In [1]:

Abdul Basit_DSC680_Week8_Project2_Milestone_3

File: Abdul Basit_DSC680_Week8_Project2_Milestone_3.ipynb Name: Abdul Basit Date: 02/04/2023 Course: DSC 680 Applied Data Science Title: Club Soccer Prediction Analysis

Club Soccer Prediction Analysis

from future import print function, division

```
from bs4 import BeautifulSoup
from matplotlib import pyplot as plt
from sklearn import preprocessing
import seaborn as sns
import statsmodels.formula.api as smf
import pandas as pd
import numpy as np
import math
import scipy.stats
import random
import requests
!apt-get update
!apt-get install -y default-jdk
!pip install tabula-py xlrd lxml
'apt-get' is not recognized as an internal or external command,
operable program or batch file.
'apt-get' is not recognized as an internal or external command,
operable program or batch file.
Requirement already satisfied: tabula-py in c:\users\basiab1\anaconda3\lib\site-packa
ges (2.6.0)
Requirement already satisfied: xlrd in c:\users\basiab1\anaconda3\lib\site-packages
Requirement already satisfied: lxml in c:\users\basiab1\anaconda3\lib\site-packages
(4.6.3)
Requirement already satisfied: distro in c:\users\basiab1\anaconda3\lib\site-packages
(from tabula-py) (1.8.0)
Requirement already satisfied: numpy in c:\users\basiab1\anaconda3\lib\site-packages
(from tabula-py) (1.24.1)
Requirement already satisfied: pandas>=0.25.3 in c:\users\basiab1\anaconda3\lib\site-
packages (from tabula-py) (1.3.4)
Requirement already satisfied: pytz>=2017.3 in c:\users\basiab1\anaconda3\lib\site-pa
ckages (from pandas>=0.25.3->tabula-py) (2021.3)
Requirement already satisfied: python-dateutil>=2.7.3 in c:\users\basiab1\anaconda3\l
ib\site-packages (from pandas>=0.25.3->tabula-py) (2.8.2)
Requirement already satisfied: six>=1.5 in c:\users\basiab1\anaconda3\lib\site-packag
es (from python-dateutil>=2.7.3->pandas>=0.25.3->tabula-py) (1.16.0)
```

```
WARNING: Ignoring invalid distribution -rotobuf (c:\users\basiab1\anaconda3\lib\site-packages)
```

Take a quick view of the data. The csv file spi_matches.csv contains match-by-match SPI ratings and forecasts.

```
# Read CSV File
   In [2]:
             df = pd.read_csv("spi_matches_latest.csv")
   In [3]:
             df.head()
   Out[3]:
                season
                            date league_id
                                             league
                                                         team1
                                                                     team2
                                                                              spi1
                                                                                     spi2
                                                                                          prob1
                                                                                                  prob2 ... imp
                                             Chinese
                                                      Shandong
                                                                    Guizhou
             0
                  2019 3/1/2019
                                      1979
                                              Super
                                                                             48.22 37.83 0.5755 0.1740
                                                         Luneng
                                                                      Renhe
                                             League
                                             Chinese
                                                       Shanghai
                                                                   Shanghai
             1
                  2019 3/1/2019
                                      1979
                                              Super
                                                                             39.81
                                                                                   60.08 0.2387 0.5203
                                                      Greenland
                                                                       SIPG
                                             League
                                             Chinese
                                                     Guangzhou
                                                                     Tianjin
             2
                  2019 3/1/2019
                                      1979
                                              Super
                                                                             65.59
                                                                                   39.99
                                                                                          0.7832 0.0673
                                                     Evergrande
                                                                  Quanujian
                                             League
                                            Chinese
                                                                     Beijing
             3
                  2019 3/1/2019
                                      1979
                                                                             32.25 54.82 0.2276 0.5226
                                              Super
                                                     Wuhan Zall
                                                                     Guoan
                                             League
                                             Chinese
                                                      Chongqing
                                                                 Guangzhou
                  2019 3/1/2019
                                      1979
                                              Super
                                                                             38.24 40.45 0.4403 0.2932
                                                           Lifan
                                             League
            5 rows × 23 columns
4
```

The data saved the score from each game (team1 vs team2), and some historical data of each team. SPI stands for Soccer Power Index, score1 and score2 are the scores of the game.

```
In [4]: # How many rows and how many columns are in my dataframe?
    df.shape
Out[4]: (11443, 23)
```

```
In [5]: # Since the data has 34580 records (it's still updating so the data size may change),
# for example Juventus (an Italian league team).
J_df = df[df['team1']=='Juventus']
```

In [6]: J_df.shape

Out[6]: (23, 23)

In [7]: J_df.head()

	_	• • • • • • • • • • • • • • • • • • • •										
Out[7]:		season	date	league_id	league	team1	team2	spi1	spi2	prob1	prob2	•••
	2534	2022	8/15/2022	1854	Italy Serie A	Juventus	Sassuolo	69.94	60.30	0.5443	0.2274	
	3009	2022	8/27/2022	1854	Italy Serie A	Juventus	AS Roma	70.03	73.60	0.3711	0.3461	
	3230	2022	8/31/2022	1854	Italy Serie A	Juventus	Spezia	69.79	46.93	0.6571	0.1278	
	3846	2022	9/11/2022	1854	Italy Serie A	Juventus	Salernitana	69.95	49.05	0.6402	0.1379	
	3936	2022	9/14/2022	1818	UEFA Champions League	Juventus	Benfica	68.94	76.93	0.3637	0.3661	

5 rows × 23 columns

```
In [8]: # Apply filter for the fields that I am interested in, which is team SPI during that s

df1 = J_df[['date','league','team1','team2','spi1','spi2','score1','score2']]

df1.shape

Out[8]: (23, 8)
```

Identify bad data

```
In [9]: # Check Last few rows of the data

df1.tail()
```

Out[9]:		date	league	team1	team2	spi1	spi2	score1	score2
	9797	4/1/2023	Italy Serie A	Juventus	Verona	72.3	58.27	NaN	NaN
	10542	4/23/2023	Italy Serie A	Juventus	Napoli	72.3	82.66	NaN	NaN
	10796	5/3/2023	Italy Serie A	Juventus	Lecce	72.3	55.08	NaN	NaN
	11078	5/14/2023	Italy Serie A	Juventus	Cremonese	72.3	48.93	NaN	NaN
	11374	5/28/2023	Italy Serie A	Juventus	AC Milan	72.3	72.19	NaN	NaN

It shows some missing values. These are match fixtures happening in future dates so there are no scores yet. Those data points need to be removed.

```
In [10]: # Drop N/As

df1 = df1.dropna()
 df1.shape

Out[10]: (14, 8)
```

Format data into a more readable form

```
# Check the format of data, sometimes the date is not in the format we want. It needs
In [11]:
          df1.dtypes
                     object
          date
Out[11]:
          league
                     object
          team1
                     object
          team2
                     object
          spi1
                    float64
                    float64
          spi2
                    float64
          score1
          score2
                    float64
          dtype: object
          df1['date'] = pd.to_datetime(df1['date'])
In [12]:
          # Plot the Juventus Soccor Power Index over time
In [13]:
          plt.figure(figsize=(10,5))
          sns.lineplot(data=df1, x="date", y="spi1")
          plt.show()
            73
            72
            71
            70
            69
            68
            67
                        2022-09
                                     2022-10
                                                   2022-11
                                                                 2022-12
                                                                               2023-01
                                                                                             2023-02
                                                       date
```

The drop on October 2022 is becasue the entire Juventus management resigned due to ongoing financial investigations. Meanwhile, Exor – the holding company which owns a majority

share in Juventus – have noted that they see Gianluca Ferrero as the man to replace Agnelli as club President.

Conduct Fuzzy Matching

```
# Plot the spi score of couple top teams. Here I only selected Juventus, Liverpool, Bo
In [14]:
          # couple other top clubs with great performance, since it's just for a simple illustra
          df2 = df[df['team1'].isin(['Juventus','Liverpool','Barcelona','Bayern Munich'])]
In [15]:
          # Clean the data
          df2 = df2[['date','league','team1','team2','spi1','spi2','score1','score2']]
          df2 = df2.dropna()
          df2['date'] = pd.to datetime(df2['date'])
          df2.shape
          (51, 8)
Out[15]:
In [16]:
          # Plot the performance of the top teams
          plt.figure(figsize=(10,5))
          sns.lineplot(data=df2, x="date", y="spi1", hue='team1')
          plt.show()
            95
            90
            85
                                                      team1
                                                     Barcelona
          등 80
                                                     Bayern Munich
                                                     Juventus
                                                     Liverpool
            75
            70
                        2022-09
                                      2022-10
                                                   2022-11
                                                                 2022-12
                                                                               2023-01
                                                                                            2023-02
                                                       date
```

Some Inferences so far: 1) Huge improvement observed for Liverpool during 2018 and consistency through 2020 2) Bayern Munich showing consistent performance 3) Barcelona performance has declined since 2017 4) Juventus has too much variations in their performance, specially since 2019

```
In [17]: df_I = df[df['league']=='Italy Serie A']
    df_I = df_I[['date','team1','team2','spi1','spi2','score1','score2']]
In [18]: df_I.head()
```

```
Out[18]:
                    date
                             team1
                                                  spi1
                                                       spi2 score1 score2
                                          team2
          2360 8/13/2022
                           AC Milan
                                         Udinese 78.31 57.94
                                                                4.0
                                                                       2.0
          2361 8/13/2022 Sampdoria
                                         Atalanta 52.95 73.01
                                                                0.0
                                                                       2.0
          2385 8/13/2022
                             Monza
                                          Torino 52.84 62.83
                                                                1.0
                                                                       2.0
          2390 8/13/2022
                              Lecce Internazionale 50.41 82.17
                                                                1.0
                                                                       2.0
          2483 8/14/2022
                          Fiorentina
                                      Cremonese 67.61 49.25
                                                                3.0
                                                                       2.0
          # Select the goal and goal lost for each team, rename the columns and stack them toget
In [19]:
          df_I1 = df_I[['date','team1','score1','score2']]
          df_I2 = df_I[['date','team2','score2','score1']]
          df_I1.columns=['date','team','offense','defense']
          df_I2.columns=['date','team','offense','defense']
          frames = [df I1,df I2]
In [20]:
          df_I3=pd.concat(frames)
          df I3.shape
          (760, 4)
Out[20]:
          # Calculate a simple offense and defense index for each team.
In [21]:
          df_score = df_I3.groupby(['team'],as_index=False).mean()
          df_score
In [22]:
```

Out[22]:

	team	offense	defense
0	AC Milan	1.850000	1.450000
1	AS Roma	1.315789	0.842105
2	Atalanta	1.950000	1.150000
3	Bologna	1.300000	1.500000
4	Cremonese	0.750000	1.750000
5	Empoli	0.950000	1.200000
6	Fiorentina	1.105263	1.315789
7	Internazionale	2.000000	1.300000
8	Juventus	1.500000	0.850000
9	Lazio	1.842105	0.789474
10	Lecce	0.950000	1.200000
11	Monza	1.250000	1.400000
12	Napoli	2.421053	0.736842
13	Salernitana	1.250000	1.900000
14	Sampdoria	0.400000	1.700000
15	Sassuolo	1.150000	1.550000
16	Spezia	0.850000	1.600000
17	Torino	1.050000	1.100000
18	Udinese	1.421053	1.105263
19	Verona	0.894737	1.631579

I want to put them into a scatterplot, so I want to fit them into a reasonable range. I will start with standarizing. I also multiplied defense index with -1, I want to make sure the higher score means better performance.

In [23]: ! pip install preprocessing

Requirement already satisfied: preprocessing in c:\users\basiab1\anaconda3\lib\site-p ackages (0.1.13)

Requirement already satisfied: sphinx-rtd-theme==0.2.4 in c:\users\basiab1\anaconda3 \lib\site-packages (from preprocessing) (0.2.4)

Requirement already satisfied: nltk==3.2.4 in c:\users\basiab1\anaconda3\lib\site-pac kages (from preprocessing) (3.2.4)

Requirement already satisfied: six in c:\users\basiab1\anaconda3\lib\site-packages (f rom nltk==3.2.4->preprocessing) (1.16.0)

```
WARNING: Ignoring invalid distribution -rotobuf (c:\users\basiab1\anaconda3\lib\site-packages)
```

In [27]: conda update --all

Collecting package metadata (current_repodata.json): ...working... done
Note: you may need to restart the kernel to use updated packages.
Solving environment: ...working...
Warning: 2 possible package resolutions (only showing differing packages):

- defaults/win-64::dask-2022.5.0-py39haa95532_0, defaults/win-64::dask-core-2022.5.0-py39haa95532_0, defaults/win-64::distributed-2022.5.0-py39haa95532_0, defaults/win-64::jupyter_client-7.4.8-py39haa95532_0, defaults/win-64::tornado-6.2-py39h2bbff1b_0

- defaults/win-64::dask-2022.7.0-py39haa95532_0, defaults/win-64::dask-core-2022.7.0-py39haa95532_0, defaults/win-64::distributed-2022.7.0-py39haa95532_0, defaults/win-64::jupyter_client-7.3.4-py39haa95532_0, defaults/win-64::tornado-6.1-py39h2bbff1b_0d one

Package Plan

environment location: C:\Users\basiab1\Anaconda3

The following packages will be downloaded:

package	build		
_anaconda_depends-2022.10	py39_2	68	KB
anaconda-client-1.11.0	py39haa95532_0	165	KB
anyio-3.5.0	py39haa95532_0	167	KB
argon2-cffi-21.3.0	pyhd3eb1b0_0	15	ΚB
argon2-cffi-bindings-21.2.0	py39h2bbff1b_0	36	KB
arrow-1.2.3	py39haa95532_0	145	ΚB
astroid-2.11.7	py39haa95532_0	341	KΒ
astropy-5.1	py39h080aedc_0	6.4	MB
attrs-22.1.0	py39haa95532_0	84	KB
automat-20.2.0	py_0	31	KB
autopep8-1.6.0	pyhd3eb1b0_1	43	KB
babel-2.11.0	py39haa95532_0	6.8	MB
backports-1.1	pyhd3eb1b0_0	4	KB
bcrypt-3.2.0	py39h2bbff1b_1	37	KB
beautifulsoup4-4.11.1	py39haa95532_0	190	KB
bitarray-2.5.1	py39h2bbff1b_0	157	KB
bkcharts-0.2	py39haa95532_1	132	KB
black-22.6.0	py39haa95532_0	244	KB

WARNING conda.gateways.disk.delete:unlink_or_rename_to_trash(143): Could not remove o r rename C:\Users\basiab1\Anaconda3\Lib\site-packages\matplotlib\mpl-data\fonts\ttf\D ejaVuSans.ttf. Please remove this file manually (you may need to reboot to free file handles)

71044	- Basit_Beedoo_vveeko_i Tojeetz	
bleach-4.1.0	pyhd3eb1b0_0	123 KB
blosc-1.21.3	h6c2663c_0	86 KB
bokeh-2.4.3	py39haa95532_0	7.6 MB
boto3-1.24.28	py39haa95532_0	114 KB
botocore-1.27.59	py39haa95532_0	5.7 MB
bottleneck-1.3.5	py39h080aedc_0	106 KB
brotli-1.0.9	h2bbff1b_7	18 KB
brotli-bin-1.0.9	h2bbff1b_7	19 KB
ca-certificates-2023.01.10	haa95532_0	121 KB
cffi-1.15.1	py39h2bbff1b_3	238 KB
cfitsio-3.470	h2bbff1b_7	518 KB
click-8.0.4	py39haa95532_0	155 KB
colorama-0.4.6	py39haa95532_0	32 KB
colorcet-3.0.1	py39haa95532_0	1.9 MB
comm-0.1.2	py39haa95532_0	14 KB
conda-23.1.0	py39haa95532_0	946 KB
conda-build-3.23.3	py39haa95532_0	576 KB
conda-content-trust-0.1.3	py39haa95532_0	86 KB
conda-env-2.6.0	haa95532_1	3 KB
conda-package-handling-2.0.2	_	286 KB
conda-package-streaming-0.7		27 KB
conda-repo-cli-1.0.27	py39haa95532_0	130 KB
conda-token-0.4.0	pyhd3eb1b0_0	13 KB
constantly-15.1.0 contourpy-1.0.5	pyh2b92418_0 py39h59b6b97_0	10 KB 159 KB
cookiecutter-1.7.3	pyhd3eb1b0_0	79 KB
cryptography-38.0.4	py39h21b164f_0	1.0 MB
cssselect-1.1.0	pyhd3eb1b0_0	18 KB
curl-7.87.0	h2bbff1b_0	145 KB
cycler-0.11.0	pyhd3eb1b0_0	12 KB
cython-0.29.32	py39hd77b12b_0	1.7 MB
cytoolz-0.12.0	py39h2bbff1b_0	288 KB
daal4py-2021.6.0	py39h757b272_1	8.0 MB
dal-2021.6.0	h59b6b97_874	46.5 MB
dask-2022.5.0	py39haa95532_0	20 KB
dask-core-2022.5.0	py39haa95532_0	1.6 MB
datashader-0.14.3	py39haa95532_0	16.8 MB
datashape-0.5.4	py39haa95532_1	103 KB
debugpy-1.5.1	py39hd77b12b_0	2.6 MB
decorator-5.1.1	pyhd3eb1b0_0	12 KB
dill-0.3.6	py39haa95532_0	186 KB
distributed-2022.5.0	py39haa95532_0	1.1 MB
docutils-0.18.1	py39haa95532_3	666 KB
entrypoints-0.4	py39haa95532_0	17 KB
fftw-3.3.9 filelock-3.9.0	h2bbff1b_1	672 KB 19 KB
flake8-4.0.1	py39haa95532_0 pyhd3eb1b0_1	13 KB
flask-2.2.2	py103e0100_1 py39haa95532_0	165 KB
freetype-2.12.1	ha860e81_0	490 KB
gensim-4.3.0	py39hd77b12b_0	21.6 MB
giflib-5.2.1	h8cc25b3 1	81 KB
glib-2.69.1	h5dc1a3c 2	1.8 MB
greenlet-2.0.1	py39hd77b12b_0	179 KB
gst-plugins-base-1.18.5	h9e645db_0	1.7 MB
gstreamer-1.18.5	hd78058f_0	1.7 MB
h5py-3.7.0	py39h3de5c98_0	823 KB
hdf5-1.10.6	h1756f20_1	7.9 MB
holoviews-1.15.3	py39haa95532_0	4.4 MB
hvplot-0.8.2	py39haa95532_0	3.1 MB
hyperlink-21.0.0	pyhd3eb1b0_0	70 KB

7 lbdc	"Basit_Beedood_weeko_i Tojeot	2_1/1110010110_0	
icc_rt-2022.1.0	h6049295_2	6.5 MB	
idna-3.4	py39haa95532_0	93 KB	
imagecodecs-2021.8.26	py39hc0a7faf_1	6.0 MB	
imageio-2.19.3	py39haa95532_0	3.3 MB	
imagesize-1.4.1	py39haa95532_0	14 KB	
importlib-metadata-4.11.3	py39haa95532_0	41 KB	
<pre>importlib_metadata-4.11.3</pre>	hd3eb1b0_0	12 KB	
incremental-21.3.0	pyhd3eb1b0_0	17 KB	
intake-0.6.6	py39haa95532_0	221 KB	
ipykernel-6.19.2	py39hd4e2768_0	218 KB	
ipython-7.31.1	py39haa95532_1	1024 KB	
itemadapter-0.3.0	pyhd3eb1b0_0	13 KB	
itemloaders-1.0.4	pyhd3eb1b0_1	14 KB	
jedi-0.18.1	py39haa95532_1	982 KB	
jellyfish-0.9.0	py39h2bbff1b_0	46 KB	
jinja2-3.1.2	py39haa95532_0	211 KB	
jinja2-time-0.2.0	pyhd3eb1b0_3	9 KB	
jmespath-0.10.0	pyhd3eb1b0_0	22 KB	
joblib-1.1.1	py39haa95532_0	383 KB	
jpeg-9e	h2bbff1b_0	292 KB	
jq-1.6	haa95532_1	992 KB	
jsonschema-4.16.0	py39haa95532_0	143 KB	
jupyter-1.0.0	py39haa95532_8	7 KB	
jupyter_client-7.4.8	py39haa95532_0	227 KB	
jupyter_console-6.4.4	py39haa95532_0	62 KB	
jupyter_core-5.1.1	py39haa95532_0	107 KB	
jupyter_server-1.23.4	py39haa95532_0	399 KB	
jupyterlab-3.5.3	py39haa95532_0	4.0 MB	
jupyterlab_server-2.16.5	py39haa95532_0	81 KB	
keyring-23.4.0	py39haa95532_0	72 KB	
kiwisolver-1.4.4	py39hd77b12b_0	60 KB	
libarchive-3.6.2	hebabd0d_0	1.8 MB	
libbrotlicommon-1.0.9	h2bbff1b_7	71 KB	
libbrotlidec-1.0.9	h2bbff1b_7	30 KB	
libbrotlienc-1.0.9	h2bbff1b_7	233 KB	
libclang-12.0.0	default_h627e005_2		
libcurl-7.87.0	h86230a5_0	324 KB	
libffi-3.4.2	hd77b12b_6	109 KB	
libiconv-1.16	h2bbff1b_2	651 KB	
liblief-0.12.3	hd77b12b_0	2.4 MB	
libogg-1.3.5	h2bbff1b_1	33 KB	
libsodium-1.0.18	h62dcd97_0	477 KB	
libssh2-1.10.0	hcd4344a_0	222 KB	
libtiff-4.5.0	h6c2663c_1	1.2 MB	
libvorbis-1.3.7	he774522_0	202 KB	
libwebp-1.2.4	h2bbff1b_0	67 KB	
libwebp-base-1.2.4	h2bbff1b_0	279 KB	
libxm12-2.9.14	h0ad7f3c_0	1.5 MB	
libxslt-1.1.35	h2bbff1b_0	407 KB	
llvmlite-0.39.1	py39h23ce68f_0	13.3 MB	
locket-1.0.0	py39haa95532_0	13 KB	
lxml-4.9.1	py39h1985fb9_0	936 KB	
1z4-3.1.3	py39h2bbff1b_0	96 KB	
1z4-c-1.9.4	h2bbff1b_0	143 KB	2 A MD
m2-msys2-runtime-2.5.0.1708		3 80 KB	3.0 MB
m2-patch-2.7.5 markdown-3.4.1	2 nv30haa05532 0	89 KB	
markupsafe-2.1.1	py39haa95532_0 py39h2bbff1b_0	148 KB 26 KB	
matplotlib-3.6.2	py39haa95532 0	20 KB 9 KB	
matplotlib-base-3.6.2	py39h1094b8e_0	6.5 MB	
machinciin-nase-3.0.7	hassiltas4086_a	סויו כ.ס	

Abdu	i basit_D3C000_vveeko_Fioj	ectz_ivillestorie_	_3
<pre>matplotlib-inline-0.1.6</pre>	py39haa95532_0	17	KB
mccabe-0.7.0	pyhd3eb1b0_0		KB
menuinst-1.4.19	py39h59b6b97_0	94	
msgpack-python-1.0.3	py39h59b6b97_0	75	
mypy_extensions-0.4.3	py39haa95532_1	10	
navigator-updater-0.3.0	py39haa95532_0	2.2	
nbclassic-0.4.8	py39haa95532_0	5.9	
nbclient-0.5.13	py39haa95532_0	108	
nbconvert-6.5.4	py39haa95532_0	537	
nbformat-5.7.0	py39haa95532_0	152	
nest-asyncio-1.5.6 networkx-2.8.4	py39haa95532_0	_	KB
	py39haa95532_0	2.2	
nltk-3.7 nose-1.3.7	pyhd3eb1b0_0 pyhd3eb1b0_1008	1010 142	
notebook-6.5.2			
notebook-shim-0.2.2	py39haa95532_0 py39haa95532_0	538	KB
numba-0.56.4	py39hf11a4ad_0	4.0	
numexpr-2.8.4	py39h111a4au_0 py39h5b0cc5e_0	127	
numpy-1.23.5	py39h3b0cc3e_0 py39h3b20f71_0		KB
numpy-1.23.5	py39h4da318b_0	6.0	
numpydoc-1.5.0	py39haa95532_0	91	
openpyx1-3.0.10	py39h2bbff1b_0	468	
packaging-22.0	py39haa95532_0		KB
pandas-1.5.2	py39hf11a4ad_0	10.5	
pandocfilters-1.5.0	pyhd3eb1b0_0		KB
panel-0.14.2	py39haa95532_0	12.3	
param-1.12.3	py39haa95532_0	149	
paramiko-2.8.1	pyhd3eb1b0_0	139	
parsel-1.6.0	py39haa95532_0	351	
parso-0.8.3	pyhd3eb1b0_0	70	
partd-1.2.0	pyhd3eb1b0_1	18	
pathlib-1.0.1	pyhd3eb1b0_1	17	
pathspec-0.10.3	py39haa95532_0	49	
patsy-0.5.3	py39haa95532_0	289	KB
pcre-8.45	hd77b12b_0	382	KB
pep8-1.7.1	py39haa95532 1	69	KB
pillow-9.3.0	py39hd77b12b_2	992	KB
pip-22.3.1	py39haa95532_0	2.7	MB
pkginfo-1.8.3	py39haa95532_0	62	KB
platformdirs-2.5.2	py39haa95532_0	24	ΚB
plotly-5.9.0	py39haa95532_0	4.1	MB
pluggy-1.0.0	py39haa95532_1	29	ΚB
<pre>prometheus_client-0.14.1</pre>	py39haa95532_0	89	ΚB
prompt-toolkit-3.0.36	py39haa95532_0	565	ΚB
<pre>prompt_toolkit-3.0.36</pre>	hd3eb1b0_0	5	ΚB
protego-0.1.16	py_0	2.2	MB
psutil-5.9.0	py39h2bbff1b_0	349	ΚB
py-1.11.0	pyhd3eb1b0_0	76	ΚB
py-lief-0.12.3	py39hd77b12b_0	2.0	MB
pyasn1-0.4.8	pyhd3eb1b0_0	54	ΚB
pyasn1-modules-0.2.8	py_0	72	
pycodestyle-2.8.0	pyhd3eb1b0_0	41	
pycosat-0.6.4	py39h2bbff1b_0	74	
pycparser-2.21	pyhd3eb1b0_0	94	
pyct-0.5.0	py39haa95532_0	49	
pycurl-7.45.1	py39hcd4344a_0	71	
pydispatcher-2.0.5	py39haa95532_2		KB
pydocstyle-6.3.0	py39haa95532_0		KB
pyflakes-2.4.0	pyhd3eb1b0_0		KB
pygments-2.11.2	pyhd3eb1b0_0	759	KB

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pyhamcrest-2.0.2	pyhd3eb1b0_2	31 KB
pyjwt-2.4.0	py39haa95532_0	38 KB
pylint-2.14.5	py39haa95532_0	652 KB
pynacl-1.5.0	py39h8cc25b3_0	1.2 MB
pyodbc-4.0.34	py39hd77b12b_0	64 KB
pyopenssl-22.0.0	pyhd3eb1b0_0	50 KB
pyparsing-3.0.9	py39haa95532_0	152 KB
pyqt-5.15.7	py39hd77b12b_0	3.7 MB
pyqt5-sip-12.11.0	py39hd77b12b_0	75 KB
pyqtwebengine-5.15.7	py39hd77b12b_0	123 KB
pytables-3.7.0	py39h388bc9b_1	2.8 MB
pytest-7.1.2	py39haa95532_0	479 KB
python-3.9.16	h6244533_0	19.4 MB
python-fastjsonschema-2.16.2		231 KB
python-lsp-black-1.2.1	py39haa95532_0	14 KB
python-lsp-server-1.5.0	py39haa95532_0	106 KB
python-snappy-0.6.1	py39hd77b12b_0	33 KB
pytz-2022.7	py39haa95532_0	210 KB
pyviz_comms-2.0.2	pyhd3eb1b0_0	23 KB
pywavelets-1.4.1	py39h2bbff1b_0	3.5 MB
pywin32-305	py39h2bbff1b_0	10.7 MB
pywinpty-2.0.2	py39h5da7b33_0	200 KB
pyzmq-23.2.0	py39hd77b12b_0	404 KB
qstylizer-0.2.2	py39haa95532_0	30 KB 9 KB
qt-5.15.7 qt-main-5.15.2	haa95532_0 he8e5bd7_7	50.0 MB
qt-webengine-5.15.9	hb9a9bb5_5	48.9 MB
qtawesome-1.2.2	py39haa95532_0	1.6 MB
qtconsole-5.3.2	py39haa95532_0	202 KB
qtpy-2.2.0	py39haa95532_0	106 KB
qtwebkit-5.212	h3ad3cdb 4	10.3 MB
queuelib-1.5.0	py39haa95532 0	259 KB
regex-2022.7.9	py39h2bbff1b_0	307 KB
requests-2.28.1	py39haa95532_0	99 KB
requests-file-1.5.1	pyhd3eb1b0_0	8 KB
rope-0.22.0	pyhd3eb1b0_0	129 KB
rtree-1.0.1	py39h2eaa2aa_0	49 KB
ruamel.yaml-0.17.21	py39h2bbff1b_0	174 KB
ruamel.yaml.clib-0.2.6	py39h2bbff1b_1	101 KB
ruamel_yaml-0.17.21	py39h2bbff1b_0	190 KB
s3transfer-0.6.0	py39haa95532_0	110 KB
scikit-image-0.19.3	py39hd77b12b_1	10.0 MB
scikit-learn-1.0.2	py39hf11a4ad_1	5.1 MB
scikit-learn-intelex-2021.6.	, _	75 KB
scipy-1.9.3	py39he11b74f_0	18.0 MB
scrapy-2.6.2 seaborn-0.12.2	py39haa95532_0	387 KB
service_identity-18.1.0	py39haa95532_0 pyhd3eb1b0_1	483 KB 13 KB
setuptools-65.6.3	py39haa95532_0	1.1 MB
sip-6.6.2	py39hd77b12b_0	434 KB
six-1.16.0	pyhd3eb1b0_1	18 KB
smart_open-5.2.1	py39haa95532 0	81 KB
snappy-1.1.9	h6c2663c_0	2.2 MB
snowballstemmer-2.2.0	pyhd3eb1b0_0	61 KB
soupsieve-2.3.2.post1	py39haa95532_0	66 KB
sphinx-5.0.2	py39haa95532_0	1.7 MB
spyder-5.3.3	py39haa95532_0	9.4 MB
spyder-kernels-2.3.3	py39haa95532_0	110 KB
sqlalchemy-1.4.39	py39h2bbff1b_0	1.9 MB
sqlite-3.40.1	h2bbff1b_0	889 KB

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statsmodels-0.13.5	py39h080aedc_0	9.6 1	MB
sympy-1.11.1	py39haa95532_0	11.7	MB
tabulate-0.8.10	py39haa95532_0	62	KΒ
tbb-2021.6.0	h59b6b97_1	148	KΒ
tbb4py-2021.6.0	py39h59b6b97_1	68	KΒ
tenacity-8.0.1	py39haa95532_1	34	KΒ
terminado-0.17.1	py39haa95532_0	32	KΒ
testpath-0.6.0	py39haa95532_0	85	KΒ
tinycss2-1.2.1	py39haa95532_0	40	KΒ
tk-8.6.12	h2bbff1b_0	3.1 /	MB
tldextract-3.2.0	pyhd3eb1b0_0	81	KΒ
tomli-2.0.1	py39haa95532_0	25	KΒ
tomlkit-0.11.1	py39haa95532_0	72	KΒ
toolz-0.12.0	py39haa95532_0	106	KΒ
tornado-6.2	py39h2bbff1b_0	609	KΒ
tqdm-4.64.1	py39haa95532_0	143	KΒ
traitlets-5.7.1	py39haa95532_0	205	KΒ
twisted-22.2.0	py39h2bbff1b_1	4.2	MB
twisted-iocpsupport-1.0.2	py39h2bbff1b_0	46	KΒ
typing-extensions-4.4.0	py39haa95532_0	9 1	KΒ
tzdata-2022g	h04d1e81_0	114	KΒ
ujson-5.4.0	py39hd77b12b_0	44	KΒ
urllib3-1.26.14	py39haa95532_0	193	KΒ
w3lib-1.21.0	pyhd3eb1b0_0	22	KΒ
watchdog-2.1.6	py39haa95532_0	110	KΒ
websocket-client-0.58.0	py39haa95532_4	69 1	KΒ
werkzeug-2.2.2	py39haa95532_0	340	KΒ
whatthepatch-1.0.2	py39haa95532_0	23	KΒ
wheel-0.37.1	pyhd3eb1b0_0	33	KΒ
widgetsnbextension-3.5.2	py39haa95532_0	646	KΒ
wrapt-1.14.1	py39h2bbff1b_0	49	KΒ
xarray-2022.11.0	py39haa95532_0	1.6 /	MB
xlsxwriter-3.0.3	pyhd3eb1b0_0	113	KΒ
xlwings-0.27.15	py39haa95532_0	1.1	MB
xz-5.2.10	h8cc25b3_1	520	KΒ
zeromq-4.3.4	hd77b12b_0	4.2	MB
zict-2.1.0	py39haa95532_0	20 1	KΒ
zipp-3.11.0	py39haa95532_0	20 1	KΒ
zlib-1.2.13	h8cc25b3_0	113	KΒ
zstandard-0.18.0	py39h2bbff1b_0	310	KΒ
zstd-1.5.2	h19a0ad4_0	509 1	KB

The following NEW packages will be INSTALLED:

```
argon2-cffi-bindi~ pkgs/main/win-64::argon2-cffi-bindings-21.2.0-py39h2bbff1b 0
                   pkgs/main/noarch::automat-20.2.0-py 0
automat
                   pkgs/main/win-64::boto3-1.24.28-py39haa95532 0
boto3
botocore
                   pkgs/main/win-64::botocore-1.27.59-py39haa95532_0
brotli-bin
                   pkgs/main/win-64::brotli-bin-1.0.9-h2bbff1b 7
                   pkgs/main/win-64::colorcet-3.0.1-py39haa95532 0
colorcet
                   pkgs/main/win-64::comm-0.1.2-py39haa95532_0
comm
conda-package-str~ pkgs/main/win-64::conda-package-streaming-0.7.0-py39haa95532_0
                   pkgs/main/noarch::constantly-15.1.0-pyh2b92418_0
constantly
contourpy
                   pkgs/main/win-64::contourpy-1.0.5-py39h59b6b97 0
                   pkgs/main/noarch::cssselect-1.1.0-pyhd3eb1b0 0
cssselect
                   pkgs/main/win-64::datashader-0.14.3-py39haa95532_0
datashader
datashape
                   pkgs/main/win-64::datashape-0.5.4-py39haa95532 1
                   pkgs/main/win-64::dill-0.3.6-py39haa95532_0
dill
```

Total:

548.3 MB

```
pkgs/main/win-64::fftw-3.3.9-h2bbff1b 1
fftw
                   pkgs/main/win-64::gensim-4.3.0-py39hd77b12b 0
gensim
glib
                   pkgs/main/win-64::glib-2.69.1-h5dc1a3c 2
gst-plugins-base
                   pkgs/main/win-64::gst-plugins-base-1.18.5-h9e645db 0
gstreamer
                   pkgs/main/win-64::gstreamer-1.18.5-hd78058f_0
holoviews
                   pkgs/main/win-64::holoviews-1.15.3-py39haa95532 0
hvplot
                   pkgs/main/win-64::hvplot-0.8.2-py39haa95532 0
hyperlink
                   pkgs/main/noarch::hyperlink-21.0.0-pyhd3eb1b0 0
                   pkgs/main/noarch::incremental-21.3.0-pyhd3eb1b0 0
incremental
intake
                   pkgs/main/win-64::intake-0.6.6-py39haa95532 0
itemadapter
                   pkgs/main/noarch::itemadapter-0.3.0-pyhd3eb1b0 0
itemloaders
                   pkgs/main/noarch::itemloaders-1.0.4-pyhd3eb1b0 1
jellyfish
                   pkgs/main/win-64::jellyfish-0.9.0-py39h2bbff1b 0
jmespath
                   pkgs/main/noarch::jmespath-0.10.0-pyhd3eb1b0_0
jq
                   pkgs/main/win-64::jq-1.6-haa95532 1
libbrotlicommon
                   pkgs/main/win-64::libbrotlicommon-1.0.9-h2bbff1b 7
libbrotlidec
                   pkgs/main/win-64::libbrotlidec-1.0.9-h2bbff1b 7
libbrotlienc
                   pkgs/main/win-64::libbrotlienc-1.0.9-h2bbff1b 7
libclang
                   pkgs/main/win-64::libclang-12.0.0-default h627e005 2
libffi
                   pkgs/main/win-64::libffi-3.4.2-hd77b12b 6
libogg
                   pkgs/main/win-64::libogg-1.3.5-h2bbff1b 1
libsodium
                   pkgs/main/win-64::libsodium-1.0.18-h62dcd97_0
libvorbis
                   pkgs/main/win-64::libvorbis-1.3.7-he774522 0
libwebp-base
                   pkgs/main/win-64::libwebp-base-1.2.4-h2bbff1b_0
                   pkgs/main/win-64::lz4-3.1.3-py39h2bbff1b 0
m2-msys2-runtime
                   pkgs/msys2/win-64::m2-msys2-runtime-2.5.0.17080.65c939c-3
m2-patch
                   pkgs/msys2/win-64::m2-patch-2.7.5-2
                   pkgs/main/win-64::markdown-3.4.1-py39haa95532 0
markdown
                   pkgs/main/win-64::notebook-shim-0.2.2-py39haa95532 0
notebook-shim
                   pkgs/main/win-64::panel-0.14.2-py39haa95532 0
panel
param
                   pkgs/main/win-64::param-1.12.3-py39haa95532 0
                   pkgs/main/win-64::parsel-1.6.0-py39haa95532_0
parsel
pathlib
                   pkgs/main/noarch::pathlib-1.0.1-pyhd3eb1b0 1
                   pkgs/main/win-64::pcre-8.45-hd77b12b 0
pcre
platformdirs
                   pkgs/main/win-64::platformdirs-2.5.2-py39haa95532 0
                   pkgs/main/win-64::plotly-5.9.0-py39haa95532 0
plotly
                   pkgs/main/noarch::protego-0.1.16-py_0
protego
                   pkgs/main/noarch::pyasn1-0.4.8-pyhd3eb1b0 0
pyasn1
pyasn1-modules
                   pkgs/main/noarch::pyasn1-modules-0.2.8-py 0
                   pkgs/main/win-64::pyct-0.5.0-py39haa95532_0
pyct
                   pkgs/main/win-64::pydispatcher-2.0.5-py39haa95532 2
pydispatcher
                   pkgs/main/noarch::pyhamcrest-2.0.2-pyhd3eb1b0 2
pyhamcrest
pyqt5-sip
                   pkgs/main/win-64::pyqt5-sip-12.11.0-py39hd77b12b 0
pyqtwebengine
                   pkgs/main/win-64::pyqtwebengine-5.15.7-py39hd77b12b 0
python-fastjsonsc~
                   pkgs/main/win-64::python-fastjsonschema-2.16.2-py39haa95532_0
python-snappy
                   pkgs/main/win-64::python-snappy-0.6.1-py39hd77b12b 0
pyviz comms
                   pkgs/main/noarch::pyviz comms-2.0.2-pyhd3eb1b0 0
at-main
                   pkgs/main/win-64::qt-main-5.15.2-he8e5bd7 7
qt-webengine
                   pkgs/main/win-64::qt-webengine-5.15.9-hb9a9bb5 5
qtwebkit
                   pkgs/main/win-64::qtwebkit-5.212-h3ad3cdb_4
queuelib
                   pkgs/main/win-64::queuelib-1.5.0-py39haa95532 0
requests-file
                   pkgs/main/noarch::requests-file-1.5.1-pyhd3eb1b0 0
ruamel.yaml
                   pkgs/main/win-64::ruamel.yaml-0.17.21-py39h2bbff1b 0
ruamel.yaml.clib
                   pkgs/main/win-64::ruamel.yaml.clib-0.2.6-py39h2bbff1b 1
s3transfer
                   pkgs/main/win-64::s3transfer-0.6.0-py39haa95532 0
                   pkgs/main/win-64::scrapy-2.6.2-py39haa95532 0
scrapy
service identity
                   pkgs/main/noarch::service identity-18.1.0-pyhd3eb1b0 1
smart open
                   pkgs/main/win-64::smart_open-5.2.1-py39haa95532_0
tabulate
                   pkgs/main/win-64::tabulate-0.8.10-py39haa95532 0
                   pkgs/main/win-64::tenacity-8.0.1-py39haa95532_1
tenacity
```

```
Abdul Basit_DSC680_Week8_Project2_Milestone_3
  tinycss2
                     pkgs/main/win-64::tinycss2-1.2.1-py39haa95532 0
  tldextract
                     pkgs/main/noarch::tldextract-3.2.0-pyhd3eb1b0 0
  tomli
                     pkgs/main/win-64::tomli-2.0.1-py39haa95532 0
                     pkgs/main/win-64::tomlkit-0.11.1-py39haa95532 0
  tomlkit
                     pkgs/main/win-64::twisted-22.2.0-py39h2bbff1b 1
  twisted
  twisted-iocpsuppo~
                     pkgs/main/win-64::twisted-iocpsupport-1.0.2-py39h2bbff1b 0
  typing-extensions
                     pkgs/main/win-64::typing-extensions-4.4.0-py39haa95532 0
  w3lib
                     pkgs/main/noarch::w3lib-1.21.0-pyhd3eb1b0_0
                     pkgs/main/win-64::websocket-client-0.58.0-py39haa95532_4
  websocket-client
                     pkgs/main/win-64::whatthepatch-1.0.2-py39haa95532 0
  whatthepatch
                     pkgs/main/win-64::xarray-2022.11.0-py39haa95532 0
  xarray
  zeroma
                     pkgs/main/win-64::zeromq-4.3.4-hd77b12b 0
                     pkgs/main/win-64::zstandard-0.18.0-py39h2bbff1b_0
  zstandard
The following packages will be REMOVED:
  anaconda-project-0.10.1-pyhd3eb1b0 0
  argh-0.26.2-py39haa95532_0
  asn1crypto-1.4.0-py 0
  async generator-1.10-pyhd3eb1b0 0
  backports.shutil get terminal size-1.0.0-pyhd3eb1b0 3
  boto-2.49.0-py39haa95532_0
  cached-property-1.5.2-py 0
  conda-pack-0.6.0-pyhd3eb1b0 0
  contextlib2-0.6.0.post1-pyhd3eb1b0 0
  dataclasses-0.8-pyh6d0b6a4_7
  fastcache-1.1.0-py39h196d8e1_0
  get terminal size-1.0.0-h38e98db 0
  gevent-21.8.0-py39h2bbff1b 1
  html5lib-1.1-pyhd3eb1b0_0
  krb5-1.19.2-h5b6d351 0
  m2w64-gcc-libgfortran-5.3.0-6
  m2w64-gcc-libs-5.3.0-7
  m2w64-gcc-libs-core-5.3.0-7
  m2w64-gmp-6.1.0-2
  more-itertools-8.10.0-pyhd3eb1b0 0
  path-16.0.0-py39haa95532 0
  path.py-12.5.0-hd3eb1b0 0
  pathlib2-2.3.6-py39haa95532 2
  pyreadline-2.1-py39haa95532_1
  simplegeneric-0.8.1-py39haa95532 2
  singledispatch-3.7.0-pyhd3eb1b0 1001
  sphinxcontrib-1.0-py39haa95532 1
  sphinxcontrib-websupport-1.2.4-py 0
  tinycss-0.4-pyhd3eb1b0_1002
  typed-ast-1.4.3-py39h2bbff1b_1
  unicodecsv-0.14.1-py39haa95532 0
  whichcraft-0.6.1-pyhd3eb1b0 0
  xlwt-1.3.0-py39haa95532 0
  xmltodict-0.12.0-pyhd3eb1b0_0
  zope.event-4.5.0-py39haa95532 0
The following packages will be UPDATED:
  _anaconda_depends
                                              2021.11-py39_0 --> 2022.10-py39_2
  anaconda-client
                                        1.9.0-py39haa95532 0 --> 1.11.0-py39haa95532 0
                                        2.2.0-py39haa95532_2 --> 3.5.0-py39haa95532_0
  anyio
                     pkgs/main/win-64::argon2-cffi-20.1.0-~ --> pkgs/main/noarch::arg
  argon2-cffi
```

on2-cffi-21.3.0-pyhd3eb1b0_0

0.13.1-py39haa95532_0 --> 1.2.3-py39haa95532_0

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2.6.6-py39haa95532 0 --> 2.11.7-py39haa95532 0
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  astropy
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rs-22.1.0-py39haa95532_0
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  autopep8
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el-2.11.0-py39haa95532 0
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                                           1.0-pyhd3eb1b0 2 --> 1.1-pyhd3eb1b0 0
  bcrypt
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                     pkgs/main/noarch::beautifulsoup4-4.10~ --> pkgs/main/win-64::bea
 beautifulsoup4
utifulsoup4-4.11.1-py39haa95532 0
  bitarray
                                       2.3.0-py39h2bbff1b 1 --> 2.5.1-py39h2bbff1b 0
  bkcharts
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ck-22.6.0-py39haa95532 0
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  bleach
 blosc
                                          1.21.0-h19a0ad4 0 --> 1.21.3-h6c2663c 0
  bokeh
                                       2.4.1-py39haa95532_0 --> 2.4.3-py39haa95532_0
  bottleneck
                                       1.3.2-py39h7cc1a96 1 --> 1.3.5-py39h080aedc 0
  brotli
                                           1.0.9-ha925a31 2 --> 1.0.9-h2bbff1b 7
  ca-certificates
                                      2022.10.11-haa95532 0 --> 2023.01.10-haa95532 0
  cffi
                                      1.14.6-py39h2bbff1b_0 --> 1.15.1-py39h2bbff1b_3
  cfitsio
                                           3.470-he774522 6 --> 3.470-h2bbff1b 7
                     pkgs/main/noarch::click-8.0.3-pyhd3eb~ --> pkgs/main/win-64::cli
  click
ck-8.0.4-py39haa95532 0
                     pkgs/main/noarch::colorama-0.4.4-pyhd~ --> pkgs/main/win-64::col
  colorama
orama-0.4.6-py39haa95532_0
                                      4.12.0-py39haa95532 0 --> 23.1.0-py39haa95532 0
  conda
                                      3.21.6-py39haa95532 0 --> 3.23.3-py39haa95532 0
  conda-build
  conda-content-tru~ pkgs/main/noarch::conda-content-trust~ --> pkgs/main/win-64::con
da-content-trust-0.1.3-py39haa95532 0
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                                       1.7.3-py39h8cc25b3_1 --> 2.0.2-py39haa95532_0
                     pkgs/main/noarch::conda-repo-cli-1.0.~ --> pkgs/main/win-64::con
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  curl
  cycler
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ler-0.11.0-pyhd3eb1b0 0
                                     0.29.24-py39h604cdb4 0 --> 0.29.32-py39hd77b12b
  cython
0
  cvtoolz
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                                    2021.3.0-py39h757b272 0 --> 2021.6.0-py39h757b272
  daal4py
_1
                                      2021.3.0-haa95532 564 --> 2021.6.0-h59b6b97 874
 dal
  dask
                     pkgs/main/noarch::dask-2021.10.0-pyhd~ --> pkgs/main/win-64::das
k-2022.5.0-py39haa95532 0
  dask-core
                     pkgs/main/noarch::dask-core-2021.10.0~ --> pkgs/main/win-64::das
k-core-2022.5.0-py39haa95532_0
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                                       1.4.1-py39hd77b12b 0 --> 1.5.1-py39hd77b12b 0
  decorator
                                         5.1.0-pyhd3eb1b0 0 --> 5.1.1-pyhd3eb1b0 0
  distributed
                                   2021.10.0-py39haa95532 0 --> 2022.5.0-py39haa95532
_0
  docutils
                                      0.17.1-py39haa95532_1 --> 0.18.1-py39haa95532_3
                                         0.3-py39haa95532 0 --> 0.4-py39haa95532 0
 entrypoints
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  filelock
elock-3.9.0-py39haa95532 0
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                                         3.9.2-pyhd3eb1b0 0 --> 4.0.1-pyhd3eb1b0 1
  flask
                     pkgs/main/noarch::flask-1.1.2-pyhd3eb~ --> pkgs/main/win-64::fla
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sk-2.2.2-py39haa95532 0
 freetype
                                          2.10.4-hd328e21 0 --> 2.12.1-ha860e81 0
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                                       1.1.1-py39hd77b12b 0 --> 2.0.1-py39hd77b12b 0
  greenlet
                                       3.2.1-py39h3de5c98 0 --> 3.7.0-py39h3de5c98 0
  h5py
  hdf5
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  icc rt
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                     pkgs/main/noarch::idna-3.2-pyhd3eb1b0~ --> pkgs/main/win-64::idn
  idna
a-3.4-py39haa95532 0
  imagecodecs
                                   2021.8.26-py39ha1f97ea 0 --> 2021.8.26-py39hc0a7fa
f_1
  imageio
                     pkgs/main/noarch::imageio-2.9.0-pyhd3~ --> pkgs/main/win-64::ima
geio-2.19.3-py39haa95532 0
                     pkgs/main/noarch::imagesize-1.2.0-pyh~ --> pkgs/main/win-64::ima
  imagesize
gesize-1.4.1-pv39haa95532 0
  importlib-metadata
                                       4.8.1-py39haa95532 0 --> 4.11.3-py39haa95532 0
  importlib metadata
                                           4.8.1-hd3eb1b0 0 --> 4.11.3-hd3eb1b0 0
                                       6.4.1-py39haa95532_1 --> 6.19.2-py39hd4e2768_0
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  ipython
                                      7.29.0-py39hd4e2768 0 --> 7.31.1-py39haa95532 1
  iedi
                                      0.18.0-py39haa95532 1 --> 0.18.1-py39haa95532 1
                     pkgs/main/noarch::jinja2-2.11.3-pyhd3~ --> pkgs/main/win-64::jin
  jinja2
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                                         0.2.0-pyhd3eb1b0 2 --> 0.2.0-pyhd3eb1b0 3
                     pkgs/main/noarch::joblib-1.1.0-pyhd3e~ --> pkgs/main/win-64::job
  joblib
lib-1.1.1-py39haa95532 0
                                              9d-h2bbff1b 0 --> 9e-h2bbff1b 0
  jpeg
  jsonschema
                     pkgs/main/noarch::jsonschema-3.2.0-py~ --> pkgs/main/win-64::jso
nschema-4.16.0-py39haa95532 0
                                       1.0.0-py39haa95532 7 --> 1.0.0-py39haa95532 8
  jupyter
  jupyter client
                     pkgs/main/noarch::jupyter client-6.1.~ --> pkgs/main/win-64::jup
yter client-7.4.8-py39haa95532 0
  jupyter_console
                     pkgs/main/noarch::jupyter_console-6.4~ --> pkgs/main/win-64::jup
yter console-6.4.4-py39haa95532 0
                                       4.8.1-py39haa95532 0 --> 5.1.1-py39haa95532 0
  jupyter_core
  jupyter_server
                                       1.4.1-py39haa95532 0 --> 1.23.4-py39haa95532 0
                     pkgs/main/noarch::jupyterlab-3.2.1-py~ --> pkgs/main/win-64::jup
  jupyterlab
yterlab-3.5.3-py39haa95532_0
  jupyterlab server pkgs/main/noarch::jupyterlab server-2~ --> pkgs/main/win-64::jup
yterlab server-2.16.5-py39haa95532 0
  keyring
                                      23.1.0-py39haa95532 0 --> 23.4.0-py39haa95532 0
  kiwisolver
                                       1.3.1-py39hd77b12b_0 --> 1.4.4-py39hd77b12b_0
  libarchive
                                           3.4.2-h5e25573 0 --> 3.6.2-hebabd0d 0
  libcurl
                                          7.78.0-h86230a5 0 --> 7.87.0-h86230a5 0
  libiconv
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  liblief
                                          0.10.1-hd77b12b_1 --> 0.12.3-hd77b12b_0
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  libtiff
                                           4.2.0-hd0e1b90 0 --> 4.5.0-h6c2663c 1
                                           1.2.0-h2bbff1b_0 --> 1.2.4-h2bbff1b_0
  libwebp
  libxml2
                                          2.9.12-h0ad7f3c 0 --> 2.9.14-h0ad7f3c 0
  libxslt
                                          1.1.34-he774522_0 --> 1.1.35-h2bbff1b_0
  llvmlite
                                      0.37.0-py39h23ce68f 1 --> 0.39.1-py39h23ce68f 0
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  1xm1
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  1z4-c
                                           1.9.3-h2bbff1b_1 --> 1.9.4-h2bbff1b_0
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 matplotlib
                                       3.4.3-py39haa95532 0 --> 3.6.2-py39haa95532 0
 matplotlib-base
                                       3.4.3-py39h49ac443_0 --> 3.6.2-py39h1094b8e_0
  matplotlib-inline pkgs/main/noarch::matplotlib-inline-0~ --> pkgs/main/win-64::mat
plotlib-inline-0.1.6-py39haa95532 0
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  mccabe
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abe-0.7.0-pyhd3eb1b0 0
                                      1.4.18-py39h59b6b97 0 --> 1.4.19-py39h59b6b97 0
  menuinst
 msgpack-python
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                                       0.4.3-py39haa95532 0 --> 0.4.3-py39haa95532 1
 mypy_extensions
                                       0.2.1-py39haa95532 0 --> 0.3.0-py39haa95532 0
  navigator-updater
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lassic-0.4.8-py39haa95532 0
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  nbformat
                     pkgs/main/noarch::nbformat-5.1.3-pyhd~ --> pkgs/main/win-64::nbf
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  nest-asyncio
t-asyncio-1.5.6-py39haa95532 0
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                     pkgs/main/noarch::networkx-2.6.3-pyhd~ --> pkgs/main/win-64::net
workx-2.8.4-py39haa95532 0
                                         3.6.5-pyhd3eb1b0 0 --> 3.7-pyhd3eb1b0 0
  nltk
                                      1.3.7-pyhd3eb1b0_1006 --> 1.3.7-pyhd3eb1b0_1008
  nose
  notebook
                                       6.4.5-py39haa95532 0 --> 6.5.2-py39haa95532 0
                                      0.54.1-py39hf11a4ad 0 --> 0.56.4-py39hf11a4ad 0
  numba
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  numexpr
                                      1.20.3-py39ha4e8547_0 --> 1.23.5-py39h3b20f71_0
  numpy
  numpy-base
                                      1.20.3-py39hc2deb75 0 --> 1.23.5-py39h4da318b 0
                     pkgs/main/noarch::numpydoc-1.1.0-pyhd~ --> pkgs/main/win-64::num
  numpydoc
pydoc-1.5.0-py39haa95532 0
  openpyxl
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npyx1-3.0.10-py39h2bbff1b 0
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  pandas
  pandocfilters
                     pkgs/main/win-64::pandocfilters-1.4.3~ --> pkgs/main/noarch::pan
docfilters-1.5.0-pyhd3eb1b0_0
                                                  2.7.2-py 0 --> 2.8.1-pyhd3eb1b0 0
  paramiko
                                         0.8.2-pyhd3eb1b0 0 --> 0.8.3-pyhd3eb1b0 0
  parso
  partd
                                         1.2.0-pyhd3eb1b0_0 --> 1.2.0-pyhd3eb1b0_1
                      pkgs/main/noarch::pathspec-0.7.0-py 0 --> pkgs/main/win-64::pat
  pathspec
hspec-0.10.3-py39haa95532_0
                                       0.5.2-py39haa95532 0 --> 0.5.3-py39haa95532 0
  patsy
                                       1.7.1-py39haa95532 0 --> 1.7.1-py39haa95532 1
  pep8
  pillow
                                       8.4.0-py39hd45dc43 0 --> 9.3.0-py39hd77b12b 2
                                      21.2.4-py39haa95532_0 --> 22.3.1-py39haa95532_0
  pip
                                       1.7.1-py39haa95532 0 --> 1.8.3-py39haa95532 0
  pkginfo
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  pluggy
  prometheus client pkgs/main/noarch::prometheus client-0~ --> pkgs/main/win-64::pro
metheus client-0.14.1-py39haa95532 0
  prompt-toolkit
                     pkgs/main/noarch::prompt-toolkit-3.0.~ --> pkgs/main/win-64::pro
mpt-toolkit-3.0.36-py39haa95532 0
  prompt_toolkit
                                          3.0.20-hd3eb1b0 0 --> 3.0.36-hd3eb1b0 0
  psutil
                                       5.8.0-py39h2bbff1b 1 --> 5.9.0-py39h2bbff1b 0
                                        1.10.0-pyhd3eb1b0_0 --> 1.11.0-pyhd3eb1b0_0
  ру
  py-lief
                                      0.10.1-py39hd77b12b 1 --> 0.12.3-py39hd77b12b 0
                                         2.7.0-pyhd3eb1b0 0 --> 2.8.0-pyhd3eb1b0 0
  pycodestyle
                                       0.6.3-py39h2bbff1b 0 --> 0.6.4-py39h2bbff1b 0
  pycosat
                                                   2.20-py_2 --> 2.21-pyhd3eb1b0_0
  pycparser
  pycurl
                                      7.44.1-py39hcd4344a_1 --> 7.45.1-py39hcd4344a_0
                     pkgs/main/noarch::pydocstyle-6.1.1-py~ --> pkgs/main/win-64::pyd
  pydocstyle
ocstyle-6.3.0-py39haa95532 0
  pyflakes
                                         2.3.1-pyhd3eb1b0 0 --> 2.4.0-pyhd3eb1b0 0
  pygments
                                        2.10.0-pyhd3eb1b0 0 --> 2.11.2-pyhd3eb1b0 0
                                       2.1.0-py39haa95532 0 --> 2.4.0-py39haa95532 0
  pyjwt
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2.9.6-py39haa95532 1 --> 2.14.5-py39haa95532 0
  pylint
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  pyodbc
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                                        21.0.0-pyhd3eb1b0_1 --> 22.0.0-pyhd3eb1b0_0
  pyopenssl
                     pkgs/main/noarch::pyparsing-3.0.4-pyh~ --> pkgs/main/win-64::pyp
  pyparsing
arsing-3.0.9-py39haa95532 0
  pyqt
                                       5.9.2-py39hd77b12b 6 --> 5.15.7-py39hd77b12b 0
                                       3.6.1-py39h56d22b6 1 --> 3.7.0-py39h388bc9b 1
 pytables
                                       6.2.4-py39haa95532_2 --> 7.1.2-py39haa95532_0
  pytest
                                           3.9.7-h6244533 1 --> 3.9.16-h6244533 0
  python
  python-lsp-black
                    pkgs/main/noarch::python-lsp-black-1.~ --> pkgs/main/win-64::pyt
hon-lsp-black-1.2.1-py39haa95532_0
  python-lsp-server pkgs/main/noarch::python-lsp-server-1~ --> pkgs/main/win-64::pyt
hon-lsp-server-1.5.0-py39haa95532_0
  pytz
                     pkgs/main/noarch::pytz-2021.3-pyhd3eb~ --> pkgs/main/win-64::pyt
z-2022.7-py39haa95532 0
                                       1.1.1-py39h080aedc 4 --> 1.4.1-py39h2bbff1b 0
  pywavelets
                                         228-py39he774522_0 --> 305-py39h2bbff1b_0
  pywin32
  pywinpty
                                       0.5.7-py39haa95532 0 --> 2.0.2-py39h5da7b33 0
                                      22.2.1-py39hd77b12b 1 --> 23.2.0-py39hd77b12b 0
  pyzmq
  qstylizer
                     pkgs/main/noarch::qstylizer-0.1.10-py~ --> pkgs/main/win-64::qst
ylizer-0.2.2-py39haa95532 0
                                       5.9.7-vc14h73c81de 0 --> 5.15.7-haa95532 0
  qt
                     pkgs/main/noarch::qtawesome-1.0.2-pyh~ --> pkgs/main/win-64::qta
  qtawesome
wesome-1.2.2-py39haa95532 0
                     pkgs/main/noarch::qtconsole-5.1.1-pyh~ --> pkgs/main/win-64::qtc
  qtconsole
onsole-5.3.2-py39haa95532_0
                     pkgs/main/noarch::qtpy-1.10.0-pyhd3eb~ --> pkgs/main/win-64::qtp
  qtpy
y-2.2.0-py39haa95532 0
                                    2021.8.3-py39h2bbff1b 0 --> 2022.7.9-py39h2bbff1b
  regex
                     pkgs/main/noarch::requests-2.26.0-pyh~ --> pkgs/main/win-64::req
  requests
uests-2.28.1-py39haa95532 0
                                        0.19.0-pyhd3eb1b0 0 --> 0.22.0-pyhd3eb1b0 0
  rope
  rtree
                                       0.9.7-py39h2eaa2aa_1 --> 1.0.1-py39h2eaa2aa_0
  ruamel yaml
                                    0.15.100-py39h2bbff1b 0 --> 0.17.21-py39h2bbff1b
  scikit-image
                                      0.18.3-py39hf11a4ad 0 --> 0.19.3-py39hd77b12b 1
  scikit-learn
                                      0.24.2-py39hf11a4ad 1 --> 1.0.2-py39hf11a4ad 1
  scikit-learn-inte~
                                    2021.3.0-py39haa95532_0 --> 2021.6.0-py39haa95532
_0
                                       1.7.1-py39hbe87c03 2 --> 1.9.3-py39he11b74f 0
  scipy
                     pkgs/main/noarch::seaborn-0.11.2-pyhd~ --> pkgs/main/win-64::sea
  seaborn
born-0.12.2-py39haa95532 0
  setuptools
                                      58.0.4-py39haa95532_0 --> 65.6.3-py39haa95532_0
  sip
                                     4.19.13-py39hd77b12b 0 --> 6.6.2-py39hd77b12b 0
                                        1.16.0-pyhd3eb1b0 0 --> 1.16.0-pyhd3eb1b0 1
  six
                                           1.1.8-h33f27b4_0 --> 1.1.9-h6c2663c_0
  snappy
  snowballstemmer
                                         2.1.0-pyhd3eb1b0 0 --> 2.2.0-pyhd3eb1b0 0
                     pkgs/main/noarch::soupsieve-2.2.1-pyh~ --> pkgs/main/win-64::sou
  soupsieve
psieve-2.3.2.post1-py39haa95532 0
                     pkgs/main/noarch::sphinx-4.2.0-pyhd3e~ --> pkgs/main/win-64::sph
  sphinx
inx-5.0.2-py39haa95532_0
  spyder
                                       5.1.5-py39haa95532 1 --> 5.3.3-py39haa95532 0
  spyder-kernels
                                       2.1.3-py39haa95532 0 --> 2.3.3-py39haa95532 0
  sqlalchemy
                                      1.4.22-py39h2bbff1b 0 --> 1.4.39-py39h2bbff1b 0
                                           3.36.0-h2bbff1b 0 --> 3.40.1-h2bbff1b 0
  sqlite
  statsmodels
                                      0.12.2-py39h2bbff1b_0 --> 0.13.5-py39h080aedc_0
  sympy
                                         1.9-py39haa95532 0 --> 1.11.1-py39haa95532 0
                                        2021.4.0-h59b6b97_0 --> 2021.6.0-h59b6b97_1
  tbb
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2021.4.0-py39h59b6b97 0 --> 2021.6.0-py39h59b6b97
 tbb4py
_1
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Windows 64-bit packages of scikit-learn can be accelerated using scikit-learn-int elex.

More details are available here: https://intel.github.io/scikit-learn-intelex

For example:

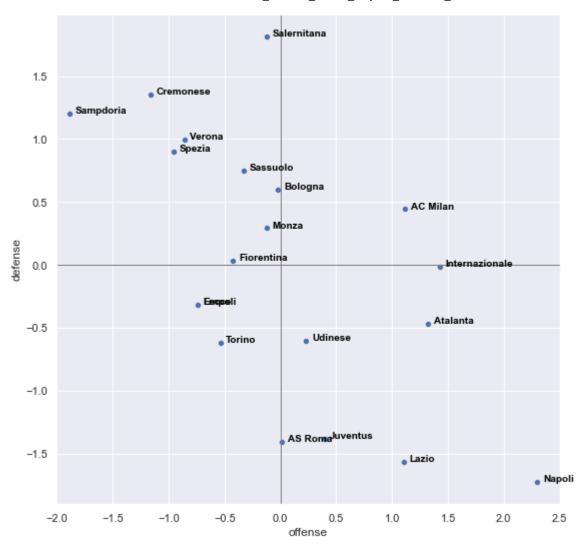
- \$ conda install scikit-learn-intelex
- \$ python -m sklearnex my_application.py

done

```
In [28]: from sklearn.preprocessing import StandardScaler
In [30]: df_score[['offense', 'defense']] = preprocessing.StandardScaler().fit_transform(df_score['defense'] = df_score['defense']*(-1)
In [31]: df_score
```

Out[31]:

	team	offense	defense
0	AC Milan	1.117423	0.444821
1	AS Roma	0.011980	-1.401606
2	Atalanta	1.324354	-0.466403
3	Bologna	-0.020693	0.596692
4	Cremonese	-1.158809	1.356045
5	Empoli	-0.744949	-0.314532
6	Fiorentina	-0.423662	0.037168
7	Internazionale	1.427819	-0.010791
8	Juventus	0.393167	-1.377627
9	Lazio	1.101087	-1.561470
10	Lecce	-0.744949	-0.314532
11	Monza	-0.124158	0.292950
12	Napoli	2.299104	-1.721334
13	Salernitana	-0.124158	1.811657
14	Sampdoria	-1.883065	1.204174
15	Sassuolo	-0.331088	0.748562
16	Spezia	-0.951879	0.900433
17	Torino	-0.538019	-0.618273
18	Udinese	0.229801	-0.602287
19	Verona	-0.859305	0.996351



Teams like AC Milan, Internazionale (Inter Milan) and Salernitana seem to have a decent performance but still we are indecisive as to see which team has a good SPI because either team has a good Offense but at the same time its Defence is not up to the mark. Let's analyze on a different league like the Spanish Primera Division.

```
df_S = df[df['league']=='Spanish Primera Division']
In [33]:
           df_S = df_S[['date','team1','team2','spi1','spi2','score1','score2']]
In [34]:
           df_S.head()
Out[34]:
                      date
                                   team1
                                                 team2
                                                          spi1
                                                                spi2 score1 score2
           2273 8/12/2022
                                 Osasuna
                                               Sevilla FC
                                                         63.69
                                                               71.45
                                                                          2.0
                                                                                 1.0
           2349
                 8/13/2022
                                Celta Vigo
                                               Espanyol
                                                         69.06
                                                               59.72
                                                                         2.0
                                                                                 2.0
           2365
                 8/13/2022
                            Real Valladolid
                                                Villarreal
                                                         59.80
                                                               77.14
                                                                         0.0
                                                                                 3.0
           2393 8/13/2022
                                Barcelona
                                          Rayo Vallecano
                                                         84.44
                                                                         0.0
                                                                                 0.0
                                                              63.56
           2472 8/14/2022
                                   Cadiz
                                           Real Sociedad 62.62 74.77
                                                                         0.0
                                                                                 1.0
```

file:///D:/Downloads/Abdul Basit DSC680 Week8 Project2 Milestone 3.html

df_S.shape

In [35]:

```
Out[35]: (380, 7)
```

```
In [36]: # Select the goal and goal lost for each team, rename the columns and stack them toget
    df_S1 = df_S[['date','team1','score1','score2']]
    df_S2 = df_S[['date','team2','score2','score1']]
    df_S1.columns=['date','team','offense','defense']
    df_S2.columns=['date','team','offense','defense']
```

```
In [37]: frames = [df_S1,df_S2]
    df_S3=pd.concat(frames)
    df_S3.shape
```

Out[37]: (760, 4)

```
In [38]: # Calculate a simple offense and defense index for each team.
df_score2 = df_S3.groupby(['team'],as_index=False).mean()
```

In [39]: df_score2

Out[39]:

	team	offense	defense
0	Almeria	1.210526	1.526316
1	Athletic Bilbao	1.388889	1.055556
2	Atletico Madrid	1.473684	0.842105
3	Barcelona	2.055556	0.333333
4	Cadiz	0.736842	1.526316
5	Celta Vigo	0.944444	1.611111
6	Elche	0.631579	2.052632
7	Espanyol	1.210526	1.526316
8	Getafe	0.842105	1.368421
9	Girona FC	1.368421	1.526316
10	Mallorca	0.789474	0.947368
11	Osasuna	0.947368	0.947368
12	Rayo Vallecano	1.333333	1.222222
13	Real Betis	1.111111	0.777778
14	Real Madrid	2.235294	0.941176
15	Real Sociedad	1.555556	1.000000
16	Real Valladolid	0.736842	1.473684
17	Sevilla FC	1.105263	1.368421
18	Valencia	1.388889	1.166667
19	Villarreal	1.166667	0.722222

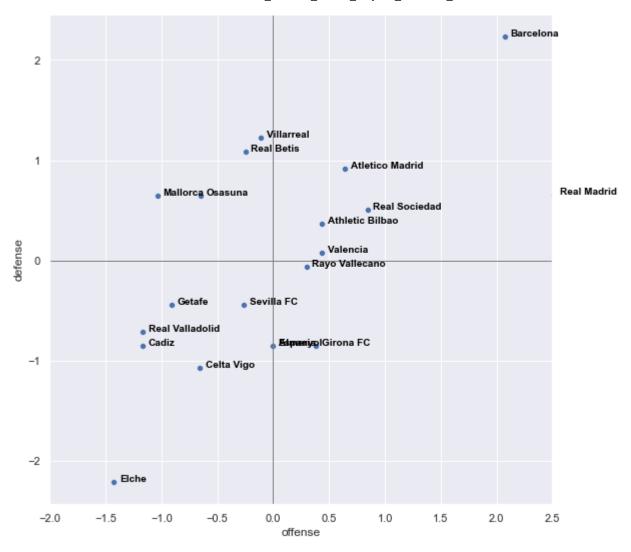
```
In [40]: df_score2[['offense', 'defense']] = preprocessing.StandardScaler().fit_transform(df_score2['defense'] = df_score2['defense']*(-1)
```

Out[41]:

In [41]:

df score2

	team	offense	defense
0	Almeria	-0.002682	-0.851433
1	Athletic Bilbao	0.435354	0.364836
2	Atletico Madrid	0.643600	0.916313
3	Barcelona	2.072602	2.230790
4	Cadiz	-1.165991	-0.851433
5	Celta Vigo	-0.656146	-1.070513
6	Elche	-1.424504	-2.211238
7	Espanyol	-0.002682	-0.851433
8	Getafe	-0.907478	-0.443492
9	Girona FC	0.385087	-0.851433
10	Mallorca	-1.036734	0.644352
11	Osasuna	-0.648965	0.644352
12	Rayo Vallecano	0.298916	-0.065768
13	Real Betis	-0.246833	1.082511
14	Real Madrid	2.514017	0.660350
15	Real Sociedad	0.844666	0.508371
16	Real Valladolid	-1.165991	-0.715453
17	Sevilla FC	-0.261195	-0.443492
18	Valencia	0.435354	0.077767
19	Villarreal	-0.110396	1.226046



Here we can see that Barcelona is the decisive winner in both Offence and Defence. Real Madrid has the best Offence but its defence is not up to the mark. Atletico Madrid is looking at a second spot after Barcelona.

Here shows normalizing data instead of standarizing. It will limit value between 0 and 1. I would minus data with 0.5 to make sure data center at 0.

```
In [43]: df_score2 = df_S3.groupby(['team'],as_index=False).mean()
In [44]: df_score2[['offense', 'defense']] = preprocessing.MinMaxScaler().fit_transform(df_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_scored_
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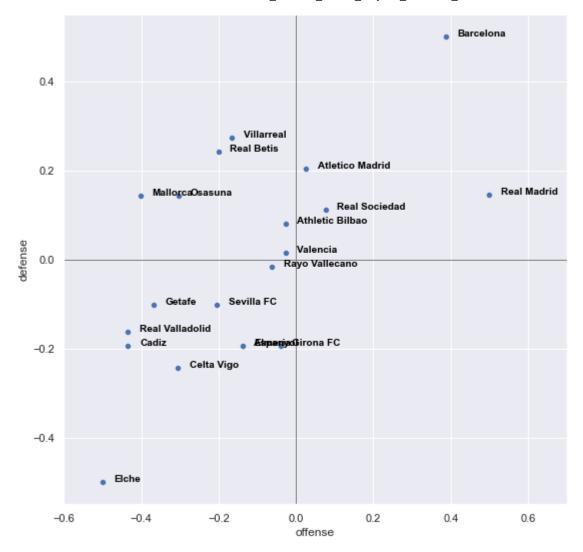
Out[44]:	team	offense	defer
Out[44]:	team	offense	defe

	team	offense	defense
0	Almeria	0.361004	0.693878
1	Athletic Bilbao	0.472222	0.420068
2	Atletico Madrid	0.525097	0.295918
3	Barcelona	0.887924	0.000000
4	Cadiz	0.065637	0.693878
5	Celta Vigo	0.195088	0.743197
6	Elche	0.000000	1.000000
7	Espanyol	0.361004	0.693878
8	Getafe	0.131274	0.602041
9	Girona FC	0.459459	0.693878
10	Mallorca	0.098456	0.357143
11	Osasuna	0.196911	0.357143
12	Rayo Vallecano	0.437580	0.517007
13	Real Betis	0.299013	0.258503
14	Real Madrid	1.000000	0.353541
15	Real Sociedad	0.576148	0.387755
16	Real Valladolid	0.065637	0.663265
17	Sevilla FC	0.295367	0.602041
18	Valencia	0.472222	0.484694
19	Villarreal	0.333655	0.226190

```
In [45]: df_score2['defense'] = df_score2['defense']*(-1)+0.5
df_score2['offense'] = df_score2['offense']-0.5
                df_score2
```

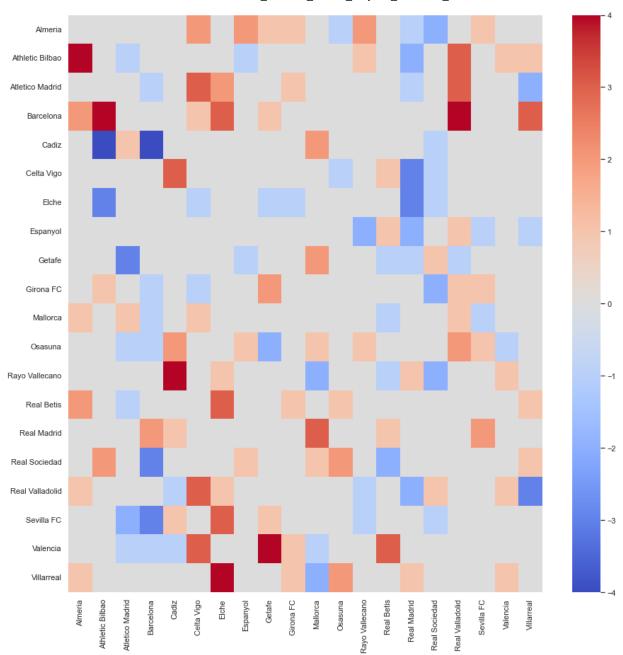
Out[45]:

	team	offense	defense
0	Almeria	-0.138996	-0.193878
1	Athletic Bilbao	-0.027778	0.079932
2	Atletico Madrid	0.025097	0.204082
3	Barcelona	0.387924	0.500000
4	Cadiz	-0.434363	-0.193878
5	Celta Vigo	-0.304912	-0.243197
6	Elche	-0.500000	-0.500000
7	Espanyol	-0.138996	-0.193878
8	Getafe	-0.368726	-0.102041
9	Girona FC	-0.040541	-0.193878
10	Mallorca	-0.401544	0.142857
11	Osasuna	-0.303089	0.142857
12	Rayo Vallecano	-0.062420	-0.017007
13	Real Betis	-0.200987	0.241497
14	Real Madrid	0.500000	0.146459
15	Real Sociedad	0.076148	0.112245
16	Real Valladolid	-0.434363	-0.163265
17	Sevilla FC	-0.204633	-0.102041
18	Valencia	-0.027778	0.015306
19	Villarreal	-0.166345	0.273810



Then I want to create a heatmap to show the overall scores between each teams.

```
Out[50]:
             team1
                            team2 score1 score2
          0 Almeria
                     Athletic Bilbao
                                      0.0
                                             0.0
          1 Almeria
                     Atletico Madrid
                                      1.0
                                             1.0
          2 Almeria
                         Barcelona
                                      0.0
                                             0.0
          3 Almeria
                             Cadiz
                                      0.0
                                             0.0
          4 Almeria
                         Celta Vigo
                                      3.0
                                             1.0
          df score3a = df S.groupby(['team1','team2'],as index=False)['score1'].count() #game cd
In [51]:
          df score3b = df score3a.rename(columns={"score1": "count"})
In [52]:
In [53]:
          df_score3c = pd.merge(df_score3, df_score3b, how='left', left_on=['team1','team2'],
          df score3c['score'] = (df score3c['score1'] - df score3c['score2'])/df score3c['count'
In [54]:
In [55]:
          df_score3c = df_score3c.dropna()
          df_score3c.head()
In [56]:
Out[56]:
             team1
                            team2 score1 score2 count score
          1 Almeria Atletico Madrid
                                      1.0
                                             1.0
                                                     1
                                                          0.0
          4 Almeria
                         Celta Vigo
                                      3.0
                                             1.0
                                                     1
                                                          2.0
          6 Almeria
                                                          2.0
                          Espanyol
                                      3.0
                                             1.0
                                                     1
          7 Almeria
                            Getafe
                                             0.0
                                                          1.0
                                      1.0
                                                     1
          8 Almeria
                         Girona FC
                                      3.0
                                             2.0
                                                     1
                                                          1.0
          L = teams.shape[0]
In [57]:
          score_matrix = pd.DataFrame(np.zeros([L,L])) #use loop to create a matrix to save the
In [58]:
          for i in range(df_score3c.shape[0]):
In [59]:
              team_a = df_score3c.iloc[i,].team1
              team b = df score3c.iloc[i,].team2
              score = df_score3c.iloc[i,].score
              ind1 = int(np.where(teams == team a)[0])
              ind2 = int(np.where(teams == team b)[0])
              score matrix.iloc[ind1,ind2] = score
          plt.figure(figsize=(15,15))
In [60]:
          hmap = sns.heatmap(score_matrix,cmap="coolwarm",xticklabels=teams, yticklabels=teams,
          plt.show()
```



Warmer color means better score. The row will show the scores with each team. If the row shows a lot of warm color, means this team can usually out score the others. This graph indicates Barcelona, Atletico Madrid, and Real Madrid are the top teams, while Elche, Espanyol, and Getafe are on the other end.