Heart_attack

July 17, 2020

0.0.1 This code can analyze the probability of a person having a heart attack from certain data.

[78]:
```
import pandas as pd
from sklearn.preprocessing import LabelEncoder
from sklearn.preprocessing import MinMaxScaler
from sklearn.model_selection import train_test_split
from sklearn import svm
from sklearn.tree import DecisionTreeClassifier
from sklearn.linear_model import LogisticRegression
from sklearn.naive_bayes import GaussianNB
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import confusion_matrix
from sklearn.metrics import accuracy_score, precision_score
```

[3]:
```
df = pd.read_csv('Attacks.csv')
df.head()
```

[3]:

	V1	V2	V3	V4	V5	V6	V7	V8	V9	Class
0	160	12.00	5.73	23.11	1	49	25.30	97.20	52	2
1	144	0.01	4.41	28.61	2	55	28.87	2.06	63	2
2	118	0.08	3.48	32.28	1	52	29.14	3.81	46	1
3	170	7.50	6.41	38.03	1	51	31.99	24.26	58	2
4	134	13.60	3.50	27.78	1	60	25.99	57.34	49	2

[5]:
```
columns =␣
↪['sbp','Tabaco','ldl','Adiposity','Family','Type','Obesity','Alcohol','Age','chd']␣
↪#Medical stuff
df.columns = columns
df.head()
```

[5]:

	sbp	Tabaco	ldl	Adiposity	Family	Type	Obesity	Alcohol	Age	chd
0	160	12.00	5.73	23.11	1	49	25.30	97.20	52	2
1	144	0.01	4.41	28.61	2	55	28.87	2.06	63	2
2	118	0.08	3.48	32.28	1	52	29.14	3.81	46	1
3	170	7.50	6.41	38.03	1	51	31.99	24.26	58	2
4	134	13.60	3.50	27.78	1	60	25.99	57.34	49	2

[10]:
```
df.dtypes
```

[10]:
```
sbp             int64
Tabaco        float64
ldl           float64
Adiposity     float64
Family          int64
Type            int64
Obesity       float64
Alcohol       float64
Age             int64
chd             int64
dtype: object
```

[11]:
```
df.isnull().sum()
```

[11]:
```
sbp           0
Tabaco        0
ldl           0
Adiposity     0
Family        0
Type          0
Obesity       0
Alcohol       0
Age           0
chd           0
dtype: int64
```

[15]:
```
encoder = LabelEncoder()
df['Family'] = encoder.fit_transform(df['Family'])
df['chd'] = encoder.fit_transform(df['chd'])
df.head()
```

[15]:

	sbp	Tabaco	ldl	Adiposity	Family	Type	Obesity	Alcohol	Age	chd
0	160	12.00	5.73	23.11	0	49	25.30	97.20	52	1
1	144	0.01	4.41	28.61	1	55	28.87	2.06	63	1
2	118	0.08	3.48	32.28	0	52	29.14	3.81	46	0
3	170	7.50	6.41	38.03	0	51	31.99	24.26	58	1
4	134	13.60	3.50	27.78	0	60	25.99	57.34	49	1

[19]:
```
scale = MinMaxScaler(feature_range = (0,100))
df['sbp'] = scale.fit_transform(df['sbp'].values.reshape(-1,1))
df.head()
```

[19]:

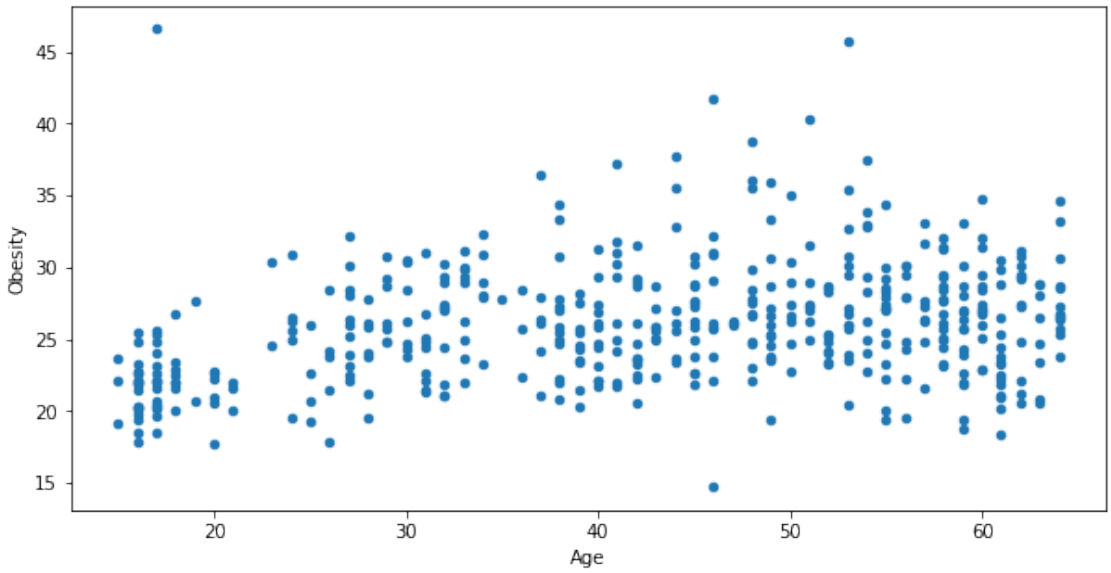
	sbp	Tabaco	ldl	Adiposity	Family	Type	Obesity	Alcohol	Age	\
0	50.427350	12.00	5.73	23.11	0	49	25.30	97.20	52	
1	36.752137	0.01	4.41	28.61	1	55	28.87	2.06	63	

```
2  14.529915    0.08  3.48      32.28       0    52    29.14     3.81   46
3  58.974359    7.50  6.41      38.03       0    51    31.99    24.26   58
4  28.205128   13.60  3.50      27.78       0    60    25.99    57.34   49

   chd
0    1
1    1
2    0
3    1
4    1
```

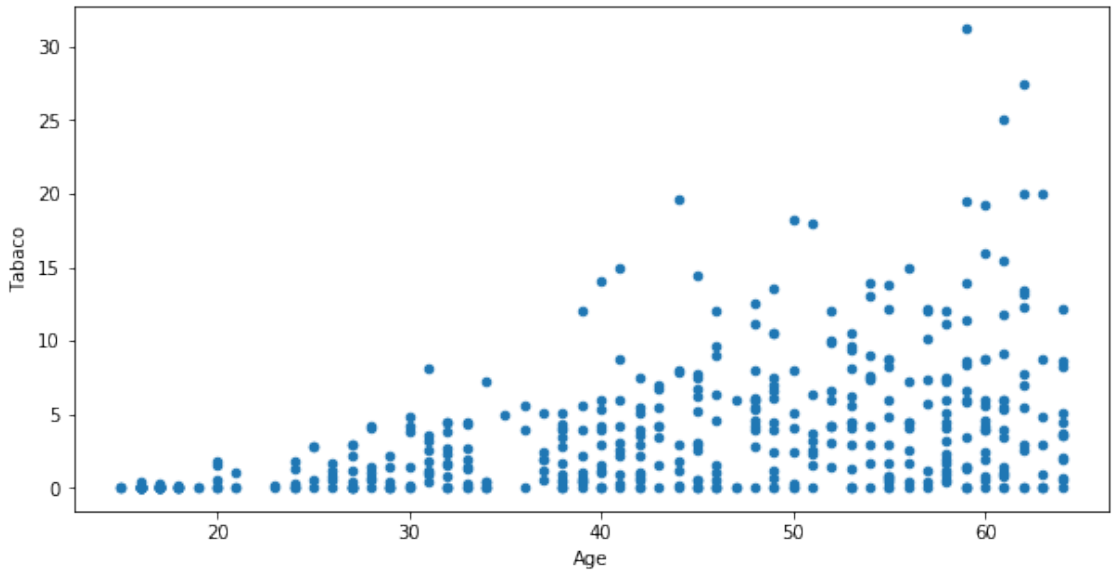
[25]:
```
df.plot(x='Age',y='Obesity',kind='scatter',figsize=(10,5))
```

[25]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f58b5243f10>
```



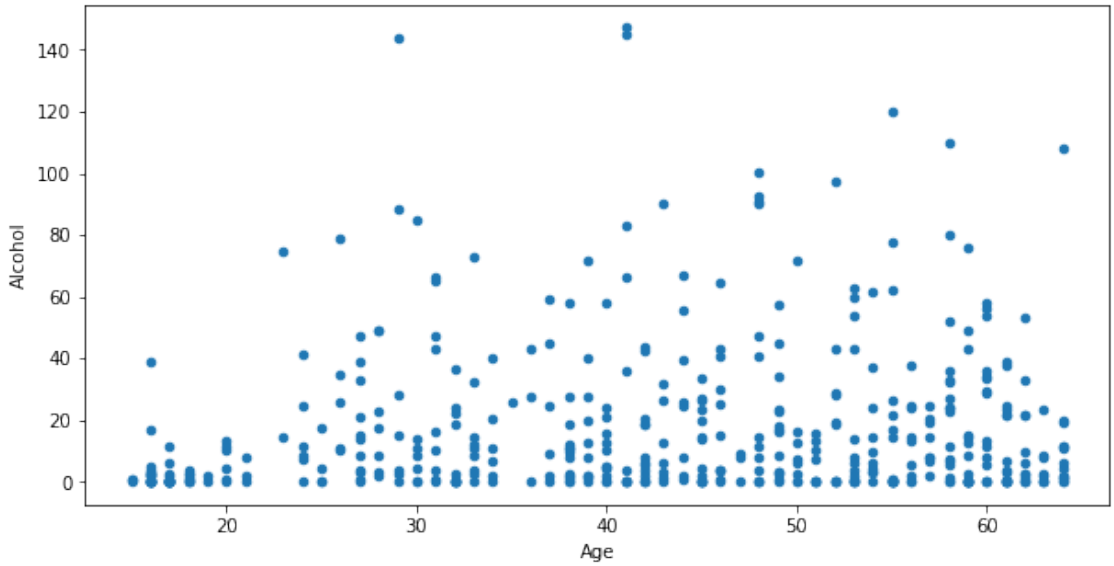
[26]:
```
df.plot(x='Age',y='Tabaco',kind='scatter',figsize=(10,5))
```

[26]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f58b51b8650>
```



[27]:
```
df.plot(x='Age',y='Alcohol',kind='scatter',figsize=(10,5))
```

[27]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f58b51ef890>
```



[36]:
```
y = df['chd']
x = df.drop('chd',axis=1)
```

[38]:
```
x_train, x_test, y_train, y_test = train_test_split(x,y,test_size=0.
↪20,random_state=1)
```

0.0.2 We tried various classification methods

1 SVM

[70]:
```
alg = svm.SVC(kernel='rbf')
alg.fit(x_train,y_train)
y_test_pred= alg.predict(x_test)
print('Confusion matrix')
print(confusion_matrix(y_test,y_test_pred))
print('Accuracy', accuracy_score(y_test,y_test_pred))
print('Presision', precision_score(y_test,y_test_pred))
```

```
Confusion matrix
[[60  6]
 [18  9]]
Accuracy 0.7419354838709677
Presision 0.6
```

1.0.1 Decision Trees

[89]:
```
clf_tree = DecisionTreeClassifier()
clf_tree.fit(x_train,y_train)
y_test_pred= clf_tree.predict(x_test)
print('Confusion matrix')
print(confusion_matrix(y_test,y_test_pred))
print('Accuracy', accuracy_score(y_test,y_test_pred))
print('Presision', precision_score(y_test,y_test_pred))
```

```
Confusion matrix
[[53 13]
 [15 12]]
Accuracy 0.6989247311827957
Presision 0.48
```

1.0.2 Logistic Regression

[88]:
```
clf_log = LogisticRegression()
clf_log.fit(x_train,y_train)
y_test_pred= clf_log.predict(x_test)
print('Confusion matrix')
print(confusion_matrix(y_test,y_test_pred))
print('Accuracy', accuracy_score(y_test,y_test_pred))
print('Presision', precision_score(y_test,y_test_pred))
```

```
Confusion matrix
[[57  9]
 [17 10]]
Accuracy 0.7204301075268817
Presision 0.5263157894736842

/home/antonio/anaconda3/lib/python3.7/site-
packages/sklearn/linear_model/_logistic.py:940: ConvergenceWarning: lbfgs failed
to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-
regression
  extra_warning_msg=_LOGISTIC_SOLVER_CONVERGENCE_MSG)
```

1.0.3 Gaussian Naive Bayes

[86]:
```
clf_gnb = GaussianNB()
clf_gnb.fit(x_train,y_train)
y_test_pred= clf_gnb.predict(x_test)
print('Confusion matrix')
print(confusion_matrix(y_test,y_test_pred))
print('Accuracy', accuracy_score(y_test,y_test_pred))
print('Presision', precision_score(y_test,y_test_pred))
```

```
Confusion matrix
[[54 12]
 [11 16]]
Accuracy 0.7526881720430108
Presision 0.5714285714285714
```

1.0.4 k-nearest neighbors

[93]:
```
clf_neigh = KNeighborsClassifier(n_neighbors=21)
clf_neigh.fit(x_train,y_train)
y_test_pred= clf_neigh.predict(x_test)
print('Confusion matrix')
print(confusion_matrix(y_test,y_test_pred))
print('Accuracy', accuracy_score(y_test,y_test_pred))
print('Presision', precision_score(y_test,y_test_pred))
```

```
Confusion matrix
[[59  7]
 [15 12]]
Accuracy 0.7634408602150538
```

```
Presision 0.631578947368421
```

[94]:
```
for i in range(1,100):
    clf_neigh = KNeighborsClassifier(n_neighbors=i)
    clf_neigh.fit(x_train,y_train)
    y_test_pred= clf_neigh.predict(x_test)
    print(i,'Accuracy', accuracy_score(y_test,y_test_pred))
```

```
1 Accuracy 0.6344086021505376
2 Accuracy 0.6881720430107527
3 Accuracy 0.6774193548387096
4 Accuracy 0.6881720430107527
5 Accuracy 0.6989247311827957
6 Accuracy 0.7096774193548387
7 Accuracy 0.6881720430107527
8 Accuracy 0.7204301075268817
9 Accuracy 0.7096774193548387
10 Accuracy 0.7204301075268817
11 Accuracy 0.6881720430107527
12 Accuracy 0.7096774193548387
13 Accuracy 0.7096774193548387
14 Accuracy 0.7419354838709677
15 Accuracy 0.7311827956989247
16 Accuracy 0.7526881720430108
17 Accuracy 0.7526881720430108
18 Accuracy 0.7419354838709677
19 Accuracy 0.7526881720430108
20 Accuracy 0.7526881720430108
21 Accuracy 0.7634408602150538
22 Accuracy 0.7419354838709677
23 Accuracy 0.7634408602150538
24 Accuracy 0.7526881720430108
25 Accuracy 0.7419354838709677
26 Accuracy 0.7634408602150538
27 Accuracy 0.7526881720430108
28 Accuracy 0.7419354838709677
29 Accuracy 0.7096774193548387
30 Accuracy 0.7311827956989247
31 Accuracy 0.7204301075268817
32 Accuracy 0.7311827956989247
33 Accuracy 0.7419354838709677
34 Accuracy 0.7311827956989247
35 Accuracy 0.7419354838709677
36 Accuracy 0.7096774193548387
37 Accuracy 0.7204301075268817
38 Accuracy 0.7311827956989247
39 Accuracy 0.7096774193548387
40 Accuracy 0.7204301075268817
```

```
41 Accuracy 0.7204301075268817
42 Accuracy 0.7096774193548387
43 Accuracy 0.7204301075268817
44 Accuracy 0.6989247311827957
45 Accuracy 0.7096774193548387
46 Accuracy 0.7096774193548387
47 Accuracy 0.7096774193548387
48 Accuracy 0.7096774193548387
49 Accuracy 0.7204301075268817
50 Accuracy 0.6989247311827957
51 Accuracy 0.7096774193548387
52 Accuracy 0.7096774193548387
53 Accuracy 0.7096774193548387
54 Accuracy 0.6989247311827957
55 Accuracy 0.7096774193548387
56 Accuracy 0.7204301075268817
57 Accuracy 0.7096774193548387
58 Accuracy 0.7096774193548387
59 Accuracy 0.7096774193548387
60 Accuracy 0.6989247311827957
61 Accuracy 0.6989247311827957
62 Accuracy 0.6989247311827957
63 Accuracy 0.6989247311827957
64 Accuracy 0.7204301075268817
65 Accuracy 0.7096774193548387
66 Accuracy 0.7204301075268817
67 Accuracy 0.7204301075268817
68 Accuracy 0.7311827956989247
69 Accuracy 0.7204301075268817
70 Accuracy 0.7204301075268817
71 Accuracy 0.7204301075268817
72 Accuracy 0.7311827956989247
73 Accuracy 0.7311827956989247
74 Accuracy 0.7311827956989247
75 Accuracy 0.7311827956989247
76 Accuracy 0.7311827956989247
77 Accuracy 0.7311827956989247
78 Accuracy 0.7311827956989247
79 Accuracy 0.7311827956989247
80 Accuracy 0.7311827956989247
81 Accuracy 0.7311827956989247
82 Accuracy 0.7311827956989247
83 Accuracy 0.7419354838709677
84 Accuracy 0.7419354838709677
85 Accuracy 0.7419354838709677
86 Accuracy 0.7419354838709677
87 Accuracy 0.7419354838709677
88 Accuracy 0.7311827956989247
```

```
89 Accuracy 0.7419354838709677
90 Accuracy 0.7419354838709677
91 Accuracy 0.7419354838709677
92 Accuracy 0.7419354838709677
93 Accuracy 0.7419354838709677
94 Accuracy 0.7419354838709677
95 Accuracy 0.7419354838709677
96 Accuracy 0.7419354838709677
97 Accuracy 0.7419354838709677
98 Accuracy 0.7419354838709677
99 Accuracy 0.7419354838709677
```

[ ]: