In [1]:

```
import sys
import numpy
import matplotlib
import pandas
import sklearn

print('Python: {}'.format(sys.version))
print('numpy: {}'.format(numpy.__version__))
print('matplotlib: {}'.format(matplotlib.__version__))
print('pandas: {}'.format(pandas.__version__))
print('sklearn: {}'.format(sklearn.__version__))
```

```
Python: 3.7.6 (default, Jan  8 2020, 20:23:39) [MSC v.1916 64 bit (AMD64)]
numpy: 1.18.1
matplotlib: 3.1.3
pandas: 0.24.2
sklearn: 0.22.1
```

In [2]:

```
import numpy as np
from sklearn import preprocessing
from sklearn.model_selection import cross_validate
from sklearn.neighbors import KNeighborsClassifier
from sklearn.svm import SVC
from sklearn import model_selection
from sklearn.metrics import classification_report, accuracy_score
from pandas.plotting import scatter_matrix
import matplotlib.pyplot as plt
import pandas as pd
```

In [3]:

```
# import the uci pima indians diabetes dataset
url = "diabetes.csv"
names = ['n_pregnant', 'glucose_concentration', 'blood_pressuer (mm Hg)', 'skin_thickness (
        'BMI', 'pedigree_function', 'age', 'class']
df = pd.read_csv(url, names = names)
```

In [4]:

```
df.replace('?',-99999,inplace=True)
print(df.axes)
```

```
[RangeIndex(start=0, stop=768, step=1), Index(['n_pregnant', 'glucose_concen
tration', 'blood_pressuer (mm Hg)',
       'skin_thickness (mm)', 'serum_insulin (mu U/ml)', 'BMI',
       'pedigree_function', 'age', 'class'],
      dtype='object')]
```

In [7]:

```
print(df)
```

```
     n_pregnant  glucose_concentration  blood_pressuer (mm Hg)  \
0             6                    148                      72
1             1                     85                      66
2             8                    183                      64
3             1                     89                      66
4             0                    137                      40
5             5                    116                      74
6             3                     78                      50
7            10                    115                       0
8             2                    197                      70
9             8                    125                      96
10            4                    110                      92
11           10                    168                      74
12           10                    139                      80
13            1                    189                      60
14            5                    166                      72
15            7                    100                       0
16            0                    118                      84
17            7                    107                      74
```

In [8]:

```
print(df.describe())
```

```
       n_pregnant  glucose_concentration  blood_pressuer (mm Hg)  \
count  768.000000             768.000000              768.000000
mean     3.845052             120.894531               69.105469
std      3.369578              31.972618               19.355807
min      0.000000               0.000000                0.000000
25%      1.000000              99.000000               62.000000
50%      3.000000             117.000000               72.000000
75%      6.000000             140.250000               80.000000
max     17.000000             199.000000              122.000000

       skin_thickness (mm)  serum_insulin (mu U/ml)         BMI  \
count           768.000000               768.000000  768.000000
mean             20.536458                79.799479   31.992578
std              15.952218               115.244002    7.884160
min               0.000000                 0.000000    0.000000
25%               0.000000                 0.000000   27.300000
50%              23.000000                30.500000   32.000000
75%              32.000000               127.250000   36.600000
max              99.000000               846.000000   67.100000

       pedigree_function         age       class
count         768.000000  768.000000  768.000000
mean            0.471876   33.240885    0.348958
std             0.331329   11.760232    0.476951
min             0.078000   21.000000    0.000000
25%             0.243750   24.000000    0.000000
50%             0.372500   29.000000    0.000000
75%             0.626250   41.000000    1.000000
max             2.420000   81.000000    1.000000
```

In [9]:

```
columns = ['glucose_concentration', 'blood_pressuer (mm Hg)', 'skin_thickness (mm)', 'serum
for col in columns:
    df[col].replace(0,np.NaN,inplace=True)
```

In [10]:

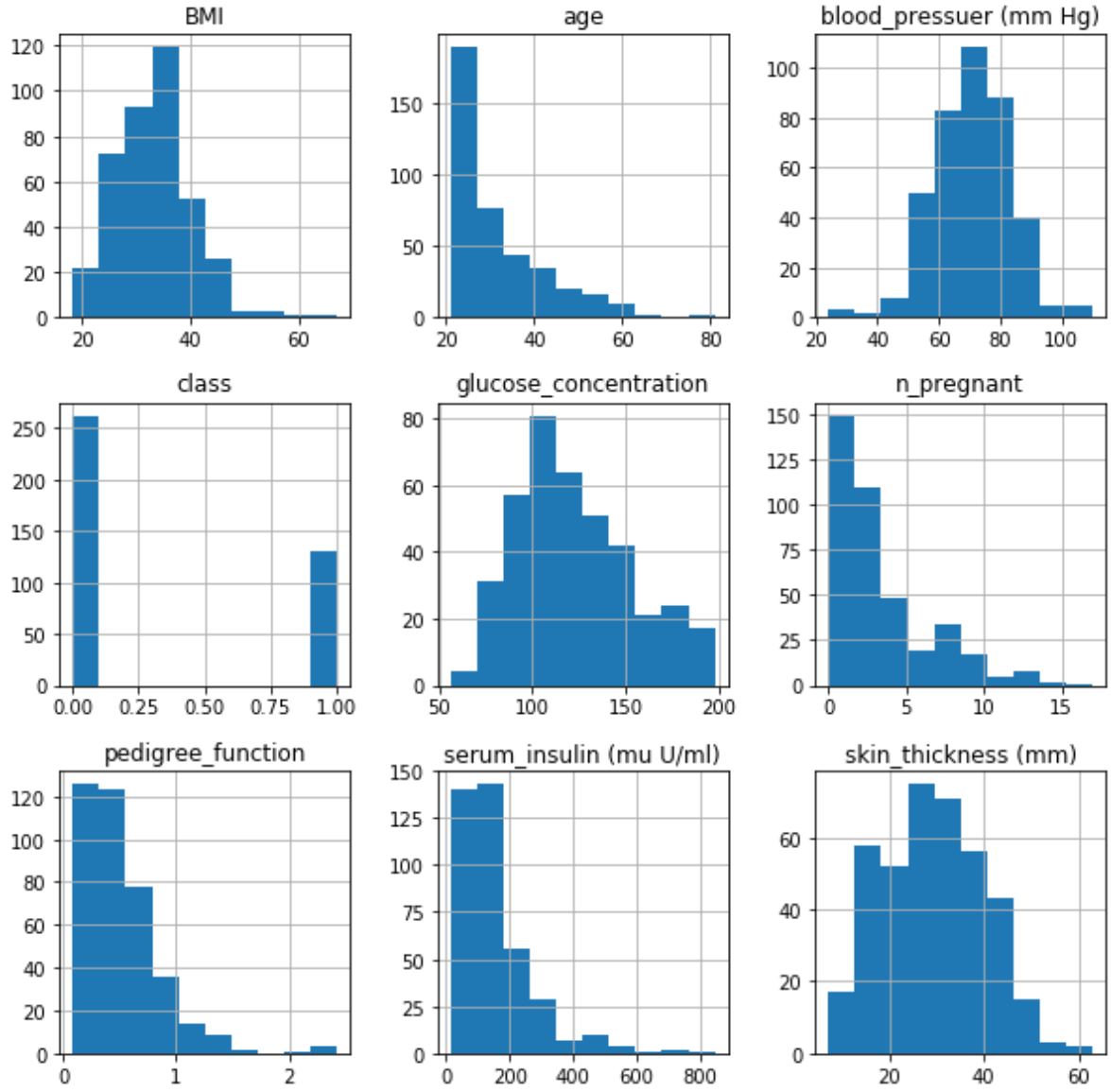
```
# Drop the rows with missing values
df.dropna(inplace=True)

# summarize the number of rows and columns in df
df.describe()
```

Out[10]:

	n_pregnant	glucose_concentration	blood_pressuer (mm Hg)	skin_thickness (mm)	serum_insulin (mu U/ml)	
count	392.000000	392.000000	392.000000	392.000000	392.000000	392.0
mean	3.301020	122.627551	70.663265	29.145408	156.056122	33.0
std	3.211424	30.860781	12.496092	10.516424	118.841690	7.0
min	0.000000	56.000000	24.000000	7.000000	14.000000	18.2
25%	1.000000	99.000000	62.000000	21.000000	76.750000	28.4
50%	2.000000	119.000000	70.000000	29.000000	125.500000	33.2
75%	5.000000	143.000000	78.000000	37.000000	190.000000	37.1
max	17.000000	198.000000	110.000000	63.000000	846.000000	67.1

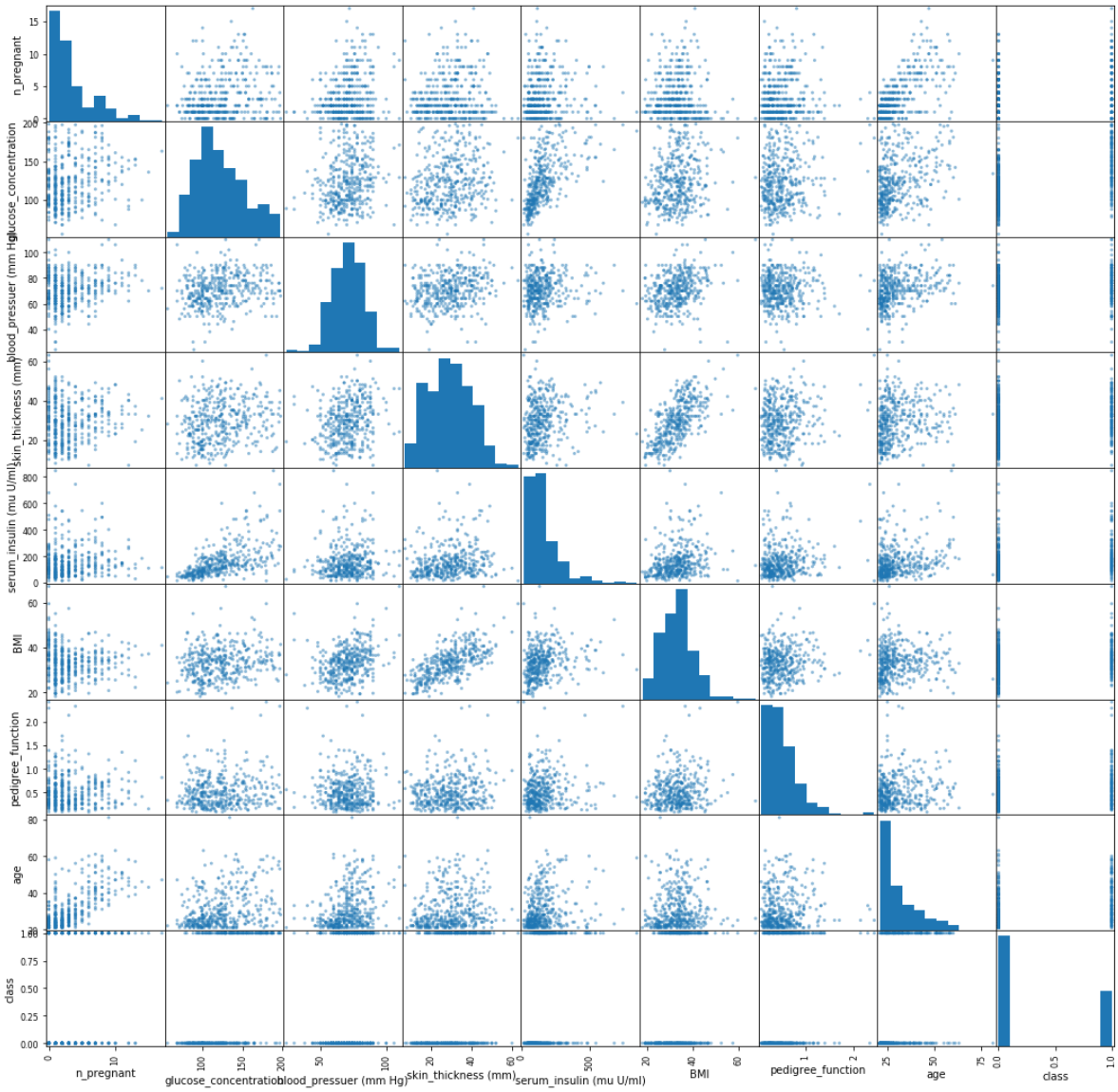
In [11]:

```
df.hist(figsize = (10, 10))
plt.show()
```



In [12]:

```
scatter_matrix(df,figsize=(18,18))
plt.show()
```



In [27]:

```
col = ['n_pregnant', 'glucose_concentration', 'blood_pressuer (mm Hg)', 'skin_thickness (mm
       'BMI', 'pedigree_function', 'age']
target='class'
X=df[col]
y=df[target].astype(int)
```

In [28]:

```
# Normalize the data using sklearn StandardScaler
from sklearn.preprocessing import StandardScaler

scaler=StandardScaler().fit(X)
print(scaler)
```

```
StandardScaler(copy=True, with_mean=True, with_std=True)
```

In [29]:

```
# Transform and display the training data
X_standardized = scaler.transform(X)
data = pd.DataFrame(X_standardized)
data.describe()
```

Out[29]:

	0	1	2	3	4	5
count	3.920000e+02	3.920000e+02	3.920000e+02	3.920000e+02	3.920000e+02	3.920000e+02
mean	-4.021726e-17	3.129583e-17	-4.641624e-16	1.042250e-16	6.485742e-17	1.543550e-16
std	1.001278e+00	1.001278e+00	1.001278e+00	1.001278e+00	1.001278e+00	1.001278e+00
min	-1.029213e+00	-2.161731e+00	-3.739001e+00	-2.108484e+00	-1.196867e+00	-2.120941e+00
25%	-7.174265e-01	-7.665958e-01	-6.941640e-01	-7.755315e-01	-6.681786e-01	-6.676780e-01
50%	-4.056403e-01	-1.176959e-01	-5.314565e-02	-1.384444e-02	-2.574448e-01	1.621036e-02
75%	5.297185e-01	6.609841e-01	5.878727e-01	7.478426e-01	2.859877e-01	5.718696e-01
max	4.271153e+00	2.445459e+00	3.151946e+00	3.223325e+00	5.812990e+00	4.846172e+00

In [364]:

```
#X=np.array(df.drop(['class'],1))
#y=np.array(df['class'])
X_train, X_test, y_train, y_test = model_selection.train_test_split(X_standardized, y, test

models=[]
models.append(('KNN',KNeighborsClassifier(n_neighbors=6)))
models.append(('SVM',SVC(kernel='linear')))
#models.append(('SVM',SVC(kernel='rbf')))
#models.append(('SVM',SVC(kernel='poly')))
#models.append(('SVM',SVC(kernel='sigmoid')))

results = []
names = []

for name,model in models:
    kfold=model_selection.KFold(n_splits=10, random_state = 0, shuffle=True)
    cv_results=model_selection.cross_val_score(model,X_train,y_train,cv=kfold,scoring='accu
    results.append(cv_results)
    names.append(name)
    print("{}:accuracy->{}(std->{})".format(name, cv_results.mean(), cv_results.std()))


for name, model in models:
    model.fit(X_train, y_train)
    predictions = model.predict(X_test)
    print(name)
    print(accuracy_score(y_test, predictions))
    print(classification_report(y_test, predictions))
```

```
KNN:accuracy->0.7065524193548388(std->0.06776930670629303)
SVM:accuracy->0.7482862903225806(std->0.08906984481918345)
KNN
0.8734177215189873
              precision    recall  f1-score   support

           0       0.87      0.98      0.92        61
           1       0.90      0.50      0.64        18

    accuracy                           0.87        79
   macro avg       0.88      0.74      0.78        79
weighted avg       0.88      0.87      0.86        79

SVM
0.9240506329113924
              precision    recall  f1-score   support

           0       0.95      0.95      0.95        61
           1       0.83      0.83      0.83        18

    accuracy                           0.92        79
   macro avg       0.89      0.89      0.89        79
weighted avg       0.92      0.92      0.92        79
```