Simple python Machine Learning Clustering example

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First, import libraries for web scraping

In [29]:
```
from urllib.request import urlopen
from bs4 import BeautifulSoup
import pandas as pd
```

scrape all the guards in the NBA, so we have a dataset to work with

In [30]:
```
# URL of page we will scrape
url = "https://www.basketball-reference.com/play-index/psl_finder.cgi?request=1&r

# get the HTML from the given URL
html = urlopen(url)
soup = BeautifulSoup(html)
```

In [31]:
```
# get the column headers
soup.findAll('tr', limit=2)

# extract text we need into a list, important to use [1] here
headers = [th.getText() for th in soup.findAll('tr', limit=2)[1].findAll('th')]

# exclude the rank column, print the column headers
headers = headers[1:]
headers
```

Out[31]:
```
['Player',
 'From',
 'To',
 'Tm',
 'Lg',
 'WS',
 'G',
 'GS',
 'MP',
 'FG',
 'FGA',
 '2P',
 '2PA',
 '3P',
 '3PA',
 'FT',
 'FTA',
 'ORB',
 'DRB',
 'TRB',
 'AST',
 'STL',
 'BLK',
 'TOV',
 'PF',
 'PTS',
 'FG%',
 '2P%',
 '3P%',
 'eFG%',
 'FT%',
 'TS%']
```

In [47]:
```
# remove the first row two rows
rows = soup.findAll('tr')[2:]
player_stats = [[td.getText() for td in rows[i].findAll('td')]
            for i in range(len(rows))]
```

In [48]:
```
player_stats = pd.DataFrame(player_stats, columns = headers)

# drop NaN values
player_stats = player_stats.dropna()
player_stats.head(5)
```

Out[48]:

	Player	From	To	Tm	Lg	WS	G	GS	MP	FG	...	BLK	TOV	PF	PTS	FG%
0	James Harden	2017	2019	HOU	NBA	45.6	231	231	36.2	9.4	...	0.6	5.0	2.7	31.9	.443
1	Damian Lillard	2017	2019	POR	NBA	35.1	228	228	36.0	8.6	...	0.4	2.7	1.8	26.5	.443
2	Stephen Curry	2017	2019	GSW	NBA	31.3	199	199	33.2	8.7	...	0.3	2.9	2.3	26.3	.476
3	Russell Westbrook	2017	2019	OKC	NBA	29.9	234	234	35.7	9.4	...	0.4	4.9	2.7	26.8	.433
4	Chris Paul	2017	2019	TOT	NBA	27.4	177	177	31.8	5.9	...	0.2	2.4	2.4	17.5	.453

5 rows × 32 columns

In [49]:
```
# only keep the columns we need (for simplicity)
player_stats = player_stats[['Player', 'PTS', '3P', 'AST', 'TRB', 'STL', 'BLK']]

# set index as player name
player_stats = player_stats.set_index('Player')
player_stats.head(5)
```

Out[49]:

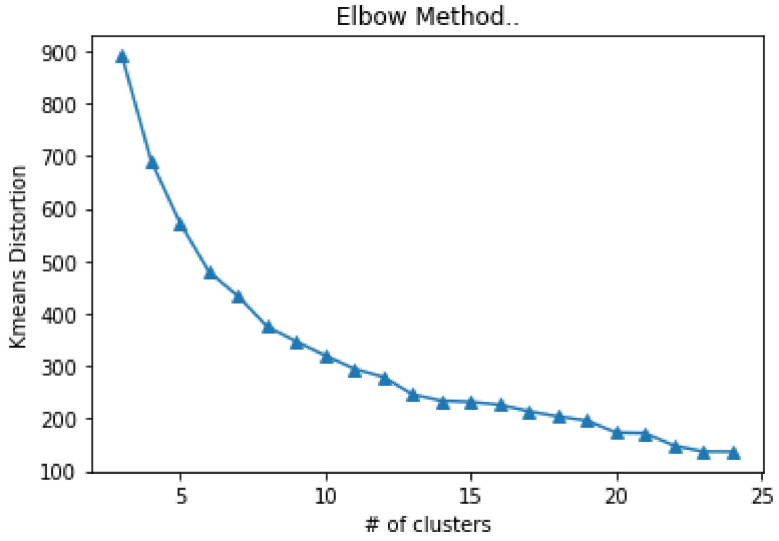
Player	PTS	3P	AST	TRB	STL	BLK
James Harden	31.9	3.9	9.2	6.8	1.8	0.6
Damian Lillard	26.5	3.0	6.5	4.7	1.0	0.4
Stephen Curry	26.3	4.5	6.0	4.9	1.6	0.3
Russell Westbrook	26.8	1.8	10.4	10.6	1.8	0.4
Chris Paul	17.5	2.2	8.4	5.0	1.9	0.2

Now, use unsupervised learning to cluster the guards into groups based on stats

In [50]:
```
# import kmeans library from scikit learn and matplotlib
from sklearn.cluster import KMeans
import matplotlib.pyplot as plt

# figure out the appropriate number of clusters for the data
# btw, this is the Elbow Method!
distortions = []
for i in range(3, 25):
    kmeans = KMeans(
        n_clusters=i, init='random',
        n_init=10, max_iter=300,
        tol=1e-04, random_state=0
    )
    kmeans.fit(player_stats)
    distortions.append(kmeans.inertia_)

# plot
plt.plot(range(3, 25), distortions, marker='^')
plt.xlabel('# of clusters')
plt.ylabel('Kmeans Distortion')
plt.title('Elbow Method..')
plt.show()
```



Looks like 15 clusters is approriate, implement final method with k=15

In [60]:
```
kmeans = KMeans(
    n_clusters=15, init='random',
    n_init=10, max_iter=300,
    tol=1e-04, random_state=0
)
player_kmeans = kmeans.fit_predict(player_stats)
```

In [61]:
```
# set the cluster as a column in the pandas dataframe
player_stats['cluster'] = player_kmeans
player_stats.head(5)
```

Out[61]:

Player	PTS	3P	AST	TRB	STL	BLK	cluster
James Harden	31.9	3.9	9.2	6.8	1.8	0.6	4
Damian Lillard	26.5	3.0	6.5	4.7	1.0	0.4	0
Stephen Curry	26.3	4.5	6.0	4.9	1.6	0.3	0
Russell Westbrook	26.8	1.8	10.4	10.6	1.8	0.4	4
Chris Paul	17.5	2.2	8.4	5.0	1.9	0.2	7

Print players in cluster 0

In [72]:
```
player_stats[player_stats.cluster == 0][['PTS', '3P', 'AST', 'TRB', 'STL', 'BLK'
```

Out[72]:

Player	PTS	3P	AST	TRB	STL	BLK
Damian Lillard	26.5	3.0	6.5	4.7	1.0	0.4
Stephen Curry	26.3	4.5	6.0	4.9	1.6	0.3
Kyrie Irving	24.5	2.6	6.0	4.0	1.3	0.4
Kemba Walker	23.7	3.0	5.7	3.8	1.2	0.3
Bradley Beal	23.8	2.6	4.5	4.2	1.2	0.5
Isaiah Thomas	23.2	2.6	5.2	2.4	0.8	0.1
Devin Booker	24.3	2.2	4.9	3.9	0.9	0.2

Print players in cluster 1

In [84]:
```
player_stats[player_stats.cluster == 1][['PTS', '3P', 'AST', 'TRB', 'STL', 'BLK'
```

Out[84]:

Player	PTS	3P	AST	TRB	STL	BLK
Raymond Felton	6.4	0.8	2.3	2.1	0.6	0.2
Pat Connaughton	5.3	0.9	1.3	2.6	0.3	0.3
Shabazz Napier	7.6	1.0	2.0	1.8	0.8	0.2
Devin Harris	7.2	1.0	2.0	1.8	0.6	0.2
Quinn Cook	7.4	1.1	1.9	2.0	0.3	0.0
Malik Beasley	7.2	1.2	0.8	1.7	0.5	0.1
Justin Anderson	5.9	0.7	0.7	2.6	0.5	0.3
Langston Galloway	7.6	1.6	1.1	2.0	0.6	0.1
Norman Powell	7.5	0.9	1.3	2.1	0.6	0.2
Jodie Meeks	7.1	1.1	1.0	1.8	0.5	0.1
Ian Clark	7.0	0.9	1.4	1.6	0.4	0.1