import libraray

In [1]:

```
import pandas as  pd
import matplotlib.pyplot as plt


from sklearn.preprocessing import StandardScaler
from sklearn.cluster import KMeans
```

In [2]:

```
#reading the data

Players_info= pd.read_csv("Fifa_Players.csv")
```

```
/var/folders/pd/vwqlxmsj1g79wbmb63_1mgnm0000gn/T/ipykernel_1124/30296707.
py:3: DtypeWarning: Columns (25,108) have mixed types. Specify dtype opti
on on import or set low_memory=False.
  Players_info= pd.read_csv("Fifa_Players.csv")
```

In [ ]:

In [3]:

```
Players_info.head()
```

Out[3]:

	sofifa_id	player_url	short_name	long_name	player_pos
0	158023	https://sofifa.com/player/158023/lionel-messi/...	L. Messi	Lionel Andrés Messi Cuccittini	RW, S
1	188545	https://sofifa.com/player/188545/robert-lewand...	R. Lewandowski	Robert Lewandowski	
2	20801	https://sofifa.com/player/20801/c-ronaldo-dos-...	Cristiano Ronaldo	Cristiano Ronaldo dos Santos Aveiro	S
3	190871	https://sofifa.com/player/190871/neymar-da-sil...	Neymar Jr	Neymar da Silva Santos Júnior	LW
4	192985	https://sofifa.com/player/192985/kevin-de-bruy...	K. De Bruyne	Kevin De Bruyne	CM

5 rows × 110 columns

In [4]:

```
Players_features = pd.DataFrame(pd.read_csv("Fifa_Players.csv" , usecols
```

In [5]:

```
Players_features.head()
```

Out[5]:

	overall	potential	value_eur	wage_eur	age
0	93	93	78000000.0	320000.0	34
1	92	92	119500000.0	270000.0	32
2	91	91	45000000.0	270000.0	36
3	91	91	129000000.0	270000.0	29
4	91	91	125500000.0	350000.0	30

In [6]:

```
Players_features.describe()
```

Out[6]:

	overall	potential	value_eur	wage_eur	age
count	19239.000000	19239.000000	1.916500e+04	19178.000000	19239.000000
mean	65.772182	71.079370	2.850452e+06	9017.989363	25.210822
std	6.880232	6.086213	7.613700e+06	19470.176724	4.748235
min	47.000000	49.000000	9.000000e+03	500.000000	16.000000
25%	61.000000	67.000000	4.750000e+05	1000.000000	21.000000
50%	66.000000	71.000000	9.750000e+05	3000.000000	25.000000
75%	70.000000	75.000000	2.000000e+06	8000.000000	29.000000
max	93.000000	95.000000	1.940000e+08	350000.000000	54.000000

In [ ]:

```

```

remove whole blanks

In [7]:

```
Players_features=Players_features.dropna()
```

In [8]:

```
Players_features.describe()
```

Out[8]:

	overall	potential	value_eur	wage_eur	age
count	19165.000000	19165.000000	1.916500e+04	19165.000000	19165.000000
mean	65.760188	71.079990	2.850452e+06	9021.721889	25.190034
std	6.882803	6.087721	7.613700e+06	19476.005074	4.727515
min	47.000000	49.000000	9.000000e+03	500.000000	16.000000
25%	61.000000	67.000000	4.750000e+05	1000.000000	21.000000
50%	66.000000	71.000000	9.750000e+05	3000.000000	25.000000
75%	70.000000	75.000000	2.000000e+06	8000.000000	29.000000
max	93.000000	95.000000	1.940000e+08	350000.000000	43.000000

allocate equal value

(value-mean)/sd

In [9]:

```
scaler = StandardScaler()
```

In [10]:

```
Players_features_sc = scaler.fit_transform(Players_features)
```

In [11]:

```
Players_features_sc
```

Out[11]:

```
array([[ 3.95776568,  3.60078658,  9.87056351, 15.96766844,  1.86359972],
       [ 3.81247225,  3.4365172 , 15.32140647, 13.40033986,  1.44053345],
       [ 3.66717883,  3.27224782,  5.53615826, 13.40033986,  2.28666598],
       ...,
       [-2.725732  , -2.64144996, -0.36125978, -0.4375612 , -0.886331  ],
       [-2.725732  , -1.82010304, -0.35994632, -0.4375612 , -1.30939726],
       [-2.725732  , -1.82010304, -0.35994632, -0.4375612 , -1.3093972
6]])
```

In [ ]:

```

```

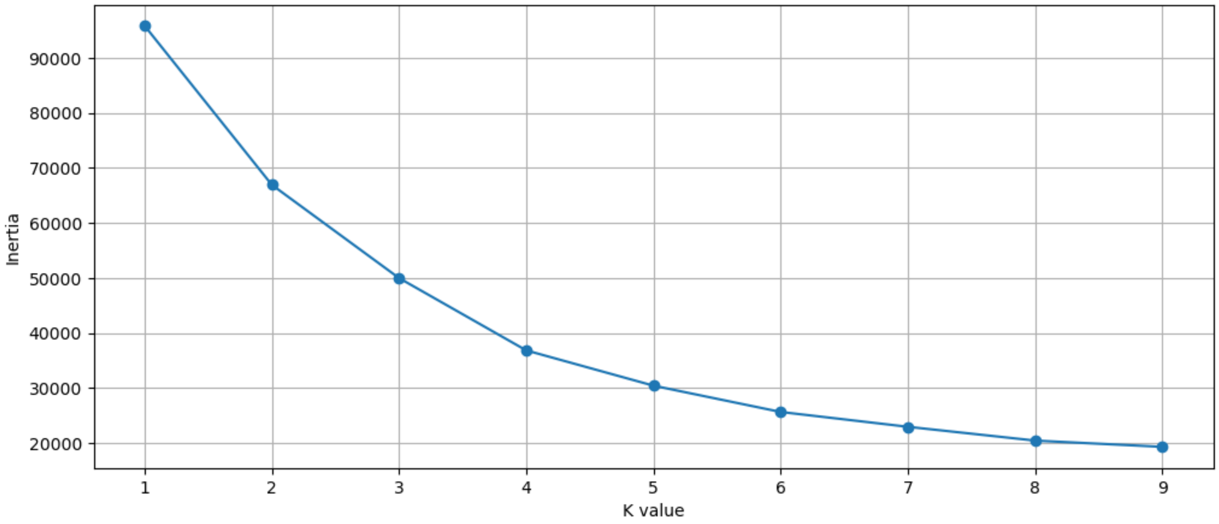
create function (for elbow plot)

In [22]:
```
def best_K_means(data, k_max):
    means = []
    inertia = []

    for k in range(1, k_max):
        kmeans = KMeans(n_clusters=k)
        kmeans.fit(data)
        means.append(k)
        inertia.append(kmeans.inertia_)

    # Elbow plot
    plt.figure(figsize=(12, 5))
    plt.plot(means, inertia, "o-")
    plt.xlabel("K value")
    plt.ylabel("Inertia")
    plt.grid(True)
    plt.show()
```

In [23]:
```
best_K_means(Players_features_sc,10)
```



In [24]:
```
kmeans =KMeans(n_clusters = 3)
```

In [ ]:
```

```

data fit

In [25]:
```
kmeans.fit(Players_features_sc)
```

Out[25]:
```
▾ KMeans
KMeans(n_clusters=3)
```

In [26]:
```
Players_features.insert (5,"K3",kmeans.labels_)
```

In [27]:
```
Players_features
```

Out[27]:

	overall	potential	value_eur	wage_eur	age	K3
0	93	93	78000000.0	320000.0	34	1
1	92	92	119500000.0	270000.0	32	1
2	91	91	45000000.0	270000.0	36	1
3	91	91	129000000.0	270000.0	29	1
4	91	91	125500000.0	350000.0	30	1
...	...	...	...	...	...	...
19234	47	52	70000.0	1000.0	22	0
19235	47	59	110000.0	500.0	19	0
19236	47	55	100000.0	500.0	21	0
19237	47	60	110000.0	500.0	19	0
19238	47	60	110000.0	500.0	19	0

19165 rows × 6 columns

In [29]:
```
Players_features.head(15)
```

Out[29]:

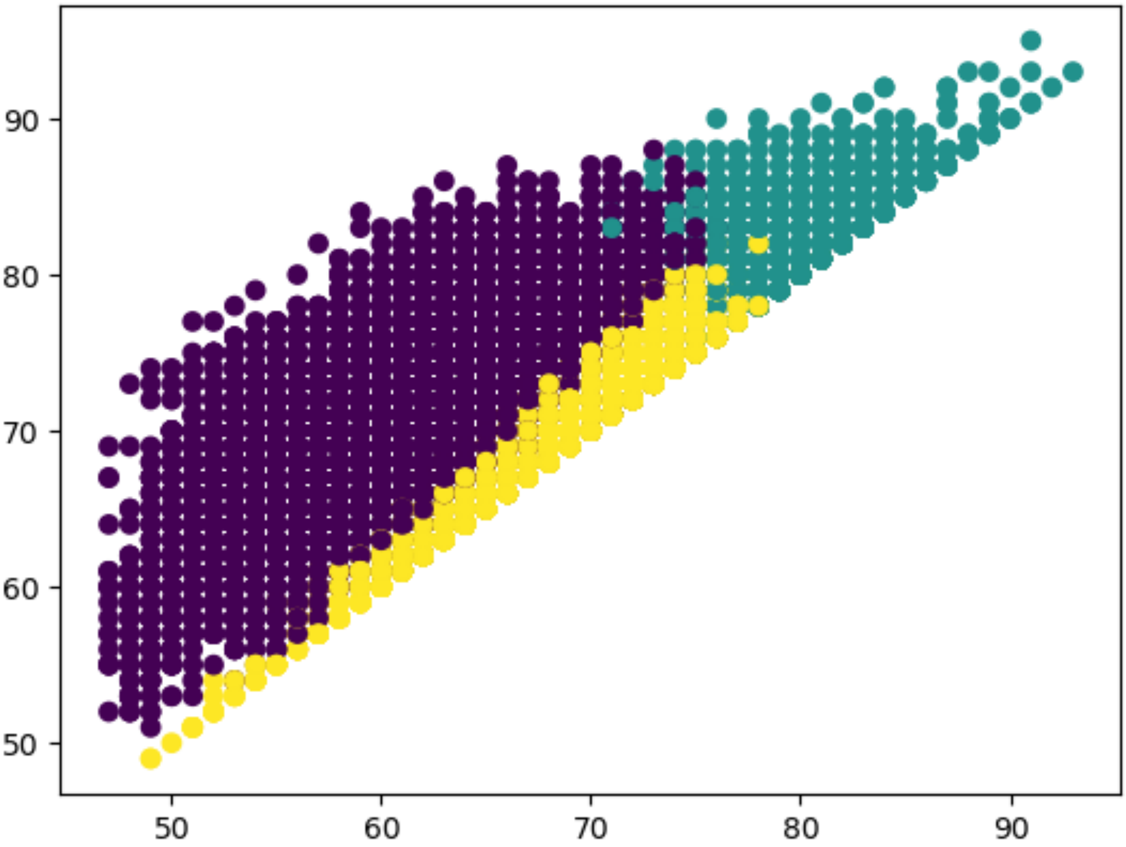
	overall	potential	value_eur	wage_eur	age	K3
0	93	93	78000000.0	320000.0	34	1
1	92	92	119500000.0	270000.0	32	1
2	91	91	45000000.0	270000.0	36	1
3	91	91	129000000.0	270000.0	29	1
4	91	91	125500000.0	350000.0	30	1
5	91	93	112000000.0	130000.0	28	1
6	91	95	194000000.0	230000.0	22	1
7	90	90	13500000.0	86000.0	35	1
8	90	92	99000000.0	250000.0	29	1
9	90	90	129500000.0	240000.0	27	1
10	90	90	100000000.0	230000.0	30	1
11	89	89	66000000.0	350000.0	33	1
12	89	91	85500000.0	250000.0	29	1
13	89	89	104000000.0	220000.0	28	1
14	89	89	88000000.0	310000.0	29	1

In [ ]:

scatter plot

In [30]:

```
plt.scatter(x = Players_features["overall"] , y=Players_features["potenti
plt.show()
```



In [ ]:

In [ ]:

In [ ]:

we can assume 2 type players (k=2)

In [33]:

```
kmeans =KMeans(n_clusters = 2)
kmeans.fit(Players_features_sc)
Players_features.insert (6,"K2",kmeans.labels_)
Players_features
```

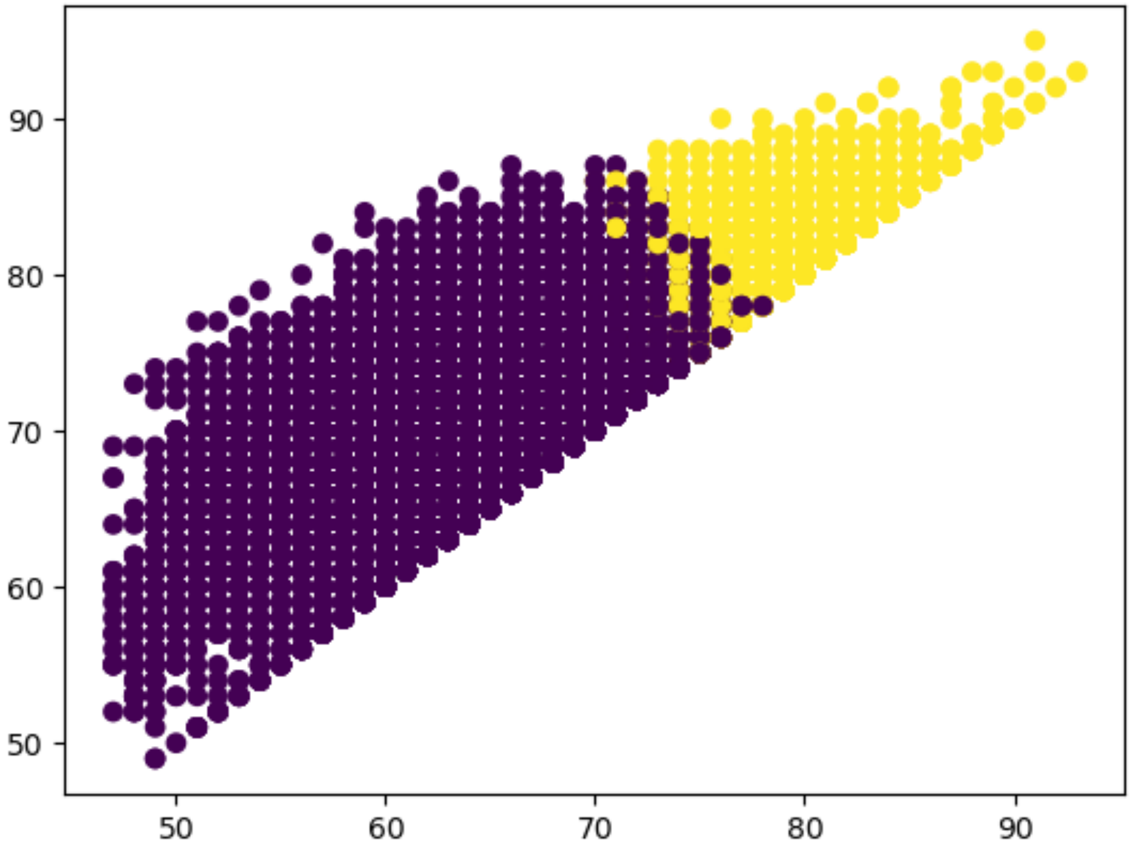
Out[33]:

	overall	potential	value_eur	wage_eur	age	K3	K2
0	93	93	78000000.0	320000.0	34	1	1
1	92	92	119500000.0	270000.0	32	1	1
2	91	91	45000000.0	270000.0	36	1	1
3	91	91	129000000.0	270000.0	29	1	1
4	91	91	125500000.0	350000.0	30	1	1
...	...	...	...	...	...	...	...
19234	47	52	70000.0	1000.0	22	0	0
19235	47	59	110000.0	500.0	19	0	0
19236	47	55	100000.0	500.0	21	0	0
19237	47	60	110000.0	500.0	19	0	0
19238	47	60	110000.0	500.0	19	0	0

19165 rows × 7 columns

In [35]:

```
plt.scatter(x = Players_features["overall"] , y=Players_features["potenti
plt.show()
```



In [ ]:

In [ ]:

In [36]:

```
from sklearn.cluster import KMeans

import joblib

model = kmeans.fit(Players_features_sc)


joblib.dump(model, "Players_info_Identifier")
```

Out[36]:

```
['Players_info_Identifier']
```

In [ ]: