rk1

April 17, 2022

```
[ ]: import numpy as np
     import pandas as pd
     import seaborn as sns
     import matplotlib.pyplot as plt
     %matplotlib inline
     sns.set(style = "ticks")
```

```
[ ]: data = pd.read_csv('./marvel-wikia-data.csv', sep=",")
```

```
[ ]: data.shape
```

```
[ ]: (16376, 13)
```

```
[ ]: data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 16376 entries, 0 to 16375
Data columns (total 13 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   page_id           16376 non-null  int64
 1   name              16376 non-null  object
 2   urlslug           16376 non-null  object
 3   ID                12606 non-null  object
 4   ALIGN             13564 non-null  object
 5   EYE               6609 non-null   object
 6   HAIR              12112 non-null  object
 7   SEX               15522 non-null  object
 8   GSM               90 non-null     object
 9   ALIVE             16373 non-null  object
 10  APPEARANCES       15280 non-null  float64
 11  FIRST APPEARANCE  15561 non-null  object
 12  Year              15561 non-null  float64
dtypes: float64(2), int64(1), object(10)
memory usage: 1.6+ MB
```

```
[ ]: data.dtypes
[ ]: page_id               int64
     name                 object
     urlslug              object
     ID                   object
     ALIGN                object
     EYE                  object
     HAIR                 object
     SEX                  object
     GSM                  object
     ALIVE                object
     APPEARANCES         float64
     FIRST APPEARANCE     object
     Year                float64
     dtype: object
```

```
[ ]: data.head()
```

```
[ ]:    page_id                                 name  \
     0     1678            Spider-Man (Peter Parker)
     1     7139      Captain America (Steven Rogers)
     2    64786  Wolverine (James \"Logan\" Howlett)
     3     1868    Iron Man (Anthony \"Tony\" Stark)
     4     2460                  Thor (Thor Odinson)

                                        urlslug                ID  \
     0              \/Spider-Man_(Peter_Parker)   Secret Identity
     1        \/Captain_America_(Steven_Rogers)   Public Identity
     2  \/Wolverine_(James_%22Logan%22_Howlett)   Public Identity
     3    \/Iron_Man_(Anthony_%22Tony%22_Stark)   Public Identity
     4                    \/Thor_(Thor_Odinson)  No Dual Identity

                     ALIGN         EYE        HAIR              SEX  GSM  \
     0     Good Characters  Hazel Eyes  Brown Hair  Male Characters  NaN
     1     Good Characters   Blue Eyes  White Hair  Male Characters  NaN
     2  Neutral Characters   Blue Eyes  Black Hair  Male Characters  NaN
     3     Good Characters   Blue Eyes  Black Hair  Male Characters  NaN
     4     Good Characters   Blue Eyes  Blond Hair  Male Characters  NaN

                    ALIVE  APPEARANCES FIRST APPEARANCE    Year
     0  Living Characters       4043.0           Aug-62  1962.0
     1  Living Characters       3360.0           Mar-41  1941.0
     2  Living Characters       3061.0           Oct-74  1974.0
     3  Living Characters       2961.0           Mar-63  1963.0
     4  Living Characters       2258.0           Nov-50  1950.0
```

```
[ ]: data.isnull().sum()
[ ]: page_id                0
     name                   0
     urlslug                0
     ID                  3770
     ALIGN               2812
     EYE                 9767
     HAIR                4264
     SEX                  854
     GSM                16286
     ALIVE                  3
     APPEARANCES         1096
     FIRST APPEARANCE     815
     Year                 815
     dtype: int64
```

```
[ ]: totalCount = data.shape[0]
     print("       : {}" .format(totalCount))
```

```
           : 16376
```

```
[ ]: catCols = []
     for col in data.columns:
         tempNullCount = data[data[col].isnull()].shape[0]
         dt = str(data[col].dtype)
         if tempNullCount>0:
             catCols.append(col)
             temp_perc = round((tempNullCount / totalCount) * 100.0, 2)
             print('     {}.         {}.                    {}, {}%.'.format(col, dt,␣
      ↪tempNullCount, temp_perc))
```

```
         ID.        object.                  3770, 23.02%.
         ALIGN.        object.                  2812, 17.17%.
         EYE.        object.                  9767, 59.64%.
         HAIR.        object.                  4264, 26.04%.
         SEX.        object.                  854, 5.21%.
         GSM.        object.                  16286, 99.45%.
         ALIVE.        object.                  3, 0.02%.
         APPEARANCES.        float64.                  1096, 6.69%.
         FIRST APPEARANCE.        object.                  815,
     4.98%.
         Year.        float64.                  815, 4.98%.
```

```
[ ]: from sklearn.impute import SimpleImputer
     from sklearn.impute import MissingIndicator
```

```
[ ]: hair_data = data[['HAIR']]
     hair_data.head()
```

```
[ ]:          HAIR
     0  Brown Hair
     1  White Hair
     2  Black Hair
     3  Black Hair
     4  Blond Hair
```

```
[ ]: hair_data['HAIR'].unique()
```

```
[ ]: array(['Brown Hair', 'White Hair', 'Black Hair', 'Blond Hair', 'No Hair',
            'Blue Hair', 'Red Hair', 'Bald', 'Auburn Hair', 'Grey Hair',
            'Silver Hair', 'Purple Hair', 'Strawberry Blond Hair',
            'Green Hair', 'Reddish Blond Hair', 'Gold Hair', nan,
            'Orange Hair', 'Pink Hair', 'Variable Hair', 'Yellow Hair',
            'Light Brown Hair', 'Magenta Hair', 'Bronze Hair', 'Dyed Hair',
            'Orange-brown Hair'], dtype=object)
```

```
[ ]: hair_data[hair_data['HAIR'].isnull()].shape
```

```
[ ]: (4264, 1)
```

```
[ ]: imp = SimpleImputer(missing_values=np.nan, strategy="most_frequent")
     data_imp = imp.fit_transform(hair_data)
     data_imp
```

```
[ ]: array([['Brown Hair'],
            ['White Hair'],
            ['Black Hair'],
            …,
            ['Bald'],
            ['Black Hair'],
            ['Black Hair']], dtype=object)
```

```
[ ]: np.unique(data_imp)
```

```
[ ]: array(['Auburn Hair', 'Bald', 'Black Hair', 'Blond Hair', 'Blue Hair',
            'Bronze Hair', 'Brown Hair', 'Dyed Hair', 'Gold Hair',
            'Green Hair', 'Grey Hair', 'Light Brown Hair', 'Magenta Hair',
            'No Hair', 'Orange Hair', 'Orange-brown Hair', 'Pink Hair',
            'Purple Hair', 'Red Hair', 'Reddish Blond Hair', 'Silver Hair',
            'Strawberry Blond Hair', 'Variable Hair', 'White Hair',
            'Yellow Hair'], dtype=object)
```

```
[ ]: data_imp.shape
```

```
[ ]: (16376, 1)
[ ]: hair_enc = pd.DataFrame({"HAIR": data_imp.T[0]})
     hair_enc
```

```
[ ]:             HAIR
     0      Brown Hair
     1      White Hair
     2      Black Hair
     3      Black Hair
     4      Blond Hair
     …            …
     16371     No Hair
     16372        Bald
     16373        Bald
     16374  Black Hair
     16375  Black Hair

     [16376 rows x 1 columns]
```

```
[ ]: from sklearn.preprocessing import OneHotEncoder
     ohe = OneHotEncoder()
     hair_ohe = ohe.fit_transform(hair_enc[['HAIR']])
```

```
[ ]: from sklearn.preprocessing import OneHotEncoder
     ohe = OneHotEncoder()
     hair_ohe = ohe.fit_transform(hair_enc[['HAIR']])
```

```
[ ]: hair_ohe.shape
```

```
[ ]: (16376, 25)
```

```
[ ]: hair_ohe.todense()[0:10]
```

```
[ ]: matrix([[0., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
              0., 0., 0., 0., 0., 0., 0., 0., 0.],
             [0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
              0., 0., 0., 0., 0., 0., 0., 1., 0.],
             [0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
              0., 0., 0., 0., 0., 0., 0., 0., 0.],
             [0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
              0., 0., 0., 0., 0., 0., 0., 0., 0.],
             [0., 0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
              0., 0., 0., 0., 0., 0., 0., 0., 0.],
             [0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 1., 0., 0.,
              0., 0., 0., 0., 0., 0., 0., 0., 0.],
             [0., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
              0., 0., 0., 0., 0., 0., 0., 0., 0.],
             [0., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
 0., 0., 0., 0., 0., 0., 0., 0., 0.],
[0., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
 0., 0., 0., 0., 0., 0., 0., 0., 0.],
[0., 0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
 0., 0., 0., 0., 0., 0., 0., 0., 0.]])
```

```
[ ]: pd.get_dummies(hair_enc).head()
```

```
[ ]:    HAIR_Auburn Hair  HAIR_Bald  HAIR_Black Hair  HAIR_Blond Hair  \
     0                 0          0                0                0
     1                 0          0                0                0
     2                 0          0                1                0
     3                 0          0                1                0
     4                 0          0                0                1

        HAIR_Blue Hair  HAIR_Bronze Hair  HAIR_Brown Hair  HAIR_Dyed Hair  \
     0               0                 0                1               0
     1               0                 0                0               0
     2               0                 0                0               0
     3               0                 0                0               0
     4               0                 0                0               0

        HAIR_Gold Hair  HAIR_Green Hair  …  HAIR_Orange-brown Hair  \
     0               0                0  …                       0
     1               0                0  …                       0
     2               0                0  …                       0
     3               0                0  …                       0
     4               0                0  …                       0

        HAIR_Pink Hair  HAIR_Purple Hair  HAIR_Red Hair  HAIR_Reddish Blond Hair  \
     0               0                 0              0                        0
     1               0                 0              0                        0
     2               0                 0              0                        0
     3               0                 0              0                        0
     4               0                 0              0                        0

        HAIR_Silver Hair  HAIR_Strawberry Blond Hair  HAIR_Variable Hair  \
     0                 0                           0                   0
     1                 0                           0                   0
     2                 0                           0                   0
     3                 0                           0                   0
     4                 0                           0                   0

        HAIR_White Hair  HAIR_Yellow Hair
     0                0                 0
     1                1                 0
     2                0                 0
```

```
3                0                 0
4                0                 0

[5 rows x 25 columns]
```

[ ]:

```
pd.get_dummies(hair_data, dummy_na=True).head()
```

[ ]:

```
   HAIR_Auburn Hair  HAIR_Bald  HAIR_Black Hair  HAIR_Blond Hair  \
0                 0          0                0                0
1                 0          0                0                0
2                 0          0                1                0
3                 0          0                1                0
4                 0          0                0                1

   HAIR_Blue Hair  HAIR_Bronze Hair  HAIR_Brown Hair  HAIR_Dyed Hair  \
0               0                 0                1               0
1               0                 0                0               0
2               0                 0                0               0
3               0                 0                0               0
4               0                 0                0               0

   HAIR_Gold Hair  HAIR_Green Hair  ...  HAIR_Pink Hair  HAIR_Purple Hair  \
0               0                0  ...               0                 0
1               0                0  ...               0                 0
2               0                0  ...               0                 0
3               0                0  ...               0                 0
4               0                0  ...               0                 0

   HAIR_Red Hair  HAIR_Reddish Blond Hair  HAIR_Silver Hair  \
0              0                        0                 0
1              0                        0                 0
2              0                        0                 0
3              0                        0                 0
4              0                        0                 0

   HAIR_Strawberry Blond Hair  HAIR_Variable Hair  HAIR_White Hair  \
0                           0                   0                0
1                           0                   0                1
2                           0                   0                0
3                           0                   0                0
4                           0                   0                0

   HAIR_Yellow Hair  HAIR_nan
0                 0         0
1                 0         0
2                 0         0
3                 0         0
```

```
4                  0         0

[5 rows x 26 columns]
```

```
[ ]: from sklearn.preprocessing import LabelEncoder
```

```
[ ]: hair_enc["HAIR"].unique()
```

```
[ ]: array(['Brown Hair', 'White Hair', 'Black Hair', 'Blond Hair', 'No Hair',
            'Blue Hair', 'Red Hair', 'Bald', 'Auburn Hair', 'Grey Hair',
            'Silver Hair', 'Purple Hair', 'Strawberry Blond Hair',
            'Green Hair', 'Reddish Blond Hair', 'Gold Hair', 'Orange Hair',
            'Pink Hair', 'Variable Hair', 'Yellow Hair', 'Light Brown Hair',
            'Magenta Hair', 'Bronze Hair', 'Dyed Hair', 'Orange-brown Hair'],
           dtype=object)
```

```
[ ]: le = LabelEncoder()
     hair_le = le.fit_transform(hair_enc["HAIR"])
```

```
[ ]: hair_le
```

```
[ ]: array([ 6, 23,  2, …,  1,  2,  2])
```

```
[ ]: np.unique(hair_le)
```

```
[ ]: array([ 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])
```

```
[ ]: le.inverse_transform([n for n in range(17)])
```

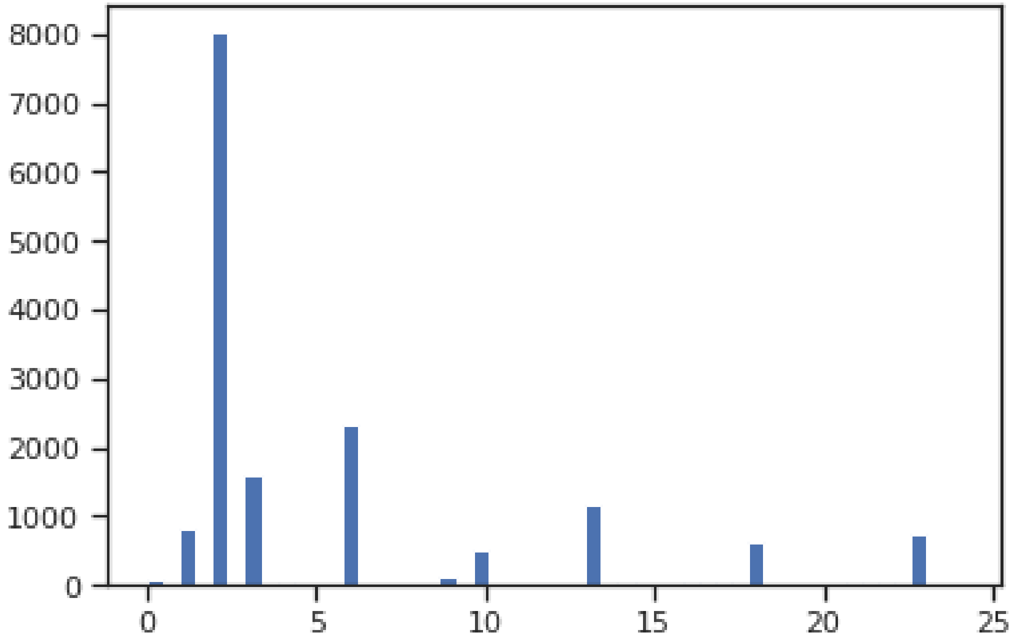
```
[ ]: array(['Auburn Hair', 'Bald', 'Black Hair', 'Blond Hair', 'Blue Hair',
            'Bronze Hair', 'Brown Hair', 'Dyed Hair', 'Gold Hair',
            'Green Hair', 'Grey Hair', 'Light Brown Hair', 'Magenta Hair',
            'No Hair', 'Orange Hair', 'Orange-brown Hair', 'Pink Hair'],
           dtype=object)
```

```
[ ]: data_digit = hair_enc.copy()
     data_digit["HAIR"] = hair_le
```

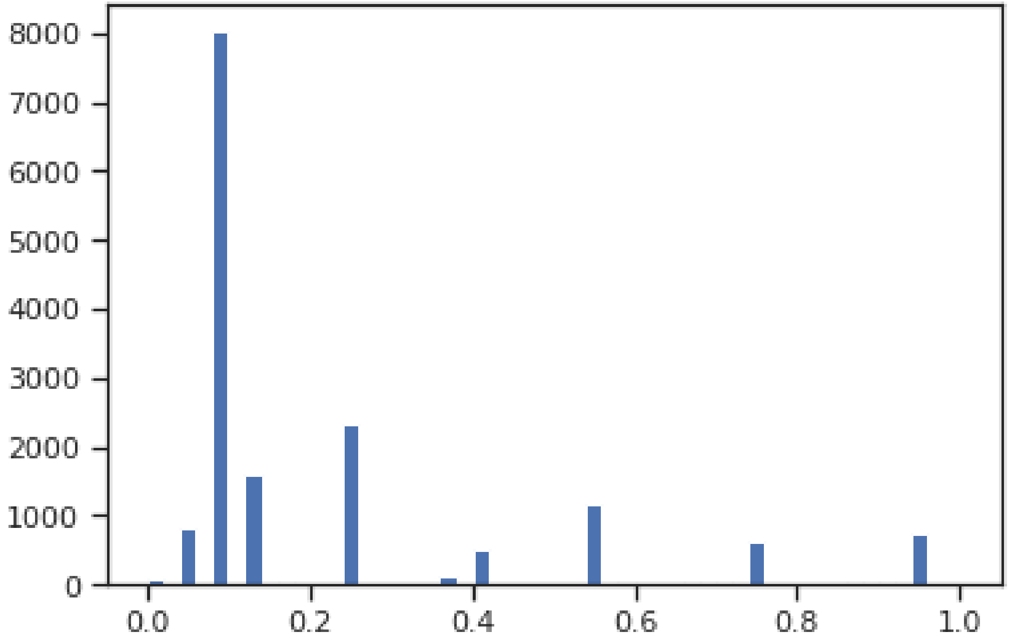
```
[ ]: from sklearn.preprocessing import MinMaxScaler, StandardScaler, Normalizer
```

```
[ ]: sc1 = MinMaxScaler()
     sc1_data = sc1.fit_transform(data_digit[["HAIR"]])
```

```
[ ]: plt.hist(data_digit["HAIR"], 50)
     plt.show()
```



```
[ ]: plt.hist(sc1_data, 50)
     plt.show()
```

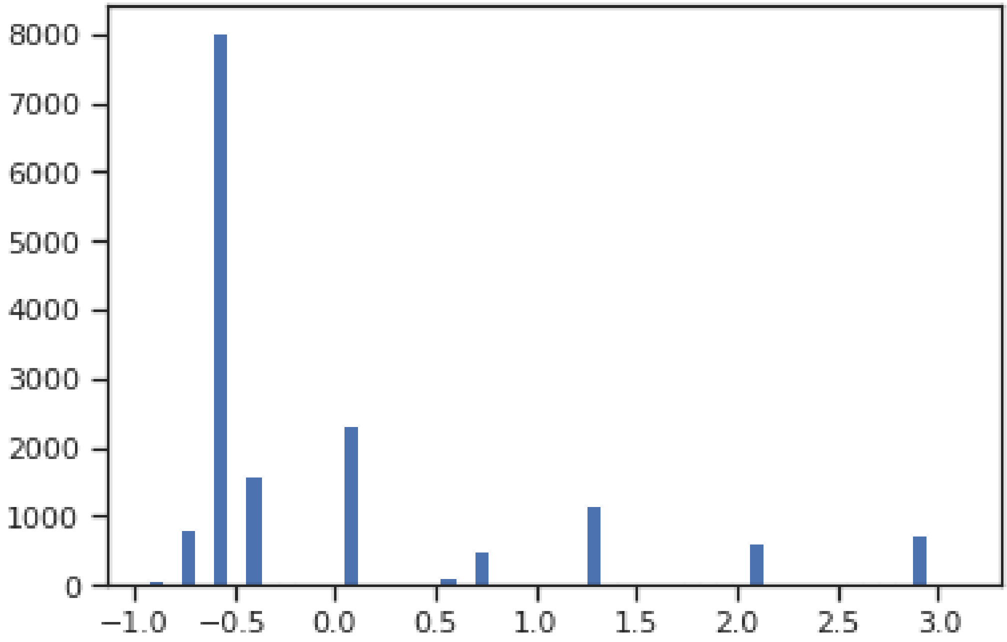


[ ]:

```
sc2 = StandardScaler()
sc2_data = sc2.fit_transform(data_digit[["HAIR"]])
```

[ ]:

```
plt.hist(sc2_data, 50)
plt.show()
```


8000
7000
6000
5000
4000
3000
2000
1000
0
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0