

coderspace

October 7, 2024

```
[1]: import warnings
warnings.filterwarnings('ignore')

import numpy as np
import pandas as pd

pd.set_option('display.max_columns', 60)

[2]: df_train=pd.read_csv("/kaggle/input/
    ↪veri-bilimi-ve-yapay-zeka-okulu-kaggle-yarismasi/train.csv")
df_test=pd.read_csv("/kaggle/input/
    ↪veri-bilimi-ve-yapay-zeka-okulu-kaggle-yarismasi/test.csv")
df_train.drop(columns=['id'],inplace=True)
df_test.drop(columns=['id'],inplace=True)

[3]: df_train['Height']=df_train['Height'].astype(str).str.replace('CM','').
    ↪astype(int)
df_test['Height']=df_test['Height'].astype(str).str.replace('CM','').astype(int)
df_train['Weight']=df_train['Weight'].astype(str).str.replace('KG','').
    ↪astype(int)
df_test['Weight']=df_test['Weight'].astype(str).str.replace('KG','').astype(int)

[4]: df_train[['Caps', 'Goals']] = df_train['Caps / Goals'].str.split(' / ',
    ↪expand=True)

df_train['Caps'] = df_train['Caps'].notna().astype(int)
df_train['Goals'] = df_train['Goals'].notna().astype(int)

df_train = df_train.drop(columns=['Caps / Goals'])

df_test[['Caps', 'Goals']] = df_test['Caps / Goals'].str.split(' / ',
    ↪expand=True)

df_test['Caps'] = df_test['Caps'].notna().astype(int)
df_test['Goals'] = df_test['Goals'].notna().astype(int)
```

```
df_test = df_test.drop(columns=['Caps / Goals'])
```

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[5]: df_train['Goals per Caps']=df_train['Goals']/df_train['Caps']
df_test['Goals per Caps']=df_test['Goals']/df_test['Caps']
```

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[6]: df_train['Goals per Caps'].fillna(0,inplace=True)
df_test['Goals per Caps'].fillna(0,inplace=True)
df_train.drop(columns=['Caps', 'Goals'],inplace=True)
df_test.drop(columns=['Caps', 'Goals'],inplace=True)
```

```
[7]: df_train[df_train['Dribbling'].isna()]
```

```
[7]:
```

	value_increased	Ability	Potential	Positions	Foot	Height	Weight	\
1	False	48.0	NaN	GK	Right	185	82	
4	False	47.0	NaN	GK	Right	193	73	
18	False	40.0	NaN	GK	Right	190	74	
49	False	53.0	NaN	GK	Right	185	78	
65	False	53.0	NaN	GK	Right	187	71	
102	False	69.0	71.0	GK	Right	183	84	
110	False	45.0	NaN	GK	Right	185	75	
114	False	51.0	NaN	GK	Right	194	89	
166	False	53.0	NaN	GK	Right	193	82	
214	False	0.0	40.0	GK	Right	187	78	
240	False	40.0	NaN	GK	Left	192	97	
247	False	36.0	NaN	GK	Right	189	74	
255	False	57.0	NaN	GK	Right	187	73	
256	False	41.0	NaN	GK	Right	191	85	
265	False	62.0	63.0	GK	Right	187	70	
267	False	42.0	NaN	GK	Left	191	80	
279	False	50.0	NaN	GK	Right	177	72	
282	False	40.0	NaN	GK	Right	184	74	
297	False	53.0	NaN	GK	Right	193	92	
331	False	38.0	NaN	GK	Right	190	75	
334	False	52.0	NaN	GK	Right	191	73	
346	False	53.0	NaN	GK	Left	193	88	
349	False	29.0	NaN	GK	Right	191	77	
376	True	41.0	NaN	GK	Right	193	79	
391	True	49.0	NaN	GK	Right	189	79	
394	False	40.0	NaN	GK	Right	194	84	
420	False	45.0	NaN	GK	Right	176	60	
429	True	49.0	NaN	GK	Right	194	80	
431	False	70.0	78.0	GK	Left	196	74	
434	False	54.0	68.0	GK	Right	188	84	
445	False	41.0	NaN	GK	Right	185	78	
449	True	38.0	NaN	GK	Right	182	70	

	Aerial Reach	Command of Area	Communication	Eccentricity	First Touch	\
1	55.0	60.0	70.0	65.0	45.0	
4	35.0	40.0	35.0	25.0	5.0	
18	60.0	55.0	35.0	65.0	25.0	
49	65.0	60.0	60.0	65.0	60.0	
65	60.0	60.0	45.0	45.0	50.0	
102	70.0	65.0	60.0	25.0	35.0	
110	45.0	55.0	40.0	25.0	5.0	
114	60.0	50.0	55.0	70.0	35.0	
166	65.0	50.0	60.0	25.0	25.0	
214	70.0	40.0	45.0	55.0	30.0	
240	65.0	20.0	50.0	25.0	25.0	
247	60.0	50.0	45.0	25.0	30.0	
255	65.0	60.0	65.0	35.0	35.0	
256	60.0	50.0	35.0	20.0	25.0	
265	80.0	65.0	70.0	30.0	30.0	
267	50.0	70.0	50.0	25.0	25.0	
279	40.0	55.0	55.0	30.0	55.0	
282	40.0	50.0	65.0	55.0	15.0	
297	60.0	60.0	60.0	40.0	30.0	
331	55.0	40.0	45.0	50.0	15.0	
334	65.0	60.0	55.0	25.0	45.0	
346	65.0	50.0	40.0	60.0	55.0	
349	40.0	15.0	30.0	25.0	15.0	
376	60.0	75.0	50.0	50.0	10.0	
391	65.0	45.0	45.0	25.0	20.0	
394	60.0	65.0	35.0	40.0	5.0	
420	30.0	65.0	40.0	25.0	5.0	
429	45.0	50.0	45.0	25.0	5.0	
431	85.0	65.0	60.0	50.0	60.0	
434	55.0	75.0	65.0	15.0	45.0	
445	55.0	45.0	50.0	25.0	20.0	
449	55.0	45.0	45.0	40.0	5.0	

	Handling	Kicking	One on Ones	Passing	Punching (Tendency)	Reflexes	\
1	45.0	65.0	60.0	60.0	55.0	55.0	
4	70.0	50.0	50.0	50.0	50.0	70.0	
18	65.0	65.0	25.0	45.0	50.0	65.0	
49	70.0	55.0	70.0	60.0	35.0	70.0	
65	60.0	70.0	70.0	75.0	25.0	70.0	
102	50.0	55.0	60.0	60.0	55.0	70.0	
110	65.0	55.0	40.0	45.0	50.0	65.0	
114	60.0	55.0	60.0	40.0	55.0	75.0	
166	65.0	70.0	60.0	50.0	35.0	70.0	
214	40.0	65.0	35.0	35.0	70.0	70.0	
240	70.0	70.0	45.0	55.0	45.0	70.0	
247	50.0	45.0	45.0	55.0	35.0	65.0	

255	60.0	55.0	65.0	35.0	40.0	75.0
256	60.0	50.0	70.0	45.0	50.0	60.0
265	80.0	60.0	55.0	30.0	45.0	70.0
267	50.0	70.0	60.0	45.0	35.0	50.0
279	55.0	60.0	55.0	55.0	50.0	60.0
282	70.0	45.0	45.0	45.0	40.0	60.0
297	70.0	55.0	55.0	65.0	45.0	70.0
331	45.0	35.0	40.0	30.0	60.0	65.0
334	60.0	50.0	75.0	60.0	60.0	65.0
346	50.0	65.0	70.0	60.0	40.0	60.0
349	65.0	25.0	40.0	30.0	25.0	65.0
376	50.0	60.0	60.0	50.0	55.0	40.0
391	65.0	40.0	55.0	25.0	75.0	65.0
394	45.0	50.0	50.0	35.0	55.0	60.0
420	65.0	65.0	35.0	55.0	25.0	65.0
429	60.0	50.0	60.0	30.0	55.0	55.0
431	70.0	65.0	65.0	60.0	45.0	80.0
434	50.0	70.0	70.0	45.0	55.0	60.0
445	60.0	45.0	50.0	65.0	60.0	55.0
449	40.0	40.0	45.0	55.0	60.0	65.0

	Rushing Out (Tendency)	Throwing	Aggression	Anticipation	Bravery	\
1	65.0	65.0	60.0	55.0	55.0	
4	25.0	45.0	45.0	65.0	60.0	
18	80.0	35.0	55.0	25.0	75.0	
49	40.0	50.0	60.0	55.0	55.0	
65	50.0	55.0	55.0	50.0	50.0	
102	55.0	65.0	40.0	70.0	75.0	
110	40.0	40.0	40.0	50.0	75.0	
114	55.0	55.0	50.0	60.0	60.0	
166	60.0	65.0	30.0	30.0	75.0	
214	60.0	25.0	55.0	25.0	45.0	
240	35.0	45.0	45.0	25.0	55.0	
247	25.0	55.0	40.0	40.0	75.0	
255	65.0	40.0	50.0	75.0	55.0	
256	55.0	55.0	35.0	55.0	50.0	
265	40.0	50.0	55.0	55.0	50.0	
267	30.0	35.0	40.0	35.0	45.0	
279	75.0	55.0	40.0	50.0	60.0	
282	25.0	55.0	55.0	55.0	75.0	
297	75.0	60.0	40.0	35.0	60.0	
331	40.0	40.0	50.0	50.0	60.0	
334	50.0	70.0	25.0	50.0	55.0	
346	80.0	70.0	45.0	55.0	55.0	
349	70.0	15.0	40.0	25.0	65.0	
376	40.0	55.0	40.0	50.0	60.0	
391	30.0	45.0	55.0	50.0	75.0	

394	25.0	45.0	35.0	30.0	60.0
420	35.0	20.0	60.0	55.0	70.0
429	40.0	60.0	50.0	35.0	75.0
431	55.0	65.0	60.0	80.0	70.0
434	60.0	65.0	45.0	75.0	70.0
445	40.0	50.0	60.0	40.0	45.0
449	30.0	40.0	30.0	50.0	55.0

	Composure	Concentration	Decisions	Determination	Flair	Leadership	\
1	65.0	50.0	55.0	75.0	25.0	35.0	
4	40.0	50.0	60.0	60.0	5.0	25.0	
18	35.0	60.0	60.0	65.0	5.0	45.0	
49	35.0	50.0	55.0	70.0	50.0	65.0	
65	50.0	50.0	50.0	70.0	15.0	25.0	
102	70.0	70.0	60.0	90.0	10.0	55.0	
110	40.0	50.0	65.0	40.0	5.0	5.0	
114	40.0	50.0	45.0	65.0	40.0	40.0	
166	30.0	50.0	65.0	80.0	5.0	50.0	
214	30.0	50.0	35.0	75.0	10.0	65.0	
240	40.0	45.0	60.0	85.0	10.0	15.0	
247	35.0	30.0	55.0	65.0	10.0	35.0	
255	70.0	60.0	50.0	75.0	15.0	45.0	
256	55.0	60.0	50.0	65.0	25.0	40.0	
265	35.0	50.0	70.0	80.0	35.0	65.0	
267	25.0	50.0	70.0	65.0	5.0	25.0	
279	55.0	65.0	55.0	70.0	5.0	40.0	
282	30.0	60.0	70.0	75.0	5.0	5.0	
297	25.0	60.0	70.0	90.0	10.0	55.0	
331	35.0	40.0	65.0	55.0	15.0	60.0	
334	60.0	75.0	55.0	60.0	15.0	35.0	
346	75.0	45.0	50.0	60.0	5.0	40.0	
349	25.0	35.0	65.0	45.0	15.0	20.0	
376	40.0	50.0	60.0	30.0	10.0	55.0	
391	40.0	60.0	65.0	50.0	5.0	5.0	
394	40.0	40.0	70.0	55.0	5.0	45.0	
420	25.0	65.0	65.0	30.0	5.0	35.0	
429	40.0	70.0	70.0	70.0	5.0	30.0	
431	65.0	70.0	55.0	60.0	20.0	40.0	
434	55.0	55.0	50.0	60.0	15.0	65.0	
445	35.0	50.0	45.0	80.0	15.0	20.0	
449	35.0	45.0	65.0	20.0	15.0	35.0	

	Off the Ball	Positioning	Teamwork	Vision	Work Rate	Acceleration	\
1	10.0	35.0	50.0	30.0	55.0	55.0	
4	15.0	50.0	30.0	35.0	35.0	60.0	
18	15.0	30.0	35.0	30.0	55.0	55.0	
49	10.0	60.0	35.0	45.0	35.0	60.0	

65	5.0	45.0	50.0	40.0	50.0	65.0
102	65.0	75.0	55.0	60.0	60.0	70.0
110	15.0	50.0	70.0	35.0	30.0	60.0
114	30.0	60.0	50.0	40.0	40.0	50.0
166	15.0	45.0	45.0	40.0	40.0	50.0
214	5.0	55.0	40.0	25.0	35.0	45.0
240	5.0	50.0	40.0	35.0	35.0	50.0
247	15.0	45.0	45.0	40.0	40.0	65.0
255	25.0	60.0	50.0	35.0	55.0	55.0
256	30.0	50.0	40.0	30.0	35.0	30.0
265	30.0	50.0	55.0	25.0	50.0	60.0
267	10.0	65.0	40.0	35.0	35.0	60.0
279	15.0	60.0	60.0	45.0	70.0	60.0
282	5.0	40.0	40.0	35.0	30.0	30.0
297	5.0	60.0	40.0	40.0	25.0	55.0
331	15.0	20.0	35.0	30.0	25.0	65.0
334	35.0	60.0	45.0	40.0	60.0	40.0
346	10.0	35.0	70.0	45.0	60.0	60.0
349	5.0	50.0	30.0	20.0	25.0	55.0
376	10.0	50.0	50.0	45.0	35.0	35.0
391	15.0	60.0	40.0	35.0	35.0	55.0
394	10.0	60.0	40.0	35.0	35.0	50.0
420	10.0	40.0	35.0	20.0	30.0	50.0
429	5.0	35.0	45.0	40.0	35.0	70.0
431	20.0	65.0	60.0	50.0	60.0	45.0
434	25.0	45.0	55.0	40.0	50.0	50.0
445	5.0	45.0	50.0	45.0	45.0	60.0
449	10.0	50.0	35.0	30.0	30.0	55.0

	Agility	Balance	Jumping	Reach	Natural	Fitness	Pace	Stamina	\
1	60.0	50.0		60.0		50.0	45.0	50.0	
4	75.0	25.0		60.0		65.0	65.0	10.0	
18	50.0	25.0		65.0		30.0	55.0	40.0	
49	65.0	45.0		70.0		70.0	45.0	35.0	
65	50.0	55.0		70.0		50.0	70.0	25.0	
102	60.0	55.0		65.0		60.0	70.0	60.0	
110	60.0	30.0		55.0		70.0	40.0	5.0	
114	70.0	50.0		70.0		60.0	50.0	50.0	
166	65.0	45.0		70.0		75.0	60.0	25.0	
214	65.0	40.0		50.0		70.0	45.0	10.0	
240	60.0	40.0		75.0		75.0	70.0	25.0	
247	35.0	45.0		45.0		65.0	60.0	20.0	
255	75.0	40.0		75.0		80.0	65.0	65.0	
256	60.0	70.0		90.0		55.0	40.0	50.0	
265	60.0	65.0		80.0		70.0	50.0	55.0	
267	45.0	20.0		65.0		60.0	50.0	20.0	
279	60.0	50.0		50.0		60.0	55.0	60.0	

282	45.0	40.0	40.0	65.0	55.0	5.0
297	65.0	45.0	80.0	65.0	50.0	15.0
331	80.0	35.0	70.0	65.0	45.0	5.0
334	60.0	70.0	70.0	45.0	50.0	40.0
346	75.0	50.0	75.0	60.0	50.0	50.0
349	80.0	30.0	70.0	70.0	55.0	15.0
376	45.0	50.0	70.0	55.0	60.0	25.0
391	75.0	40.0	55.0	50.0	50.0	15.0
394	60.0	40.0	65.0	60.0	45.0	15.0
420	55.0	35.0	15.0	70.0	50.0	15.0
429	65.0	30.0	75.0	85.0	65.0	10.0
431	80.0	60.0	85.0	75.0	45.0	65.0
434	60.0	40.0	60.0	50.0	45.0	40.0
445	50.0	45.0	65.0	70.0	65.0	25.0
449	75.0	35.0	50.0	75.0	60.0	10.0

	Strength	Corners	Crossing	Dribbling	Finishing	Free Kick Taking	\
1	50.0	NaN	NaN	NaN	NaN	35.0	
4	35.0	NaN	NaN	NaN	NaN	40.0	
18	20.0	NaN	NaN	NaN	NaN	25.0	
49	40.0	NaN	NaN	NaN	NaN	35.0	
65	45.0	NaN	NaN	NaN	NaN	20.0	
102	50.0	NaN	NaN	NaN	NaN	40.0	
110	25.0	NaN	NaN	NaN	NaN	35.0	
114	70.0	NaN	NaN	NaN	NaN	35.0	
166	40.0	NaN	NaN	NaN	NaN	25.0	
214	30.0	NaN	NaN	NaN	NaN	35.0	
240	35.0	NaN	NaN	NaN	NaN	35.0	
247	35.0	NaN	NaN	NaN	NaN	15.0	
255	70.0	NaN	NaN	NaN	NaN	5.0	
256	55.0	NaN	NaN	NaN	NaN	5.0	
265	80.0	NaN	NaN	NaN	NaN	30.0	
267	35.0	NaN	NaN	NaN	NaN	30.0	
279	50.0	NaN	NaN	NaN	NaN	35.0	
282	25.0	NaN	NaN	NaN	NaN	40.0	
297	35.0	NaN	NaN	NaN	NaN	30.0	
331	25.0	NaN	NaN	NaN	NaN	25.0	
334	45.0	NaN	NaN	NaN	NaN	30.0	
346	55.0	NaN	NaN	NaN	NaN	30.0	
349	20.0	NaN	NaN	NaN	NaN	25.0	
376	35.0	NaN	NaN	NaN	NaN	20.0	
391	30.0	NaN	NaN	NaN	NaN	25.0	
394	35.0	NaN	NaN	NaN	NaN	30.0	
420	30.0	NaN	NaN	NaN	NaN	40.0	
429	30.0	NaN	NaN	NaN	NaN	40.0	
431	45.0	NaN	NaN	NaN	NaN	40.0	
434	50.0	NaN	NaN	NaN	NaN	55.0	

445	40.0	NaN	NaN	NaN	NaN	35.0
449	20.0	NaN	NaN	NaN	NaN	25.0

	Heading	Long Shots	Long Throws	Marking	Penalty Taking	Tackling \
1	NaN	NaN	NaN	NaN	15.0	NaN
4	NaN	NaN	NaN	NaN	15.0	NaN
18	NaN	NaN	NaN	NaN	5.0	NaN
49	NaN	NaN	NaN	NaN	35.0	NaN
65	NaN	NaN	NaN	NaN	15.0	NaN
102	NaN	NaN	NaN	NaN	20.0	NaN
110	NaN	NaN	NaN	NaN	5.0	NaN
114	NaN	NaN	NaN	NaN	5.0	NaN
166	NaN	NaN	NaN	NaN	10.0	NaN
214	NaN	NaN	NaN	NaN	5.0	NaN
240	NaN	NaN	NaN	NaN	5.0	NaN
247	NaN	NaN	NaN	NaN	15.0	NaN
255	NaN	NaN	NaN	NaN	5.0	NaN
256	NaN	NaN	NaN	NaN	20.0	NaN
265	NaN	NaN	NaN	NaN	15.0	NaN
267	NaN	NaN	NaN	NaN	5.0	NaN
279	NaN	NaN	NaN	NaN	20.0	NaN
282	NaN	NaN	NaN	NaN	15.0	NaN
297	NaN	NaN	NaN	NaN	15.0	NaN
331	NaN	NaN	NaN	NaN	5.0	NaN
334	NaN	NaN	NaN	NaN	20.0	NaN
346	NaN	NaN	NaN	NaN	15.0	NaN
349	NaN	NaN	NaN	NaN	15.0	NaN
376	NaN	NaN	NaN	NaN	5.0	NaN
391	NaN	NaN	NaN	NaN	15.0	NaN
394	NaN	NaN	NaN	NaN	15.0	NaN
420	NaN	NaN	NaN	NaN	10.0	NaN
429	NaN	NaN	NaN	NaN	10.0	NaN
431	NaN	NaN	NaN	NaN	10.0	NaN
434	NaN	NaN	NaN	NaN	10.0	NaN
445	NaN	NaN	NaN	NaN	10.0	NaN
449	NaN	NaN	NaN	NaN	5.0	NaN

	Technique	Goals per Caps
1	55.0	0.0
4	15.0	0.0
18	10.0	0.0
49	55.0	0.0
65	60.0	0.0
102	30.0	1.0
110	20.0	0.0
114	40.0	0.0
166	25.0	0.0

214	5.0	0.0
240	5.0	0.0
247	25.0	0.0
255	35.0	0.0
256	25.0	0.0
265	25.0	1.0
267	5.0	0.0
279	55.0	0.0
282	10.0	0.0
297	55.0	0.0
331	25.0	0.0
334	45.0	0.0
346	60.0	0.0
349	10.0	0.0
376	35.0	0.0
391	25.0	0.0
394	5.0	0.0
420	15.0	0.0
429	25.0	0.0
431	60.0	0.0
434	30.0	0.0
445	5.0	0.0
449	20.0	0.0

- All of them are goalkeepers. Therefore goalkeepers dont benefit from the following stats

```
[8]: gk_values={'Corners':0,'Crossing':0,'Dribbling':0,'Finishing':0,'Heading':
      ↪0,'Long Shots':0,'Long Throws':0,'Marking':0,'Tackling':0}
df_train.fillna(value=gk_values,inplace=True)
df_train[df_train['Positions']=='GK']
```

```
[8]:
```

	value_increased	Ability	Potential	Positions	Foot	Height	Weight	\
1	False	48.0	NaN	GK	Right	185	82	
4	False	47.0	NaN	GK	Right	193	73	
18	False	40.0	NaN	GK	Right	190	74	
49	False	53.0	NaN	GK	Right	185	78	
65	False	53.0	NaN	GK	Right	187	71	
102	False	69.0	71.0	GK	Right	183	84	
110	False	45.0	NaN	GK	Right	185	75	
114	False	51.0	NaN	GK	Right	194	89	
166	False	53.0	NaN	GK	Right	193	82	
214	False	0.0	40.0	GK	Right	187	78	
240	False	40.0	NaN	GK	Left	192	97	
247	False	36.0	NaN	GK	Right	189	74	
255	False	57.0	NaN	GK	Right	187	73	
256	False	41.0	NaN	GK	Right	191	85	
265	False	62.0	63.0	GK	Right	187	70	

267	False	42.0	NaN	GK	Left	191	80
279	False	50.0	NaN	GK	Right	177	72
282	False	40.0	NaN	GK	Right	184	74
297	False	53.0	NaN	GK	Right	193	92
331	False	38.0	NaN	GK	Right	190	75
334	False	52.0	NaN	GK	Right	191	73
346	False	53.0	NaN	GK	Left	193	88
349	False	29.0	NaN	GK	Right	191	77
376	True	41.0	NaN	GK	Right	193	79
391	True	49.0	NaN	GK	Right	189	79
394	False	40.0	NaN	GK	Right	194	84
420	False	45.0	NaN	GK	Right	176	60
429	True	49.0	NaN	GK	Right	194	80
431	False	70.0	78.0	GK	Left	196	74
434	False	54.0	68.0	GK	Right	188	84
445	False	41.0	NaN	GK	Right	185	78
449	True	38.0	NaN	GK	Right	182	70

	Aerial Reach	Command of Area	Communication	Eccentricity	First Touch \
1	55.0	60.0	70.0	65.0	45.0
4	35.0	40.0	35.0	25.0	5.0
18	60.0	55.0	35.0	65.0	25.0
49	65.0	60.0	60.0	65.0	60.0
65	60.0	60.0	45.0	45.0	50.0
102	70.0	65.0	60.0	25.0	35.0
110	45.0	55.0	40.0	25.0	5.0
114	60.0	50.0	55.0	70.0	35.0
166	65.0	50.0	60.0	25.0	25.0
214	70.0	40.0	45.0	55.0	30.0
240	65.0	20.0	50.0	25.0	25.0
247	60.0	50.0	45.0	25.0	30.0
255	65.0	60.0	65.0	35.0	35.0
256	60.0	50.0	35.0	20.0	25.0
265	80.0	65.0	70.0	30.0	30.0
267	50.0	70.0	50.0	25.0	25.0
279	40.0	55.0	55.0	30.0	55.0
282	40.0	50.0	65.0	55.0	15.0
297	60.0	60.0	60.0	40.0	30.0
331	55.0	40.0	45.0	50.0	15.0
334	65.0	60.0	55.0	25.0	45.0
346	65.0	50.0	40.0	60.0	55.0
349	40.0	15.0	30.0	25.0	15.0
376	60.0	75.0	50.0	50.0	10.0
391	65.0	45.0	45.0	25.0	20.0
394	60.0	65.0	35.0	40.0	5.0
420	30.0	65.0	40.0	25.0	5.0
429	45.0	50.0	45.0	25.0	5.0

431	85.0	65.0	60.0	50.0	60.0
434	55.0	75.0	65.0	15.0	45.0
445	55.0	45.0	50.0	25.0	20.0
449	55.0	45.0	45.0	40.0	5.0

	Handling	Kicking	One on Ones	Passing	Punching (Tendency)	Reflexes \
1	45.0	65.0	60.0	60.0	55.0	55.0
4	70.0	50.0	50.0	50.0	50.0	70.0
18	65.0	65.0	25.0	45.0	50.0	65.0
49	70.0	55.0	70.0	60.0	35.0	70.0
65	60.0	70.0	70.0	75.0	25.0	70.0
102	50.0	55.0	60.0	60.0	55.0	70.0
110	65.0	55.0	40.0	45.0	50.0	65.0
114	60.0	55.0	60.0	40.0	55.0	75.0
166	65.0	70.0	60.0	50.0	35.0	70.0
214	40.0	65.0	35.0	35.0	70.0	70.0
240	70.0	70.0	45.0	55.0	45.0	70.0
247	50.0	45.0	45.0	55.0	35.0	65.0
255	60.0	55.0	65.0	35.0	40.0	75.0
256	60.0	50.0	70.0	45.0	50.0	60.0
265	80.0	60.0	55.0	30.0	45.0	70.0
267	50.0	70.0	60.0	45.0	35.0	50.0
279	55.0	60.0	55.0	55.0	50.0	60.0
282	70.0	45.0	45.0	45.0	40.0	60.0
297	70.0	55.0	55.0	65.0	45.0	70.0
331	45.0	35.0	40.0	30.0	60.0	65.0
334	60.0	50.0	75.0	60.0	60.0	65.0
346	50.0	65.0	70.0	60.0	40.0	60.0
349	65.0	25.0	40.0	30.0	25.0	65.0
376	50.0	60.0	60.0	50.0	55.0	40.0
391	65.0	40.0	55.0	25.0	75.0	65.0
394	45.0	50.0	50.0	35.0	55.0	60.0
420	65.0	65.0	35.0	55.0	25.0	65.0
429	60.0	50.0	60.0	30.0	55.0	55.0
431	70.0	65.0	65.0	60.0	45.0	80.0
434	50.0	70.0	70.0	45.0	55.0	60.0
445	60.0	45.0	50.0	65.0	60.0	55.0
449	40.0	40.0	45.0	55.0	60.0	65.0

	Rushing Out (Tendency)	Throwing	Aggression	Anticipation	Bravery \
1	65.0	65.0	60.0	55.0	55.0
4	25.0	45.0	45.0	65.0	60.0
18	80.0	35.0	55.0	25.0	75.0
49	40.0	50.0	60.0	55.0	55.0
65	50.0	55.0	55.0	50.0	50.0
102	55.0	65.0	40.0	70.0	75.0
110	40.0	40.0	40.0	50.0	75.0

114	55.0	55.0	50.0	60.0	60.0
166	60.0	65.0	30.0	30.0	75.0
214	60.0	25.0	55.0	25.0	45.0
240	35.0	45.0	45.0	25.0	55.0
247	25.0	55.0	40.0	40.0	75.0
255	65.0	40.0	50.0	75.0	55.0
256	55.0	55.0	35.0	55.0	50.0
265	40.0	50.0	55.0	55.0	50.0
267	30.0	35.0	40.0	35.0	45.0
279	75.0	55.0	40.0	50.0	60.0
282	25.0	55.0	55.0	55.0	75.0
297	75.0	60.0	40.0	35.0	60.0
331	40.0	40.0	50.0	50.0	60.0
334	50.0	70.0	25.0	50.0	55.0
346	80.0	70.0	45.0	55.0	55.0
349	70.0	15.0	40.0	25.0	65.0
376	40.0	55.0	40.0	50.0	60.0
391	30.0	45.0	55.0	50.0	75.0
394	25.0	45.0	35.0	30.0	60.0
420	35.0	20.0	60.0	55.0	70.0
429	40.0	60.0	50.0	35.0	75.0
431	55.0	65.0	60.0	80.0	70.0
434	60.0	65.0	45.0	75.0	70.0
445	40.0	50.0	60.0	40.0	45.0
449	30.0	40.0	30.0	50.0	55.0

	Composure	Concentration	Decisions	Determination	Flair	Leadership \
1	65.0	50.0	55.0	75.0	25.0	35.0
4	40.0	50.0	60.0	60.0	5.0	25.0
18	35.0	60.0	60.0	65.0	5.0	45.0
49	35.0	50.0	55.0	70.0	50.0	65.0
65	50.0	50.0	50.0	70.0	15.0	25.0
102	70.0	70.0	60.0	90.0	10.0	55.0
110	40.0	50.0	65.0	40.0	5.0	5.0
114	40.0	50.0	45.0	65.0	40.0	40.0
166	30.0	50.0	65.0	80.0	5.0	50.0
214	30.0	50.0	35.0	75.0	10.0	65.0
240	40.0	45.0	60.0	85.0	10.0	15.0
247	35.0	30.0	55.0	65.0	10.0	35.0
255	70.0	60.0	50.0	75.0	15.0	45.0
256	55.0	60.0	50.0	65.0	25.0	40.0
265	35.0	50.0	70.0	80.0	35.0	65.0
267	25.0	50.0	70.0	65.0	5.0	25.0
279	55.0	65.0	55.0	70.0	5.0	40.0
282	30.0	60.0	70.0	75.0	5.0	5.0
297	25.0	60.0	70.0	90.0	10.0	55.0
331	35.0	40.0	65.0	55.0	15.0	60.0

334	60.0	75.0	55.0	60.0	15.0	35.0
346	75.0	45.0	50.0	60.0	5.0	40.0
349	25.0	35.0	65.0	45.0	15.0	20.0
376	40.0	50.0	60.0	30.0	10.0	55.0
391	40.0	60.0	65.0	50.0	5.0	5.0
394	40.0	40.0	70.0	55.0	5.0	45.0
420	25.0	65.0	65.0	30.0	5.0	35.0
429	40.0	70.0	70.0	70.0	5.0	30.0
431	65.0	70.0	55.0	60.0	20.0	40.0
434	55.0	55.0	50.0	60.0	15.0	65.0
445	35.0	50.0	45.0	80.0	15.0	20.0
449	35.0	45.0	65.0	20.0	15.0	35.0

	Off the Ball	Positioning	Teamwork	Vision	Work Rate	Acceleration \
1	10.0	35.0	50.0	30.0	55.0	55.0
4	15.0	50.0	30.0	35.0	35.0	60.0
18	15.0	30.0	35.0	30.0	55.0	55.0
49	10.0	60.0	35.0	45.0	35.0	60.0
65	5.0	45.0	50.0	40.0	50.0	65.0
102	65.0	75.0	55.0	60.0	60.0	70.0
110	15.0	50.0	70.0	35.0	30.0	60.0
114	30.0	60.0	50.0	40.0	40.0	50.0
166	15.0	45.0	45.0	40.0	40.0	50.0
214	5.0	55.0	40.0	25.0	35.0	45.0
240	5.0	50.0	40.0	35.0	35.0	50.0
247	15.0	45.0	45.0	40.0	40.0	65.0
255	25.0	60.0	50.0	35.0	55.0	55.0
256	30.0	50.0	40.0	30.0	35.0	30.0
265	30.0	50.0	55.0	25.0	50.0	60.0
267	10.0	65.0	40.0	35.0	35.0	60.0
279	15.0	60.0	60.0	45.0	70.0	60.0
282	5.0	40.0	40.0	35.0	30.0	30.0
297	5.0	60.0	40.0	40.0	25.0	55.0
331	15.0	20.0	35.0	30.0	25.0	65.0
334	35.0	60.0	45.0	40.0	60.0	40.0
346	10.0	35.0	70.0	45.0	60.0	60.0
349	5.0	50.0	30.0	20.0	25.0	55.0
376	10.0	50.0	50.0	45.0	35.0	35.0
391	15.0	60.0	40.0	35.0	35.0	55.0
394	10.0	60.0	40.0	35.0	35.0	50.0
420	10.0	40.0	35.0	20.0	30.0	50.0
429	5.0	35.0	45.0	40.0	35.0	70.0
431	20.0	65.0	60.0	50.0	60.0	45.0
434	25.0	45.0	55.0	40.0	50.0	50.0
445	5.0	45.0	50.0	45.0	45.0	60.0
449	10.0	50.0	35.0	30.0	30.0	55.0

	Agility	Balance	Jumping	Reach	Natural	Fitness	Pace	Stamina	\
1	60.0	50.0		60.0		50.0	45.0	50.0	
4	75.0	25.0		60.0		65.0	65.0	10.0	
18	50.0	25.0		65.0		30.0	55.0	40.0	
49	65.0	45.0		70.0		70.0	45.0	35.0	
65	50.0	55.0		70.0		50.0	70.0	25.0	
102	60.0	55.0		65.0		60.0	70.0	60.0	
110	60.0	30.0		55.0		70.0	40.0	5.0	
114	70.0	50.0		70.0		60.0	50.0	50.0	
166	65.0	45.0		70.0		75.0	60.0	25.0	
214	65.0	40.0		50.0		70.0	45.0	10.0	
240	60.0	40.0		75.0		75.0	70.0	25.0	
247	35.0	45.0		45.0		65.0	60.0	20.0	
255	75.0	40.0		75.0		80.0	65.0	65.0	
256	60.0	70.0		90.0		55.0	40.0	50.0	
265	60.0	65.0		80.0		70.0	50.0	55.0	
267	45.0	20.0		65.0		60.0	50.0	20.0	
279	60.0	50.0		50.0		60.0	55.0	60.0	
282	45.0	40.0		40.0		65.0	55.0	5.0	
297	65.0	45.0		80.0		65.0	50.0	15.0	
331	80.0	35.0		70.0		65.0	45.0	5.0	
334	60.0	70.0		70.0		45.0	50.0	40.0	
346	75.0	50.0		75.0		60.0	50.0	50.0	
349	80.0	30.0		70.0		70.0	55.0	15.0	
376	45.0	50.0		70.0		55.0	60.0	25.0	
391	75.0	40.0		55.0		50.0	50.0	15.0	
394	60.0	40.0		65.0		60.0	45.0	15.0	
420	55.0	35.0		15.0		70.0	50.0	15.0	
429	65.0	30.0		75.0		85.0	65.0	10.0	
431	80.0	60.0		85.0		75.0	45.0	65.0	
434	60.0	40.0		60.0		50.0	45.0	40.0	
445	50.0	45.0		65.0		70.0	65.0	25.0	
449	75.0	35.0		50.0		75.0	60.0	10.0	

	Strength	Corners	Crossing	Dribbling	Finishing	Free Kick	Taking	\
1	50.0	0.0	0.0	0.0	0.0		35.0	
4	35.0	0.0	0.0	0.0	0.0		40.0	
18	20.0	0.0	0.0	0.0	0.0		25.0	
49	40.0	0.0	0.0	0.0	0.0		35.0	
65	45.0	0.0	0.0	0.0	0.0		20.0	
102	50.0	0.0	0.0	0.0	0.0		40.0	
110	25.0	0.0	0.0	0.0	0.0		35.0	
114	70.0	0.0	0.0	0.0	0.0		35.0	
166	40.0	0.0	0.0	0.0	0.0		25.0	
214	30.0	0.0	0.0	0.0	0.0		35.0	
240	35.0	0.0	0.0	0.0	0.0		35.0	
247	35.0	0.0	0.0	0.0	0.0		15.0	

255	70.0	0.0	0.0	0.0	0.0	5.0
256	55.0	0.0	0.0	0.0	0.0	5.0
265	80.0	0.0	0.0	0.0	0.0	30.0
267	35.0	0.0	0.0	0.0	0.0	30.0
279	50.0	0.0	0.0	0.0	0.0	35.0
282	25.0	0.0	0.0	0.0	0.0	40.0
297	35.0	0.0	0.0	0.0	0.0	30.0
331	25.0	0.0	0.0	0.0	0.0	25.0
334	45.0	0.0	0.0	0.0	0.0	30.0
346	55.0	0.0	0.0	0.0	0.0	30.0
349	20.0	0.0	0.0	0.0	0.0	25.0
376	35.0	0.0	0.0	0.0	0.0	20.0
391	30.0	0.0	0.0	0.0	0.0	25.0
394	35.0	0.0	0.0	0.0	0.0	30.0
420	30.0	0.0	0.0	0.0	0.0	40.0
429	30.0	0.0	0.0	0.0	0.0	40.0
431	45.0	0.0	0.0	0.0	0.0	40.0
434	50.0	0.0	0.0	0.0	0.0	55.0
445	40.0	0.0	0.0	0.0	0.0	35.0
449	20.0	0.0	0.0	0.0	0.0	25.0

	Heading	Long Shots	Long Throws	Marking	Penalty Taking	Tackling \
1	0.0	0.0	0.0	0.0	15.0	0.0
4	0.0	0.0	0.0	0.0	15.0	0.0
18	0.0	0.0	0.0	0.0	5.0	0.0
49	0.0	0.0	0.0	0.0	35.0	0.0
65	0.0	0.0	0.0	0.0	15.0	0.0
102	0.0	0.0	0.0	0.0	20.0	0.0
110	0.0	0.0	0.0	0.0	5.0	0.0
114	0.0	0.0	0.0	0.0	5.0	0.0
166	0.0	0.0	0.0	0.0	10.0	0.0
214	0.0	0.0	0.0	0.0	5.0	0.0
240	0.0	0.0	0.0	0.0	5.0	0.0
247	0.0	0.0	0.0	0.0	15.0	0.0
255	0.0	0.0	0.0	0.0	5.0	0.0
256	0.0	0.0	0.0	0.0	20.0	0.0
265	0.0	0.0	0.0	0.0	15.0	0.0
267	0.0	0.0	0.0	0.0	5.0	0.0
279	0.0	0.0	0.0	0.0	20.0	0.0
282	0.0	0.0	0.0	0.0	15.0	0.0
297	0.0	0.0	0.0	0.0	15.0	0.0
331	0.0	0.0	0.0	0.0	5.0	0.0
334	0.0	0.0	0.0	0.0	20.0	0.0
346	0.0	0.0	0.0	0.0	15.0	0.0
349	0.0	0.0	0.0	0.0	15.0	0.0
376	0.0	0.0	0.0	0.0	5.0	0.0
391	0.0	0.0	0.0	0.0	15.0	0.0

394	0.0	0.0	0.0	0.0	15.0	0.0
420	0.0	0.0	0.0	0.0	10.0	0.0
429	0.0	0.0	0.0	0.0	10.0	0.0
431	0.0	0.0	0.0	0.0	10.0	0.0
434	0.0	0.0	0.0	0.0	10.0	0.0
445	0.0	0.0	0.0	0.0	10.0	0.0
449	0.0	0.0	0.0	0.0	5.0	0.0

	Technique	Goals per Caps
1	55.0	0.0
4	15.0	0.0
18	10.0	0.0
49	55.0	0.0
65	60.0	0.0
102	30.0	1.0
110	20.0	0.0
114	40.0	0.0
166	25.0	0.0
214	5.0	0.0
240	5.0	0.0
247	25.0	0.0
255	35.0	0.0
256	25.0	0.0
265	25.0	1.0
267	5.0	0.0
279	55.0	0.0
282	10.0	0.0
297	55.0	0.0
331	25.0	0.0
334	45.0	0.0
346	60.0	0.0
349	10.0	0.0
376	35.0	0.0
391	25.0	0.0
394	5.0	0.0
420	15.0	0.0
429	25.0	0.0
431	60.0	0.0
434	30.0	0.0
445	5.0	0.0
449	20.0	0.0

```
[9]: df_test.fillna(value=gk_values,inplace=True)
df_test[df_test['Positions']=='GK']
```

```
[9]:      Ability  Potential Positions  Foot  Height  Weight  Aerial Reach \
3      39.0      NaN      GK  Right      187      74      55.0
```


50	46.0	NaN	GK Right	190	80	40.0
66	41.0	NaN	GK Right	183	76	65.0
90	49.0	NaN	GK Right	189	79	65.0
129	56.0	NaN	GK Right	192	80	70.0
132	38.0	NaN	GK Right	192	79	65.0
141	45.0	NaN	GK Right	185	77	60.0
158	30.0	NaN	GK Right	189	79	55.0
174	40.0	NaN	GK Right	191	81	60.0
246	51.0	NaN	GK Right	188	85	60.0
251	37.0	NaN	GK Left	188	74	50.0
254	50.0	NaN	GK Right	194	83	50.0

	Command of Area	Communication	Eccentricity	First Touch	Handling \
3	40.0	30.0	25.0	15.0	70.0
50	45.0	50.0	25.0	5.0	65.0
66	55.0	55.0	30.0	30.0	70.0
90	60.0	70.0	20.0	50.0	65.0
129	65.0	60.0	65.0	45.0	60.0
132	45.0	55.0	25.0	5.0	65.0
141	40.0	50.0	25.0	5.0	70.0
158	65.0	40.0	25.0	25.0	45.0
174	70.0	35.0	25.0	20.0	40.0
246	55.0	60.0	40.0	30.0	55.0
251	50.0	35.0	25.0	15.0	60.0
254	45.0	40.0	25.0	20.0	70.0

	Kicking	One on Ones	Passing	Punching (Tendency)	Reflexes \
3	50.0	35.0	45.0	25.0	70.0
50	50.0	35.0	50.0	25.0	65.0
66	50.0	65.0	40.0	50.0	65.0
90	60.0	60.0	50.0	55.0	70.0
129	50.0	60.0	45.0	60.0	70.0
132	40.0	50.0	30.0	45.0	60.0
141	70.0	40.0	25.0	75.0	70.0
158	60.0	30.0	20.0	55.0	45.0
174	40.0	50.0	45.0	25.0	70.0
246	50.0	60.0	30.0	45.0	60.0
251	45.0	40.0	50.0	35.0	45.0
254	50.0	55.0	40.0	45.0	55.0

	Rushing Out (Tendency)	Throwing	Aggression	Anticipation	Bravery \
3	55.0	40.0	25.0	40.0	45.0
50	40.0	35.0	25.0	45.0	75.0
66	70.0	40.0	60.0	55.0	55.0
90	40.0	55.0	40.0	50.0	40.0
129	65.0	50.0	45.0	60.0	55.0
132	65.0	35.0	45.0	40.0	70.0

141	60.0	55.0	55.0	50.0	65.0
158	25.0	25.0	75.0	50.0	75.0
174	40.0	30.0	25.0	55.0	65.0
246	55.0	50.0	50.0	55.0	50.0
251	35.0	40.0	25.0	35.0	60.0
254	30.0	45.0	60.0	45.0	75.0

	Composure	Concentration	Decisions	Determination	Flair	Leadership	\
3	30.0	50.0	70.0	75.0	15.0	55.0	
50	35.0	55.0	65.0	50.0	10.0	30.0	
66	40.0	50.0	45.0	70.0	35.0	20.0	
90	50.0	40.0	40.0	75.0	55.0	25.0	
129	50.0	65.0	60.0	70.0	35.0	50.0	
132	30.0	55.0	55.0	30.0	10.0	60.0	
141	30.0	65.0	70.0	50.0	15.0	30.0	
158	30.0	40.0	65.0	55.0	10.0	30.0	
174	30.0	35.0	75.0	35.0	10.0	25.0	
246	50.0	65.0	55.0	60.0	20.0	55.0	
251	40.0	40.0	60.0	45.0	10.0	55.0	
254	45.0	60.0	70.0	70.0	15.0	60.0	

	Off the Ball	Positioning	Teamwork	Vision	Work Rate	Acceleration	\
3	15.0	55.0	40.0	35.0	35.0	55.0	
50	5.0	50.0	15.0	35.0	30.0	65.0	
66	20.0	55.0	40.0	30.0	40.0	30.0	
90	60.0	60.0	60.0	60.0	55.0	60.0	
129	35.0	55.0	65.0	40.0	65.0	50.0	
132	5.0	55.0	35.0	30.0	25.0	50.0	
141	15.0	55.0	40.0	35.0	15.0	65.0	
158	5.0	35.0	30.0	25.0	25.0	55.0	
174	15.0	70.0	45.0	40.0	35.0	50.0	
246	40.0	65.0	60.0	55.0	55.0	55.0	
251	15.0	40.0	35.0	30.0	25.0	65.0	
254	5.0	50.0	45.0	25.0	35.0	55.0	

	Agility	Balance	Jumping	Reach	Natural Fitness	Pace	Stamina	\
3	50.0	40.0		45.0	90.0	55.0	35.0	
50	70.0	30.0		55.0	60.0	50.0	10.0	
66	60.0	40.0		65.0	70.0	30.0	50.0	
90	60.0	50.0		65.0	70.0	60.0	65.0	
129	60.0	65.0		75.0	65.0	50.0	75.0	
132	50.0	35.0		50.0	50.0	40.0	5.0	
141	35.0	40.0		45.0	45.0	60.0	20.0	
158	35.0	5.0		55.0	70.0	50.0	10.0	
174	55.0	20.0		70.0	50.0	40.0	10.0	
246	60.0	50.0		65.0	50.0	60.0	55.0	
251	75.0	35.0		60.0	75.0	65.0	10.0	

254	70.0	45.0	75.0	30.0	60.0	10.0
	Strength	Corners	Crossing	Dribbling	Finishing	Free Kick Taking \
3	35.0	0.0	0.0	0.0	0.0	10.0
50	30.0	0.0	0.0	0.0	0.0	30.0
66	30.0	0.0	0.0	0.0	0.0	30.0
90	55.0	0.0	0.0	0.0	0.0	20.0
129	65.0	0.0	0.0	0.0	0.0	40.0
132	25.0	0.0	0.0	0.0	0.0	30.0
141	30.0	0.0	0.0	0.0	0.0	45.0
158	30.0	0.0	0.0	0.0	0.0	30.0
174	30.0	0.0	0.0	0.0	0.0	30.0
246	50.0	0.0	0.0	0.0	0.0	30.0
251	20.0	0.0	0.0	0.0	0.0	20.0
254	35.0	0.0	0.0	0.0	0.0	25.0

	Heading	Long Shots	Long Throws	Marking	Penalty Taking	Tackling \
3	0.0	0.0	0.0	0.0	10.0	0.0
50	0.0	0.0	0.0	0.0	10.0	0.0
66	0.0	0.0	0.0	0.0	15.0	0.0
90	0.0	0.0	0.0	0.0	5.0	0.0
129	0.0	0.0	0.0	0.0	5.0	0.0
132	0.0	0.0	0.0	0.0	10.0	0.0
141	0.0	0.0	0.0	0.0	10.0	0.0
158	0.0	0.0	0.0	0.0	15.0	0.0
174	0.0	0.0	0.0	0.0	15.0	0.0
246	0.0	0.0	0.0	0.0	10.0	0.0
251	0.0	0.0	0.0	0.0	5.0	0.0
254	0.0	0.0	0.0	0.0	15.0	0.0

	Technique	Goals per Caps
3	25.0	0.0
50	10.0	0.0
66	30.0	0.0
90	40.0	0.0
129	40.0	0.0
132	10.0	0.0
141	25.0	0.0
158	10.0	0.0
174	10.0	0.0
246	35.0	0.0
251	5.0	0.0
254	25.0	0.0

```
[10]: df_train[df_train['Throwing'].notna()]
```

```

[10]:      value_increased  Ability  Potential Positions  Foot  Height  Weight  \
1           False      48.0         NaN           GK  Right    185    82
4           False      47.0         NaN           GK  Right    193    73
18          False      40.0         NaN           GK  Right    190    74
49          False      53.0         NaN           GK  Right    185    78
65          False      53.0         NaN           GK  Right    187    71
102         False      69.0        71.0           GK  Right    183    84
110         False      45.0         NaN           GK  Right    185    75
114         False      51.0         NaN           GK  Right    194    89
166         False      53.0         NaN           GK  Right    193    82
214         False       0.0        40.0           GK  Right    187    78
240         False      40.0         NaN           GK  Left     192    97
247         False      36.0         NaN           GK  Right    189    74
255         False      57.0         NaN           GK  Right    187    73
256         False      41.0         NaN           GK  Right    191    85
265         False      62.0        63.0           GK  Right    187    70
267         False      42.0         NaN           GK  Left     191    80
279         False      50.0         NaN           GK  Right    177    72
282         False      40.0         NaN           GK  Right    184    74
297         False      53.0         NaN           GK  Right    193    92
331         False      38.0         NaN           GK  Right    190    75
334         False      52.0         NaN           GK  Right    191    73
346         False      53.0         NaN           GK  Left     193    88
349         False      29.0         NaN           GK  Right    191    77
376          True      41.0         NaN           GK  Right    193    79
391          True      49.0         NaN           GK  Right    189    79
394         False      40.0         NaN           GK  Right    194    84
420         False      45.0         NaN           GK  Right    176    60
429          True      49.0         NaN           GK  Right    194    80
431         False      70.0        78.0           GK  Left     196    74
434         False      54.0        68.0           GK  Right    188    84
445         False      41.0         NaN           GK  Right    185    78
449          True      38.0         NaN           GK  Right    182    70

      Aerial Reach  Command of Area  Communication  Eccentricity  First Touch  \
1           55.0         60.0         70.0         65.0         45.0
4           35.0         40.0         35.0         25.0          5.0
18          60.0         55.0         35.0         65.0         25.0
49          65.0         60.0         60.0         65.0         60.0
65          60.0         60.0         45.0         45.0         50.0
102         70.0         65.0         60.0         25.0         35.0
110         45.0         55.0         40.0         25.0          5.0
114         60.0         50.0         55.0         70.0         35.0
166         65.0         50.0         60.0         25.0         25.0
214         70.0         40.0         45.0         55.0         30.0
240         65.0         20.0         50.0         25.0         25.0
247         60.0         50.0         45.0         25.0         30.0

```

255	65.0	60.0	65.0	35.0	35.0
256	60.0	50.0	35.0	20.0	25.0
265	80.0	65.0	70.0	30.0	30.0
267	50.0	70.0	50.0	25.0	25.0
279	40.0	55.0	55.0	30.0	55.0
282	40.0	50.0	65.0	55.0	15.0
297	60.0	60.0	60.0	40.0	30.0
331	55.0	40.0	45.0	50.0	15.0
334	65.0	60.0	55.0	25.0	45.0
346	65.0	50.0	40.0	60.0	55.0
349	40.0	15.0	30.0	25.0	15.0
376	60.0	75.0	50.0	50.0	10.0
391	65.0	45.0	45.0	25.0	20.0
394	60.0	65.0	35.0	40.0	5.0
420	30.0	65.0	40.0	25.0	5.0
429	45.0	50.0	45.0	25.0	5.0
431	85.0	65.0	60.0	50.0	60.0
434	55.0	75.0	65.0	15.0	45.0
445	55.0	45.0	50.0	25.0	20.0
449	55.0	45.0	45.0	40.0	5.0

	Handling	Kicking	One on Ones	Passing	Punching (Tendency)	Reflexes \
1	45.0	65.0	60.0	60.0	55.0	55.0
4	70.0	50.0	50.0	50.0	50.0	70.0
18	65.0	65.0	25.0	45.0	50.0	65.0
49	70.0	55.0	70.0	60.0	35.0	70.0
65	60.0	70.0	70.0	75.0	25.0	70.0
102	50.0	55.0	60.0	60.0	55.0	70.0
110	65.0	55.0	40.0	45.0	50.0	65.0
114	60.0	55.0	60.0	40.0	55.0	75.0
166	65.0	70.0	60.0	50.0	35.0	70.0
214	40.0	65.0	35.0	35.0	70.0	70.0
240	70.0	70.0	45.0	55.0	45.0	70.0
247	50.0	45.0	45.0	55.0	35.0	65.0
255	60.0	55.0	65.0	35.0	40.0	75.0
256	60.0	50.0	70.0	45.0	50.0	60.0
265	80.0	60.0	55.0	30.0	45.0	70.0
267	50.0	70.0	60.0	45.0	35.0	50.0
279	55.0	60.0	55.0	55.0	50.0	60.0
282	70.0	45.0	45.0	45.0	40.0	60.0
297	70.0	55.0	55.0	65.0	45.0	70.0
331	45.0	35.0	40.0	30.0	60.0	65.0
334	60.0	50.0	75.0	60.0	60.0	65.0
346	50.0	65.0	70.0	60.0	40.0	60.0
349	65.0	25.0	40.0	30.0	25.0	65.0
376	50.0	60.0	60.0	50.0	55.0	40.0
391	65.0	40.0	55.0	25.0	75.0	65.0

394	45.0	50.0	50.0	35.0	55.0	60.0
420	65.0	65.0	35.0	55.0	25.0	65.0
429	60.0	50.0	60.0	30.0	55.0	55.0
431	70.0	65.0	65.0	60.0	45.0	80.0
434	50.0	70.0	70.0	45.0	55.0	60.0
445	60.0	45.0	50.0	65.0	60.0	55.0
449	40.0	40.0	45.0	55.0	60.0	65.0

	Rushing Out (Tendency)	Throwing	Aggression	Anticipation	Bravery	\
1	65.0	65.0	60.0	55.0	55.0	
4	25.0	45.0	45.0	65.0	60.0	
18	80.0	35.0	55.0	25.0	75.0	
49	40.0	50.0	60.0	55.0	55.0	
65	50.0	55.0	55.0	50.0	50.0	
102	55.0	65.0	40.0	70.0	75.0	
110	40.0	40.0	40.0	50.0	75.0	
114	55.0	55.0	50.0	60.0	60.0	
166	60.0	65.0	30.0	30.0	75.0	
214	60.0	25.0	55.0	25.0	45.0	
240	35.0	45.0	45.0	25.0	55.0	
247	25.0	55.0	40.0	40.0	75.0	
255	65.0	40.0	50.0	75.0	55.0	
256	55.0	55.0	35.0	55.0	50.0	
265	40.0	50.0	55.0	55.0	50.0	
267	30.0	35.0	40.0	35.0	45.0	
279	75.0	55.0	40.0	50.0	60.0	
282	25.0	55.0	55.0	55.0	75.0	
297	75.0	60.0	40.0	35.0	60.0	
331	40.0	40.0	50.0	50.0	60.0	
334	50.0	70.0	25.0	50.0	55.0	
346	80.0	70.0	45.0	55.0	55.0	
349	70.0	15.0	40.0	25.0	65.0	
376	40.0	55.0	40.0	50.0	60.0	
391	30.0	45.0	55.0	50.0	75.0	
394	25.0	45.0	35.0	30.0	60.0	
420	35.0	20.0	60.0	55.0	70.0	
429	40.0	60.0	50.0	35.0	75.0	
431	55.0	65.0	60.0	80.0	70.0	
434	60.0	65.0	45.0	75.0	70.0	
445	40.0	50.0	60.0	40.0	45.0	
449	30.0	40.0	30.0	50.0	55.0	

	Composure	Concentration	Decisions	Determination	Flair	Leadership	\
1	65.0	50.0	55.0	75.0	25.0	35.0	
4	40.0	50.0	60.0	60.0	5.0	25.0	
18	35.0	60.0	60.0	65.0	5.0	45.0	
49	35.0	50.0	55.0	70.0	50.0	65.0	

65	50.0	50.0	50.0	70.0	15.0	25.0
102	70.0	70.0	60.0	90.0	10.0	55.0
110	40.0	50.0	65.0	40.0	5.0	5.0
114	40.0	50.0	45.0	65.0	40.0	40.0
166	30.0	50.0	65.0	80.0	5.0	50.0
214	30.0	50.0	35.0	75.0	10.0	65.0
240	40.0	45.0	60.0	85.0	10.0	15.0
247	35.0	30.0	55.0	65.0	10.0	35.0
255	70.0	60.0	50.0	75.0	15.0	45.0
256	55.0	60.0	50.0	65.0	25.0	40.0
265	35.0	50.0	70.0	80.0	35.0	65.0
267	25.0	50.0	70.0	65.0	5.0	25.0
279	55.0	65.0	55.0	70.0	5.0	40.0
282	30.0	60.0	70.0	75.0	5.0	5.0
297	25.0	60.0	70.0	90.0	10.0	55.0
331	35.0	40.0	65.0	55.0	15.0	60.0
334	60.0	75.0	55.0	60.0	15.0	35.0
346	75.0	45.0	50.0	60.0	5.0	40.0
349	25.0	35.0	65.0	45.0	15.0	20.0
376	40.0	50.0	60.0	30.0	10.0	55.0
391	40.0	60.0	65.0	50.0	5.0	5.0
394	40.0	40.0	70.0	55.0	5.0	45.0
420	25.0	65.0	65.0	30.0	5.0	35.0
429	40.0	70.0	70.0	70.0	5.0	30.0
431	65.0	70.0	55.0	60.0	20.0	40.0
434	55.0	55.0	50.0	60.0	15.0	65.0
445	35.0	50.0	45.0	80.0	15.0	20.0
449	35.0	45.0	65.0	20.0	15.0	35.0

	Off the Ball	Positioning	Teamwork	Vision	Work Rate	Acceleration \
1	10.0	35.0	50.0	30.0	55.0	55.0
4	15.0	50.0	30.0	35.0	35.0	60.0
18	15.0	30.0	35.0	30.0	55.0	55.0
49	10.0	60.0	35.0	45.0	35.0	60.0
65	5.0	45.0	50.0	40.0	50.0	65.0
102	65.0	75.0	55.0	60.0	60.0	70.0
110	15.0	50.0	70.0	35.0	30.0	60.0
114	30.0	60.0	50.0	40.0	40.0	50.0
166	15.0	45.0	45.0	40.0	40.0	50.0
214	5.0	55.0	40.0	25.0	35.0	45.0
240	5.0	50.0	40.0	35.0	35.0	50.0
247	15.0	45.0	45.0	40.0	40.0	65.0
255	25.0	60.0	50.0	35.0	55.0	55.0
256	30.0	50.0	40.0	30.0	35.0	30.0
265	30.0	50.0	55.0	25.0	50.0	60.0
267	10.0	65.0	40.0	35.0	35.0	60.0
279	15.0	60.0	60.0	45.0	70.0	60.0

282	5.0	40.0	40.0	35.0	30.0	30.0
297	5.0	60.0	40.0	40.0	25.0	55.0
331	15.0	20.0	35.0	30.0	25.0	65.0
334	35.0	60.0	45.0	40.0	60.0	40.0
346	10.0	35.0	70.0	45.0	60.0	60.0
349	5.0	50.0	30.0	20.0	25.0	55.0
376	10.0	50.0	50.0	45.0	35.0	35.0
391	15.0	60.0	40.0	35.0	35.0	55.0
394	10.0	60.0	40.0	35.0	35.0	50.0
420	10.0	40.0	35.0	20.0	30.0	50.0
429	5.0	35.0	45.0	40.0	35.0	70.0
431	20.0	65.0	60.0	50.0	60.0	45.0
434	25.0	45.0	55.0	40.0	50.0	50.0
445	5.0	45.0	50.0	45.0	45.0	60.0
449	10.0	50.0	35.0	30.0	30.0	55.0

	Agility	Balance	Jumping	Reach	Natural	Fitness	Pace	Stamina	\
1	60.0	50.0		60.0		50.0	45.0	50.0	
4	75.0	25.0		60.0		65.0	65.0	10.0	
18	50.0	25.0		65.0		30.0	55.0	40.0	
49	65.0	45.0		70.0		70.0	45.0	35.0	
65	50.0	55.0		70.0		50.0	70.0	25.0	
102	60.0	55.0		65.0		60.0	70.0	60.0	
110	60.0	30.0		55.0		70.0	40.0	5.0	
114	70.0	50.0		70.0		60.0	50.0	50.0	
166	65.0	45.0		70.0		75.0	60.0	25.0	
214	65.0	40.0		50.0		70.0	45.0	10.0	
240	60.0	40.0		75.0		75.0	70.0	25.0	
247	35.0	45.0		45.0		65.0	60.0	20.0	
255	75.0	40.0		75.0		80.0	65.0	65.0	
256	60.0	70.0		90.0		55.0	40.0	50.0	
265	60.0	65.0		80.0		70.0	50.0	55.0	
267	45.0	20.0		65.0		60.0	50.0	20.0	
279	60.0	50.0		50.0		60.0	55.0	60.0	
282	45.0	40.0		40.0		65.0	55.0	5.0	
297	65.0	45.0		80.0		65.0	50.0	15.0	
331	80.0	35.0		70.0		65.0	45.0	5.0	
334	60.0	70.0		70.0		45.0	50.0	40.0	
346	75.0	50.0		75.0		60.0	50.0	50.0	
349	80.0	30.0		70.0		70.0	55.0	15.0	
376	45.0	50.0		70.0		55.0	60.0	25.0	
391	75.0	40.0		55.0		50.0	50.0	15.0	
394	60.0	40.0		65.0		60.0	45.0	15.0	
420	55.0	35.0		15.0		70.0	50.0	15.0	
429	65.0	30.0		75.0		85.0	65.0	10.0	
431	80.0	60.0		85.0		75.0	45.0	65.0	
434	60.0	40.0		60.0		50.0	45.0	40.0	

445	50.0	45.0	65.0	70.0	65.0	25.0
449	75.0	35.0	50.0	75.0	60.0	10.0

	Strength	Corners	Crossing	Dribbling	Finishing	Free Kick Taking	\
1	50.0	0.0	0.0	0.0	0.0	35.0	
4	35.0	0.0	0.0	0.0	0.0	40.0	
18	20.0	0.0	0.0	0.0	0.0	25.0	
49	40.0	0.0	0.0	0.0	0.0	35.0	
65	45.0	0.0	0.0	0.0	0.0	20.0	
102	50.0	0.0	0.0	0.0	0.0	40.0	
110	25.0	0.0	0.0	0.0	0.0	35.0	
114	70.0	0.0	0.0	0.0	0.0	35.0	
166	40.0	0.0	0.0	0.0	0.0	25.0	
214	30.0	0.0	0.0	0.0	0.0	35.0	
240	35.0	0.0	0.0	0.0	0.0	35.0	
247	35.0	0.0	0.0	0.0	0.0	15.0	
255	70.0	0.0	0.0	0.0	0.0	5.0	
256	55.0	0.0	0.0	0.0	0.0	5.0	
265	80.0	0.0	0.0	0.0	0.0	30.0	
267	35.0	0.0	0.0	0.0	0.0	30.0	
279	50.0	0.0	0.0	0.0	0.0	35.0	
282	25.0	0.0	0.0	0.0	0.0	40.0	
297	35.0	0.0	0.0	0.0	0.0	30.0	
331	25.0	0.0	0.0	0.0	0.0	25.0	
334	45.0	0.0	0.0	0.0	0.0	30.0	
346	55.0	0.0	0.0	0.0	0.0	30.0	
349	20.0	0.0	0.0	0.0	0.0	25.0	
376	35.0	0.0	0.0	0.0	0.0	20.0	
391	30.0	0.0	0.0	0.0	0.0	25.0	
394	35.0	0.0	0.0	0.0	0.0	30.0	
420	30.0	0.0	0.0	0.0	0.0	40.0	
429	30.0	0.0	0.0	0.0	0.0	40.0	
431	45.0	0.0	0.0	0.0	0.0	40.0	
434	50.0	0.0	0.0	0.0	0.0	55.0	
445	40.0	0.0	0.0	0.0	0.0	35.0	
449	20.0	0.0	0.0	0.0	0.0	25.0	

	Heading	Long Shots	Long Throws	Marking	Penalty Taking	Tackling	\
1	0.0	0.0	0.0	0.0	15.0	0.0	
4	0.0	0.0	0.0	0.0	15.0	0.0	
18	0.0	0.0	0.0	0.0	5.0	0.0	
49	0.0	0.0	0.0	0.0	35.0	0.0	
65	0.0	0.0	0.0	0.0	15.0	0.0	
102	0.0	0.0	0.0	0.0	20.0	0.0	
110	0.0	0.0	0.0	0.0	5.0	0.0	
114	0.0	0.0	0.0	0.0	5.0	0.0	
166	0.0	0.0	0.0	0.0	10.0	0.0	

214	0.0	0.0	0.0	0.0	5.0	0.0
240	0.0	0.0	0.0	0.0	5.0	0.0
247	0.0	0.0	0.0	0.0	15.0	0.0
255	0.0	0.0	0.0	0.0	5.0	0.0
256	0.0	0.0	0.0	0.0	20.0	0.0
265	0.0	0.0	0.0	0.0	15.0	0.0
267	0.0	0.0	0.0	0.0	5.0	0.0
279	0.0	0.0	0.0	0.0	20.0	0.0
282	0.0	0.0	0.0	0.0	15.0	0.0
297	0.0	0.0	0.0	0.0	15.0	0.0
331	0.0	0.0	0.0	0.0	5.0	0.0
334	0.0	0.0	0.0	0.0	20.0	0.0
346	0.0	0.0	0.0	0.0	15.0	0.0
349	0.0	0.0	0.0	0.0	15.0	0.0
376	0.0	0.0	0.0	0.0	5.0	0.0
391	0.0	0.0	0.0	0.0	15.0	0.0
394	0.0	0.0	0.0	0.0	15.0	0.0
420	0.0	0.0	0.0	0.0	10.0	0.0
429	0.0	0.0	0.0	0.0	10.0	0.0
431	0.0	0.0	0.0	0.0	10.0	0.0
434	0.0	0.0	0.0	0.0	10.0	0.0
445	0.0	0.0	0.0	0.0	10.0	0.0
449	0.0	0.0	0.0	0.0	5.0	0.0

	Technique	Goals per Caps
1	55.0	0.0
4	15.0	0.0
18	10.0	0.0
49	55.0	0.0
65	60.0	0.0
102	30.0	1.0
110	20.0	0.0
114	40.0	0.0
166	25.0	0.0
214	5.0	0.0
240	5.0	0.0
247	25.0	0.0
255	35.0	0.0
256	25.0	0.0
265	25.0	1.0
267	5.0	0.0
279	55.0	0.0
282	10.0	0.0
297	55.0	0.0
331	25.0	0.0
334	45.0	0.0
346	60.0	0.0

349	10.0	0.0
376	35.0	0.0
391	25.0	0.0
394	5.0	0.0
420	15.0	0.0
429	25.0	0.0
431	60.0	0.0
434	30.0	0.0
445	5.0	0.0
449	20.0	0.0

- All of them are goalkeepers too. Therefore non goalkeepers dont benefit from the following stats.

```
[11]: non_gk_values={'Aerial Reach':0,'Command of Area':0,'Communication':
      ↪0,'Eccentricity':0,'Handling':0,'Kicking':0,'One on Ones':0,'Punching_
      ↪(Tendency)':0,'Reflexes':0,'Rushing Out (Tendency)':0,'Throwing':0}
df_train.fillna(value=non_gk_values,inplace=True)
df_train[df_train['Positions']!='GK']
```

```
[11]:
```

	value_increased	Ability	Potential	Positions	Foot	Height	\
0	False	46.0	NaN	AMC	Right	178	
2	False	58.0	NaN	DL DC	Left	185	
3	True	38.0	NaN	DC	Right	185	
5	True	56.0	69.0	ST	Right	185	
6	False	43.0	NaN	MC	Left	183	
..	
460	False	54.0	NaN	MC AMC	Right	181	
461	False	53.0	NaN	AML	Right	176	
462	True	35.0	NaN	DM	Left	180	
463	False	43.0	NaN	MR AMR	Right	178	
464	False	46.0	NaN	MR ML AMR AML	Right	168	

	Weight	Aerial Reach	Command of Area	Communication	Eccentricity	\
0	72	0.0	0.0	0.0	0.0	
2	80	0.0	0.0	0.0	0.0	
3	74	0.0	0.0	0.0	0.0	
5	75	0.0	0.0	0.0	0.0	
6	73	0.0	0.0	0.0	0.0	
..	
460	74	0.0	0.0	0.0	0.0	
461	72	0.0	0.0	0.0	0.0	
462	73	0.0	0.0	0.0	0.0	
463	65	0.0	0.0	0.0	0.0	
464	68	0.0	0.0	0.0	0.0	

First Touch Handling Kicking One on Ones Passing \

0	55.0	0.0	0.0	0.0	55.0
2	55.0	0.0	0.0	0.0	60.0
3	35.0	0.0	0.0	0.0	30.0
5	60.0	0.0	0.0	0.0	50.0
6	50.0	0.0	0.0	0.0	50.0
..
460	65.0	0.0	0.0	0.0	60.0
461	60.0	0.0	0.0	0.0	60.0
462	65.0	0.0	0.0	0.0	60.0
463	65.0	0.0	0.0	0.0	60.0
464	55.0	0.0	0.0	0.0	40.0

	Punching (Tendency)	Reflexes	Rushing Out (Tendency)	Throwing	\
0	0.0	0.0	0.0	0.0	
2	0.0	0.0	0.0	0.0	
3	0.0	0.0	0.0	0.0	
5	0.0	0.0	0.0	0.0	
6	0.0	0.0	0.0	0.0	
..	
460	0.0	0.0	0.0	0.0	
461	0.0	0.0	0.0	0.0	
462	0.0	0.0	0.0	0.0	
463	0.0	0.0	0.0	0.0	
464	0.0	0.0	0.0	0.0	

	Aggression	Anticipation	Bravery	Composure	Concentration	Decisions	\
0	45.0	55.0	50.0	45.0	50.0	40.0	
2	55.0	70.0	65.0	70.0	55.0	65.0	
3	40.0	60.0	45.0	30.0	40.0	70.0	
5	55.0	50.0	55.0	55.0	55.0	50.0	
6	55.0	60.0	55.0	50.0	60.0	65.0	
..	
460	75.0	55.0	50.0	45.0	50.0	55.0	
461	35.0	50.0	55.0	50.0	55.0	55.0	
462	70.0	50.0	35.0	35.0	40.0	70.0	
463	50.0	55.0	55.0	45.0	50.0	45.0	
464	30.0	20.0	45.0	40.0	45.0	50.0	

	Determination	Flair	Leadership	Off the Ball	Positioning	Teamwork	\
0	70.0	45.0	50.0	55.0	50.0	65.0	
2	65.0	30.0	50.0	35.0	60.0	65.0	
3	10.0	35.0	20.0	20.0	70.0	35.0	
5	65.0	65.0	35.0	65.0	35.0	50.0	
6	70.0	35.0	40.0	30.0	45.0	70.0	
..	
460	50.0	60.0	35.0	60.0	35.0	60.0	
461	50.0	60.0	30.0	60.0	50.0	50.0	

462	75.0	25.0	55.0	35.0	35.0	35.0
463	60.0	55.0	30.0	60.0	35.0	60.0
464	75.0	55.0	60.0	60.0	25.0	50.0

	Vision	Work Rate	Acceleration	Agility	Balance	Jumping Reach	\
0	55.0	60.0	55.0	65.0	50.0	45.0	
2	30.0	55.0	55.0	50.0	50.0	65.0	
3	30.0	40.0	55.0	55.0	40.0	50.0	
5	65.0	55.0	75.0	60.0	55.0	65.0	
6	40.0	55.0	55.0	55.0	50.0	55.0	
..	
460	65.0	60.0	70.0	55.0	45.0	25.0	
461	50.0	55.0	65.0	65.0	50.0	45.0	
462	60.0	55.0	40.0	35.0	40.0	35.0	
463	60.0	60.0	65.0	65.0	35.0	40.0	
464	35.0	45.0	75.0	60.0	50.0	10.0	

	Natural Fitness	Pace	Stamina	Strength	Corners	Crossing	Dribbling	\
0	50.0	55.0	60.0	40.0	40.0	40.0	45.0	
2	60.0	55.0	60.0	75.0	30.0	60.0	40.0	
3	65.0	50.0	25.0	25.0	25.0	30.0	15.0	
5	60.0	70.0	55.0	60.0	30.0	35.0	55.0	
6	55.0	45.0	60.0	40.0	30.0	35.0	35.0	
..	
460	35.0	60.0	55.0	30.0	50.0	55.0	60.0	
461	55.0	70.0	60.0	55.0	30.0	50.0	60.0	
462	65.0	40.0	30.0	35.0	30.0	25.0	10.0	
463	65.0	60.0	55.0	35.0	40.0	60.0	65.0	
464	70.0	70.0	25.0	70.0	50.0	60.0	70.0	

	Finishing	Free Kick Taking	Heading	Long Shots	Long Throws	Marking	\
0	35.0	35.0	30.0	35.0	40.0	40.0	
2	30.0	15.0	65.0	35.0	50.0	55.0	
3	10.0	20.0	70.0	10.0	35.0	70.0	
5	65.0	40.0	55.0	55.0	25.0	30.0	
6	30.0	35.0	40.0	35.0	40.0	40.0	
..	
460	60.0	50.0	20.0	60.0	35.0	30.0	
461	60.0	30.0	50.0	50.0	30.0	25.0	
462	25.0	30.0	30.0	30.0	15.0	35.0	
463	40.0	40.0	40.0	55.0	35.0	30.0	
464	35.0	40.0	10.0	35.0	40.0	30.0	

	Penalty Taking	Tackling	Technique	Goals per Caps
0	25.0	45.0	50.0	0.0
2	55.0	70.0	45.0	0.0
3	20.0	55.0	10.0	0.0

5	60.0	30.0	60.0	1.0
6	40.0	55.0	50.0	0.0
..
460	20.0	25.0	65.0	0.0
461	25.0	20.0	60.0	0.0
462	15.0	65.0	40.0	0.0
463	45.0	30.0	65.0	0.0
464	15.0	25.0	60.0	0.0

[433 rows x 55 columns]

```
[12]: df_test.fillna(value=non_gk_values,inplace=True)
df_test[df_test['Positions']!='GK']
```

```
[12]:
```

	Ability	Potential	Positions	Foot	Height	Weight	Aerial Reach \
0	40.0	NaN	DR	Right	165	60	0.0
1	42.0	NaN	DC	Right	191	79	0.0
2	40.0	NaN	DM	Left	182	74	0.0
4	38.0	NaN	AMC	Left	179	67	0.0
5	40.0	NaN	DL	Left	179	69	0.0
..
305	45.0	NaN	AML	Left	173	65	0.0
306	52.0	NaN	DC	Right	184	74	0.0
307	70.0	NaN	AMR AML AMC	Right	177	75	0.0
308	36.0	NaN	AML	Right	172	64	0.0
309	62.0	85.0	DC	Right	190	76	0.0

	Command of Area	Communication	Eccentricity	First Touch	Handling \
0	0.0	0.0	0.0	35.0	0.0
1	0.0	0.0	0.0	40.0	0.0
2	0.0	0.0	0.0	45.0	0.0
4	0.0	0.0	0.0	65.0	0.0
5	0.0	0.0	0.0	65.0	0.0
..
305	0.0	0.0	0.0	60.0	0.0
306	0.0	0.0	0.0	50.0	0.0
307	0.0	0.0	0.0	75.0	0.0
308	0.0	0.0	0.0	55.0	0.0
309	0.0	0.0	0.0	65.0	0.0

	Kicking	One on Ones	Passing	Punching (Tendency)	Reflexes \
0	0.0	0.0	40.0	0.0	0.0
1	0.0	0.0	35.0	0.0	0.0
2	0.0	0.0	55.0	0.0	0.0
4	0.0	0.0	50.0	0.0	0.0
5	0.0	0.0	50.0	0.0	0.0
..

305	0.0	0.0	70.0	0.0	0.0
306	0.0	0.0	55.0	0.0	0.0
307	0.0	0.0	55.0	0.0	0.0
308	0.0	0.0	40.0	0.0	0.0
309	0.0	0.0	60.0	0.0	0.0

	Rushing Out (Tendency)	Throwing	Aggression	Anticipation	Bravery \
0	0.0	0.0	50.0	55.0	45.0
1	0.0	0.0	25.0	50.0	45.0
2	0.0	0.0	65.0	30.0	40.0
4	0.0	0.0	30.0	35.0	45.0
5	0.0	0.0	75.0	40.0	50.0
..
305	0.0	0.0	30.0	30.0	45.0
306	0.0	0.0	55.0	60.0	70.0
307	0.0	0.0	35.0	50.0	30.0
308	0.0	0.0	40.0	35.0	35.0
309	0.0	0.0	50.0	55.0	65.0

	Composure	Concentration	Decisions	Determination	Flair	Leadership \
0	30.0	30.0	35.0	45.0	35.0	20.0
1	35.0	35.0	65.0	75.0	25.0	45.0
2	25.0	40.0	65.0	25.0	30.0	30.0
4	50.0	50.0	35.0	50.0	70.0	10.0
5	30.0	40.0	60.0	80.0	25.0	20.0
..
305	55.0	50.0	35.0	90.0	60.0	35.0
306	60.0	45.0	80.0	70.0	25.0	35.0
307	60.0	55.0	65.0	50.0	75.0	65.0
308	40.0	35.0	25.0	75.0	70.0	25.0
309	60.0	60.0	60.0	60.0	50.0	50.0

	Off the Ball	Positioning	Teamwork	Vision	Work Rate	Acceleration \
0	55.0	45.0	30.0	40.0	45.0	80.0
1	30.0	65.0	30.0	10.0	40.0	55.0
2	25.0	65.0	35.0	30.0	55.0	65.0
4	40.0	30.0	35.0	60.0	40.0	70.0
5	40.0	30.0	35.0	30.0	45.0	75.0
..
305	70.0	40.0	50.0	50.0	50.0	70.0
306	35.0	55.0	60.0	50.0	65.0	55.0
307	75.0	45.0	45.0	70.0	55.0	80.0
308	45.0	10.0	40.0	40.0	45.0	70.0
309	60.0	60.0	55.0	60.0	65.0	60.0

	Agility	Balance	Jumping Reach	Natural Fitness	Pace	Stamina \
0	80.0	45.0	30.0	45.0	70.0	50.0

1	65.0	35.0	55.0	65.0	60.0	20.0
2	55.0	35.0	50.0	55.0	65.0	30.0
4	65.0	25.0	35.0	65.0	65.0	45.0
5	65.0	45.0	40.0	35.0	70.0	55.0
..
305	70.0	50.0	15.0	55.0	70.0	50.0
306	45.0	60.0	70.0	65.0	55.0	60.0
307	75.0	55.0	35.0	60.0	75.0	60.0
308	55.0	35.0	40.0	50.0	70.0	45.0
309	65.0	50.0	75.0	70.0	60.0	70.0

	Strength	Corners	Crossing	Dribbling	Finishing	Free Kick Taking	\
0	35.0	35.0	25.0	45.0	20.0	35.0	
1	35.0	20.0	30.0	10.0	25.0	30.0	
2	35.0	10.0	15.0	25.0	20.0	25.0	
4	25.0	40.0	50.0	50.0	60.0	60.0	
5	40.0	30.0	45.0	40.0	15.0	10.0	
..	
305	30.0	50.0	60.0	60.0	50.0	40.0	
306	65.0	30.0	15.0	35.0	25.0	10.0	
307	45.0	50.0	65.0	75.0	50.0	60.0	
308	35.0	45.0	45.0	55.0	45.0	45.0	
309	60.0	30.0	25.0	50.0	35.0	20.0	

	Heading	Long Shots	Long Throws	Marking	Penalty Taking	Tackling	\
0	30.0	20.0	35.0	55.0	30.0	40.0	
1	40.0	25.0	5.0	55.0	5.0	65.0	
2	40.0	30.0	5.0	60.0	5.0	60.0	
4	55.0	50.0	15.0	35.0	35.0	25.0	
5	20.0	40.0	25.0	35.0	10.0	60.0	
..	
305	40.0	35.0	40.0	35.0	25.0	50.0	
306	70.0	35.0	25.0	60.0	20.0	60.0	
307	35.0	40.0	35.0	25.0	15.0	25.0	
308	30.0	40.0	15.0	15.0	35.0	15.0	
309	65.0	50.0	45.0	65.0	45.0	65.0	

	Technique	Goals per Caps
0	30.0	0.0
1	20.0	0.0
2	40.0	0.0
4	65.0	0.0
5	50.0	0.0
..
305	65.0	0.0
306	50.0	0.0
307	75.0	1.0

308	55.0	0.0
309	60.0	0.0

[298 rows x 54 columns]

- GK Stats:
 - Aerial Reach
 - Command of Area
 - Communication
 - Eccentricity
 - Handling
 - Kicking
 - One on Ones
 - Punching Tendency
 - Reflexes
 - Rushing out Tendency
 - Throwing
- Non GK Stats:
 - Corners
 - Crossing
 - Dribbling
 - Finishing
 - Heading
 - Long Shots
 - Long Throws
 - Marking
 - Tackling
- Common Stats:
 - Ability
 - Passing
 - Aggression
 - Anticipation
 - Bravery
 - Composure
 - Concentration
 - Decisions
 - Determination
 - Flair
 - Leadership
 - Off the Ball
 - Positioning
 - Teamwork
 - Vision
 - Work Rate
 - Acceleration
 - Agility
 - Balance

- Jumping Reach
- Natural Fitness
- Pace
- Stamina
- Strength
- Technique

```
[13]: gk_stats = ['Aerial Reach', 'Command of Area', 'Communication', 'Eccentricity',
    ↪ 'Handling', 'Kicking',
    ↪ 'One on Ones', 'Punching (Tendency)', 'Reflexes', 'Rushing Out',
    ↪ '(Tendency)', 'Throwing']

non_gk_stats = ['Corners', 'Crossing', 'Dribbling', 'Finishing', 'Heading',
    ↪ 'Long Shots', 'Long Throws',
    ↪ 'Marking', 'Tackling']

common_stats = ['Aggression', 'Anticipation', 'Bravery', 'Composure',
    ↪ 'Concentration', 'Decisions',
    ↪ 'Determination', 'Flair', 'Leadership', 'Off the Ball',
    ↪ 'Positioning', 'Teamwork',
    ↪ 'Vision', 'Work Rate', 'Acceleration', 'Agility', 'Balance',
    ↪ 'Jumping Reach',
    ↪ 'Natural Fitness', 'Pace', 'Stamina', 'Strength', 'Technique']

def calculate_potential(df):
    if df['Positions'] == 'GK':
        relevant_stats = df[(gk_stats + common_stats)].mean()
    else:
        relevant_stats = df[(non_gk_stats + common_stats)].mean()

    return relevant_stats

df_train['Potential'] = df_train['Potential'].fillna(df_train.
    ↪ apply(calculate_potential, axis=1))
df_test['Potential'] = df_test['Potential'].fillna(df_test.
    ↪ apply(calculate_potential, axis=1))
```

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

# Create a copy of the object-type columns transformed by LabelEncoder
df_train[df_train.select_dtypes(include=['object']).columns] = df_train.
    ↪ select_dtypes(include=['object']).apply(LabelEncoder().fit_transform)
df_test[df_test.select_dtypes(include=['object']).columns] = df_test.
    ↪ select_dtypes(include=['object']).apply(LabelEncoder().fit_transform)
```

```
[15]: from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split
```

```

from sklearn.metrics import classification_report

X=df_train.drop(columns=['value_increased'])
y=df_train['value_increased']

X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.
↪2,random_state=100)

log=LogisticRegression(solver='liblinear',random_state=42)
log.fit(X_train,y_train)
y_pred=log.predict(X_test)

print(classification_report(y_pred,y_test))

```

	precision	recall	f1-score	support
False	0.94	0.90	0.92	86
True	0.18	0.29	0.22	7
accuracy			0.85	93
macro avg	0.56	0.59	0.57	93
weighted avg	0.88	0.85	0.86	93

```

[16]: import optuna
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split, cross_val_score
from sklearn.preprocessing import StandardScaler
from sklearn.pipeline import Pipeline

def objective(trial):
    X = df_train.drop(columns=['value_increased'])
    y = df_train['value_increased']
    X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,↪
↪random_state=42)

    solver = trial.suggest_categorical('solver', ['newton-cg', 'lbfgs',↪
↪'liblinear', 'sag', 'saga'])
    penalty = trial.suggest_categorical('penalty', ['l1', 'l2', 'elasticnet',↪
↪'none'])
    C = trial.suggest_float('C', 1e-6, 1e2, log=True)

    l1_ratio = None
    if penalty == 'elasticnet':
        if solver == 'saga':
            l1_ratio = trial.suggest_float('l1_ratio', 0.0, 1.0)
        else:

```

```

        return float('nan')

    if solver in ['newton-cg', 'lbfgs', 'sag'] and penalty != 'l2':
        return float('nan')
    if solver == 'liblinear' and penalty not in ['l1', 'l2']:
        return float('nan')
    if solver == 'saga' and penalty == 'none':
        penalty = None

    model = LogisticRegression(solver=solver, penalty=penalty, C=C,
↪max_iter=1000, l1_ratio=l1_ratio)

    pipe = Pipeline([('scaler', StandardScaler()), ('lr', model)])

    score = cross_val_score(pipe, X_train, y_train, cv=5, scoring='f1',
↪error_score='raise').mean()

    return score

study = optuna.create_study(direction='maximize')
study.optimize(objective, n_trials=50)

print("Best trial:")
trial = study.best_trial
print(f"Value: {trial.value}")
print("Best hyperparameters:", trial.params)

```

```

[I 2024-10-07 06:45:05,700] A new study created in memory with name: no-
name-69da1374-26a9-4997-af33-556ca9a08ba6
[I 2024-10-07 06:45:06,147] Trial 0 finished with value: 0.04852941176470588 and
parameters: {'solver': 'newton-cg', 'penalty': 'l2', 'C': 0.7016426472079761}.
Best is trial 0 with value: 0.04852941176470588.
[I 2024-10-07 06:45:06,302] Trial 1 finished with value: 0.053333333333333344
and parameters: {'solver': 'liblinear', 'penalty': 'l2', 'C':
0.075230089229997}. Best is trial 1 with value: 0.053333333333333344.
[W 2024-10-07 06:45:06,308] Trial 2 failed with parameters: {'solver': 'lbfgs',
'penalty': 'l1', 'C': 0.0026572303093363187} because of the following error: The
value nan is not acceptable.
[W 2024-10-07 06:45:06,309] Trial 2 failed with value nan.
[W 2024-10-07 06:45:06,316] Trial 3 failed with parameters: {'solver': 'sag',
'penalty': 'none', 'C': 4.338562222382993e-06} because of the following error:
The value nan is not acceptable.
[W 2024-10-07 06:45:06,318] Trial 3 failed with value nan.
[W 2024-10-07 06:45:06,324] Trial 4 failed with parameters: {'solver': 'sag',

```

'penalty': 'none', 'C': 0.1507586528931401} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:06,325] Trial 4 failed with value nan.

[W 2024-10-07 06:45:06,331] Trial 5 failed with parameters: {'solver': 'newton-cg', 'penalty': 'l1', 'C': 0.12455352132887647} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:06,332] Trial 5 failed with value nan.

[I 2024-10-07 06:45:06,494] Trial 6 finished with value: 0.0 and parameters: {'solver': 'newton-cg', 'penalty': 'l2', 'C': 2.6324558480427784e-05}. Best is trial 1 with value: 0.053333333333333344.

[W 2024-10-07 06:45:06,503] Trial 7 failed with parameters: {'solver': 'liblinear', 'penalty': 'elasticnet', 'C': 0.0042526679423706025} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:06,505] Trial 7 failed with value nan.

[W 2024-10-07 06:45:06,513] Trial 8 failed with parameters: {'solver': 'lbfgs', 'penalty': 'elasticnet', 'C': 0.004631057152466885} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:06,515] Trial 8 failed with value nan.

[I 2024-10-07 06:45:06,710] Trial 9 finished with value: 0.0 and parameters: {'solver': 'saga', 'penalty': 'l2', 'C': 0.004031254863914883}. Best is trial 1 with value: 0.053333333333333344.

[W 2024-10-07 06:45:06,716] Trial 10 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 1.7761975810977837e-05} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:06,716] Trial 10 failed with value nan.

[I 2024-10-07 06:45:06,878] Trial 11 finished with value: 0.0 and parameters: {'solver': 'lbfgs', 'penalty': 'l2', 'C': 0.006472726405598051}. Best is trial 1 with value: 0.053333333333333344.

[I 2024-10-07 06:45:07,665] Trial 12 finished with value: 0.05523809523809524 and parameters: {'solver': 'saga', 'penalty': 'elasticnet', 'C': 0.426668181540445, 'l1_ratio': 0.7245095213941797}. Best is trial 12 with value: 0.05523809523809524.

[W 2024-10-07 06:45:07,671] Trial 13 failed with parameters: {'solver': 'newton-cg', 'penalty': 'elasticnet', 'C': 2.075626842150456e-06} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:07,672] Trial 13 failed with value nan.

[W 2024-10-07 06:45:07,678] Trial 14 failed with parameters: {'solver': 'liblinear', 'penalty': 'none', 'C': 1.0204542380597963e-06} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:07,679] Trial 14 failed with value nan.

[W 2024-10-07 06:45:07,685] Trial 15 failed with parameters: {'solver': 'newton-cg', 'penalty': 'elasticnet', 'C': 0.0771865609782329} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:07,686] Trial 15 failed with value nan.

[I 2024-10-07 06:45:08,579] Trial 16 finished with value: 0.12528104575163398 and parameters: {'solver': 'liblinear', 'penalty': 'l1', 'C': 38.719871400783866}. Best is trial 16 with value: 0.12528104575163398.

[I 2024-10-07 06:45:08,656] Trial 17 finished with value: 0.0 and parameters:

```

{'solver': 'saga', 'penalty': 'elasticnet', 'C': 0.0002582816118243611,
'11_ratio': 0.27410738990844496}. Best is trial 16 with value:
0.12528104575163398.
[W 2024-10-07 06:45:08,662] Trial 18 failed with parameters: {'solver': 'sag',
'penalty': 'l1', 'C': 0.0552003398385968} because of the following error: The
value nan is not acceptable.
[W 2024-10-07 06:45:08,663] Trial 18 failed with value nan.
[W 2024-10-07 06:45:08,669] Trial 19 failed with parameters: {'solver': 'lbfgs',
'penalty': 'elasticnet', 'C': 5.1827891457729436e-05} because of the following
error: The value nan is not acceptable.
[W 2024-10-07 06:45:08,670] Trial 19 failed with value nan.
[W 2024-10-07 06:45:08,677] Trial 20 failed with parameters: {'solver': 'newton-
cg', 'penalty': 'none', 'C': 1.021215045230389e-05} because of the following
error: The value nan is not acceptable.
[W 2024-10-07 06:45:08,678] Trial 20 failed with value nan.
[W 2024-10-07 06:45:08,684] Trial 21 failed with parameters: {'solver': 'sag',
'penalty': 'l1', 'C': 0.004834575566524379} because of the following error: The
value nan is not acceptable.
[W 2024-10-07 06:45:08,685] Trial 21 failed with value nan.
[I 2024-10-07 06:45:10,462] Trial 22 finished with value: 0.10772498167840742
and parameters: {'solver': 'saga', 'penalty': 'elasticnet', 'C':
57.12559917140922, '11_ratio': 0.6407795814656521}. Best is trial 16 with value:
0.12528104575163398.
[I 2024-10-07 06:45:10,641] Trial 23 finished with value: 0.0 and parameters:
{'solver': 'saga', 'penalty': 'l2', 'C': 9.116531181605843e-05}. Best is trial
16 with value: 0.12528104575163398.
[I 2024-10-07 06:45:11,637] Trial 24 finished with value: 0.12528104575163398
and parameters: {'solver': 'liblinear', 'penalty': 'l1', 'C':
68.74691127353597}. Best is trial 16 with value: 0.12528104575163398.
[I 2024-10-07 06:45:12,670] Trial 25 finished with value: 0.12528104575163398
and parameters: {'solver': 'liblinear', 'penalty': 'l1', 'C':
43.378479514713206}. Best is trial 16 with value: 0.12528104575163398.
[I 2024-10-07 06:45:12,979] Trial 26 finished with value: 0.13083075335397315
and parameters: {'solver': 'liblinear', 'penalty': 'l1', 'C':
6.856747722386633}. Best is trial 26 with value: 0.13083075335397315.
[W 2024-10-07 06:45:12,993] Trial 27 failed with parameters: {'solver': 'sag',
'penalty': 'l1', 'C': 3.408585956097477} because of the following error: The
value nan is not acceptable.
[W 2024-10-07 06:45:12,994] Trial 27 failed with value nan.
[W 2024-10-07 06:45:13,008] Trial 28 failed with parameters: {'solver': 'sag',
'penalty': 'l1', 'C': 1.1789033018755467e-06} because of the following error:
The value nan is not acceptable.
[W 2024-10-07 06:45:13,009] Trial 28 failed with value nan.
[W 2024-10-07 06:45:13,024] Trial 29 failed with parameters: {'solver': 'sag',
'penalty': 'l1', 'C': 1.2954279386675166e-06} because of the following error:
The value nan is not acceptable.
[W 2024-10-07 06:45:13,025] Trial 29 failed with value nan.
[W 2024-10-07 06:45:13,040] Trial 30 failed with parameters: {'solver': 'sag',

```

'penalty': 'l1', 'C': 4.0789168315005595} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:13,041] Trial 30 failed with value nan.

[W 2024-10-07 06:45:13,055] Trial 31 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 3.454572824662281} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:13,056] Trial 31 failed with value nan.

[W 2024-10-07 06:45:13,070] Trial 32 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 2.858034091756987} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:13,071] Trial 32 failed with value nan.

[W 2024-10-07 06:45:13,085] Trial 33 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 3.3188072352479097} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:13,086] Trial 33 failed with value nan.

[W 2024-10-07 06:45:13,100] Trial 34 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 1.1970512239858173e-06} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:13,101] Trial 34 failed with value nan.

[W 2024-10-07 06:45:13,116] Trial 35 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 1.2607681207645673e-06} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:13,117] Trial 35 failed with value nan.

[W 2024-10-07 06:45:13,132] Trial 36 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 3.1449743089607103} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:13,133] Trial 36 failed with value nan.

[W 2024-10-07 06:45:13,148] Trial 37 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 2.9957866788018763} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:13,149] Trial 37 failed with value nan.

[W 2024-10-07 06:45:13,163] Trial 38 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 2.685806660088758} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:13,165] Trial 38 failed with value nan.

[W 2024-10-07 06:45:13,179] Trial 39 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 5.6913588336016305} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:13,180] Trial 39 failed with value nan.

[W 2024-10-07 06:45:13,194] Trial 40 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 6.742480666159453} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:13,195] Trial 40 failed with value nan.

[W 2024-10-07 06:45:13,209] Trial 41 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 3.857143295415424} because of the following error: The value nan is not acceptable.

[W 2024-10-07 06:45:13,210] Trial 41 failed with value nan.

[W 2024-10-07 06:45:13,225] Trial 42 failed with parameters: {'solver': 'sag',

'penalty': 'l1', 'C': 3.620564430378719} because of the following error: The value nan is not acceptable.
[W 2024-10-07 06:45:13,227] Trial 42 failed with value nan.
[W 2024-10-07 06:45:13,241] Trial 43 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 3.312826755374832} because of the following error: The value nan is not acceptable.
[W 2024-10-07 06:45:13,242] Trial 43 failed with value nan.
[W 2024-10-07 06:45:13,257] Trial 44 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 2.512677586105959} because of the following error: The value nan is not acceptable.
[W 2024-10-07 06:45:13,259] Trial 44 failed with value nan.
[W 2024-10-07 06:45:13,273] Trial 45 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 2.9293718160600024} because of the following error: The value nan is not acceptable.
[W 2024-10-07 06:45:13,274] Trial 45 failed with value nan.
[W 2024-10-07 06:45:13,288] Trial 46 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 1.0453189468296348e-06} because of the following error: The value nan is not acceptable.
[W 2024-10-07 06:45:13,289] Trial 46 failed with value nan.
[W 2024-10-07 06:45:13,303] Trial 47 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 3.5019999018402865} because of the following error: The value nan is not acceptable.
[W 2024-10-07 06:45:13,304] Trial 47 failed with value nan.
[W 2024-10-07 06:45:13,319] Trial 48 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 4.6311555799138455} because of the following error: The value nan is not acceptable.
[W 2024-10-07 06:45:13,320] Trial 48 failed with value nan.
[W 2024-10-07 06:45:13,334] Trial 49 failed with parameters: {'solver': 'sag', 'penalty': 'l1', 'C': 4.488994915842671} because of the following error: The value nan is not acceptable.
[W 2024-10-07 06:45:13,335] Trial 49 failed with value nan.

Best trial:
Value: 0.13083075335397315
Best hyperparameters: {'solver': 'liblinear', 'penalty': 'l1', 'C': 6.856747722386633}

```
[17]: from sklearn.linear_model import LogisticRegression

log_reg = LogisticRegression(**trial.params, class_weight='balanced',
    ↪ random_state=42)

log_reg.fit(X_train, y_train)

y_pred_log = log_reg.predict(X_test)

from sklearn.metrics import classification_report
print(classification_report(y_test, y_pred_log))
```


	precision	recall	f1-score	support
False	0.91	0.77	0.83	82
True	0.21	0.45	0.29	11
accuracy			0.73	93
macro avg	0.56	0.61	0.56	93
weighted avg	0.83	0.73	0.77	93

```
[18]: test_pred=log_reg.predict(df_test)
      test_pred
```

```
[18]: array([False, False, False, False,  True,  True,  True, False, False,
          False, False, False, False, False, False, False, False, False, False,
          False,  True, False, False, False, False, False, False, False, False,
           True,  True, False, False,  True, False, False, False, False, False,
          False,  True, False, False, False, False, False, False, False,  True,
          False, False,  True, False, False, False, False, False,  True,
          False,  True, False, False,  True, False,  True, False, False,
          False, False, False, False,  True, False, False, False, False,
          False,  True, False, False,  True, False, False, False, False, False,
           True, False, False, False, False, False, False, False, False, False,
           True, False,  True, False,  True, False, False,  True, False,
          False, False, False, False, False, False,  True, False, False,
          False, False, False, False, False, False,  True, False, False,
          False,  True, False, False,  True, False,  True,  True,
          False,  True, False, False, False, False,  True, False,  True,
          False, False, False, False, False, False,  True, False,  True,
          True, False,  True, False, False, False, False, False, False,
          True, False, False, False, False, False, False, False, False, False,
          False,  True,  True, False, False, False, False, False, False, False,
          True, False,  True, False, False, False, False, False, False, False,
          True, False, False,  True,  True,  True, False, False, False,
          False,  True, False, False, False, False, False, False, False,  True,
           True, False, False, False, False, False,  True,  True,  True,
          False, False, False, False, False, False,  True, False,  True, False,
          False, False, False, False, False, False, False, False, False, False,
           True, False, False, False, False, False, False, False, False, False,
          False, False, False, False,  True, False,  True, False, False,
          False,  True,  True, False, False, False,  True,  True, False,
          False, False, False,  True, False,  True,  True, False, False,
          False, False, False, False, False, False, False, False, False, False,
          False, False, False, False, False, False, False, False, False,  True,
          False, False, False, False,  True, False,  True,  True,  True,
```

```
False, True, True, False])
```

```
[19]: p=pd.Series(test_pred)
```

```
[20]: print(p.value_counts())
```

```
False    228
True      82
Name: count, dtype: int64
```

```
[21]: df_sub=pd.read_csv("/kaggle/input/
↳veri-bilimi-ve-yapay-zeka-okulu-kaggle-yarismasi/sample_submission.csv")
df_sub
```

```
[21]:
```

	id	value_increased
0	13436	NaN
1	49790	NaN
2	73335	NaN
3	15949	NaN
4	26364	NaN
..
305	54262	NaN
306	88859	NaN
307	79479	NaN
308	38016	NaN
309	61663	NaN

```
[310 rows x 2 columns]
```

```
[22]: p.replace({0:False,1:True},inplace=True)
```

```
[23]: df_sub['value_increased'].fillna(p,inplace=True)
df_sub.set_index('id',inplace=True)
```

```
[24]: df_sub
```

```
[24]:
```

	value_increased
id	
13436	False
49790	False
73335	False
15949	False
26364	True
...	...
54262	True
88859	False
79479	True

```
38016          True
61663          False
```

```
[310 rows x 1 columns]
```

```
[25]: df_sub.to_csv('submission.csv')
```