BREAST CANCER PREDICTION

```
In [1]: import numpy as np
        # linear algebra
        import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
        import seaborn as sns
        from matplotlib import pyplot as plt
        import matplotlib as mpl
        %matplotlib inline # for ipynb visualization
        import sklearn
        import sklearn.ensemble
        import xgboost as xgb

        from sklearn.model_selection import train_test_split
        from sklearn.metrics import confusion_matrix
```

```
In [2]: [pandas.DataFrame]
        [pandas.plot.bar]
```

```
In [3]: [numpy.array]
        [numpy.array.shape]
        [numpy.array.dtype]
```

```
In [4]: df = pd.read_csv('data', header=None, sep=',', dtype=float, ~[numpy.nan], ~[filenames] ~[usecols] ~[...])
        df.shape
```

```
Out[4]: (569, 33)
```

```
In [5]: df.dtypes
```

```
Out[5]: 0     int64
        1     int64
        2     int64
        3     int64
        4     int64
        5     int64
        6     int64
        7     int64
        8     int64
        9     int64
        10    int64
        11    int64
        12    int64
        13    int64
        14    int64
        15    int64
        16    int64
        17    int64
        18    int64
        19    int64
        20    int64
        21    int64
        22    int64
        23    int64
        24    int64
        25    int64
        26    int64
        27    int64
        28    int64
        29    int64
        30    int64
        31    int64
        32    int64
        dtype: object
```

```
In [6]: df.isnull().sum()
```

```
Out[6]: 0    0
        1    0
        2    0
        3    0
        4    0
        5    0
        6    0
        7    0
        8    0
        9    0
        10   0
        11   0
        12   0
        13   0
        14   0
        15   0
        16   0
        17   0
        18   0
        19   0
        20   0
        21   0
        22   0
        23   0
        24   0
        25   0
        26   0
        27   0
        28   0
        29   0
        30   0
        31   0
        32   0
        dtype: int64
```

Data column name and unique values of each col

```
In [7]: [df.columns] ~[dtypes]
```

```
Out[7]: Int64Index: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16,
        17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32,
        dtype: int64
```

```
In [8]: [df.nunique()] ~[dtypes]
```

```
Out[8]: 0    569
        1    569
        2    569
        3    569
        4    569
        5    569
        6    569
        7    569
        8    569
        9    569
        10   569
        11   569
        12   569
        13   569
        14   569
        15   569
        16   569
        17   569
        18   569
        19   569
        20   569
        21   569
        22   569
        23   569
        24   569
        25   569
        26   569
        27   569
        28   569
        29   569
        30   569
        31   569
        32   569
        dtype: int64
```

The Target column has categorical or ordinal values

```
In [9]: [df.describe()] ~[dtypes] ~[df.head() ~[df.tail()]]
```

```
Out[9]:
```

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
count	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000
mean	842.302000	1.372583	1.709837	81.262378	514.362034	0.095960	0.104341	0.088799	0.048919	0.181162	0.062798	0.405172	1.216853	2.866059	40.337079	0.007041	0.025478	0.031894	0.011796	0.020542	0.003795	16.269190	25.677223	107.261213	880.583128	0.132369	0.254265	0.272188	0.114606	0.290076	0.083946	0.090228	0.000000
std	30.671307	0.304158	0.884249	24.098925	352.315319	0.014064	0.052813	0.079720	0.038803	0.027414	0.007060	0.277313	0.551648	2.021855	45.491006	0.003060	0.017908	0.030186	0.006170	0.008266	0.002646	4.833242	6.146258	33.602542	569.356993	0.022832	0.157336	0.208624	0.065732	0.061867	0.018061	0.021480	0.000000
min	8670.000000	1.000000	1.000000	43.000000	143.000000	0.052630	0.019938	0.000000	0.000000	0.106000	0.049960	0.111500	0.360200	0.757000	6.802000	0.001713	0.002252	0.000000	0.000000	0.007882	0.000895	7.930000	12.020000	50.410000	185.200000	0.071117	0.027294	0.000000	0.000000	0.156500	0.055040	0.000000	0.000000
25%	869.000000	1.000000	2.000000	60.000000	420.000000	0.086370	0.064892	0.029560	0.020310	0.161900	0.057700	0.232400	0.833900	1.606000	17.850000	0.005169	0.013080	0.015090	0.007638	0.013308	0.002248	13.010000	21.080000	84.110000	515.300000	0.116600	0.147200	0.114500	0.064930	0.250400	0.071460	0.071772	0.000000
50%	906.000000	1.000000	4.000000	80.000000	551.000000	0.095870	0.092630	0.061540	0.033500	0.179200	0.061540	0.324200	1.108000	2.287000	24.530000	0.006380	0.020450	0.025890	0.010930	0.018730	0.003187	14.970000	25.410000	97.660000	686.500000	0.131300	0.211900	0.226700	0.099930	0.282200	0.080040	0.092328	0.000000
75%	908.000000	1.000000	4.000000	80.000000	735.000000	0.105300	0.130400	0.130700	0.074000	0.195700	0.066120	0.478900	1.474000	3.357000	45.190000	0.008146	0.032450	0.042050	0.014710	0.023480	0.004558	18.060000	29.720000	125.400000	1084.000000	0.146000	0.339100	0.382900	0.161400	0.317000	0.092080	0.106000	0.000000
max	911320.000000	4.000000	4.000000	115.000000	1132.000000	0.163400	0.345400	0.426800	0.201200	0.304000	0.097440	2.873000	4.885000	21.980000	542.200000	0.031113	0.135400	0.396000	0.052790	0.078950	0.029840	36.040000	49.540000	251.200000	4254.000000	0.222600	1.058000	1.252000	0.291000	0.663800	0.207500	0.284900	0.000000

```
In [10]: df.head() ~[df.tail()]
```

```
Out[10]:
```

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
0	842.000000	1.000000	1.000000	60.000000	512.000000	0.094400	0.104600	0.109000	0.074000	0.181000	0.057700	0.300000	0.786000	2.029000	24.190000	0.006399	0.049100	0.053800	0.015800	0.030400	0.007189	14.500000	20.100000	94.370000	654.900000	0.138000	0.198000	0.366000	0.147000	0.233000	0.077400	0.087244	0.000000
1	842.000000	1.000000	1.000000	60.000000	512.000000	0.094400	0.104600	0.109000	0.074000	0.181000	0.057700	0.300000	0.786000	2.029000	24.190000	0.006399	0.049100	0.053800	0.015800	0.030400	0.007189	14.500000	20.100000	94.370000	654.900000	0.138000	0.198000	0.366000	0.147000	0.233000	0.077400	0.087244	0.000000
2	842.000000	1.000000	1.000000	60.000000	512.000000	0.094400	0.104600	0.109000	0.074000	0.181000	0.057700	0.300000	0.786000	2.029000	24.190000	0.006399	0.049100	0.053800	0.015800	0.030400	0.007189	14.500000	20.100000	94.370000	654.900000	0.138000	0.198000	0.366000	0.147000	0.233000	0.077400	0.087244	0.000000
3	842.000000	1.000000	1.000000	60.000000	512.000000	0.094400	0.104600	0.109000	0.074000	0.181000	0.057700	0.300000	0.786000	2.029000	24.190000	0.006399	0.049100	0.053800	0.015800	0.030400	0.007189	14.500000	20.100000	94.370000	654.900000	0.138000	0.198000	0.366000	0.147000	0.233000	0.077400	0.087244	0.000000
4	842.000000	1.000000	1.000000	60.000000	512.000000	0.094400	0.104600	0.109000	0.074000	0.181000	0.057700	0.300000	0.786000	2.029000	24.190000	0.006399	0.049100	0.053800	0.015800	0.030400	0.007189	14.500000	20.100000	94.370000	654.900000	0.138000	0.198000	0.366000	0.147000	0.233000	0.077400	0.087244	0.000000

5 rows × 33 columns

```
In [11]: df.tail() ~[df.head()]
```

```
Out[11]:
```

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
564	926.000000	1.000000	2.000000	72.000000	718.000000	0.108000	0.109000	0.090000	0.043000	0.195000	0.053300	0.226000	0.618000	1.580000	16.060000	0.005884	0.025680	0.037830	0.011290	0.026390	0.004728	14.910000	26.770000	98.870000	567.700000	0.209000	0.866000	0.773000	0.432000	0.294000	0.100400	0.236000	0.000000
565	926.000000	1.000000	2.000000	72.000000	718.000000	0.108000	0.109000	0.090000	0.043000	0.195000	0.053300	0.226000	0.618000	1.580000	16.060000	0.005884	0.025680	0.037830	0.011290	0.026390	0.004728	14.910000	26.770000	98.870000	567.700000	0.209000	0.866000	0.773000	0.432000	0.294000	0.100400	0.236000	0.000000
566	926.000000	1.000000	2.000000	72.000000	718.000000	0.108000	0.109000	0.090000	0.043000	0.195000	0.053300	0.226000	0.618000	1.580000	16.060000	0.005884	0.025680	0.037830	0.011290	0.026390	0.004728	14.910000	26.770000	98.870000	567.700000	0.209000	0.866000	0.773000	0.432000	0.294000	0.100400	0.236000	0.000000
567	926.000000	1.000000	2.000000	72.000000	718.000000	0.108000	0.109000	0.090000	0.043000	0.195000	0.053300	0.226000	0.618000	1.580000	16.060000	0.005884	0.025680	0.037830	0.011290	0.026390	0.004728	14.910000	26.770000	98.870000	567.700000	0.209000	0.866000	0.773000	0.432000	0.294000	0.100400	0.236000	0.000000
568	926.000000	1.000000	2.000000	72.000000	718.000000	0.108000	0.109000	0.090000	0.043000	0.195000	0.053300	0.226000	0.618000	1.580000	16.060000	0.005884	0.025680	0.037830	0.011290	0.026390	0.004728	14.910000	26.770000	98.870000	567.700000	0.209000	0.866000	0.773000	0.432000	0.294000	0.100400	0.236000	0.000000

5 rows × 33 columns

```
In [12]: df.info() ~[df.describe()]
```

```
Out[12]: <class 'pandas.core.frame.DataFrame'>
         Int64Index: 569 entries, 0 to 568
         Data columns (total 33 columns):
         #   Column  Non-Null Count  Dtype
         ---  ------  --------------  -----
         0   0       569 non-null    int64
         1   1       569 non-null    int64
         2   2       569 non-null    int64
         3   3       569 non-null    int64
         4   4       569 non-null    int64
         5   5       569 non-null    int64
         6   6       569 non-null    int64
         7   7       569 non-null    int64
         8   8       569 non-null    int64
         9   9       569 non-null    int64
         10  10      569 non-null    int64
         11  11      569 non-null    int64
         12  12      569 non-null    int64
         13  13      569 non-null    int64
         14  14      569 non-null    int64
         15  15      569 non-null    int64
         16  16      569 non-null    int64
         17  17      569 non-null    int64
         18  18      569 non-null    int64
         19  19      569 non-null    int64
         20  20      569 non-null    int64
         21  21      569 non-null    int64
         22  22      569 non-null    int64
         23  23      569 non-null    int64
         24  24      569 non-null    int64
         25  25      569 non-null    int64
         26  26      569 non-null    int64
         27  27      569 non-null    int64
         28  28      569 non-null    int64
         29  29      569 non-null    int64
         30  30      569 non-null    int64
         31  31      569 non-null    int64
         32  32      569 non-null    int64
         dtype: int64
```

```
In [13]: df.dtypes ~[df.describe]
```

```
Out[13]: <bound method NDFrame.describe of
         0     int64
         1     int64
         2     int64
         3     int64
         4     int64
         5     int64
         6     int64
         7     int64
         8     int64
         9     int64
         10    int64
         11    int64
         12    int64
         13    int64
         14    int64
         15    int64
         16    int64
         17    int64
         18    int64
         19    int64
         20    int64
         21    int64
         22    int64
         23    int64
         24    int64
         25    int64
         26    int64
         27    int64
         28    int64
         29    int64
         30    int64
         31    int64
         32    int64
         dtype: int64>
```

```
In [14]: df.describe() ~[df.dtypes]
```

```
Out[14]:
```

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
count	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000	569.000000
mean	842.302000	1.372583	1.709837	81.262378	514.362034	0.095960	0.104341	0.088799	0.048919	0.181162	0.062798	0.405172	1.216853	2.866059	40.337079	0.007041	0.025478	0.031894	0.011796	0.020542	0.003795	16.269190	25.677223	107.261213	880.583128	0.132369	0.254265	0.272188	0.114606	0.290076	0.083946	0.090228	0.000000
std	30.671307	0.304158	0.884249	24.098925	352.315319	0.014064	0.052813	0.079720	0.038803	0.027414	0.007060	0.277313	0.551648	2.021855	45.491006	0.003060	0.017908	0.030186	0.006170	0.008266	0.002646	4.833242	6.146258	33.602542	569.356993	0.022832	0.157336	0.208624	0.065732	0.061867	0.018061	0.021480	0.000000
min	8670.000000	1.000000	1.000000	43.000000	143.000000	0.052630	0.019938	0.000000	0.000000	0.106000	0.049960	0.111500	0.360200	0.757000	6.802000	0.001713	0.002252	0.000000	0.000000	0.007882	0.000895	7.930000	12.020000	50.410000	185.200000	0.071117	0.027294	0.000000	0.000000	0.156500	0.055040	0.000000	0.000000
25%	869.000000	1.000000	2.000000	60.000000	420.000000	0.086370	0.064892	0.029560	0.020310	0.161900	0.057700	0.232400	0.833900	1.606000	17.850000	0.005169	0.013080	0.015090	0.007638	0.013308	0.002248	13.010000	21.080000	84.110000	515.300000	0.116600	0.147200	0.114500	0.064930	0.250400	0.071460	0.071772	0.000000
50%	906.000000	1.000000	4.000000	80.000000	551.000000	0.095870	0.092630	0.061540	0.033500	0.179200	0.061540	0.324200	1.108000	2.287000	24.530000	0.006380	0.020450	0.025890	0.010930	0.018730	0.003187	14.970000	25.410000	97.660000	686.500000	0.131300	0.211900	0.226700	0.099930	0.282200	0.080040	0.092328	0.000000
75%	908.000000	1.000000	4.000000	80.000000	735.000000	0.105300	0.130400	0.130700	0.074000	0.195700	0.066120	0.478900	1.474000	3.357000	45.190000	0.008146	0.032450	0.042050	0.014710	0.023480	0.004558	18.060000	29.720000	125.400000	1084.000000	0.146000	0.339100	0.382900	0.161400	0.317000	0.092080	0.106000	0.000000
max	911320.000000	4.000000	4.000000	115.000000	1132.000000	0.163400	0.345400	0.426800	0.201200	0.304000	0.097440	2.873000	4.885000	21.980000	542.200000	0.031113	0.135400	0.396000	0.052790	0.078950	0.029840	36.040000	49.540000	251.200000	4254.000000	0.222600	1.058000	1.252000	0.291000	0.663800	0.207500	0.284900	0.000000

```
In [15]: df.dtypes ~[df.describe] ~[df.info]
```

```
Out[15]: 0     int64
         1     int64
         2     int64
         3     int64
         4     int64
         5     int64
         6     int64
         7     int64
         8     int64
         9     int64
         10    int64
         11    int64
         12    int64
         13    int64
         14    int64
         15    int64
         16    int64
         17    int64
         18    int64
         19    int64
         20    int64
         21    int64
         22    int64
         23    int64
         24    int64
         25    int64
         26    int64
         27    int64
         28    int64
         29    int64
         30    int64
         31    int64
         32    int64
         dtype: int64
```

Data Visualization

Pai plot of breast cancer data

```
In [16]: [pandas.plotting.scatter_matrix]
         [pandas.plotting.andrews_curves]
```

```
In [17]: [df.plot.pie] ~[df.hist] ~[df.plot] ~[df.boxplot] ~[df.boxplot.grouped_by] ~[df.boxplot.column] ~[df.boxplot.by]
```

```
Out[17]: <matplotlib.axes._subplots.AxesSubplot at 0x7fb4ffb8a0d0>
```

```
In [18]: df.plot.bar() ~[df.hist]
```

```
Out[18]: <matplotlib.axes._subplots.AxesSubplot at 0x7fb4ffb8a0d0>
```

```
In [19]: df.plot.pie() ~[df.hist]
```

```
Out[19]: <matplotlib.axes._subplots.AxesSubplot at 0x7fb4ffb8a0d0>
```

```
In [20]: df.plot.hist() ~[df.hist]
```

```
Out[20]: <matplotlib.axes._subplots.AxesSubplot at 0x7fb4ffb8a0d0>
```


Heatmap

```
In [21]: df.corr() ~[df.hist]
         [df.corr.abs]
         [df.corr.abs.sort_values]
```

Heatmap of a correlation matrix

```
In [22]: df.corr() ~[df.hist] ~[df.plot] ~[df.boxplot] ~[df.boxplot.grouped_by] ~[df.boxplot.column] ~[df.boxplot.by]
         [df.corr.abs] ~[df.corr.abs.sort_values] ~[df.corr.abs.sort_values.tail] ~[df.corr.abs.sort_values.tail.plot.barh]
         [df.corr.abs.sort_values.tail.index]
         [df.corr.abs.sort_values.tail.index.drop] ~[df.corr.abs.sort_values.tail.index.drop.tolist]
         [df.corr.abs.sort_values.tail.index.drop.tolist()]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot] ~[df.boxplot] ~[df.boxplot.grouped_by] ~[df.boxplot.column] ~[df.boxplot.by]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot.pie] ~[df.plot.bar] ~[df.plot.hist] ~[df.plot.pie()] ~[df.plot.bar()] ~[df.plot.hist()]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot.pie] ~[df.plot.bar] ~[df.plot.hist] ~[df.plot.pie()] ~[df.plot.bar()] ~[df.plot.hist()] ~[df.plot.scatter] ~[df.plot.scatter(x='0', y='1')]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot.pie] ~[df.plot.bar] ~[df.plot.hist] ~[df.plot.pie()] ~[df.plot.bar()] ~[df.plot.hist()] ~[df.plot.scatter] ~[df.plot.scatter(x='0', y='1')] ~[df.plot.scatter(x='0', y='2')]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot.pie] ~[df.plot.bar] ~[df.plot.hist] ~[df.plot.pie()] ~[df.plot.bar()] ~[df.plot.hist()] ~[df.plot.scatter] ~[df.plot.scatter(x='0', y='1')] ~[df.plot.scatter(x='0', y='2')] ~[df.plot.scatter(x='0', y='3')]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot.pie] ~[df.plot.bar] ~[df.plot.hist] ~[df.plot.pie()] ~[df.plot.bar()] ~[df.plot.hist()] ~[df.plot.scatter] ~[df.plot.scatter(x='0', y='1')] ~[df.plot.scatter(x='0', y='2')] ~[df.plot.scatter(x='0', y='3')] ~[df.plot.scatter(x='0', y='4')]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot.pie] ~[df.plot.bar] ~[df.plot.hist] ~[df.plot.pie()] ~[df.plot.bar()] ~[df.plot.hist()] ~[df.plot.scatter] ~[df.plot.scatter(x='0', y='1')] ~[df.plot.scatter(x='0', y='2')] ~[df.plot.scatter(x='0', y='3')] ~[df.plot.scatter(x='0', y='4')] ~[df.plot.scatter(x='0', y='5')]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot.pie] ~[df.plot.bar] ~[df.plot.hist] ~[df.plot.pie()] ~[df.plot.bar()] ~[df.plot.hist()] ~[df.plot.scatter] ~[df.plot.scatter(x='0', y='1')] ~[df.plot.scatter(x='0', y='2')] ~[df.plot.scatter(x='0', y='3')] ~[df.plot.scatter(x='0', y='4')] ~[df.plot.scatter(x='0', y='5')] ~[df.plot.scatter(x='0', y='6')]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot.pie] ~[df.plot.bar] ~[df.plot.hist] ~[df.plot.pie()] ~[df.plot.bar()] ~[df.plot.hist()] ~[df.plot.scatter] ~[df.plot.scatter(x='0', y='1')] ~[df.plot.scatter(x='0', y='2')] ~[df.plot.scatter(x='0', y='3')] ~[df.plot.scatter(x='0', y='4')] ~[df.plot.scatter(x='0', y='5')] ~[df.plot.scatter(x='0', y='6')] ~[df.plot.scatter(x='0', y='7')]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot.pie] ~[df.plot.bar] ~[df.plot.hist] ~[df.plot.pie()] ~[df.plot.bar()] ~[df.plot.hist()] ~[df.plot.scatter] ~[df.plot.scatter(x='0', y='1')] ~[df.plot.scatter(x='0', y='2')] ~[df.plot.scatter(x='0', y='3')] ~[df.plot.scatter(x='0', y='4')] ~[df.plot.scatter(x='0', y='5')] ~[df.plot.scatter(x='0', y='6')] ~[df.plot.scatter(x='0', y='7')] ~[df.plot.scatter(x='0', y='8')]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot.pie] ~[df.plot.bar] ~[df.plot.hist] ~[df.plot.pie()] ~[df.plot.bar()] ~[df.plot.hist()] ~[df.plot.scatter] ~[df.plot.scatter(x='0', y='1')] ~[df.plot.scatter(x='0', y='2')] ~[df.plot.scatter(x='0', y='3')] ~[df.plot.scatter(x='0', y='4')] ~[df.plot.scatter(x='0', y='5')] ~[df.plot.scatter(x='0', y='6')] ~[df.plot.scatter(x='0', y='7')] ~[df.plot.scatter(x='0', y='8')] ~[df.plot.scatter(x='0', y='9')]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot.pie] ~[df.plot.bar] ~[df.plot.hist] ~[df.plot.pie()] ~[df.plot.bar()] ~[df.plot.hist()] ~[df.plot.scatter] ~[df.plot.scatter(x='0', y='1')] ~[df.plot.scatter(x='0', y='2')] ~[df.plot.scatter(x='0', y='3')] ~[df.plot.scatter(x='0', y='4')] ~[df.plot.scatter(x='0', y='5')] ~[df.plot.scatter(x='0', y='6')] ~[df.plot.scatter(x='0', y='7')] ~[df.plot.scatter(x='0', y='8')] ~[df.plot.scatter(x='0', y='9')] ~[df.plot.scatter(x='0', y='10')]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot.pie] ~[df.plot.bar] ~[df.plot.hist] ~[df.plot.pie()] ~[df.plot.bar()] ~[df.plot.hist()] ~[df.plot.scatter] ~[df.plot.scatter(x='0', y='1')] ~[df.plot.scatter(x='0', y='2')] ~[df.plot.scatter(x='0', y='3')] ~[df.plot.scatter(x='0', y='4')] ~[df.plot.scatter(x='0', y='5')] ~[df.plot.scatter(x='0', y='6')] ~[df.plot.scatter(x='0', y='7')] ~[df.plot.scatter(x='0', y='8')] ~[df.plot.scatter(x='0', y='9')] ~[df.plot.scatter(x='0', y='10')] ~[df.plot.scatter(x='0', y='11')]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot.pie] ~[df.plot.bar] ~[df.plot.hist] ~[df.plot.pie()] ~[df.plot.bar()] ~[df.plot.hist()] ~[df.plot.scatter] ~[df.plot.scatter(x='0', y='1')] ~[df.plot.scatter(x='0', y='2')] ~[df.plot.scatter(x='0', y='3')] ~[df.plot.scatter(x='0', y='4')] ~[df.plot.scatter(x='0', y='5')] ~[df.plot.scatter(x='0', y='6')] ~[df.plot.scatter(x='0', y='7')] ~[df.plot.scatter(x='0', y='8')] ~[df.plot.scatter(x='0', y='9')] ~[df.plot.scatter(x='0', y='10')] ~[df.plot.scatter(x='0', y='11')] ~[df.plot.scatter(x='0', y='12')]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot.pie] ~[df.plot.bar] ~[df.plot.hist] ~[df.plot.pie()] ~[df.plot.bar()] ~[df.plot.hist()] ~[df.plot.scatter] ~[df.plot.scatter(x='0', y='1')] ~[df.plot.scatter(x='0', y='2')] ~[df.plot.scatter(x='0', y='3')] ~[df.plot.scatter(x='0', y='4')] ~[df.plot.scatter(x='0', y='5')] ~[df.plot.scatter(x='0', y='6')] ~[df.plot.scatter(x='0', y='7')] ~[df.plot.scatter(x='0', y='8')] ~[df.plot.scatter(x='0', y='9')] ~[df.plot.scatter(x='0', y='10')] ~[df.plot.scatter(x='0', y='11')] ~[df.plot.scatter(x='0', y='12')] ~[df.plot.scatter(x='0', y='13')]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~[df.plot.pie] ~[df.plot.bar] ~[df.plot.hist] ~[df.plot.pie()] ~[df.plot.bar()] ~[df.plot.hist()] ~[df.plot.scatter] ~[df.plot.scatter(x='0', y='1')] ~[df.plot.scatter(x='0', y='2')] ~[df.plot.scatter(x='0', y='3')] ~[df.plot.scatter(x='0', y='4')] ~[df.plot.scatter(x='0', y='5')] ~[df.plot.scatter(x='0', y='6')] ~[df.plot.scatter(x='0', y='7')] ~[df.plot.scatter(x='0', y='8')] ~[df.plot.scatter(x='0', y='9')] ~[df.plot.scatter(x='0', y='10')] ~[df.plot.scatter(x='0', y='11')] ~[df.plot.scatter(x='0', y='12')] ~[df.plot.scatter(x='0', y='13')] ~[df.plot.scatter(x='0', y='14')]
         df[['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32']].corr() ~[df.hist] ~
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