EDA

April 4, 2022

[19]:
```
import sys
!{sys.executable} -m pip install -U pandas-profiling[notebook]
!jupyter nbextension enable --py widgetsnbextension
!pip install matplotlib
!pip install graphviz --user
!pip3 install imblearn --trusted-host pypi.org --trusted-host pypi.python.org␣
↪--trusted-host files.pythonhosted.org --user
```

[20]:
```
import os
import numpy as np
import pandas as pd
```

[21]:
```
df= pd.read_csv(r'C:\Users\zdehg\Downloads\archive\DASS_data_21.02.19\data.
↪csv',  error_bad_lines=False, warn_bad_lines=False, sep=r'\t' )
```

```
C:\ProgramData\Anaconda3\lib\site-packages\pandas\util\_decorators.py:311:
ParserWarning: Falling back to the 'python' engine because the 'c' engine does
not support regex separators (separators > 1 char and different from '\s+' are
interpreted as regex); you can avoid this warning by specifying engine='python'.
  return func(*args, **kwargs)
C:\ProgramData\Anaconda3\lib\site-
packages\IPython\core\interactiveshell.py:3444: FutureWarning: The
warn_bad_lines argument has been deprecated and will be removed in a future
version.


  exec(code_obj, self.user_global_ns, self.user_ns)
C:\ProgramData\Anaconda3\lib\site-
packages\IPython\core\interactiveshell.py:3444: FutureWarning: The
error_bad_lines argument has been deprecated and will be removed in a future
version.


  exec(code_obj, self.user_global_ns, self.user_ns)
```

[22]:
```
```

```
df.drop(['Q1I', 'Q1E', 'Q2I', 'Q2E','Q3I', 'Q3E','Q4I', 'Q4E', 'Q5I',␣
 ↪'Q5E','Q6I', 'Q6E','Q7I', 'Q7E', 'Q8I', 'Q8E','Q9I', 'Q9E','Q10I', 'Q10E',␣
 ↪'Q11I', 'Q11E','Q12I', 'Q12E','Q13I', 'Q13E', 'Q14I', 'Q14E','Q15I',␣
 ↪'Q15E','Q16I', 'Q16E','Q17I', 'Q17E', 'Q18I', 'Q18E','Q19I', 'Q19E', 'Q20I',␣
 ↪'Q20E', 'Q21I', 'Q21E','Q22I', 'Q22E','Q23I', 'Q23E', 'Q24I', 'Q24E','Q25I',␣
 ↪'Q25E','Q26I', 'Q26E','Q27I', 'Q27E', 'Q28I', 'Q28E','Q29I', 'Q29E', 'Q30I',␣
 ↪'Q30E', 'Q31I', 'Q31E','Q32I', 'Q32E','Q33I', 'Q33E', 'Q34I', 'Q34E','Q35I',␣
 ↪'Q35E','Q36I', 'Q36E','Q37I', 'Q37E', 'Q38I', 'Q38E','Q39I', 'Q39E','Q40I',␣
 ↪'Q40E', 'Q41I', 'Q41E','Q42I', 'Q42E', 'source', 'introelapse',␣
 ↪'testelapse', 'surveyelapse'] , axis=1)
```

[22]:

	Q1A	Q2A	Q3A	Q4A	Q5A	Q6A	Q7A	Q8A	Q9A	Q10A	…	screensize	\
0	4	4	2	4	4	4	4	4	2	1	…	1	
1	4	1	2	3	4	4	3	4	3	2	…	2	
2	3	1	4	1	4	3	1	3	2	4	…	2	
3	2	3	2	1	3	3	4	2	3	3	…	2	
4	2	2	3	4	4	2	4	4	4	3	…	2	
…	…	…	…	…	…	…	…	…	…	…	…	…	
39770	2	1	3	2	3	2	1	3	1	4	…	2	
39771	3	4	3	4	3	4	4	4	3	4	…	1	
39772	2	1	2	1	1	1	1	1	2	1	…	2	
39773	3	1	2	2	3	3	3	4	3	1	…	2	
39774	2	1	2	1	4	2	1	1	1	1	…	1	

	uniquenetworklocation	hand	religion	orientation	race	voted	\
0	1	1	12	1	10	2	
1	1	2	7	0	70	2	
2	1	1	4	3	60	1	
3	1	2	4	5	70	2	
4	2	3	10	1	10	2	
…	…	…	…	…	…	…	
39770	1	1	2	4	60	2	
39771	1	1	10	0	10	2	
39772	1	1	7	1	30	1	
39773	1	1	6	1	60	1	
39774	1	1	10	1	10	1	

	married	familysize	major
0	1	2	None
1	1	4	None
2	1	3	None
3	1	5	biology
4	1	4	Psychology
…	…	…	…
39770	1	2	None
39771	1	4	Mathematic
39772	2	3	Computer Science

```
39773        1           2            History
39774        1           4  Cognitive Science

[39775 rows x 84 columns]
```

[23]:
```
DASS_keys = {'Depression': [3, 5, 10, 13, 16, 17, 21, 24, 26, 31, 34, 37, 38,␣
↪42],
             'Anxiety': [2, 4, 7, 9, 15, 19, 20, 23, 25, 28, 30, 36, 40, 41],
             'Stress': [1, 6, 8, 11, 12, 14, 18, 22, 27, 29, 32, 33, 35, 39]}

DASS_bins = {'Depression': [(0, 10), (10, 14), (14, 21), (21, 28)],
             'Anxiety': [(0, 8), (8, 10), (10, 15), (15, 20)],
             'Stress': [(0, 15), (15, 19), (19, 26), (26, 34)]}


for name, keys in DASS_keys.items():
    # Subtract one to match definition of DASS score in source
    df[name] = (df.filter(regex='Q(%s)A' % '|'.join(map(str, keys))) - 1).
↪sum(axis=1)

    bins = DASS_bins[name]
    bins.append( (DASS_bins[name][-1][-1], df[name].max() + 1) )
    bins = pd.IntervalIndex.from_tuples(bins, closed='left')
    df[name + '_cat'] = np.arange(len(bins))[pd.cut(df[name], bins=bins).cat.
↪codes]

dass = df[DASS_keys.keys()]
dass_cat = df[[k + '_cat' for k in DASS_keys.keys()]]
```

[24]:
```
# Add personality types to data
personality_types = ['Extraversion', 'Agreeableness', 'Conscientiousness',␣
↪'EmotionalStability', 'Openness']

# Invert some entries
tipi = df.filter(regex='TIPI\d+').copy()
tipi_inv = tipi.filter(regex='TIPI(2|4|6|8|10)').apply(lambda d: 7 - d)
tipi[tipi.columns.intersection(tipi_inv.columns)] = tipi_inv

# Calculate scores
for idx, pt in enumerate( personality_types ):
    df[pt] = tipi[['TIPI{}'.format(idx + 1), 'TIPI{}'.format(6 + idx)]].
↪mean(axis=1)

personalities = df[personality_types]
personalities[['Extraversion', 'Agreeableness', 'Conscientiousness',␣
↪'EmotionalStability', 'Openness']].describe()
```

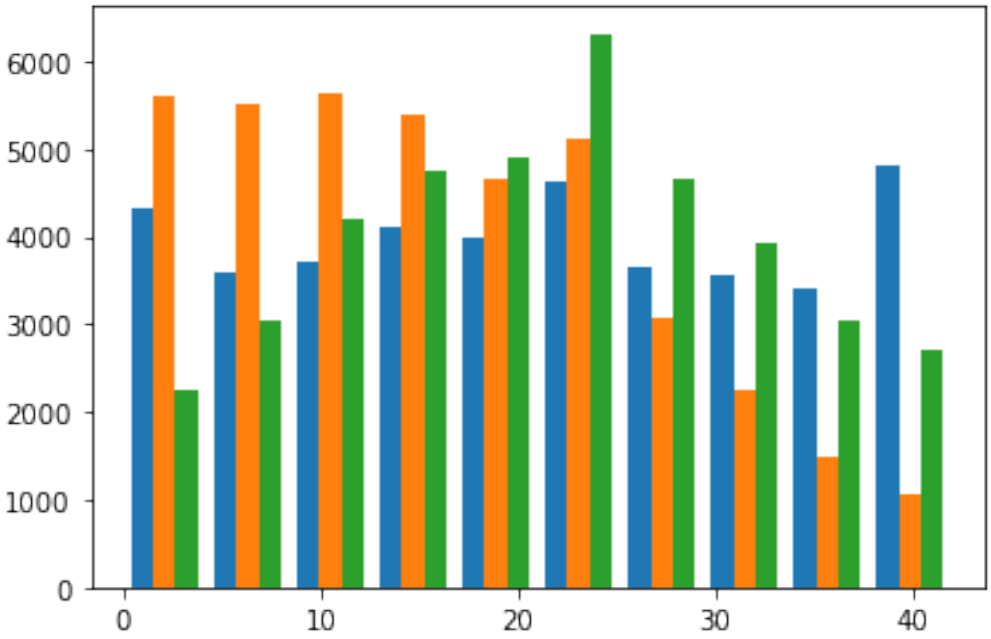
[24]:
```
       Extraversion  Agreeableness  Conscientiousness  EmotionalStability  \
count  39775.000000   39775.000000       39775.000000        39775.000000
mean       2.967278       4.040377           3.730660            2.738290
std        1.555143       1.229776           1.491769            1.527743
min        0.000000       0.000000           0.000000            0.000000
25%        1.500000       3.500000           2.500000            1.500000
50%        3.000000       4.000000           3.500000            2.500000
75%        4.000000       5.000000           5.000000            3.500000
max        7.000000       7.000000           7.000000            7.000000

           Openness
count  39775.000000
mean       4.101634
std        1.335035
min        0.000000
25%        3.500000
50%        4.000000
75%        5.000000
max        7.000000
```

[25]:
```
import matplotlib.pyplot as plt
```

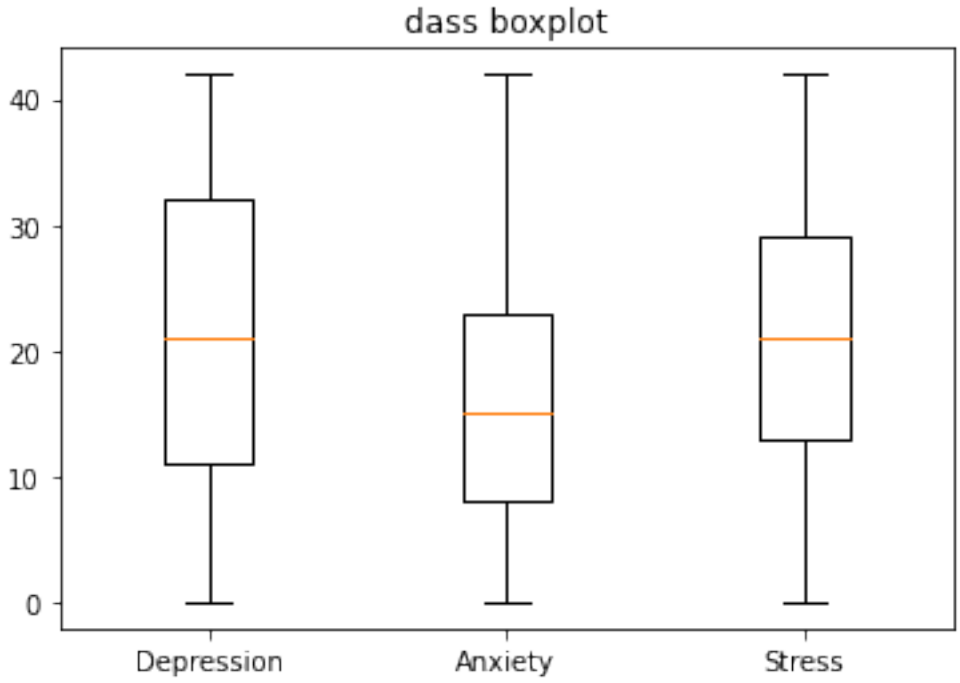
[26]:
```
plt.hist(dass)
#It can be sen that this class variable is not imbalanced toward a certain␣
 ↪result
```

[26]:
```
(array([[4318., 3594., 3728., 4101., 3980., 4622., 3657., 3555., 3419.,
         4801.],
        [5602., 5523., 5625., 5378., 4652., 5111., 3070., 2259., 1480.,
         1075.],
        [2238., 3037., 4208., 4756., 4897., 6315., 4655., 3920., 3041.,
         2708.]]),
 array([ 0. ,  4.2,  8.4, 12.6, 16.8, 21. , 25.2, 29.4, 33.6, 37.8, 42. ]),
 <a list of 3 BarContainer objects>)
```



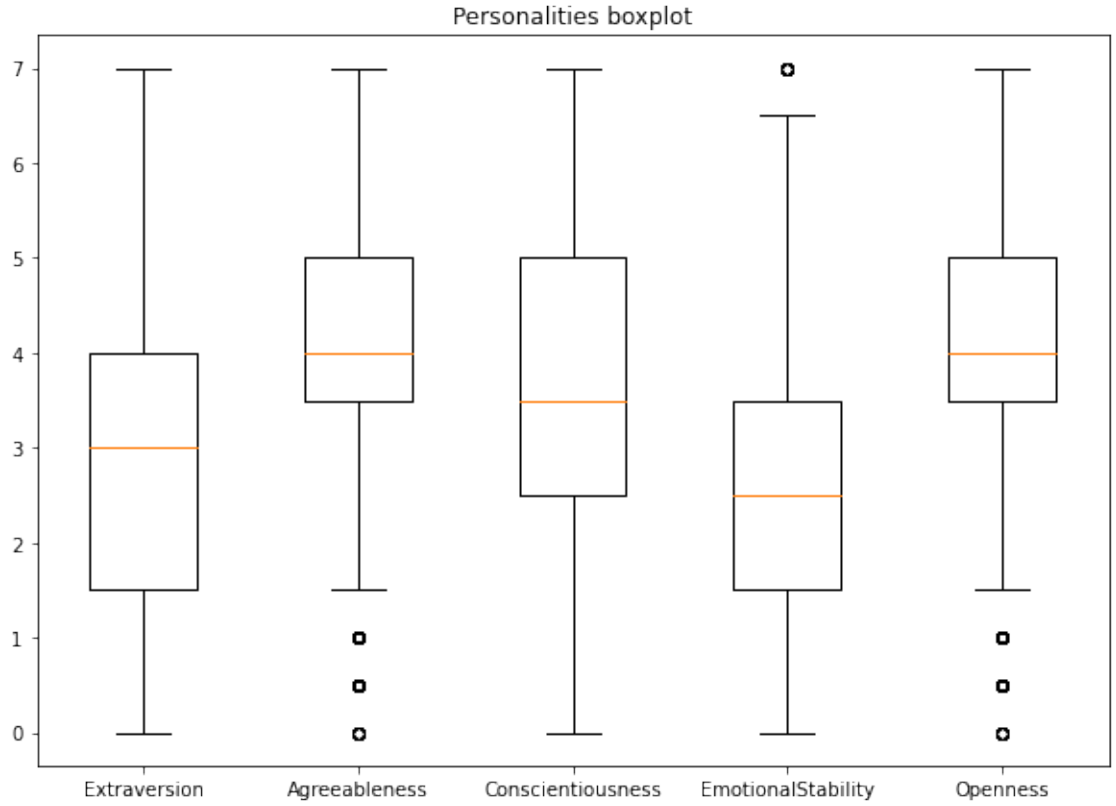
[27]:
```
fig, axs = plt.subplots()
axs.boxplot(dass, labels = ['Depression', 'Anxiety','Stress'], )
axs.set_title('dass boxplot')
```

[27]: Text(0.5, 1.0, 'dass boxplot')



[28]:
```
fig = plt.figure(figsize =(10, 7))
axs = fig.add_subplot(111)
axs.boxplot(personalities, labels= ['Extraversion', 'Agreeableness',␣
↪'Conscientiousness', 'EmotionalStability', 'Openness'])
axs.set_title('Personalities boxplot')
```

[28]:
```
Text(0.5, 1.0, 'Personalities boxplot')
```

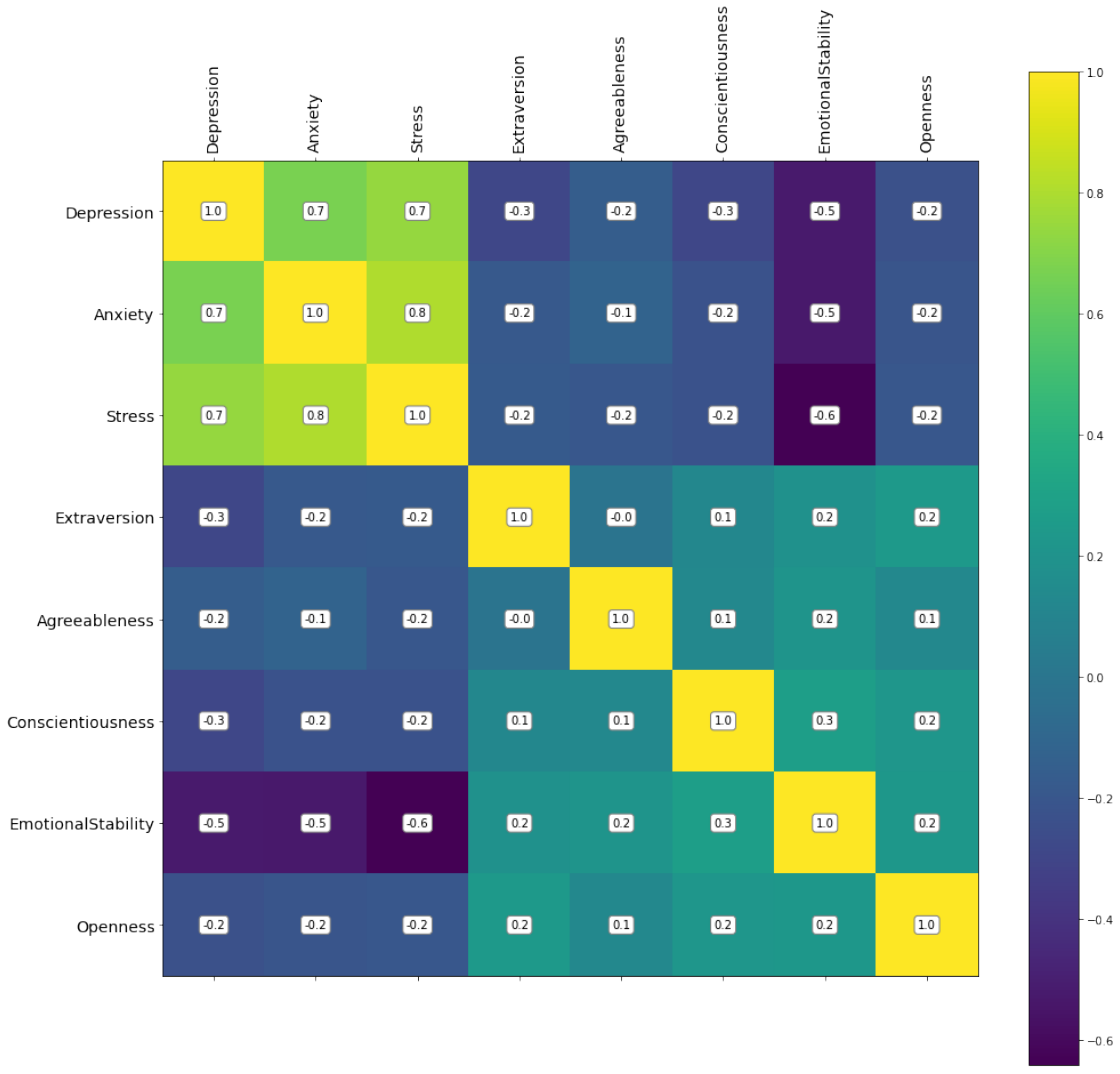


[29]:
```
def plot_correlation(df, cmap='RdBu_r'):
    size = len(df.columns)
    fig, ax = plt.subplots(figsize=(2 * size,2 * size))
    corr = df.corr()

    im = ax.matshow(corr, cmap=cmap
                    )
    for (i, j), z in np.ndenumerate(corr):
        ax.text(j, i, '{:0.1f}'.format(z), ha='center', va='center',
                bbox=dict(boxstyle='round', facecolor='white', edgecolor='0.5'))
```

```
    plt.xticks(range(df.select_dtypes(['number']).shape[1]), df.
↪select_dtypes(['number']).columns, fontsize=14, rotation=90)
    plt.yticks(range(df.select_dtypes(['number']).shape[1]), df.
↪select_dtypes(['number']).columns, fontsize=14)
    cb = plt.colorbar(im)
    ax.tick_params(labelsize=14)
    plt.show()
```

[30]:
```
character = pd.concat([dass, personalities], axis=1)
plot_correlation(character, cmap='viridis')
```



[31]:
```
def clasVar(df):
    conditions = [
```

```
    (df['Depression'] >= 14) ,
    (df['Anxiety'] >= 10)  ,
    (df['Stress'] >= 19),
    ((df['Depression'] < 14)  & (df['Anxiety'] < 10) & (df['Stress'] < 19)),
    ]
    values = ['Depressed','axious', 'Stressed', 'Normal']
    df['diagnosis Category'] = np.select(conditions, values)
    return df
```

[32]:
```
dfNew = clasVar(df)
dfNew.head(10)
```

[32]:

	Q1A	Q1I	Q1E	Q2A	Q2I	Q2E	Q3A	Q3I	Q3E	Q4A	…	Anxiety	\
0	4	28	3890	4	25	2122	2	16	1944	4	…	34	
1	4	2	8118	1	36	2890	2	35	4777	3	…	17	
2	3	7	5784	1	33	4373	4	41	3242	1	…	12	
3	2	23	5081	3	11	6837	2	37	5521	1	…	17	
4	2	36	3215	2	13	7731	3	5	4156	4	…	40	
5	1	18	6116	1	28	3193	2	2	12542	1	…	6	
6	1	20	4325	1	34	4009	2	38	3604	3	…	19	
7	1	34	4796	1	9	2618	1	39	5823	1	…	4	
8	4	4	3470	4	14	2139	3	1	11043	4	…	39	
9	3	38	5187	2	28	2600	4	9	2015	1	…	28	

	Anxiety_cat	Stress	Stress_cat	Extraversion	Agreeableness	\
0	4	40	4	0.5	4.5	
1	3	27	3	4.5	4.5	
2	2	17	1	1.5	3.5	
3	3	16	1	2.0	6.0	
4	4	29	3	2.0	3.5	
5	0	12	0	1.0	6.5	
6	3	14	0	3.5	4.0	
7	0	6	0	6.0	3.5	
8	4	33	3	0.5	4.5	
9	4	34	4	0.5	0.5	

	Conscientiousness	EmotionalStability	Openness	diagnosis Category
0	4.5	0.5	6.5	Depressed
1	2.0	0.5	3.5	Depressed
2	2.0	4.0	5.0	Depressed
3	6.5	4.5	6.0	Depressed
4	2.0	2.0	4.5	Depressed
5	5.5	6.0	3.5	Normal
6	5.0	3.5	2.5	Depressed
7	4.0	3.5	4.0	Normal
8	2.5	0.5	4.0	Depressed
9	5.0	0.5	2.5	Depressed

```
[10 rows x 184 columns]
```

[33]:
```
dfNew = dfNew.loc[:,['Extraversion', 'Agreeableness', 'Conscientiousness',␣
↪'EmotionalStability', 'Openness', 'diagnosis Category']]
dfNew
```

[33]:

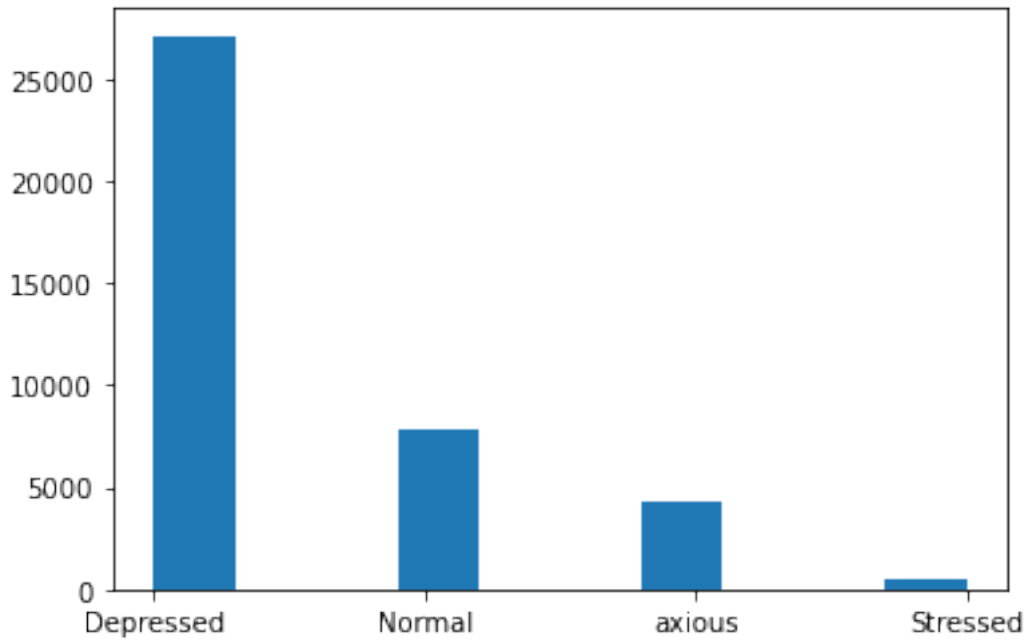
	Extraversion	Agreeableness	Conscientiousness	EmotionalStability	\
0	0.5	4.5	4.5	0.5	
1	4.5	4.5	2.0	0.5	
2	1.5	3.5	2.0	4.0	
3	2.0	6.0	6.5	4.5	
4	2.0	3.5	2.0	2.0	
…	…	…	…	…	
39770	2.0	5.0	3.5	2.5	
39771	2.5	3.0	2.5	2.0	
39772	5.0	3.5	6.5	3.5	
39773	1.5	2.0	3.5	1.5	
39774	5.0	5.0	2.5	1.5	

	Openness	diagnosis Category
0	6.5	Depressed
1	3.5	Depressed
2	5.0	Depressed
3	6.0	Depressed
4	4.5	Depressed
…	…	…
39770	3.5	Depressed
39771	3.5	Depressed
39772	4.5	Normal
39773	3.0	Depressed
39774	5.5	Depressed

```
[39775 rows x 6 columns]
```

[34]:
```
plt.hist(dfNew['diagnosis Category'])
```

[34]:
```
(array([27133.,     0.,     0.,  7833.,     0.,     0.,  4287.,     0.,
            0.,   522.]),
 array([0. , 0.3, 0.6, 0.9, 1.2, 1.5, 1.8, 2.1, 2.4, 2.7, 3. ]),
 <BarContainer object of 10 artists>)
```



[35]:
```
dfNew.describe()
```

[35]:

	Extraversion	Agreeableness	Conscientiousness	EmotionalStability	\
count	39775.000000	39775.000000	39775.000000	39775.000000	
mean	2.967278	4.040377	3.730660	2.738290	
std	1.555143	1.229776	1.491769	1.527743	
min	0.000000	0.000000	0.000000	0.000000	
25%	1.500000	3.500000	2.500000	1.500000	
50%	3.000000	4.000000	3.500000	2.500000	
75%	4.000000	5.000000	5.000000	3.500000	
max	7.000000	7.000000	7.000000	7.000000	

	Openness
count	39775.000000
mean	4.101634
std	1.335035
min	0.000000
25%	3.500000
50%	4.000000
75%	5.000000
max	7.000000

[36]:
```
from collections import Counter
from sklearn.datasets import make_classification
from matplotlib import pyplot
from numpy import where
```

[37]:
```
y = dfNew['diagnosis Category']
counter = Counter(y)
print(counter)
```

```
Counter({'Depressed': 27133, 'Normal': 7833, 'axious': 4287, 'Stressed': 522})
```

[38]:
```
from imblearn.over_sampling import SMOTENC
sm = SMOTENC(random_state=42, categorical_features=[5])
dfNew_res, y_res = sm.fit_resample(dfNew, y)
print(f'Resampled dataset samples per class {Counter(y_res)}')
```

```
Resampled dataset samples per class Counter({'Depressed': 27133, 'Normal':
27133, 'axious': 27133, 'Stressed': 27133})
```

[39]:
```
plt.hist(dfNew_res['diagnosis Category'])
```

[39]:
```
(array([27133.,     0.,     0., 27133.,     0.,     0., 27133.,     0.,
            0., 27133.]),
 array([0. , 0.3, 0.6, 0.9, 1.2, 1.5, 1.8, 2.1, 2.4, 2.7, 3. ]),
 <BarContainer object of 10 artists>)
```