042186 , 0.00450414,
                0.00486791, 0.00550357, 0.00628477, 0.00643704, 0.00645932,
                0.00664478, 0.00697121, 0.00697142, 0.00757783, 0.00895931,
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```

```
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0.97716526, 0.98104994, 0.98491947, 0.99460722, 0.99893939,
          ])
```

```
In [68]: drug['Source'].unique()
Out[68]: array(['generated', 'training', 'hiv', 'manual'], dtype=object)
```

In [69]: drug_sorted= drug.sort_values(by = 'P_value', ascending = True)
 drug_sorted

Out[69]:	ld Gen			Smile	Source	Score	P_value	Co
-	0 1 0		0	COc1cccc(NC(=O)Cc2ccc(NC(=O)N3CCCC3)cc2)c1	generated	99.9	0.003320	
	1	2	0	C = CCNC(=O)CNc1cccc(C(=O)N(C)CCc2ccccc2)c1	generated	99.9	0.003384	
	2	3	0	CC(=O)Nc1ccc(S(=O)(=O)Nc2ccc(C)c(C)c2)cc1	training	99.9	0.003397	
	3	4	0	CCOC(=O)C1 = C(C(=O)OCC)C(c2cccc(CI)c2)NC(=O)N1	generated	99.9	0.003427	
	4	5	0	NC(=O)c1ccc(NC(=O)C(CC(=O)O)NC(=O)c2cc(-c3cccc	generated	99.9	0.003468	
	•••							
	772	773	0	COc1ccc2c(c1)OC(CNC(=O)NCc1ccco1)CC2	generated	99.9	1.000000	
	773	774	0	COC(=O)C1COC(=O)N(c2ccc(NS(C)(=O)=O)cc2)C1	generated	99.9	1.000000	
	774	775	0	O=C(COc1ccc2cc(OCCCN3CCOCC3)ccc2c1)NCC(c1ccccc	generated	99.9	1.000000	
	767	768	0	Cc1cccc(C)c1N(C)S(=O)(=O)c1cnn(C)c1	generated	99.9	1.000000	

Smile

Source Score P_value Co

Id Gen

		ld	Gen				Sm	ile	Source	Score	P_value	(
	1176	1177	0	COC(=O))NC(C(=O)NC	CCCC(CO)N(C	CC(C)C)S(= (=O)c1		manual	99.9	1.000000	
	1177 rd	ows ×	8 columns									
in [70]:	ur.ug_	_sorte	ed = drug_s ed	sorted[['	Smile', 'P	_value']]						
Out[70]:						Smile	P_value	•				
	0		COc1cccc(NC	C(=O)Cc2ccc	c(NC(=O)N3C	CCC3)cc2)c1	0.003320)				
	1		C=CCNC(=0	O)CNc1cccc	(C(=O)N(C)C	Cc2cccc2)c1	0.003384	ļ				
	2		CC(=O)N	lc1ccc(S(=O)(=O)Nc2ccc	(C)c(C)c2)cc1	0.003397	7				
	3	CC	COC(=O)C1=C	(C(=O)OCC)	C(c2ccc(Cl)c	2)NC(=O)N1	0.003427	7				
	4	NC(=0)c1ccc(NC(=O)C(CC(=C	0)0)NC(=0)c	2cc(-c3cccc	0.003468	3				
	772		COc1d	cc2c(c1)OC	(CNC(=O)NC	c1ccco1)CC2	1.000000)				
	773		COC(=O)C1C	OC(=0)N(c2	2ccc(NS(C)(=0	O)=O)cc2)C1	1.000000)				
	774	O=C(0	COc1ccc2cc(O	CCCN3CCO(CC3)ccc2c1)N	CC(c1ccccc	1.000000)				
	767		C	c1cccc(C)c1l	N(C)S(=O)(=C)	D)c1cnn(C)c1	1.000000)				
	1176	COC(=	=O)NC(C(=O)N	1CCCCC(CO)	N(CC(C)C)S(=	=O)(=O)c1c	1.000000)				
n [71]:	<clas< th=""><th>s 'pa</th><th>ed.info() ndas.core.f : 1177 entr</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></clas<>	s 'pa	ed.info() ndas.core.f : 1177 entr									
	Data		ns (total 2 n Non-Nu]	-):							
	1 dtype:	s: fl		on-null on-null object(1)	object float64							
In [72]:	drug	['Soui	rce']=drug['Source'].map({'ge	enerated':1	,'train	ing':0	,'hiv'	:2,'ma	nual':3})
n [73]:	drug:		g.drop([' <mark>I</mark> c	d','Gen',	'Name'],ax	xis=1)						
Out[73]:						Smile	Source	Score	P_val	ue Co	nnectivity	_
	0		COc1cccc(N	C(=O)Cc2cc	c(NC(=O)N30	CCCC3)cc2)c1	1	99.9	0.0033	20	-0.376625	
	1		C=CCNC(=	O)CNc1cccc	C(C(=O)N(C)C	Cc2cccc2)c1	1	99.9	0.0033	84	-0.269090	
	2		CC(_O)(Noteco/S/C))(=0)N c2ccc	·(C)c(C)c2)cc1	0	00.0	0 0022	07	0 210005	

CC(=O)Nc1ccc(S(=O)(=O)Nc2ccc(C)c(C)c2)cc1

2

-0.318895

99.9 0.003397

0

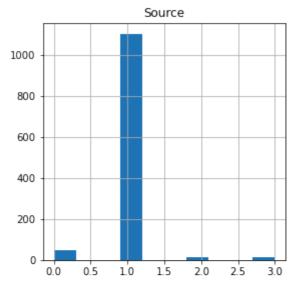
	Smile	Source	Score	P_value	Connectivity
3	CCOC(=O)C1=C(C(=O)OCC)C(c2cccc(Cl)c2)NC(=O)N1	1	99.9	0.003427	-0.329905
4	NC(=O)c1ccc(NC(=O)C(CC(=O)O)NC(=O)c2cc(-c3cccc	1	99.9	0.003468	-0.288555
•••					
1172	$CCCC1(CCc2ccccc2)CC(O) \!=\! C(C(CC)c2cccc(NS(=O)(=O$	3	99.9	1.000000	0.000000
1173	O = C1Nc2ccc(CI)cc2C(C#CC2CC2)(C(F)(F)F)O1	3	99.9	1.000000	0.000000
1174	CC(C)(C)NC(=O)C1CN(Cc2cccnc2)CCN1CC(O)CC(Cc1cc	3	99.9	1.000000	0.000000
1175	CCOP(=O) (COc1ccc(CC(NC(=O)OC2COC3OCCC23)C(O)CN	3	99.9	1.000000	0.000000
1176	COC(=O)NC(C(=O)NCCCCC(CO)N(CC(C)C)S(=O)(=O)c1c	3	99.9	1.000000	0.000000

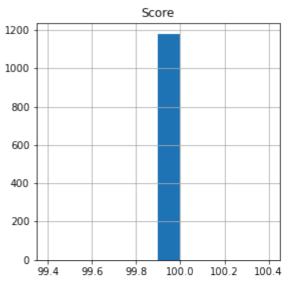
1177 rows × 5 columns

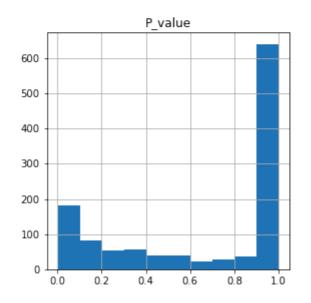
In [74]: drug1.hist(figsize=(10,10))

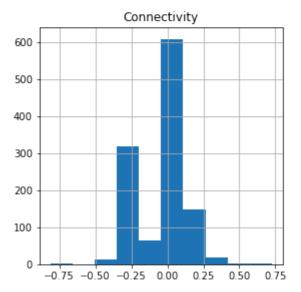
Out[74]:

<AxesSubplot:title={'center':'Connectivity'}>]], dtype=object)









```
In [75]:
          drug1.isna().sum()
                         0
         Smile
Out[75]:
         Source
                         0
         Score
                         0
         P value
                         0
         Connectivity
         dtype: int64
In [76]:
          x=drug1.drop(['Smile', 'P_value'],axis=1)
          y=drug1['P_value']
In [77]:
          from sklearn.model_selection import train_test_split
          x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.30,random_state=42)
In [78]:
          from sklearn.model selection import GridSearchCV
          from sklearn.ensemble import RandomForestRegressor
          reg=RandomForestRegressor()
          n_estimators=[25,50,75,100,125,150,175,200]
          criterion=['squared_error']
          max_depth=[3,5,10]
          parameters={'n_estimators': n_estimators,'criterion':criterion,'max_depth':max_depth
          rfc_reg = GridSearchCV(reg, parameters)
          rfc_reg.fit(x_train,y_train)
                      GridSearchCV
Out[78]:
          ▶ estimator: RandomForestRegressor
                RandomForestRegressor
In [79]:
          rfc reg.best params
         {'criterion': 'squared_error', 'max_depth': 3, 'n_estimators': 125}
Out[79]:
In [80]:
          reg=RandomForestRegressor(n estimators=125,criterion='squared error',max depth=3)
In [81]:
          reg.fit(x_train,y_train)
Out[81]:
                           RandomForestRegressor
         RandomForestRegressor(max_depth=3, n_estimators=125)
In [82]:
          y_pred4=reg.predict(x_test)
          y_pred4
         array([0.11394094, 0.98344282, 0.08022616, 0.98344282, 0.98344282,
Out[82]:
                0.98344282, 0.98344282, 0.98344282, 0.08460217, 0.67503556,
                0.97781285, 0.18298636, 0.98344282, 0.98344282, 0.08376053,
                0.23771604, 0.97433455, 0.98344282, 0.23901554, 0.98344282,
                0.11394094, 0.36115587, 0.36115587, 0.98344282, 0.08022616,
                0.46363525, 0.23771604, 0.23901554, 0.24020433, 0.39011664,
```

```
0.08376053, 0.98344282, 0.98344282, 0.08022616, 0.97433455,
0.98344282, 0.98344282, 0.67503556, 0.17284582, 0.98344282,
0.98344282, 0.98344282, 0.24020433, 0.98344282, 0.98344282,
0.35677375, 0.98344282, 0.98344282, 0.98344282, 0.55170252,
0.98344282, 0.16092847, 0.18298636, 0.23771604, 0.98344282,
0.98344282, 0.98344282, 0.98344282, 0.98344282, 0.98344282,
0.98344282, 0.98344282, 0.39011664, 0.98344282, 0.98344282,
0.98344282, 0.98344282, 0.98155505, 0.98344282, 0.47006357,
0.98155505, 0.98344282, 0.98344282, 0.08376053, 0.98344282,
0.98344282, 0.30806659, 0.25676267, 0.98344282, 0.98344282,
0.23901554, 0.46363525, 0.14565726, 0.30035269, 0.23771604,
0.2487313 , 0.21265106, 0.98344282, 0.98344282, 0.98344282,
0.47006357, 0.98344282, 0.98344282, 0.98344282, 0.98344282,
0.39011664, 0.67775977, 0.23771604, 0.98344282, 0.98344282,
0.98344282, 0.08022616, 0.98344282, 0.98344282, 0.98344282,
0.08376053, 0.98344282, 0.08376053, 0.98344282, 0.98344282,
0.29844605, 0.08022616, 0.98344282, 0.35677375, 0.98344282,
0.46805783, 0.67503556, 0.39011664, 0.98344282, 0.24758739,
0.98344282, 0.98344282, 0.14565726, 0.23771604, 0.48621922,
0.16092847, 0.23771604, 0.11394094, 0.98344282, 0.98155505,
0.14565726, 0.98344282, 0.98344282, 0.67503556, 0.23771604,
0.98344282, 0.98344282, 0.97433455, 0.14565726, 0.11394094,
0.08600972, 0.98344282, 0.39011664, 0.23771604, 0.98344282,
0.08022616, 0.98344282, 0.23901554, 0.98344282, 0.98344282,
0.24020433, 0.16092847, 0.98344282, 0.97433455, 0.14565726,
0.98344282, 0.08376053, 0.98344282, 0.98344282, 0.98344282,
0.98344282, 0.98344282, 0.98344282, 0.14814182, 0.91341502,
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0.67503556, 0.98344282, 0.98344282, 0.12057016, 0.98344282,
0.98344282,\ 0.98344282,\ 0.98344282,\ 0.98344282,\ 0.98344282,
0.84265949, 0.98344282, 0.98344282, 0.98344282, 0.66742357,
0.98344282, 0.24758739, 0.84265949, 0.98344282, 0.98344282,
0.96207513, 0.98344282, 0.23901554, 0.98344282, 0.98344282,
0.98344282, 0.98344282, 0.67503556, 0.98344282, 0.70058939,
0.98344282, 0.08022616, 0.98344282, 0.98344282, 0.98344282,
0.17284582, 0.98344282, 0.98344282, 0.39011664, 0.08376053,
0.98155505, 0.98344282, 0.98344282, 0.98344282, 0.67503556,
0.08376053, 0.98344282, 0.14814182, 0.14814182, 0.98344282,
0.98344282, 0.14565726, 0.23771604, 0.93843854, 0.67503556,
0.14814182, 0.08376053, 0.37155545, 0.98344282, 0.18298636,
0.1445022 , 0.98344282, 0.08022616, 0.98344282, 0.67271978,
0.98344282, 0.98344282, 0.23901554, 0.62053942, 0.97433455,
0.84265949, 0.09272078, 0.98344282, 0.46363525, 0.98344282,
0.23901554, 0.98344282, 0.23771604, 0.98344282, 0.23901554,
0.98344282, 0.38628721, 0.23771604, 0.95407736, 0.23901554,
0.98344282, 0.55170252, 0.98344282, 0.08460217, 0.98344282,
0.98344282, 0.18298636, 0.08022616, 0.23901554, 0.25608627,
0.47245739, 0.23771604, 0.98344282, 0.98344282, 0.08022616,
0.62053942, 0.98344282, 0.98344282, 0.98344282, 0.37155545,
0.98344282, 0.98344282, 0.98344282, 0.11035792, 0.98344282,
0.98344282, 0.40155541, 0.98344282, 0.98344282, 0.98344282,
0.98344282, 0.14565726, 0.98344282, 0.98344282, 0.98344282,
0.37155545, 0.23901554, 0.08376053, 0.98344282, 0.08600972,
0.08022616, 0.98344282, 0.98344282, 0.98344282, 0.98344282,
0.98344282, 0.98344282, 0.98344282, 0.67503556, 0.98344282,
0.98344282, 0.71355391, 0.98344282, 0.97433455, 0.98344282,
0.27886675, 0.98344282, 0.08022616, 0.98155505, 0.08022616,
0.11421769, 0.18298636, 0.98344282, 0.24020433, 0.98344282,
0.18298636, 0.96560003, 0.08022616, 0.98344282, 0.46363525,
0.39153281, 0.98344282, 0.98344282, 0.11035792, 0.98344282,
0.98344282, 0.98344282, 0.42106301, 0.36642945, 0.36103774,
0.08022616, 0.46363525, 0.23901554, 0.24020433, 0.23901554,
0.08376053, 0.98344282, 0.11421769, 0.14565726, 0.98344282,
```

```
0.98344282, 0.98344282, 0.14565726, 0.98344282, 0.98344282, 0.98344282, 0.98344282, 0.98344282])
```

```
In [83]:
           from sklearn.metrics import r2_score
           r2_score(y_test,y_pred4)
          0.9382886492776896
Out[83]:
In [84]:
           results=pd.DataFrame(columns=['actual','predicted'])
           results['actual']=y_test
           results['predicted']=y_pred4
           results=results.reset_index()
           results['ID']=results.index
           results.head(5)
Out[84]:
             index
                     actual predicted ID
               107 0.053120
                             0.113941
          1
                  1.000000
                             0.983443
               774
                                       1
          2
                   0.039904
                             0.080226
                   1.000000
                             0.983443
                                       3
          3
               787
               665
                   1.000000
                             0.983443
In [85]:
           import seaborn as sns
           import matplotlib.pyplot as plt
           sns.lineplot(x='ID',y='actual',data=results.head(50))\\
           sns.lineplot(x='ID',y='predicted',data=results.head(50))
           plt.plot()
Out[85]: []
            1.0
            0.8
            0.6
            0.4
```

Personalized Treatment Recommendations

30

50

```
import numpy as np
import seaborn as sns
from matplotlib import pyplot as plt
import warnings
import os
```

10

20

ID

0.2

0.0

```
import importlib
warnings.filterwarnings('ignore')
sns.set_theme(color_codes=True)
```

```
def check_and_install_library(library_name):
    try:
        importlib.import_module(library_name)
        print(f"{library_name} is already installed.")
    except ImportError:
        print(f"{library_name} is not installed. Installing...")
        try:
            import pip
            pip.main(['install', library_name])
        except:
            print("Error: Failed to install the library. Please install it manually.
```

In [88]:

!pip show scikit-surprise

Name: scikit-surprise

Version: 1.1.3

Summary: An easy-to-use library for recommender systems.

Home-page: https://surpriselib.com

Author: Nicolas Hug

Author-email: contact@nicolas-hug.com

License: GPLv3+

Location: c:\users\reshma_koduri\anaconda3\lib\site-packages

Requires: joblib, numpy, scipy

Required-by:

```
import sys
print(sys.path)
import sys
sys.path.append('/path/to/directory')
```

['C:\\Users\\reshma_koduri', 'C:\\Users\\reshma_koduri\\anaconda3\\python39.zip', 'C:\\Users\\reshma_koduri\\anaconda3\\lib\\site-packages\\lib\\site-packages\\vin32\\lib\\site-packages\\win32\\lib\\site-packages\\win32\\lib\\site-packages\\win32\\lib\\site-packages\\pythonwin', 'C:\\Users\\reshma_koduri\\anaconda3\\lib\\site-packages\\win32\\lib\\site-packages\\win32\\lib\\site-packages\\win32\\lib\\site-packages\\win32\\lib\\site-packages\\win32\\lib\\site-packages\\win32\\lib\\site-packages\\pythonwin', 'C:\\Users\\reshma_koduri\\anaconda3\\\lib\\site-packages\\Pythonwin', 'C:\\Users\\reshma_koduri\\naconda3\\\lib\\site-packages\\IPython\\extensions', 'C:\\Users\\reshma_koduri\\.ip\ython']

In [90]:

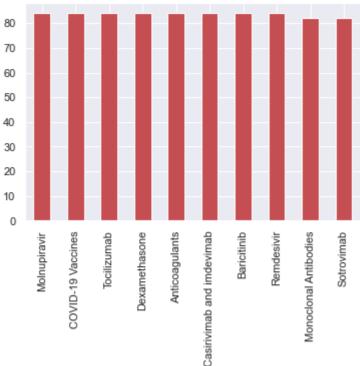
treatment=pd.read_csv(r"C:\Users\reshma_koduri\OneDrive\Documents\Healthcare Diagnos
treatment

Out[90]:		User_id	Age	Sex	Source	Haemoglobins	Erythrocyte	Leucocyte	Haematocrit	Treatme
	0	1	68	F	out	11.8	4.65	6.3	35.1	Oxyge Therap
	1	2	70	F	out	14.8	5.39	12.7	43.5	Convalescei Plasm
	2	3	64	F	out	11.3	4.74	13.2	33.5	COVID-1 Vaccine
	3	4	73	F	out	13.7	4.98	10.5	39.1	Tocilizuma
	4	5	66	М	out	9.9	4.23	22.1	30.9	Dexamethasor

	User_id	Age	Sex	Source	Haemoglobins	Erythrocyte	Leucocyte	Haematocrit	Treatmei
•••									
1184	1185	90	F	out	12.5	4.41	10.9	37.1	Remdesiv
1185	1186	90	F	out	10.6	4.44	9.4	33.7	Baricitin
1186	1187	90	F	in	11.2	4.06	8.4	35.4	Anticoagulan
1187	1188	25	М	in	13.8	4.88	3.5	40.0	Molnupirav
1188	1189	31	М	in	13.8	4.86	2.3	39.4	Casirivimab an imdevima

1189 rows × 11 columns

```
In [91]:
          treatment.groupby(['Condition']).count()
Out[91]:
                   User_id Age Sex Source Haemoglobins Erythrocyte Leucocyte Haematocrit Treatmei
          Condition
                                                                                      414
          improved
                       414
                           414 414
                                        414
                                                     414
                                                                414
                                                                          414
                                                                                                 41
             stable
                       418
                           418 418
                                        418
                                                     418
                                                                418
                                                                          418
                                                                                      418
                                                                                                 41
                           357 357
                                                     357
                                                                 357
                                                                          357
                                                                                       357
             worse
                       357
                                        357
                                                                                                 3:
In [92]:
          treatment['Condition'].unique()
          array(['worse', 'improved', 'stable'], dtype=object)
Out[92]:
In [93]:
          treatment['Source'].unique()
          array(['out', 'in'], dtype=object)
Out[93]:
In [94]:
          treatment['Treatment'].unique()
         array(['Oxygen Therapy', 'Convalescent Plasma', 'COVID-19 Vaccines',
Out[94]:
                 'Tocilizumab', 'Dexamethasone',
                 'Non-invasive Ventilation (CPAP/BiPAP)',
                 'Casirivimab and imdevimab', 'Baricitinib', 'Remdesivir',
                 'Monoclonal Antibodies', 'Etesevimab', 'Mechanical Ventilation',
                 'Molnupiravir', 'Bamlanivimab', 'Sotrovimab', 'Anticoagulants',
                 'Methylprednisolone', 'Heparin'], dtype=object)
In [95]:
          import seaborn as sns
          import matplotlib.pyplot as plt
          treatment['Treatment'].value_counts().head(10).plot(kind='bar',color='r')
         <AxesSubplot:>
Out[95]:
```



```
In [96]:
           treatment['Sex']=treatment['Sex'].map({'F':1,'M':0})
           treatment['Condition']=treatment['Condition'].map({'worse':1,'stable':2,'improved':3
           treatment['Source']=treatment['Source'].map({'in':1,'out':0})
 In [97]:
           from surprise import Dataset, Reader
           from surprise import KNNBasic, accuracy,SVD
           from surprise.model_selection import train_test_split
 In [98]:
           reader = Reader(rating_scale=(1,3))
           surprise_data = Dataset.load_from_df(treatment[['User_id', 'Treatment', 'Ratings']],
 In [99]:
           trainset,testset = train test split(surprise data, test size=0.3,random state=42)
In [100...
           model = SVD()
           model.fit(trainset)
           <surprise.prediction_algorithms.matrix_factorization.SVD at 0x1ad91ee5df0>
Out[100...
In [101...
           predictions =model.test(testset)
In [102...
           from surprise.accuracy import rmse
In [103...
           accuracy = rmse(predictions)
           print(f'RMSE: {accuracy}')
          RMSE: 0.1045
          RMSE: 0.10451349669382987
```