importing libraries

In [5]:
```
import numpy as np
import pandas as pd
import seaborn as sns
sns.set_style(style='whitegrid')
import matplotlib.pyplot as plt
from collections import Counter
%matplotlib inline
import os
for dirname ,_ , filenames in os.walk(r"C:\Users\user\Documents"):
    for filename in filenames:
        print(os.path.join(dirname,filename))
```

```
C:\Users\user\Documents\!qhlogs.doc
C:\Users\user\Documents\3D Objects - Shortcut.lnk
C:\Users\user\Documents\desktop.ini
C:\Users\user\Documents\FIFA.csv
C:\Users\user\Documents\heart.csv
C:\Users\user\Documents\Movie-Rating.csv
C:\Users\user\Documents\movie.csv
C:\Users\user\Documents\rating.csv
C:\Users\user\Documents\Rawdata.xlsx
C:\Users\user\Documents\Sample - Superstore_Orders.csv
C:\Users\user\Documents\sample1-json.json
C:\Users\user\Documents\sample1.xml
C:\Users\user\Documents\samplepdf.pdf
C:\Users\user\Documents\table.html
C:\Users\user\Documents\tag.csv
C:\Users\user\Documents\TASK -- convert raw data - clean data.xlsx
C:\Users\user\Documents\Tasks.txt
```

In [7]:
```
import warnings
warnings.filterwarnings('ignore')
```

Read dataset

In this kernel, we will focus on those datasets which help to explain various features of Seaborn. So, we will read the related datasets with pandas read_csv() function.

In [10]:
```
fifa=pd.read_csv(r"C:\Users\user\Documents\FIFA.csv")
```

Exploratory Data Analysis

Preview the dataset

In [14]:
```
fifa.head()
```

Out[14]:

	Unnamed: 0	ID	Name	Age	Photo	Natio
0	0	158023	L. Messi	31	https://cdn.sofifa.org/players/4/19/158023.png	Arge
1	1	20801	Cristiano Ronaldo	33	https://cdn.sofifa.org/players/4/19/20801.png	Po
2	2	190871	Neymar Jr	26	https://cdn.sofifa.org/players/4/19/190871.png	
3	3	193080	De Gea	27	https://cdn.sofifa.org/players/4/19/193080.png	
4	4	192985	K. De Bruyne	27	https://cdn.sofifa.org/players/4/19/192985.png	Be

5 rows × 89 columns

View summary of dataset

In [17]:

```
fifa.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 18207 entries, 0 to 18206
Data columns (total 89 columns):
 #   Column                    Non-Null Count  Dtype  
---  ------                    --------------  -----  
 0   Unnamed: 0                18207 non-null  int64  
 1   ID                        18207 non-null  int64  
 2   Name                      18207 non-null  object 
 3   Age                       18207 non-null  int64  
 4   Photo                     18207 non-null  object 
 5   Nationality               18207 non-null  object 
 6   Flag                      18207 non-null  object 
 7   Overall                   18207 non-null  int64  
 8   Potential                 18207 non-null  int64  
 9   Club                      17966 non-null  object 
 10  Club Logo                 18207 non-null  object 
 11  Value                     18207 non-null  object 
 12  Wage                      18207 non-null  object 
 13  Special                   18207 non-null  int64  
 14  Preferred Foot            18159 non-null  object 
 15  International Reputation  18159 non-null  float64
 16  Weak Foot                 18159 non-null  float64
 17  Skill Moves               18159 non-null  float64
 18  Work Rate                 18159 non-null  object 
 19  Body Type                 18159 non-null  object 
 20  Real Face                 18159 non-null  object 
 21  Position                  18147 non-null  object 
 22  Jersey Number             18147 non-null  float64
 23  Joined                    16654 non-null  object 
 24  Loaned From               1264 non-null   object 
 25  Contract Valid Until      17918 non-null  object 
 26  Height                    18159 non-null  object 
 27  Weight                    18159 non-null  object 
 28  LS                        16122 non-null  object 
 29  ST                        16122 non-null  object 
 30  RS                        16122 non-null  object 
 31  LW                        16122 non-null  object 
 32  LF                        16122 non-null  object 
 33  CF                        16122 non-null  object 
 34  RF                        16122 non-null  object 
 35  RW                        16122 non-null  object 
 36  LAM                       16122 non-null  object 
 37  CAM                       16122 non-null  object 
 38  RAM                       16122 non-null  object 
 39  LM                        16122 non-null  object 
 40  LCM                       16122 non-null  object 
 41  CM                        16122 non-null  object 
 42  RCM                       16122 non-null  object 
 43  RM                        16122 non-null  object 
 44  LWB                       16122 non-null  object 
 45  LDM                       16122 non-null  object 
 46  CDM                       16122 non-null  object 
 47  RDM                       16122 non-null  object 
 48  RWB                       16122 non-null  object 
 49  LB                        16122 non-null  object 
 50  LCB                       16122 non-null  object 
 51  CB                        16122 non-null  object 
 52  RCB                       16122 non-null  object 
 53  RB                        16122 non-null  object 
 54  Crossing                  18159 non-null  float64
```

```
 55  Finishing                 18159 non-null  float64
 56  HeadingAccuracy           18159 non-null  float64
 57  ShortPassing              18159 non-null  float64
 58  Volleys                   18159 non-null  float64
 59  Dribbling                 18159 non-null  float64
 60  Curve                     18159 non-null  float64
 61  FKAccuracy                18159 non-null  float64
 62  LongPassing               18159 non-null  float64
 63  BallControl               18159 non-null  float64
 64  Acceleration              18159 non-null  float64
 65  SprintSpeed               18159 non-null  float64
 66  Agility                   18159 non-null  float64
 67  Reactions                 18159 non-null  float64
 68  Balance                   18159 non-null  float64
 69  ShotPower                 18159 non-null  float64
 70  Jumping                   18159 non-null  float64
 71  Stamina                   18159 non-null  float64
 72  Strength                  18159 non-null  float64
 73  LongShots                 18159 non-null  float64
 74  Aggression                18159 non-null  float64
 75  Interceptions             18159 non-null  float64
 76  Positioning               18159 non-null  float64
 77  Vision                    18159 non-null  float64
 78  Penalties                 18159 non-null  float64
 79  Composure                 18159 non-null  float64
 80  Marking                   18159 non-null  float64
 81  StandingTackle            18159 non-null  float64
 82  SlidingTackle             18159 non-null  float64
 83  GKDiving                  18159 non-null  float64
 84  GKHandling                18159 non-null  float64
 85  GKKicking                 18159 non-null  float64
 86  GKPositioning             18159 non-null  float64
 87  GKReflexes                18159 non-null  float64
 88  Release Clause            16643 non-null  object
dtypes: float64(38), int64(6), object(45)
memory usage: 12.4+ MB
```

In [19]:

```
fifa.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 18207 entries, 0 to 18206
Data columns (total 89 columns):
 #   Column                    Non-Null Count  Dtype  
---  ------                    --------------  -----  
 0   Unnamed: 0                18207 non-null  int64  
 1   ID                        18207 non-null  int64  
 2   Name                      18207 non-null  object 
 3   Age                       18207 non-null  int64  
 4   Photo                     18207 non-null  object 
 5   Nationality               18207 non-null  object 
 6   Flag                      18207 non-null  object 
 7   Overall                   18207 non-null  int64  
 8   Potential                 18207 non-null  int64  
 9   Club                      17966 non-null  object 
 10  Club Logo                 18207 non-null  object 
 11  Value                     18207 non-null  object 
 12  Wage                      18207 non-null  object 
 13  Special                   18207 non-null  int64  
 14  Preferred Foot            18159 non-null  object 
 15  International Reputation  18159 non-null  float64
 16  Weak Foot                 18159 non-null  float64
 17  Skill Moves               18159 non-null  float64
 18  Work Rate                 18159 non-null  object 
 19  Body Type                 18159 non-null  object 
 20  Real Face                 18159 non-null  object 
 21  Position                  18147 non-null  object 
 22  Jersey Number             18147 non-null  float64
 23  Joined                    16654 non-null  object 
 24  Loaned From               1264 non-null   object 
 25  Contract Valid Until      17918 non-null  object 
 26  Height                    18159 non-null  object 
 27  Weight                    18159 non-null  object 
 28  LS                        16122 non-null  object 
 29  ST                        16122 non-null  object 
 30  RS                        16122 non-null  object 
 31  LW                        16122 non-null  object 
 32  LF                        16122 non-null  object 
 33  CF                        16122 non-null  object 
 34  RF                        16122 non-null  object 
 35  RW                        16122 non-null  object 
 36  LAM                       16122 non-null  object 
 37  CAM                       16122 non-null  object 
 38  RAM                       16122 non-null  object 
 39  LM                        16122 non-null  object 
 40  LCM                       16122 non-null  object 
 41  CM                        16122 non-null  object 
 42  RCM                       16122 non-null  object 
 43  RM                        16122 non-null  object 
 44  LWB                       16122 non-null  object 
 45  LDM                       16122 non-null  object 
 46  CDM                       16122 non-null  object 
 47  RDM                       16122 non-null  object 
 48  RWB                       16122 non-null  object 
 49  LB                        16122 non-null  object 
 50  LCB                       16122 non-null  object 
 51  CB                        16122 non-null  object 
 52  RCB                       16122 non-null  object 
 53  RB                        16122 non-null  object 
 54  Crossing                  18159 non-null  float64
```

```
 55  Finishing                 18159 non-null  float64
 56  HeadingAccuracy           18159 non-null  float64
 57  ShortPassing              18159 non-null  float64
 58  Volleys                   18159 non-null  float64
 59  Dribbling                 18159 non-null  float64
 60  Curve                     18159 non-null  float64
 61  FKAccuracy                18159 non-null  float64
 62  LongPassing               18159 non-null  float64
 63  BallControl               18159 non-null  float64
 64  Acceleration              18159 non-null  float64
 65  SprintSpeed               18159 non-null  float64
 66  Agility                   18159 non-null  float64
 67  Reactions                 18159 non-null  float64
 68  Balance                   18159 non-null  float64
 69  ShotPower                 18159 non-null  float64
 70  Jumping                   18159 non-null  float64
 71  Stamina                   18159 non-null  float64
 72  Strength                  18159 non-null  float64
 73  LongShots                 18159 non-null  float64
 74  Aggression                18159 non-null  float64
 75  Interceptions             18159 non-null  float64
 76  Positioning               18159 non-null  float64
 77  Vision                    18159 non-null  float64
 78  Penalties                 18159 non-null  float64
 79  Composure                 18159 non-null  float64
 80  Marking                   18159 non-null  float64
 81  StandingTackle            18159 non-null  float64
 82  SlidingTackle             18159 non-null  float64
 83  GKDiving                  18159 non-null  float64
 84  GKHandling                18159 non-null  float64
 85  GKKicking                 18159 non-null  float64
 86  GKPositioning             18159 non-null  float64
 87  GKReflexes                18159 non-null  float64
 88  Release Clause            16643 non-null  object
dtypes: float64(38), int64(6), object(45)
memory usage: 12.4+ MB
```

Comment

- This dataset contains 89 variables.
- Out of the 89 variables, 44 are numerical variables. 38 are of float64 data type and remaining 6 are of int64 data type.
- The remaining 45 variables are of character data type.
- Let's explore this further.

In [22]:
```
fifa['Body Type'].value_counts()
```

Out[22]:

```
Body Type
Normal                 10595
Lean                    6417
Stocky                  1140
Messi                      1
C. Ronaldo                 1
Neymar                     1
Courtois                   1
PLAYER_BODY_TYPE_25        1
Shaqiri                    1
Akinfenwa                  1
Name: count, dtype: int64
```

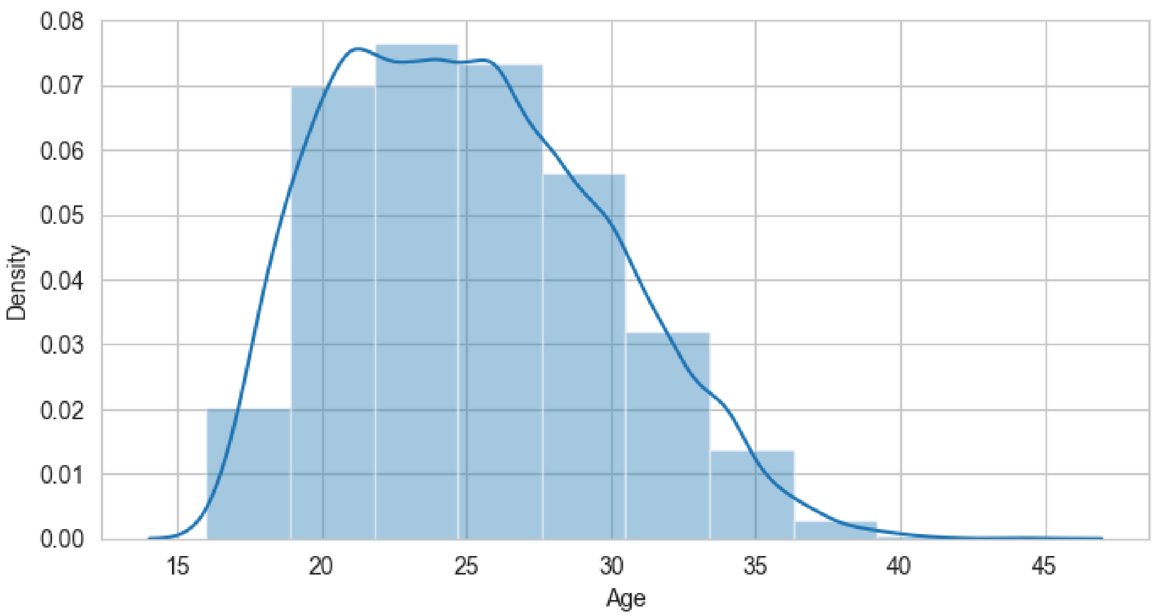
Explore `Age` variable

Visualize distribution of `Age` variable with Seaborn `distplot()` function

- Seaborn `distplot()` function flexibly plots a univariate distribution of observations.
- This function combines the matplotlib hist function (with automatic calculation of a good default bin size) with the seaborn kdeplot() and rugplot() functions.
-
  - So, let's visualize the distribution of `Age` variable with Seaborn `distplot()` function.

In [26]:

```python
f, ax = plt.subplots(figsize=(8,4))
x = fifa['Age']
ax = sns.distplot(x, bins=10)
plt.show()
```

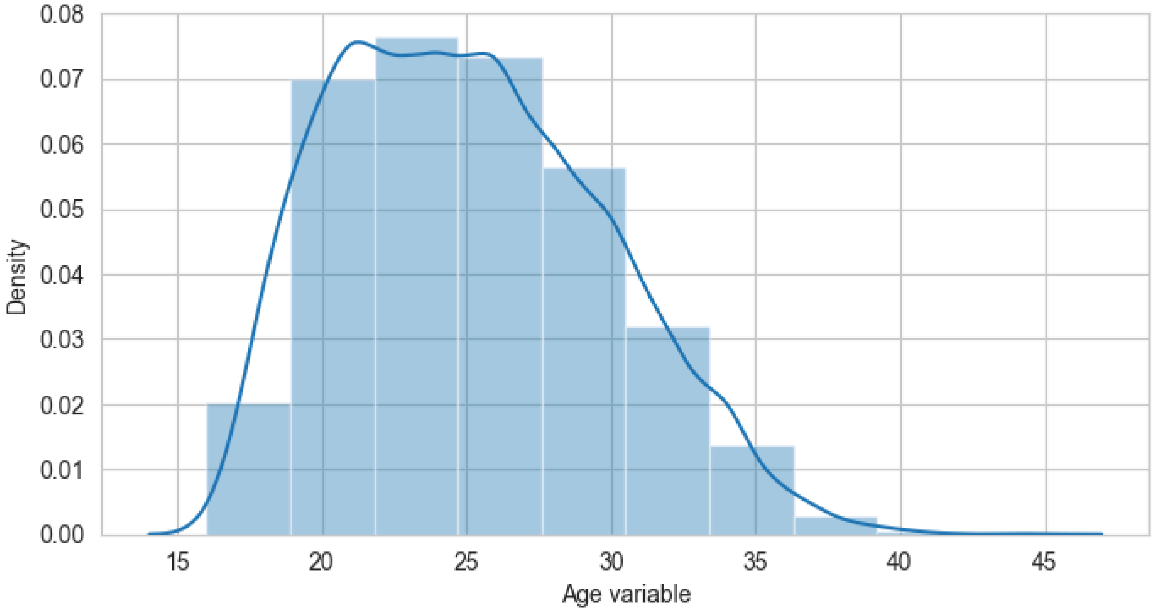


Comment

- It can be seen that the `Age` variable is slightly positively skewed.

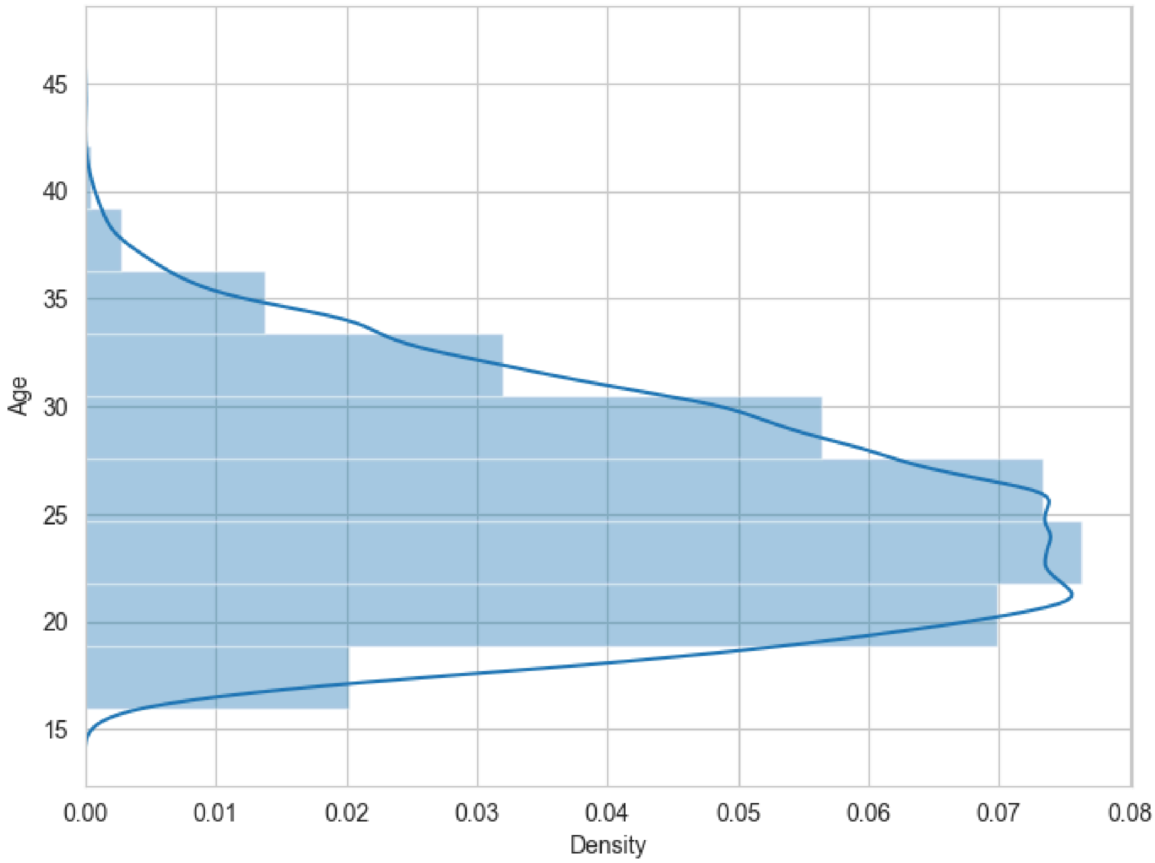
We can use Pandas series object to get an informative axis label as follows-

In [30]:
```
f, ax = plt.subplots(figsize=(8,4))
x = fifa['Age']
x = pd.Series(x, name="Age variable")
ax = sns.distplot(x, bins=10)
plt.show()
```



We can plot the distribution on the vertical axis as follows:-

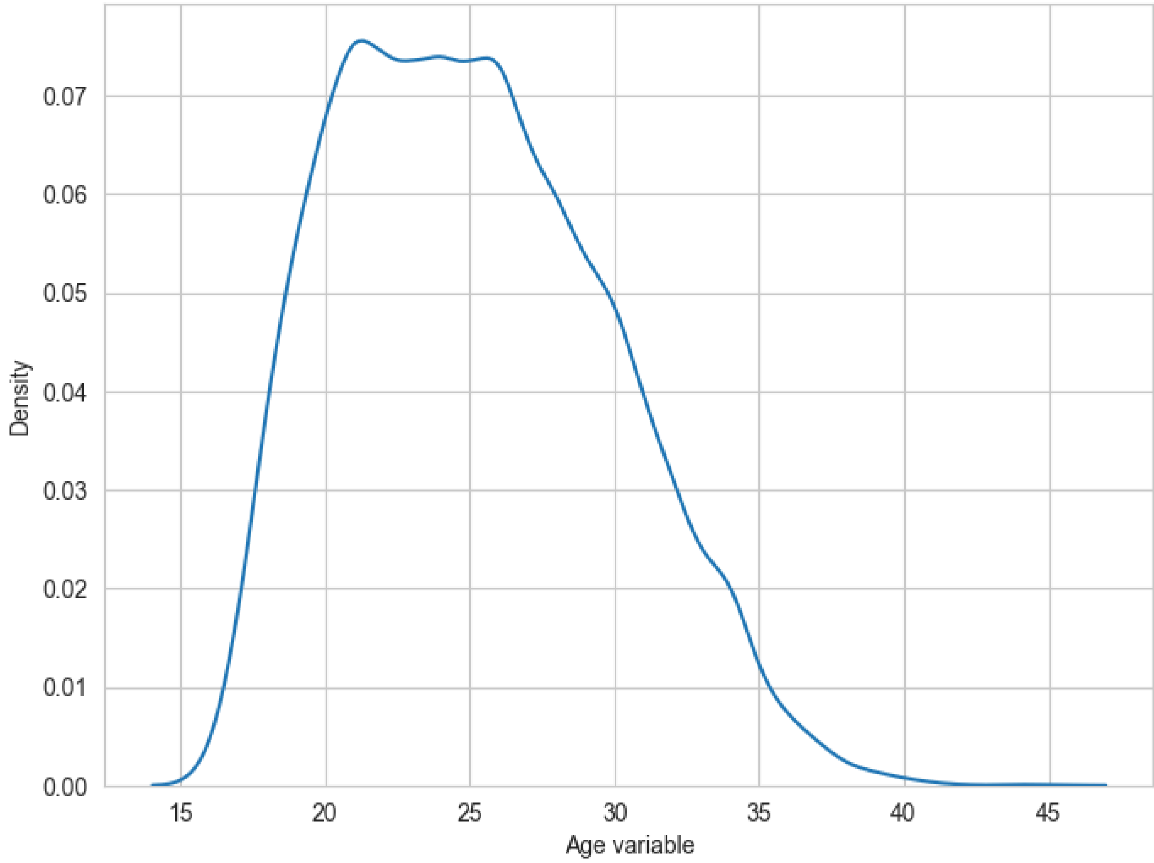
In [33]:
```
f, ax = plt.subplots(figsize=(8,6))
x = fifa['Age']
ax = sns.distplot(x, bins=10, vertical = True)
plt.show()
```



Seaborn Kernel Density Estimation (KDE) Plot

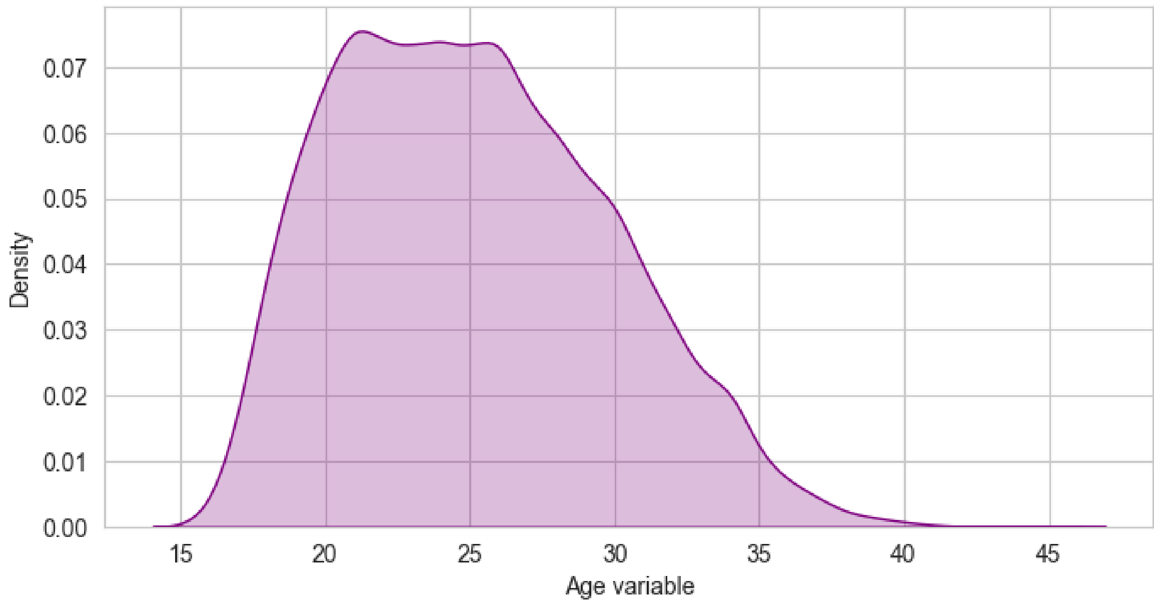
- The `kernel density estimate (KDE)` plot is a useful tool for plotting the shape of a distribution.
- Seaborn kdeplot is another seaborn plotting function that fits and plot a univariate or bivariate kernel density estimate.
- Like the histogram, the KDE plots encode the density of observations on one axis with height along the other axis.
- We can plot a KDE plot as follows-

In [36]:
```
f, ax = plt.subplots(figsize=(8,6))
x = fifa['Age']
x = pd.Series(x, name="Age variable")
ax = sns.kdeplot(x)
plt.show()
```



We can shade under the density curve and use a different color as follows:-

In [39]:
```
f, ax = plt.subplots(figsize=(8,4))
x = fifa['Age']
x = pd.Series(x, name="Age variable")
ax = sns.kdeplot(x, shade=True, color='purple')
plt.show()
```

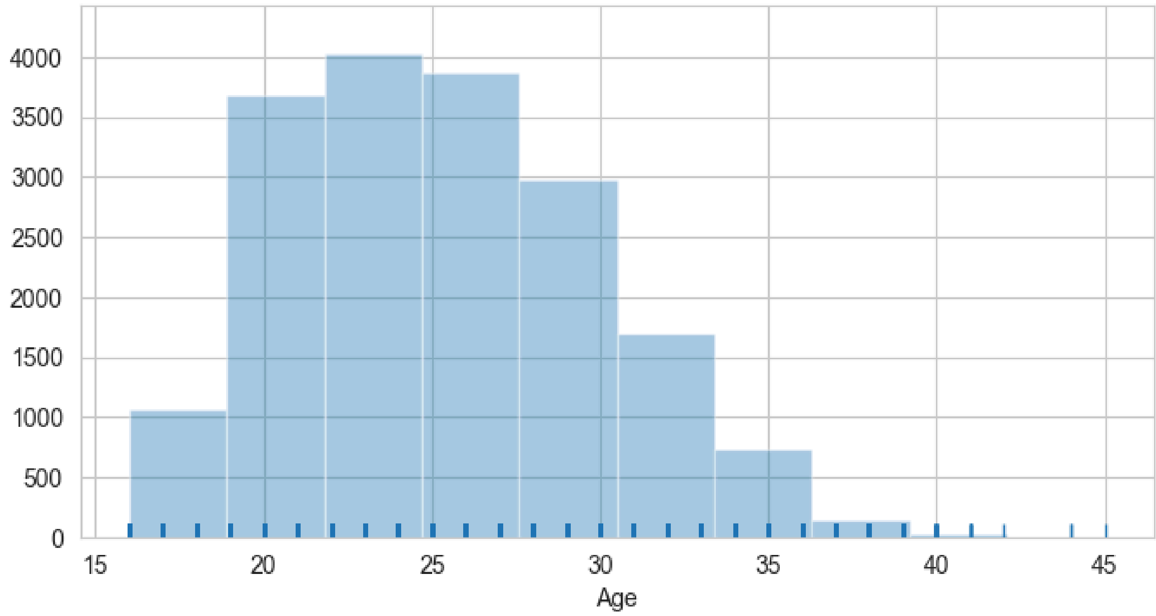


Histograms

- A histogram represents the distribution of data by forming bins along the range of the data and then drawing bars to show the number of observations that fall in each bin.

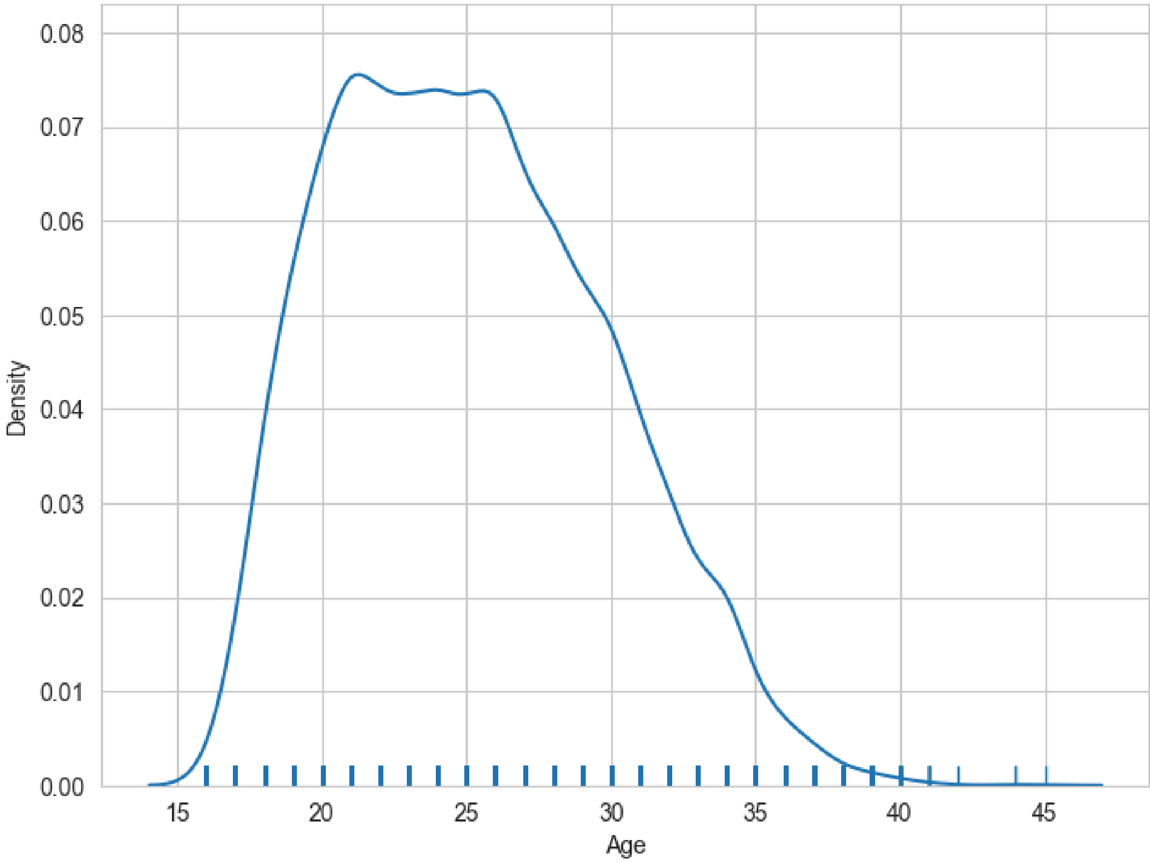
- A `hist()` function already exists in matplotlib.
- We can use Seaborn to plot a histogram.

In [41]:
```
f,ax=plt.subplots(figsize=(8,4))
x=fifa['Age']
ax=sns.distplot(x,kde=False,rug=True,bins=10)
plt.show()
```



We can plot a KDE plot alternatively as follows:-

In [44]:
```
f, ax = plt.subplots(figsize=(8,6))
x = fifa['Age']
ax = sns.distplot(x, hist=False, rug=True, bins=10)
plt.show()
```



Explore `Preferred Foot` variable

Check number of unique values in `Preferred Foot` variable

In [47]:
```
fifa['Preferred Foot'].nunique()
```

Out[47]:
```
2
```

We can see that there are two types of unique values in `Preferred Foot` variable.

In [50]:
```
fifa['Preferred Foot'].unique()
```

Out[50]:
```
array(['Left', 'Right', nan], dtype=object)
```

Check frequency distribution of values in `Preferred Foot` variable

In [52]:
```
fifa['Preferred Foot'].value_counts()
```

Out[52]:
```
Preferred Foot
Right    13948
Left      4211
Name: count, dtype: int64
```

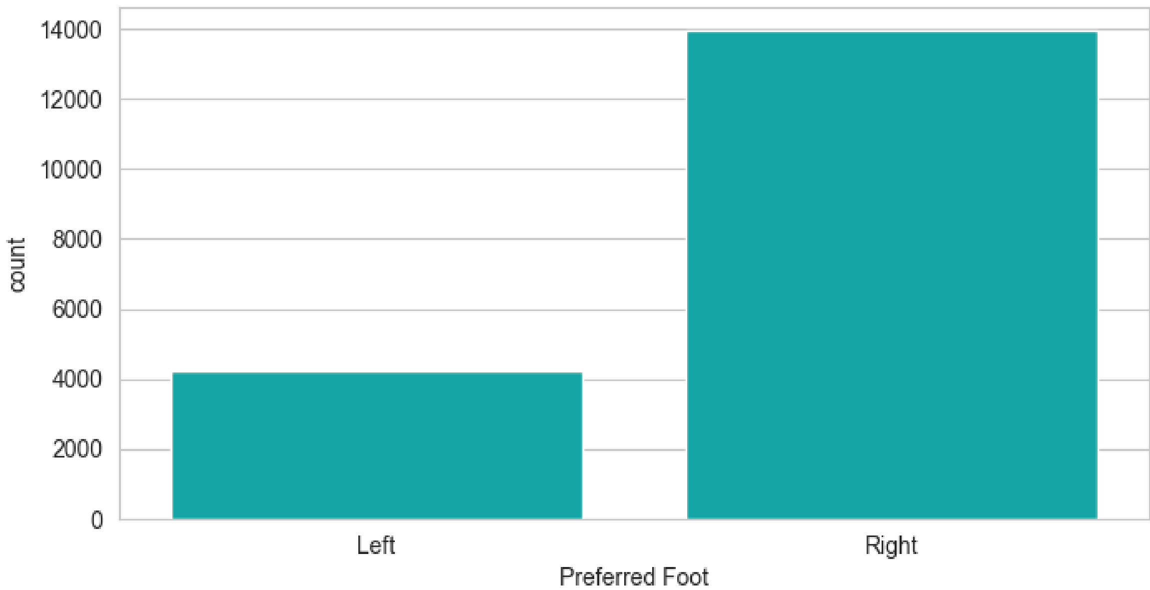
The `Preferred Foot` variable contains two types of values - `Right` and `Left`.

Visualize distribution of values with Seaborn `countplot()` function.

- A countplot shows the counts of observations in each categorical bin using bars.
- It can be thought of as a histogram across a categorical, instead of quantitative, variable.
- This function always treats one of the variables as categorical and draws data at ordinal positions (0, 1, … n) on the relevant axis, even when the data has a numeric or date type.

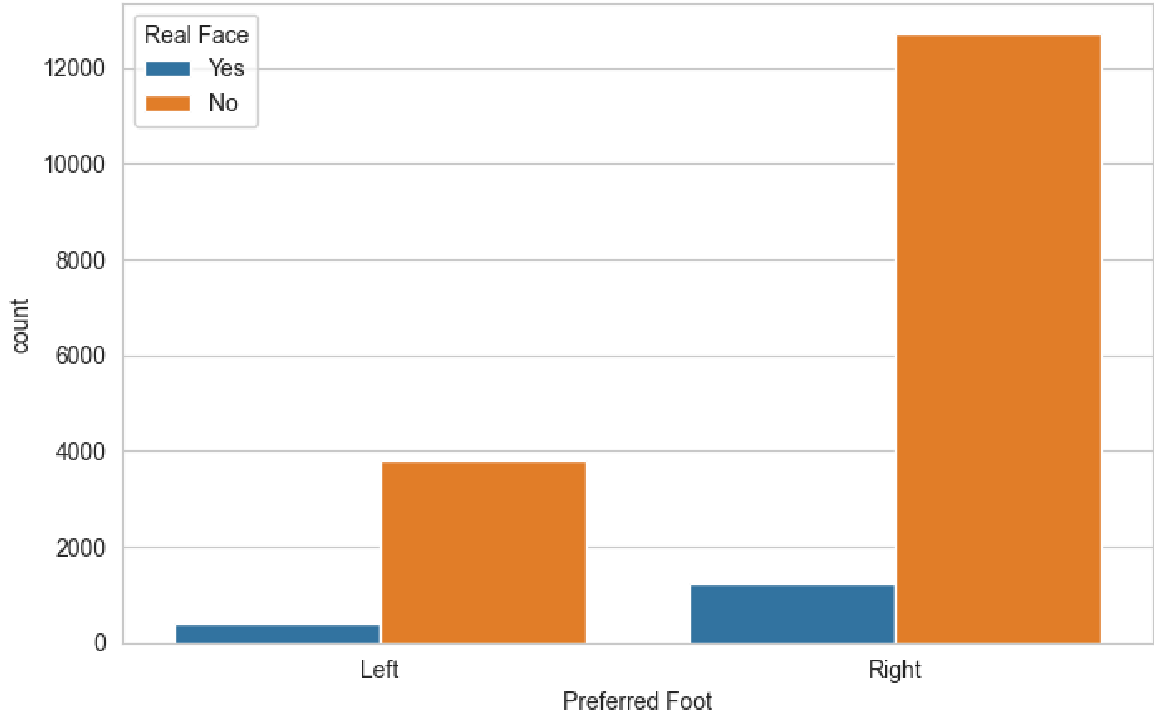
1. - We can visualize the distribution of values with Seaborn `countplot()` function as follows-

In [59]:
```
f, ax = plt.subplots(figsize=(8, 4))
sns.countplot(x="Preferred Foot", data=fifa, color="c")
plt.show()
```



We can show value counts for two categorical variables as follows-

In [62]:
```
f,ax=plt.subplots(figsize=(8,5))
sns.countplot(x='Preferred Foot',hue='Real Face',data=fifa)
plt.show()
```



We can draw plot vertically as follows-

f, ax = plt.subplots(figsize=(8, 6)) sns.countplot(y="Preferred Foot", data=fifa, color="c") plt.show()

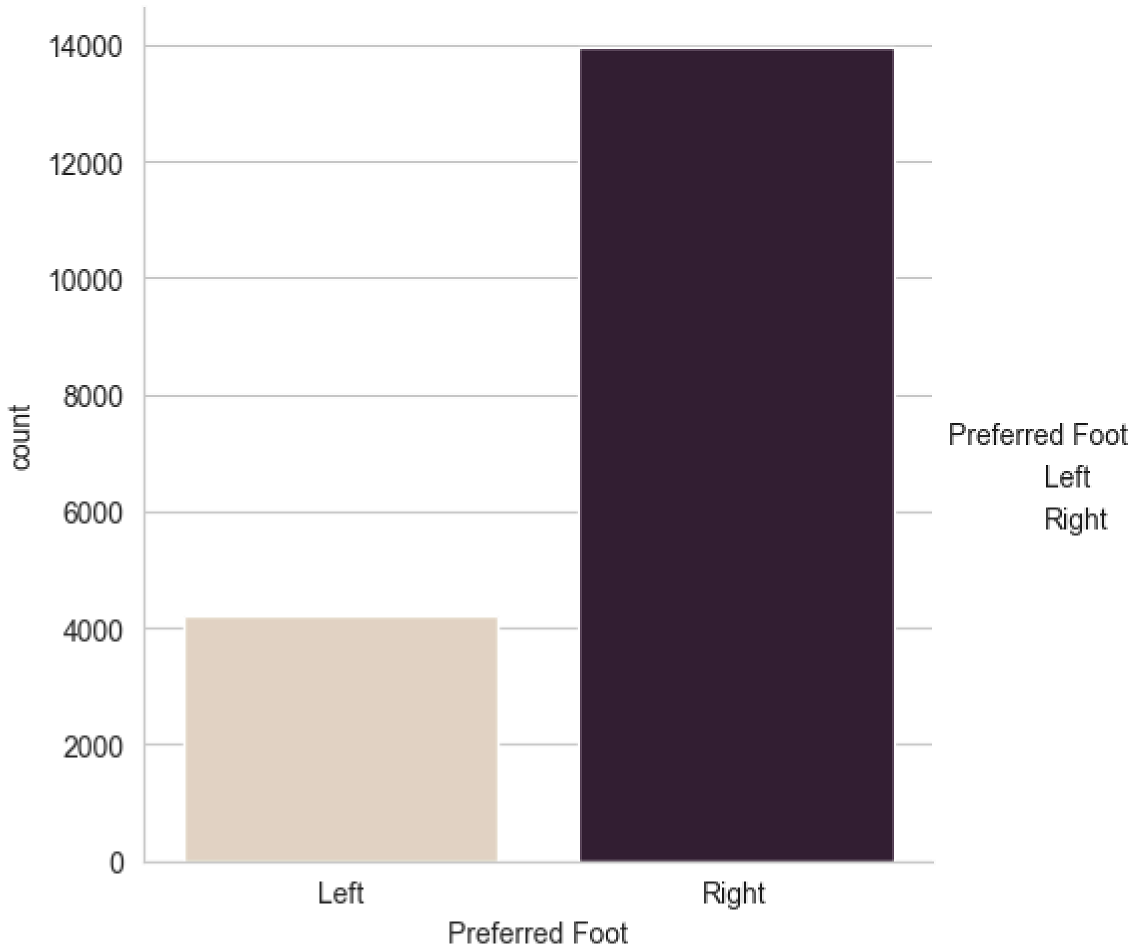
Seaborn `Catplot()` function

- We can use Seaborn `Catplot()` function to plot categorical scatterplots.
- The default representation of the data in `catplot()` uses a scatterplot.
- It helps to draw figure-level interface for drawing categorical plots onto a facetGrid.
- This function provides access to several axes-level functions that show the relationship between a numerical and one or more categorical variables using one of several visual representations.
- The `kind` parameter selects the underlying axes-level function to use.

We can use the kind parameter to draw different plot to visualize the same data. We can use the Seaborn `catplot()` function to draw a `countplot()` as follows-

In [68]:
```
g=sns.catplot(x="Preferred Foot", kind="count", palette="ch:.25", data=fifa)
```

In [69]:
```
plt.show()
```



Explore `International Reputation` variable

Check the number of unique values in `International Reputation` variable

In [73]:
```
fifa['International Reputation'].nunique()
```

Out[73]:
```
5
```

In [74]:
```
fifa['International Reputation'].unique()
```

Out[74]:
```
array([ 5.,  4.,  3.,  2.,  1., nan])
```

Check the distribution of values in `International Reputation` variable

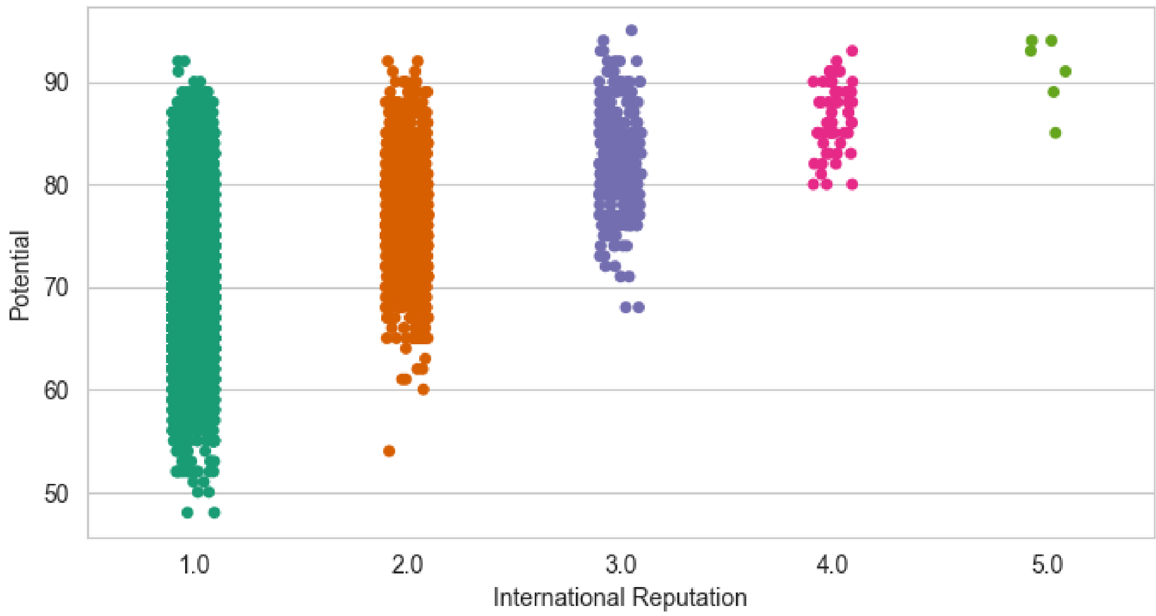
In [79]:
```
fifa['International Reputation'].value_counts()
```

Out[79]:
```
International Reputation
1.0    16532
2.0     1261
3.0      309
4.0       51
5.0        6
Name: count, dtype: int64
```

Seaborn `Stripplot()` function

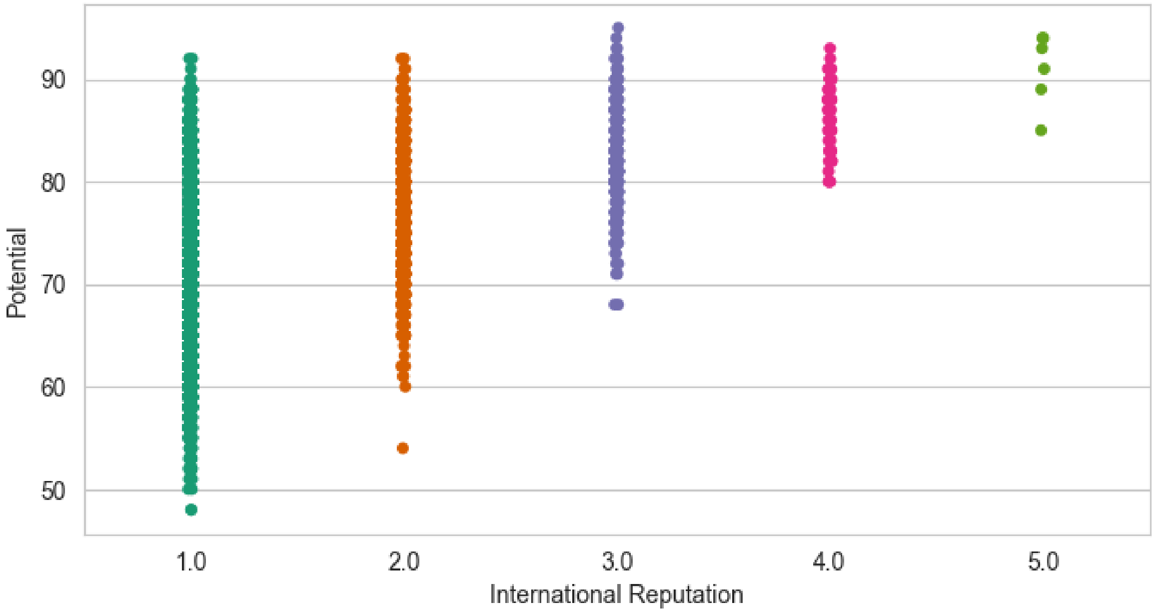
- This function draws a scatterplot where one variable is categorical.
- A strip plot can be drawn on its own, but it is also a good complement to a box or violin plot in cases where we want to show all observations along with some representation of the underlying distribution.
- I will plot a stripplot with `International Reputation` as categorical variable and `Potential` as the other variable.

In [82]:
```
f, ax = plt.subplots(figsize=(8, 4))
sns.stripplot(x="International Reputation", y="Potential", data=fifa,palette="Da
plt.show()
```



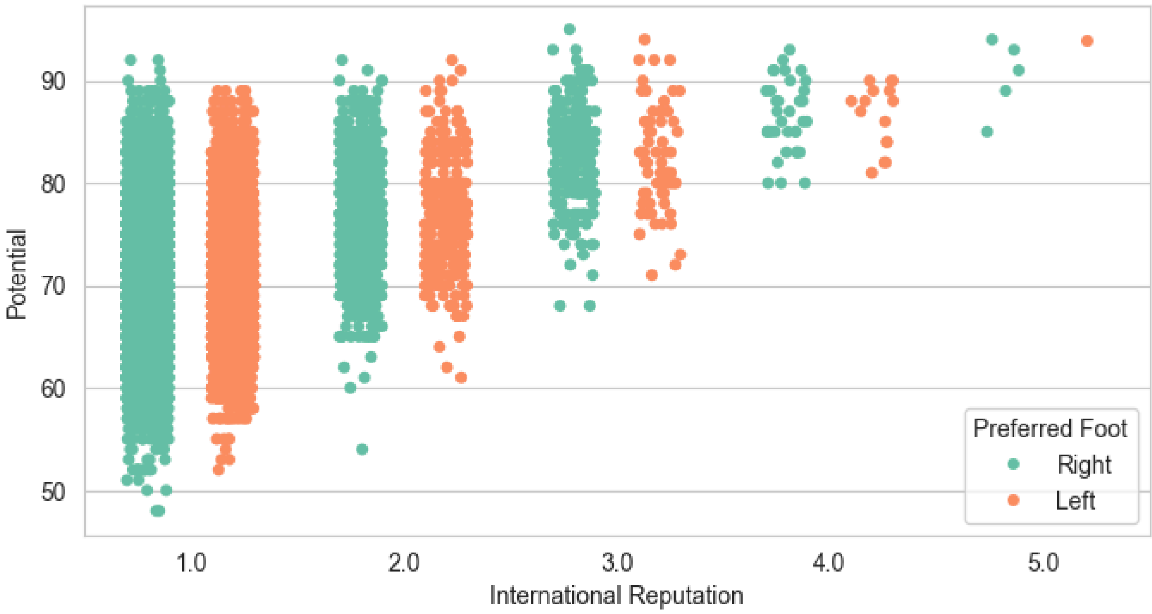
We can add jitter to bring out the distribution of values as follows-

In [84]:
```
f,ax=plt.subplots(figsize=(8,4))
sns.stripplot(x='International Reputation',y='Potential',data=fifa,palette="Dark
plt.show()
```



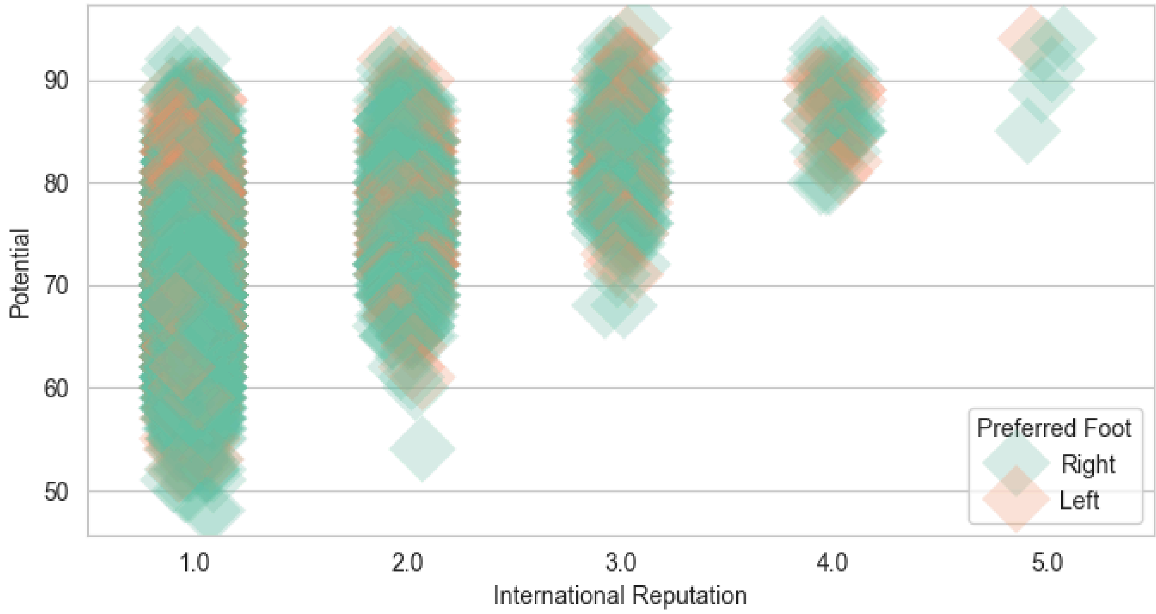
We can nest the strips within a second categorical variable - `Preferred Foot` as folows-

In [87]:
```
f,ax=plt.subplots(figsize=(8,4))
sns.stripplot(x="International Reputation",y="Potential",hue="Preferred Foot",da
plt.show()
```



We can draw strips with large points and different aesthetics as follows-

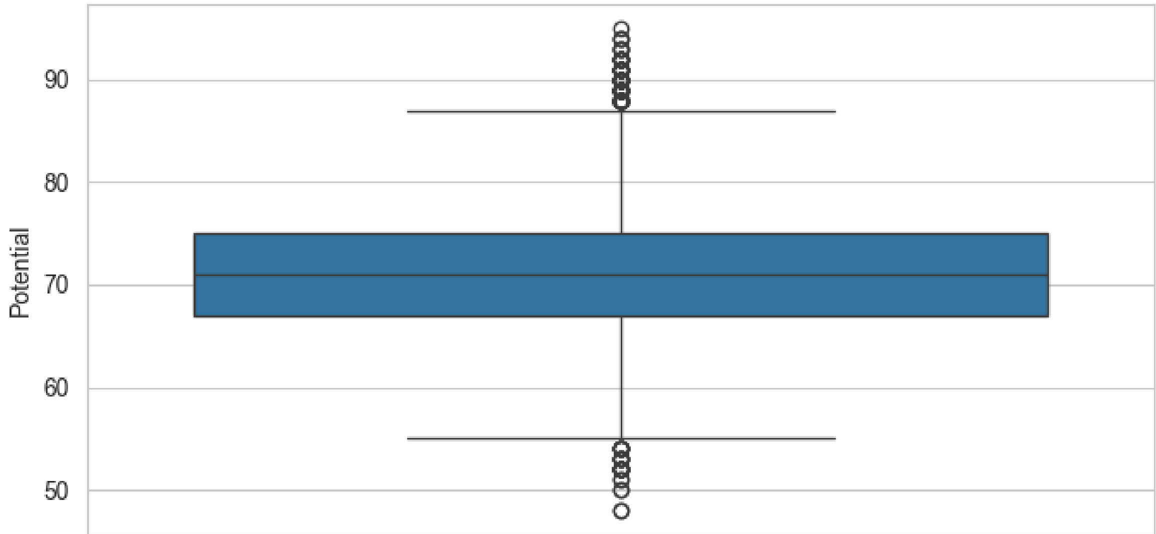
In [90]:
```
f,ax=plt.subplots(figsize=(8,4))
sns.stripplot(x="International Reputation",y="Potential",hue="Preferred Foot",da
plt.show()
```



Seaborn `boxplot()` function

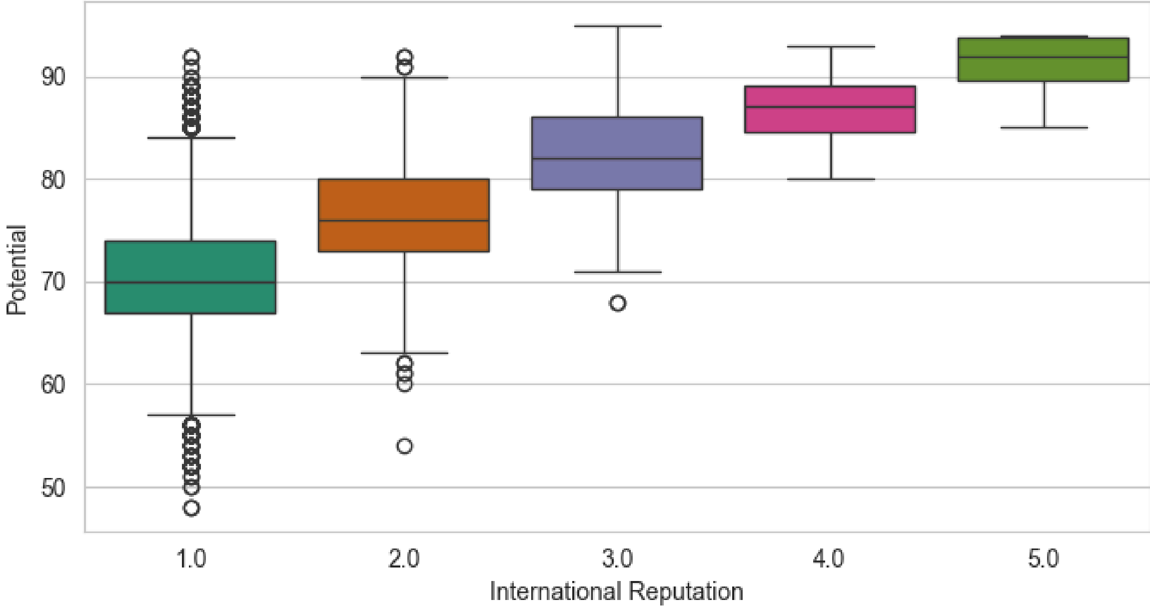
- This function draws a box plot to show distributions with respect to categories.
- A box plot (or box-and-whisker plot) shows the distribution of quantitative data in a way that facilitates comparisons between variables or across levels of a categorical variable.
- The box shows the quartiles of the dataset while the whiskers extend to show the rest of the distribution, except for points that are determined to be “outliers” using a method that is a function of the inter-quartile range.
- I will plot the boxplot of the `Potential` variable as follows-

In [92]:
```
f,ax=plt.subplots(figsize=(8,4))
x=fifa['Potential']
sns.boxplot(x)
plt.show()
```



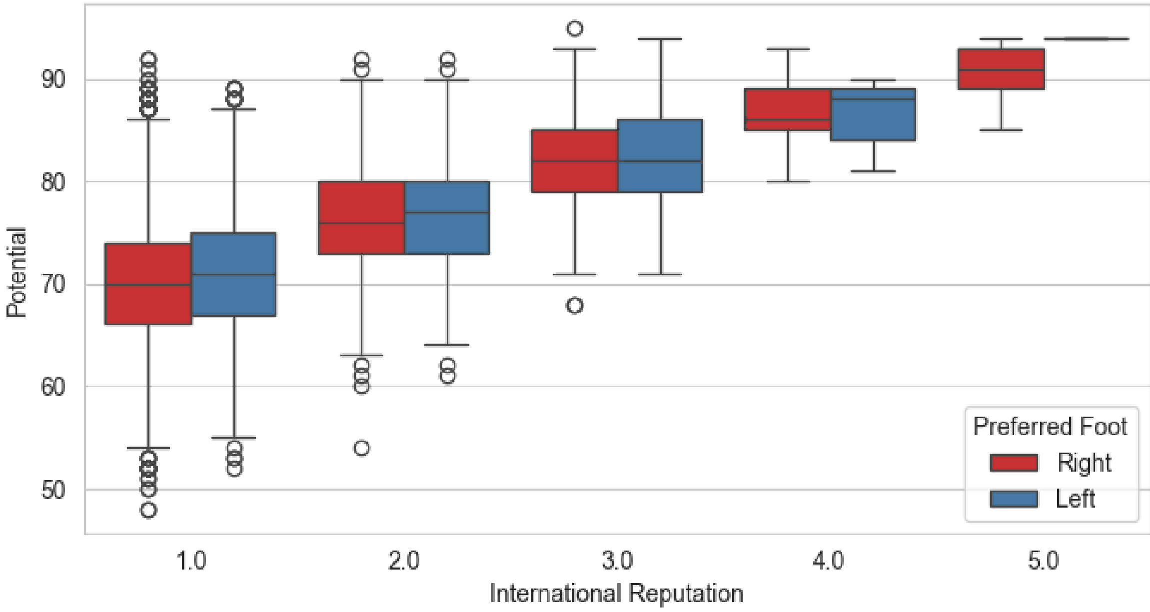
We can draw the vertical boxplot grouped by the categorical variable `International Reputation` as follows-

In [94]:
```
f,ax=plt.subplots(figsize=(8,4))
sns.boxplot(x="International Reputation",y="Potential",data=fifa,palette="Dark2"
plt.show()
```



We can draw a boxplot with nested grouping by two categorical variables as follows-

In [96]:
```
f,ax=plt.subplots(figsize=(8,4))
sns.boxplot(x="International Reputation",y="Potential",hue="Preferred Foot",data
plt.show()
```

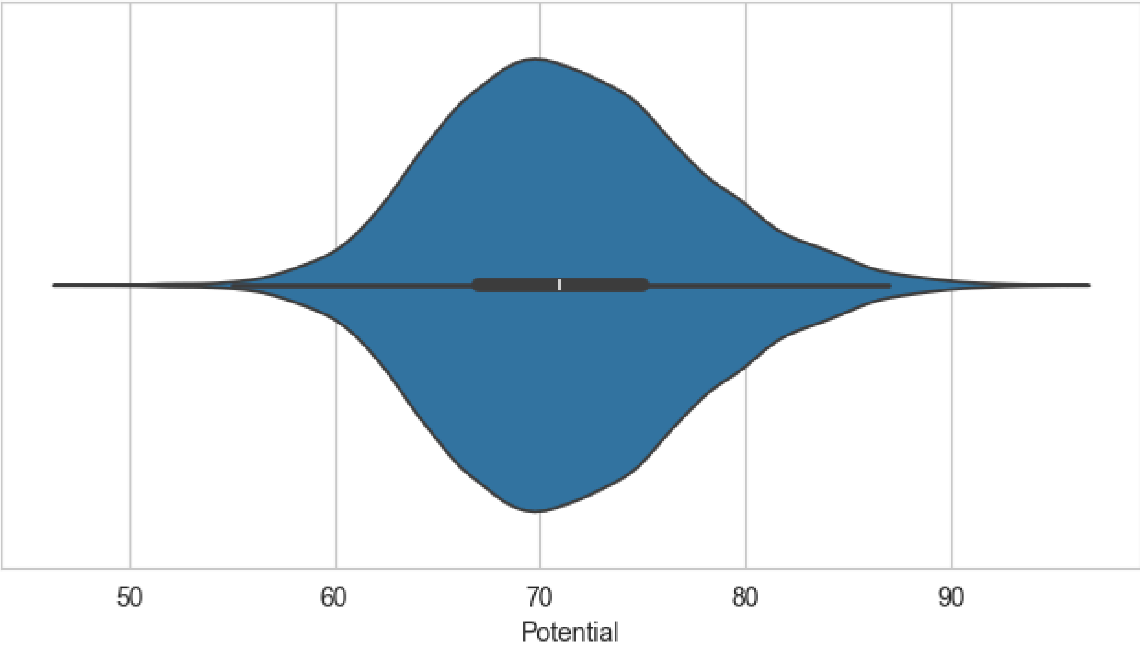


Seaborn `violinplot()` function

- This function draws a combination of boxplot and kernel density estimate.
- A violin plot plays a similar role as a box and whisker plot.

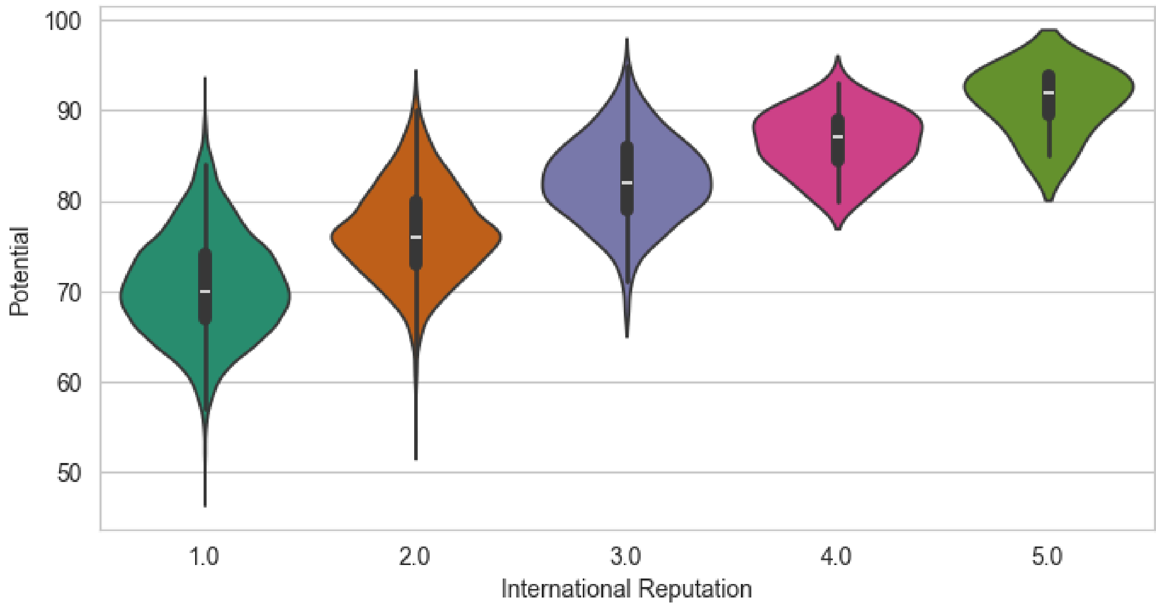
- It shows the distribution of quantitative data across several levels of one (or more) categorical variables such that those distributions can be compared.
- Unlike a box plot, in which all of the plot components correspond to actual datapoints, the violin plot features a kernel density estimation of the underlying distribution.
- I will plot the violinplot of `Potential` variable as follows-

In [99]:
```
f, ax = plt.subplots(figsize=(8, 4))
sns.violinplot(x=fifa["Potential"])
plt.show()
```



We can draw the vertical violinplot grouped by the categorical variable `International Reputation` as follows-

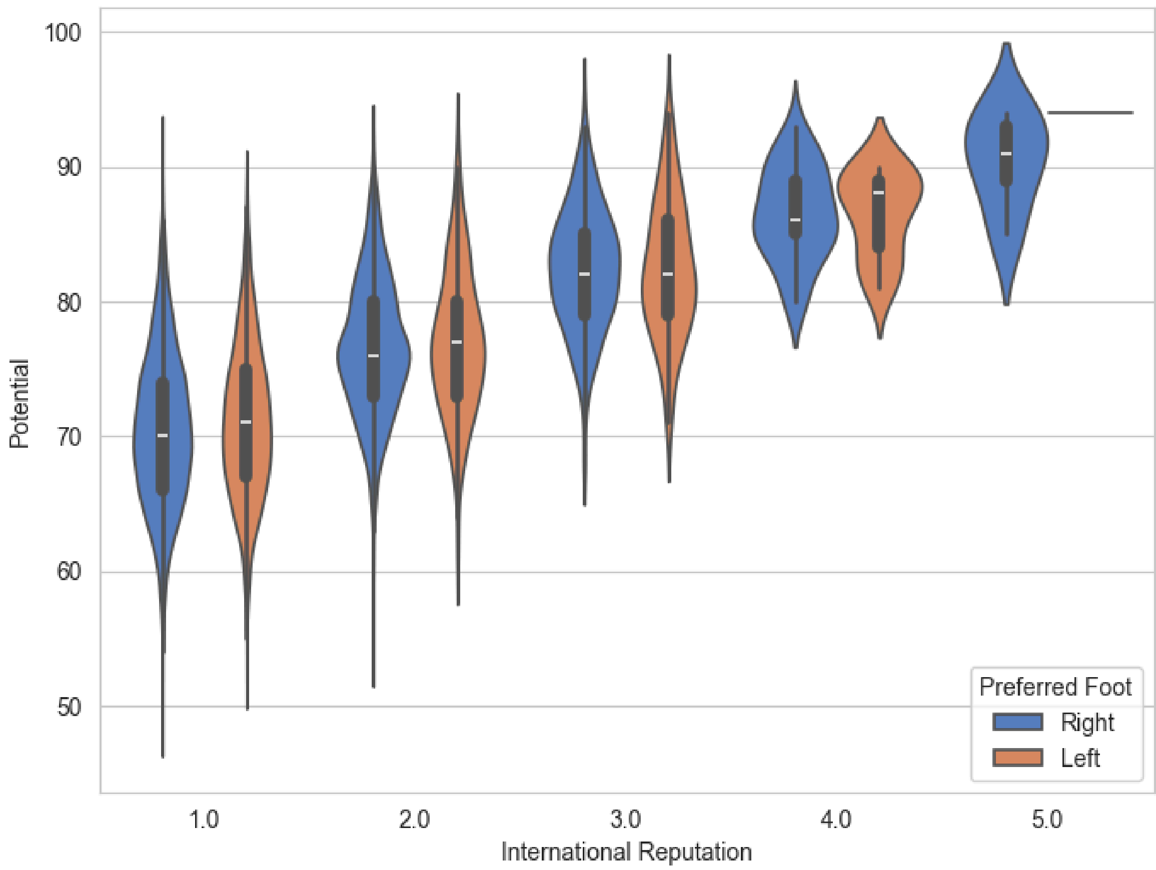
In [101…
```
f,ax=plt.subplots(figsize=(8,4))
sns.violinplot(x="International Reputation", y="Potential", data=fifa,palette="D
plt.show()
```



We can draw a violinplot with nested grouping by two categorical variables as follows-

In [103…

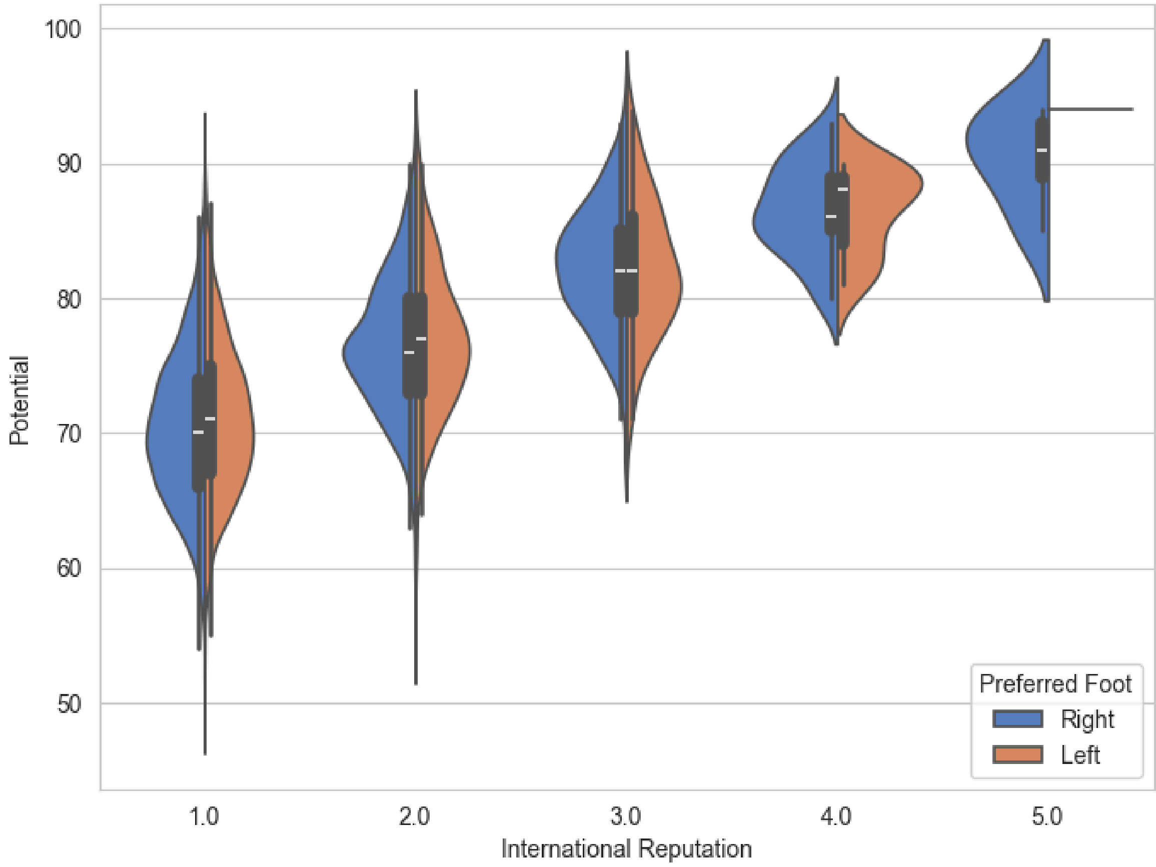
```
f, ax = plt.subplots(figsize=(8, 6))
sns.violinplot(x="International Reputation", y="Potential", hue="Preferred Foot"
plt.show()
```



We can draw split violins to compare the across the hue variable as follows-

In [105…

```
f, ax = plt.subplots(figsize=(8, 6))
sns.violinplot(x="International Reputation", y="Potential", hue="Preferred Foot"
               data=fifa, palette="muted", split=True)
plt.show()
```

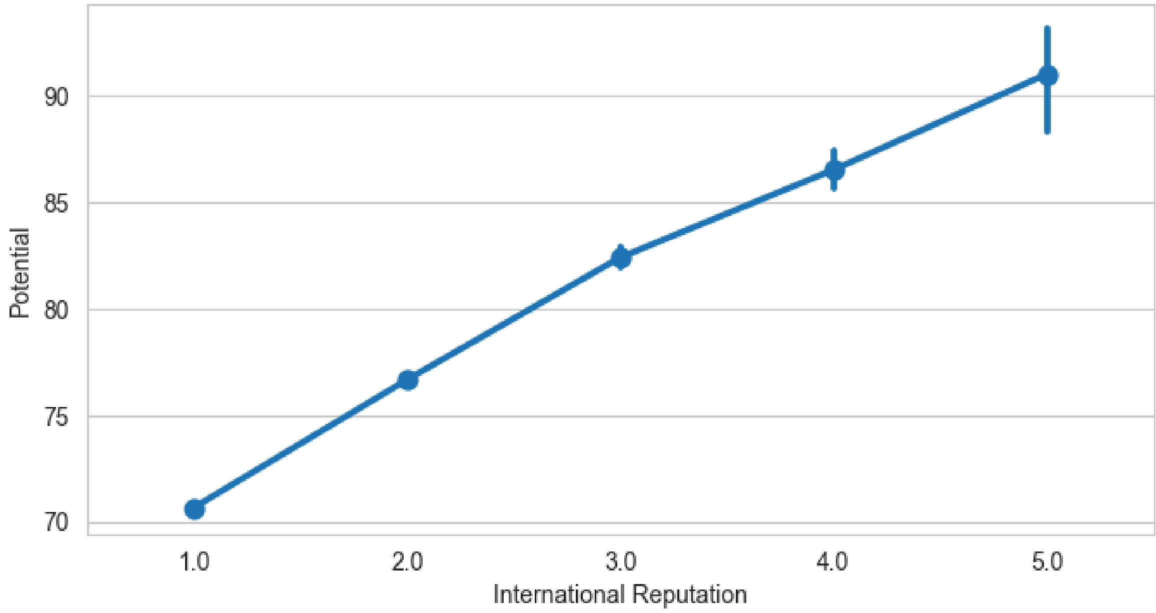


Seaborn `pointplot()` function

- This function show point estimates and confidence intervals using scatter plot graphs.
- A point plot represents an estimate of central tendency for a numeric variable by the position of scatter plot points and provides some indication of the uncertainty around that estimate using error bars.

In [107…

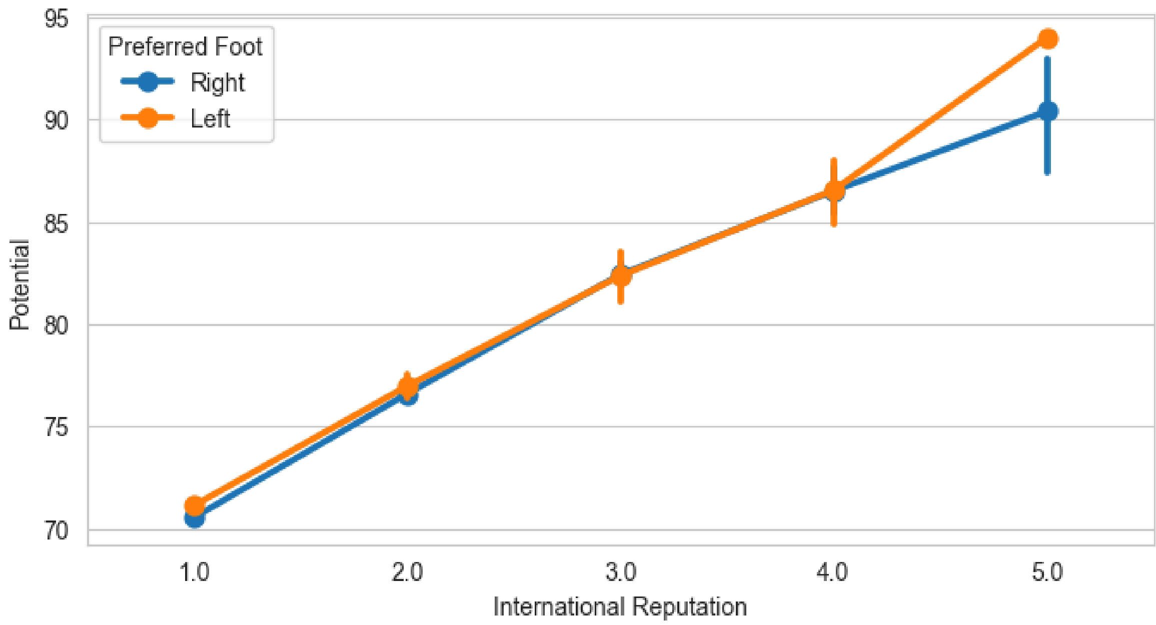
```
f, ax = plt.subplots(figsize=(8, 4))
sns.pointplot(x="International Reputation", y="Potential", data=fifa)
plt.show()
```



We can draw a set of vertical points with nested grouping by a two variables as follows-

In [110…

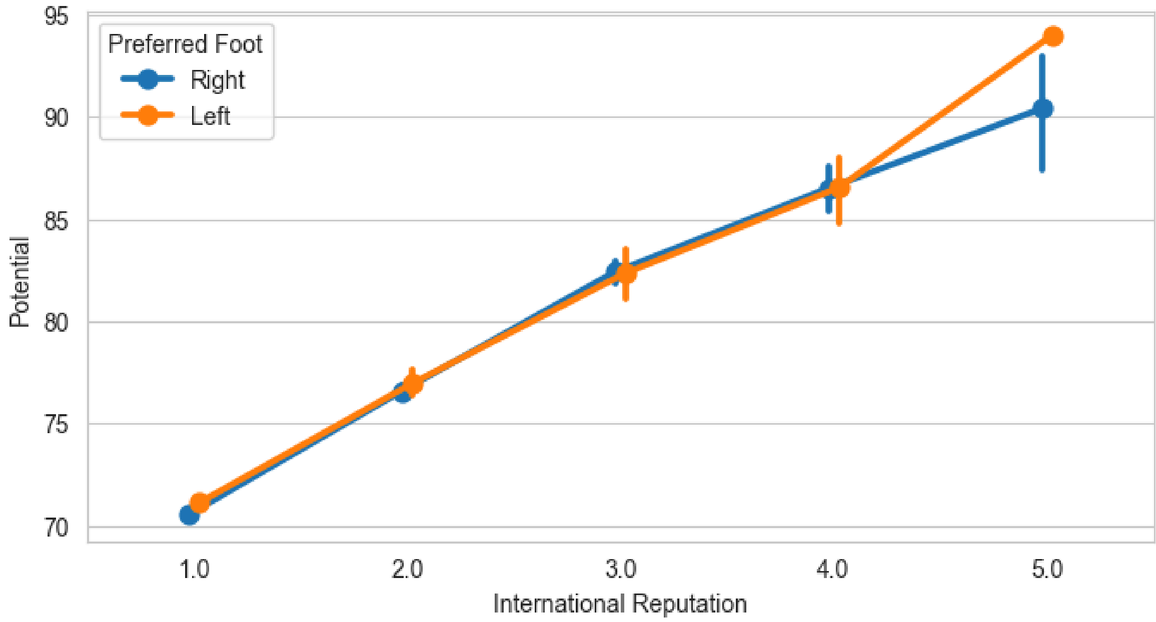
```
f, ax = plt.subplots(figsize=(8, 4))
sns.pointplot(x="International Reputation", y="Potential", hue="Preferred Foot",
plt.show()
```



We can separate the points for different hue levels along the categorical axis as follows-

In [113…

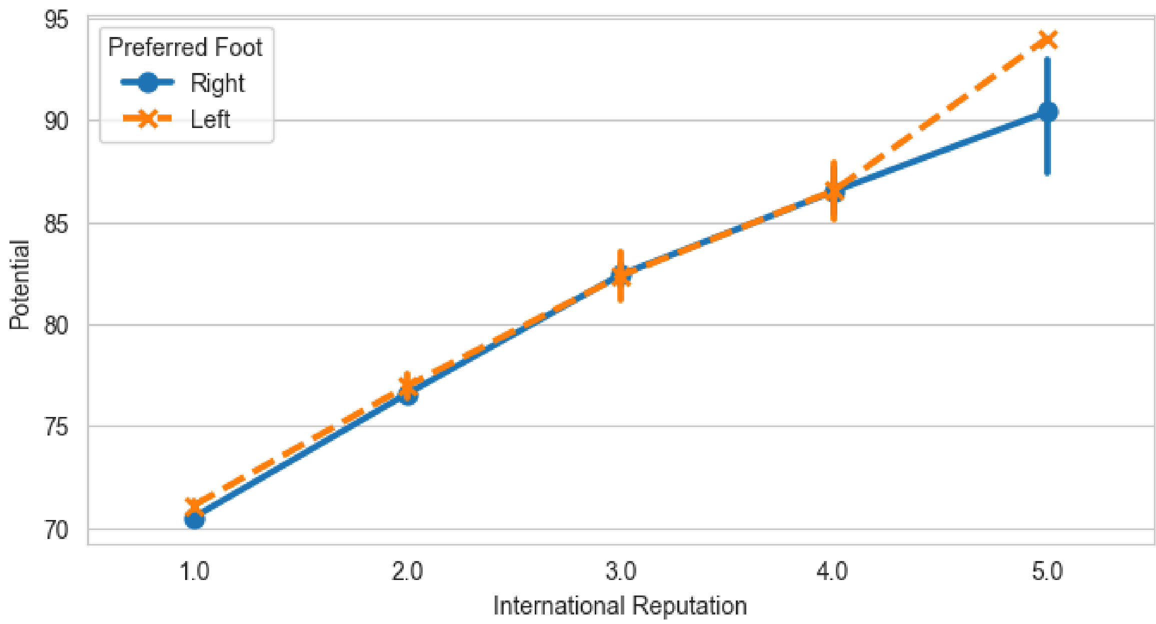
```
f, ax = plt.subplots(figsize=(8, 4))
sns.pointplot(x="International Reputation", y="Potential", hue="Preferred Foot",
plt.show()
```



We can use a different marker and line style for the hue levels as follows-

In [116…

```
f, ax = plt.subplots(figsize=(8, 4))
sns.pointplot(x="International Reputation", y="Potential", hue="Preferred Foot",
              data=fifa, markers=["o", "x"], linestyles=["-", "--"])
plt.show()
```



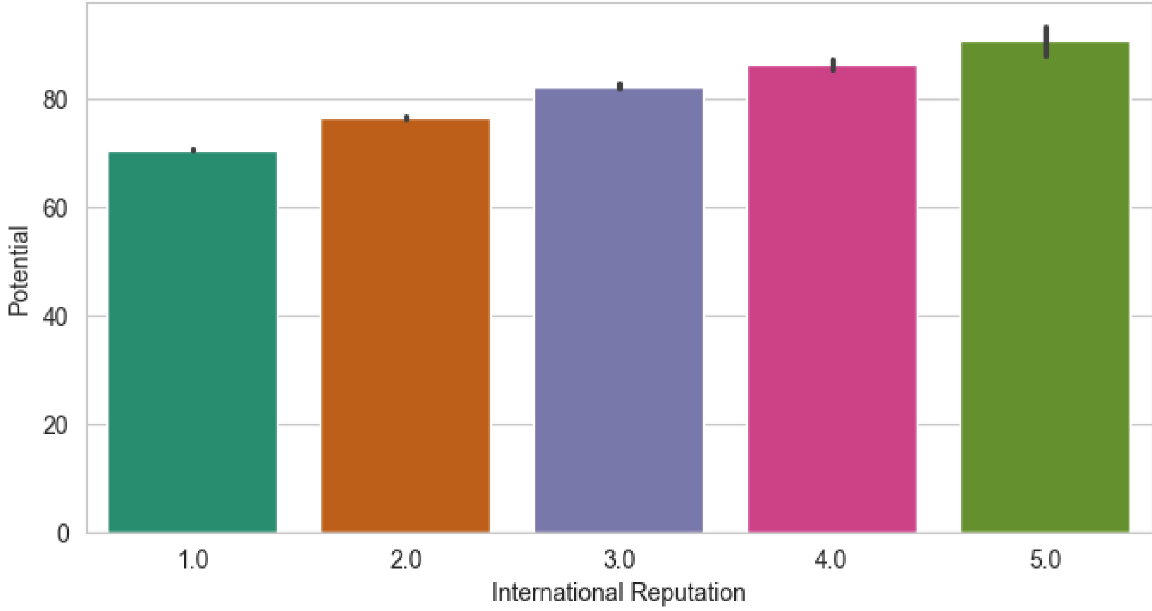
Seaborn `barplot()` function

- This function show point estimates and confidence intervals as rectangular bars.
- A bar plot represents an estimate of central tendency for a numeric variable with the height of each rectangle and provides some indication of the uncertainty around that estimate using error bars.
- Bar plots include 0 in the quantitative axis range, and they are a good choice when 0 is a meaningful value for the quantitative variable, and you want to make

comparisons against it.

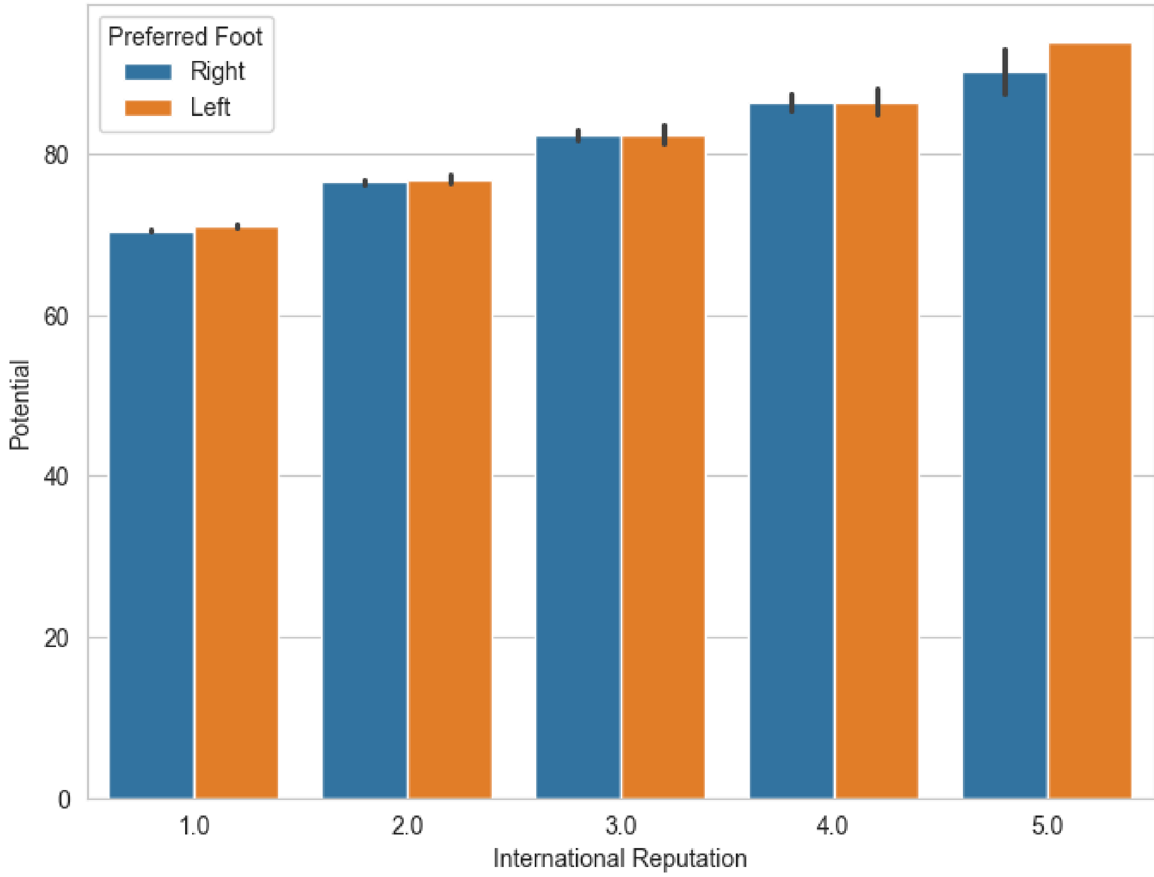
- We can plot a barplot as follows-

In [118…
```
f, ax = plt.subplots(figsize=(8,4))
sns.barplot(x="International Reputation", y="Potential", data=fifa,palette="Dark
plt.show()
```



We can draw a set of vertical bars with nested grouping by a two variables as follows-

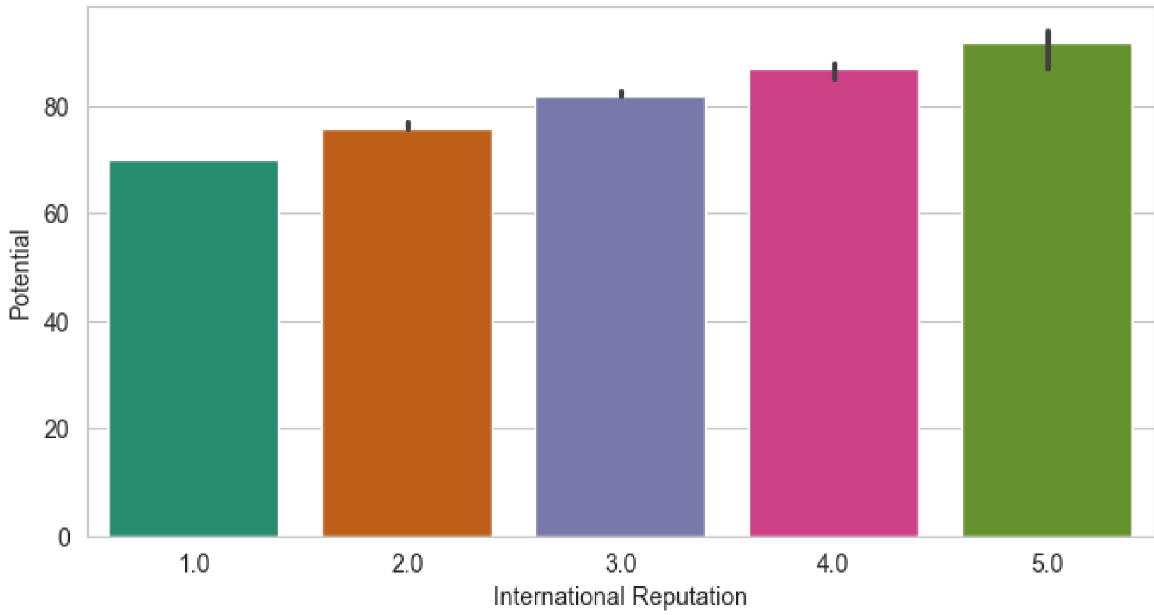
In [121…
```
f, ax = plt.subplots(figsize=(8, 6))
sns.barplot(x="International Reputation", y="Potential", hue="Preferred Foot", d
plt.show()
```



We can use median as the estimate of central tendency as follows-

In [124…

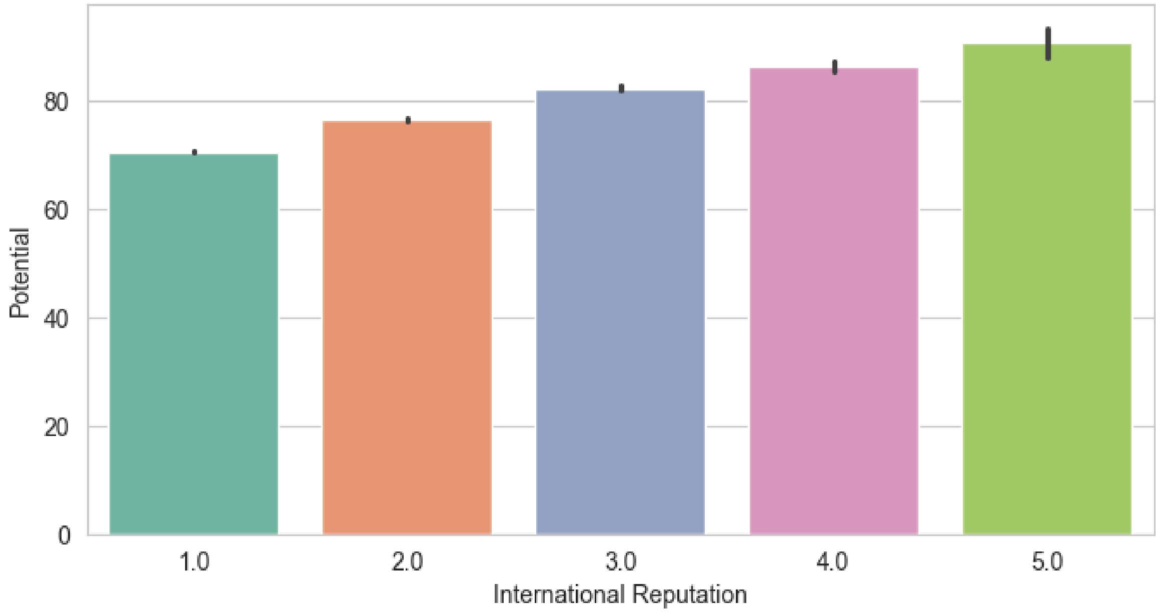
```
from numpy import median
f, ax = plt.subplots(figsize=(8, 4))
sns.barplot(x="International Reputation", y="Potential", data=fifa, estimator=me
plt.show()
```



We can show the standard error of the mean with the error bars as follows-

In [136…

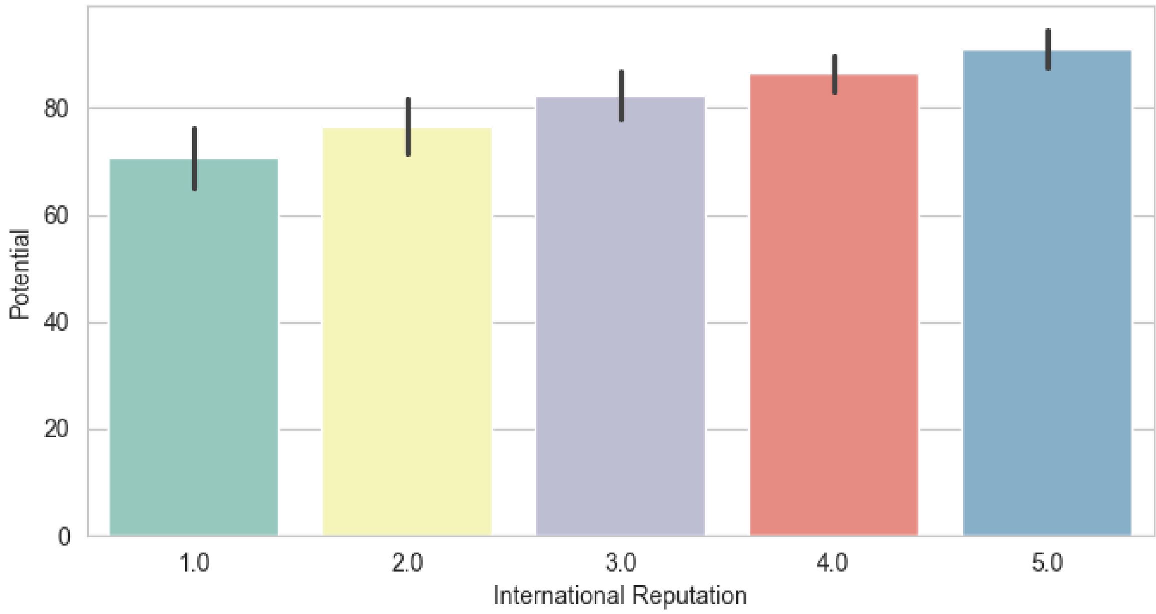
```
f,ax=plt.subplots(figsize=(8,4))
sns.barplot(x="International Reputation",y="Potential",data=fifa,ci=95,palette="
plt.show()
```



We can show standard deviation of observations instead of a confidence interval as follows-

In [144…

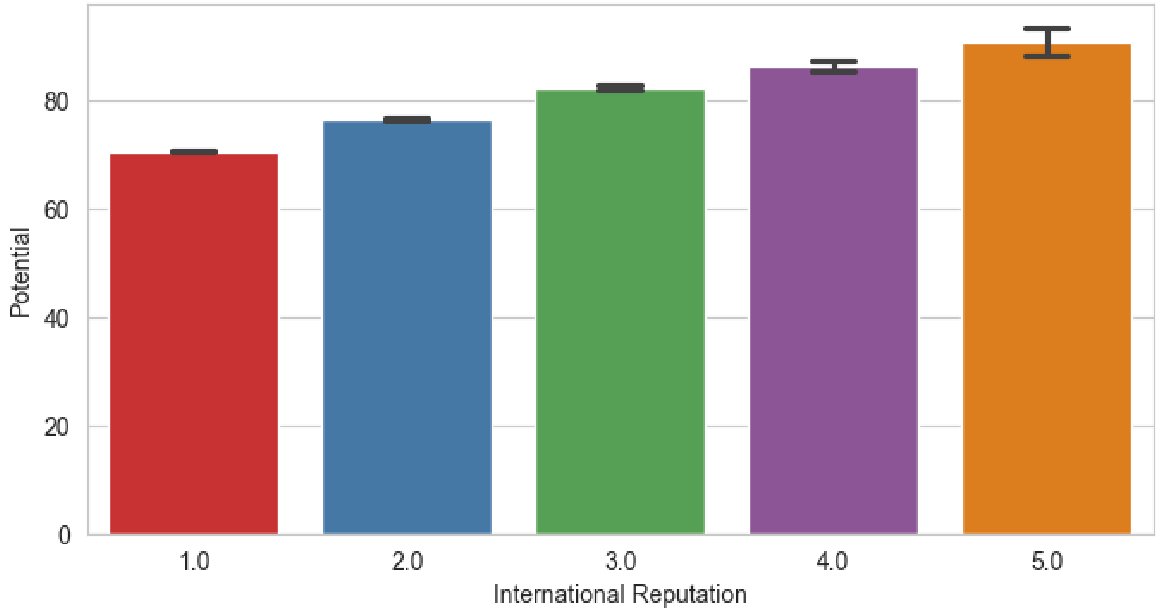
```
f, ax = plt.subplots(figsize=(8, 4))
sns.barplot(x="International Reputation", y="Potential", data=fifa, ci="sd",pale
plt.show()
```



We can add “caps” to the error bars as follows-

In [152…

```
f, ax = plt.subplots(figsize=(8, 4))
sns.barplot(x="International Reputation", y="Potential", data=fifa, capsize=0.2,
plt.show()
```



Visualizing statistical relationship with Seaborn `relplot()` function

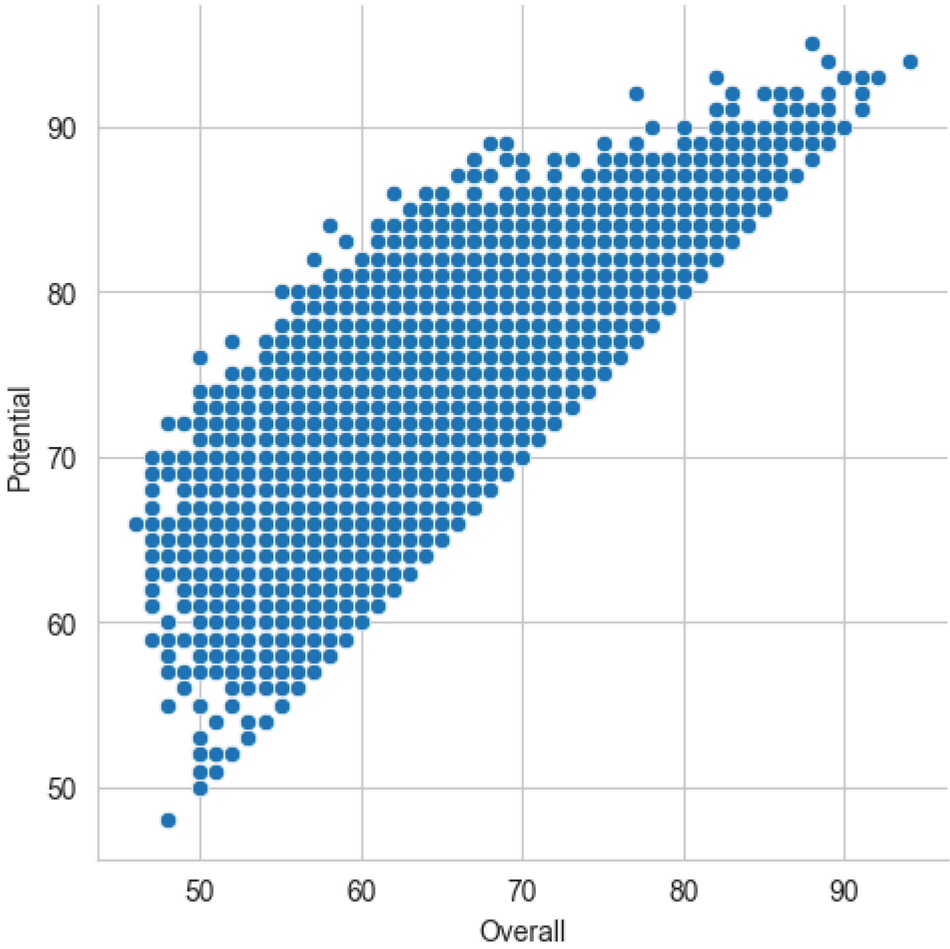
Seaborn `relplot()` function

- Seaborn `relplot()` function helps us to draw figure-level interface for drawing relational plots onto a FacetGrid.
- This function provides access to several different axes-level functions that show the relationship between two variables with semantic mappings of subsets.
- The `kind` parameter selects the underlying axes-level function to use-
- scatterplot() (with kind="scatter"; the default)
- lineplot() (with kind="line")

We can plot a scatterplot with variables `Heigh` and `Weight` with Seaborn `relplot()` function as follows-

In [167…
```
g = sns.relplot(x="Overall", y="Potential", data=fifa)
```

In [169…
```
plt.show()
```

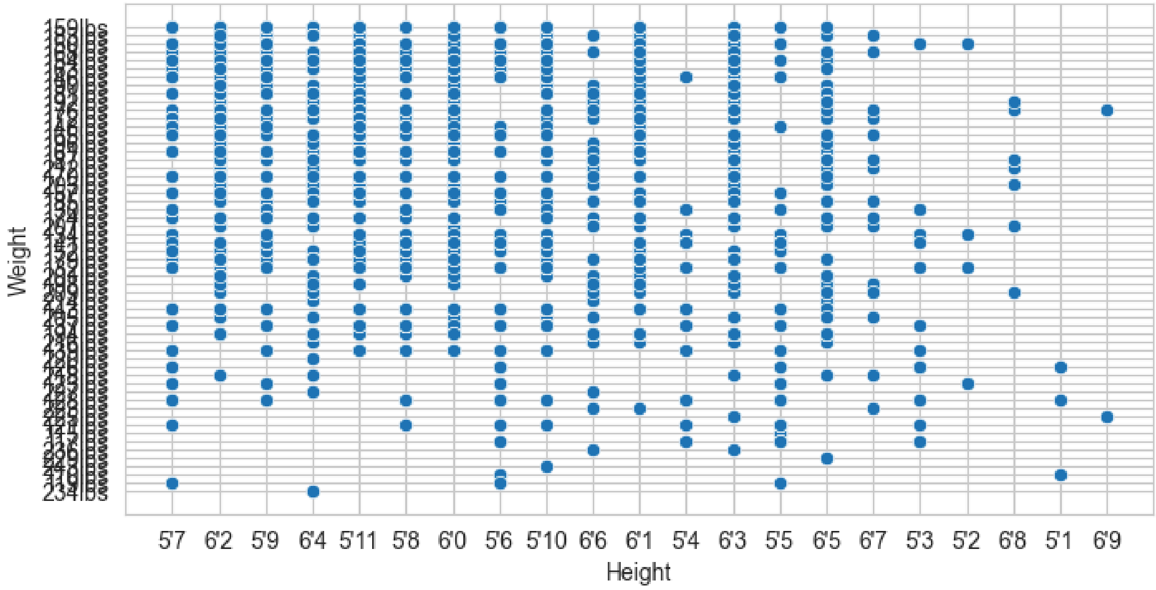


Seaborn `scatterplot()` function

- This function draws a scatter plot with possibility of several semantic groups.
- The relationship between x and y can be shown for different subsets of the data using the `hue`, `size` and `style` parameters.
- These parameters control what visual semantics are used to identify the different subsets.

In [174…

```
f, ax = plt.subplots(figsize=(8, 4))
sns.scatterplot(x="Height", y="Weight", data=fifa)
plt.show()
```

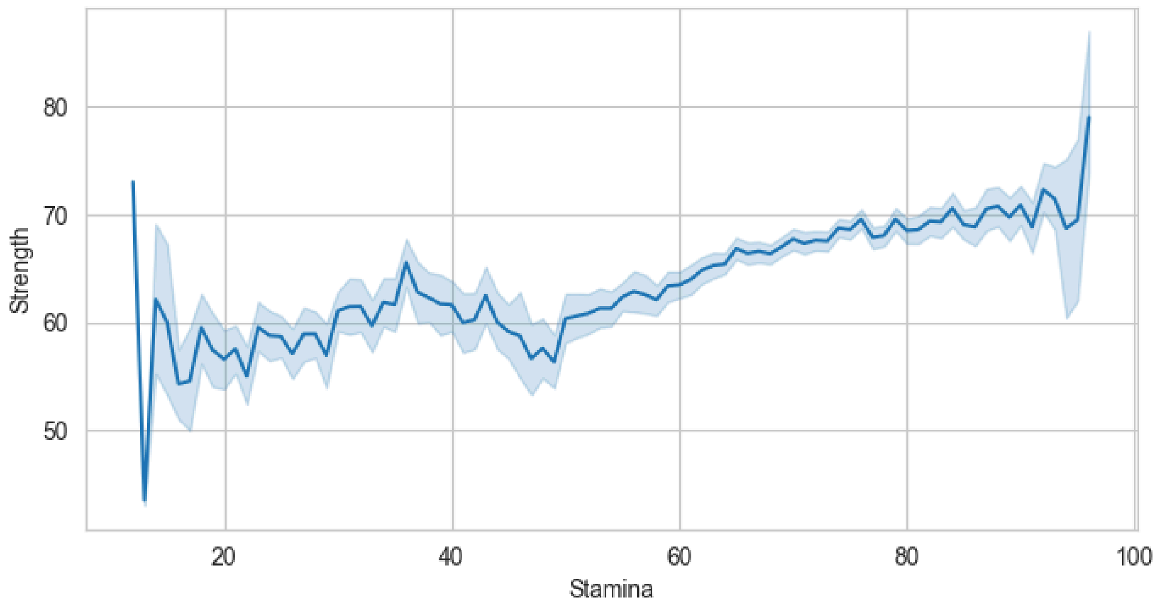


Seaborn `lineplot()` function

- THis function draws a line plot with possibility of several semantic groupings.
- The relationship between x and y can be shown for different subsets of the data using the `hue` , `size` and `style` parameters.
- These parameters control what visual semantics are used to identify the different subsets.

In [179…

```
f, ax = plt.subplots(figsize=(8, 4))
ax = sns.lineplot(x="Stamina", y="Strength", data=fifa)
plt.show()
```



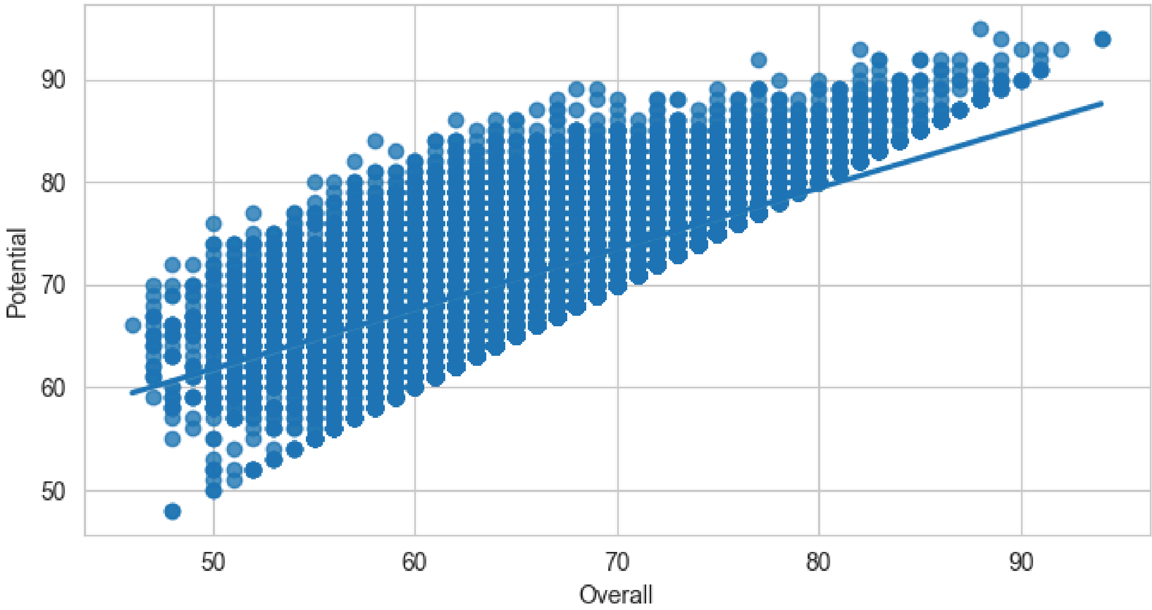
Visualize linear relationship with Seaborn `regplot()` function

Seaborn `regplot()` function

- This function plots data and a linear regression model fit.
- We can plot a linear regression model between `Overall` and `Potential` variable with `regplot()` function as follows-

In [220…

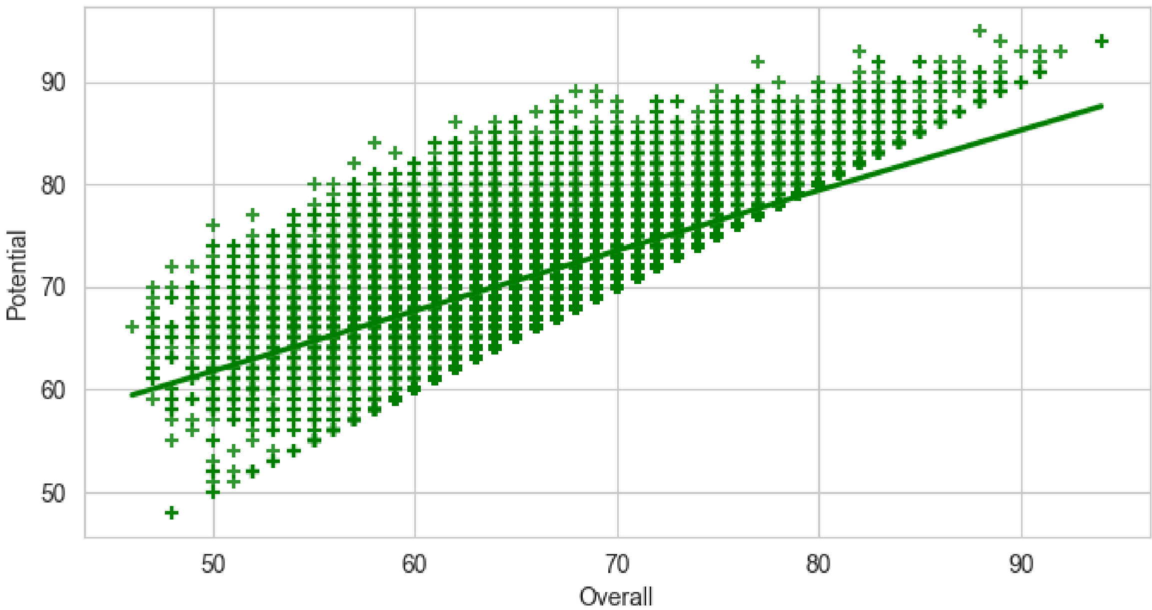
```
f, ax = plt.subplots(figsize=(8, 4))
ax = sns.regplot(x="Overall", y="Potential", data=fifa)
plt.show()
```



We can use a different color and marker as follows-

In [223…

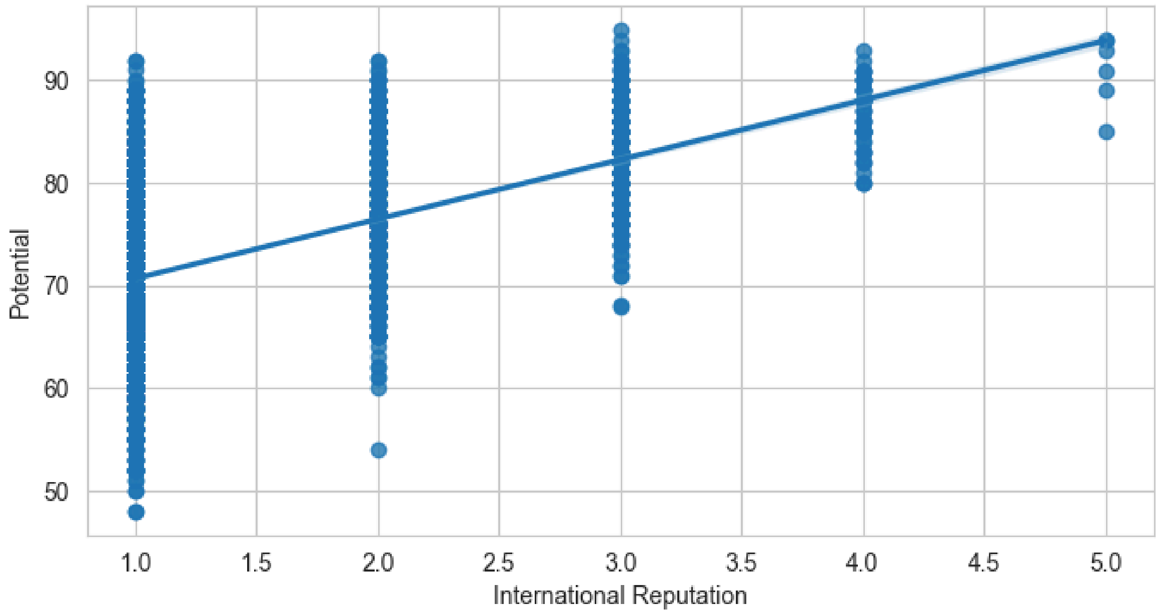
```
f, ax = plt.subplots(figsize=(8, 4))
ax = sns.regplot(x="Overall", y="Potential", data=fifa, color= "g", marker="+")
plt.show()
```



We can plot with a discrete variable and add some jitter as follows-

In [226…

```
f, ax = plt.subplots(figsize=(8, 4))
sns.regplot(x="International Reputation", y="Potential", data=fifa, y_jitter=.01
plt.show()
```

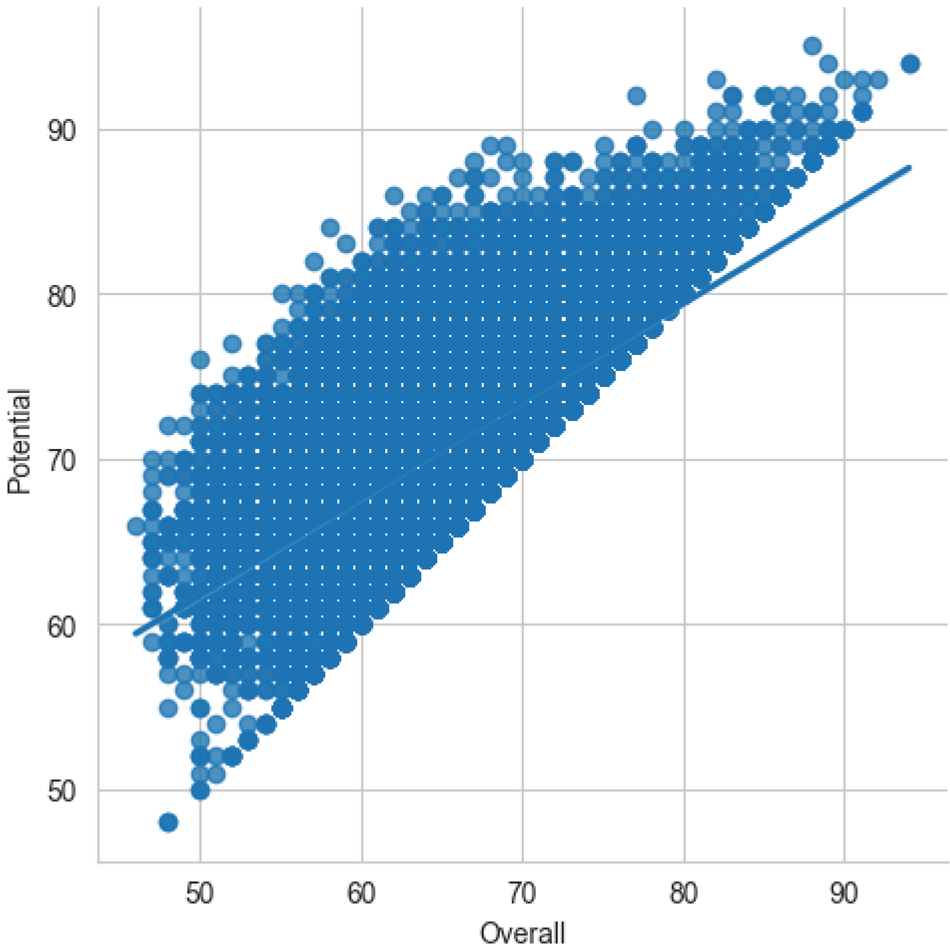


Seaborn `lmplot()` function

- This function plots data and regression model fits across a FacetGrid.
- This function combines `regplot()` and `FacetGrid`.
- It is intended as a convenient interface to fit regression models across conditional subsets of a dataset.
- We can plot a linear regression model between `Overall` and `Potential` variable with `lmplot()` function as follows-

In [229…

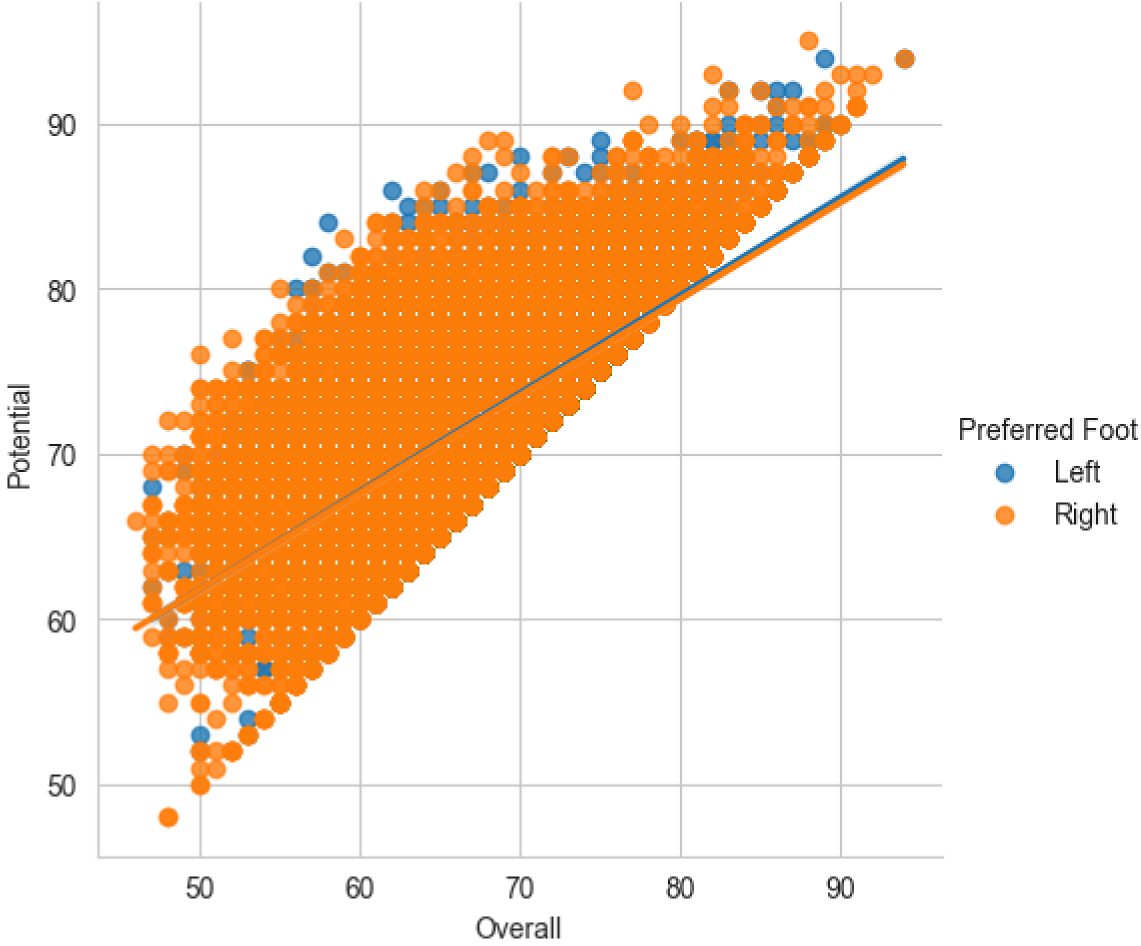
```
g= sns.lmplot(x="Overall", y="Potential", data=fifa)
plt.show()
```



We can condition on a third variable and plot the levels in different colors as follows-

In [232…

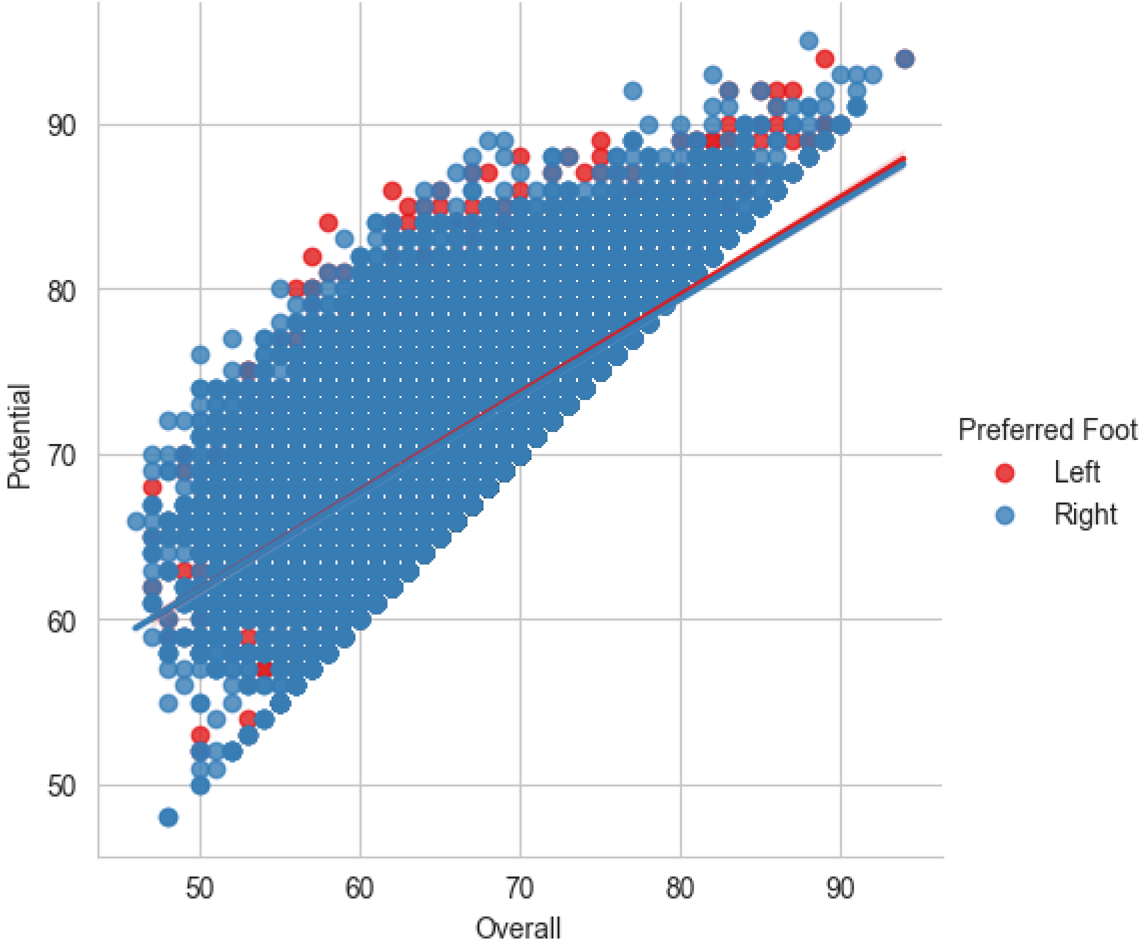
```
g= sns.lmplot(x="Overall", y="Potential", hue="Preferred Foot", data=fifa)
plt.show()
```



We can use a different color palette as follows-

In [246…

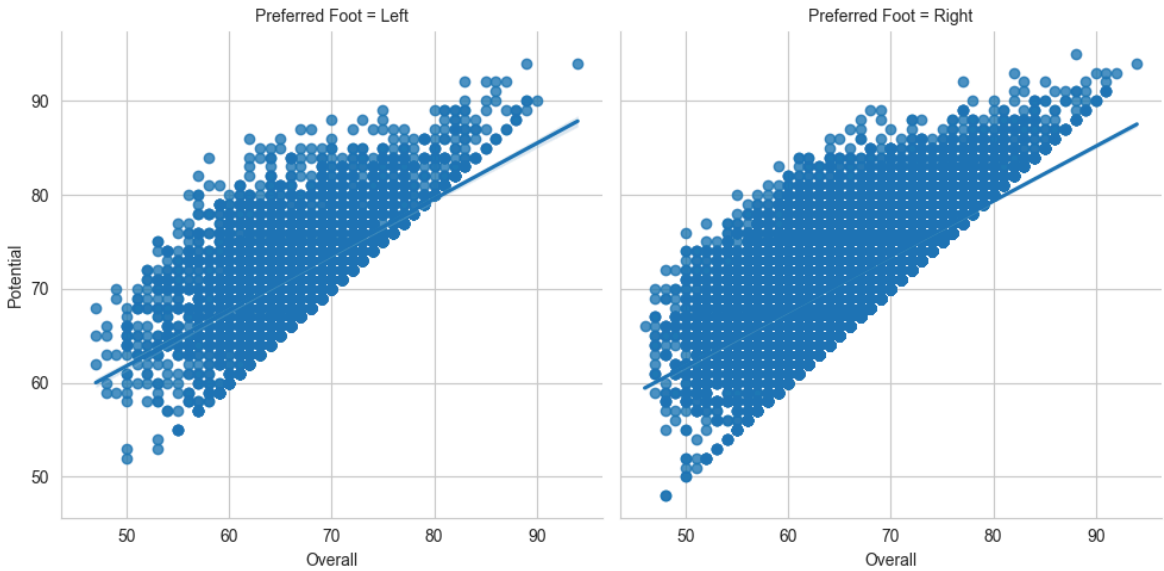
```
g= sns.lmplot(x="Overall", y="Potential", hue="Preferred Foot", data=fifa, palet
plt.show()
```



We can plot the levels of the third variable across different columns as follows-

In [270…

```
g= sns.lmplot(x="Overall", y="Potential", col="Preferred Foot", data=fifa)
plt.show()
```



Multi-plot grids

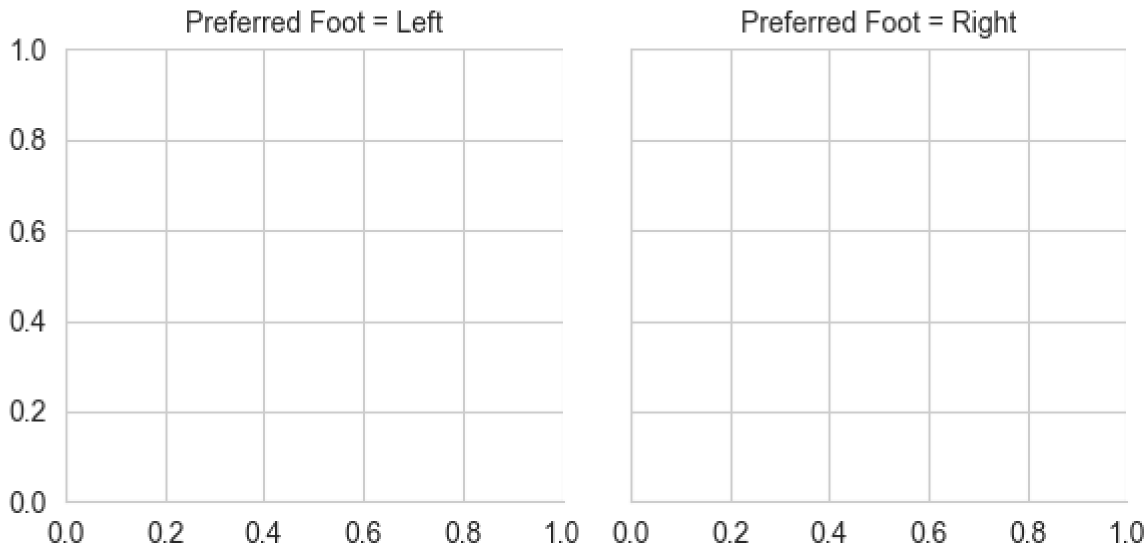
Seaborn `FacetGrid()` function

- The FacetGrid class is useful when you want to visualize the distribution of a variable or the relationship between multiple variables separately within subsets of your dataset.
- A FacetGrid can be drawn with up to three dimensions - `row`, `col` and `hue`. The first two have obvious correspondence with the resulting array of axes - the `hue` variable is a third dimension along a depth axis, where different levels are plotted with different colors.
- The class is used by initializing a FacetGrid object with a dataframe and the names of the variables that will form the `row`, `column` or `hue` dimensions of the grid.
- These variables should be categorical or discrete, and then the data at each level of the variable will be used for a facet along that axis.

We can initialize a 1x2 grid of facets using the fifa dataset.

In [286…

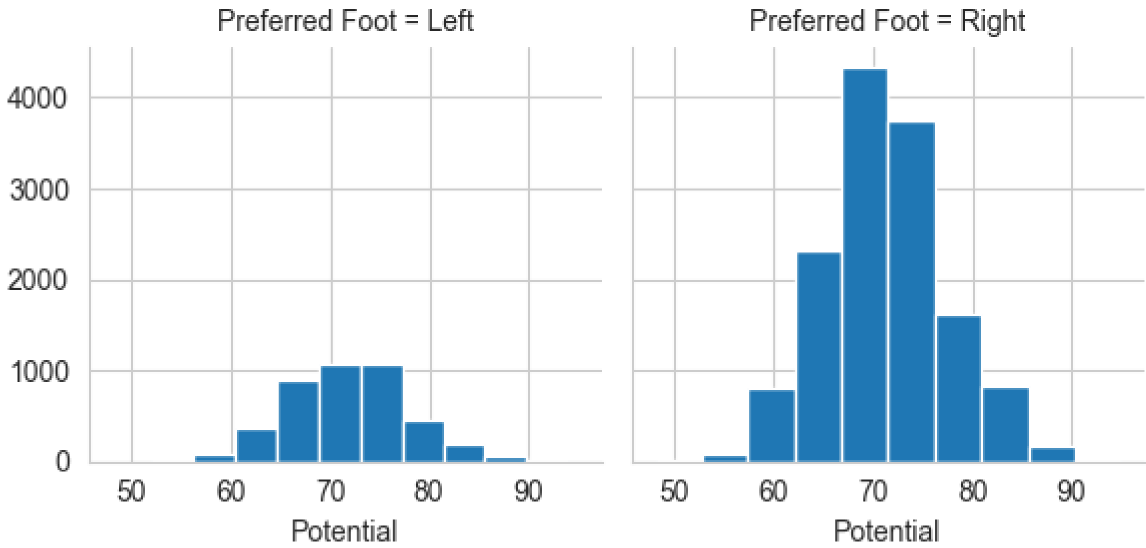
```
g = sns.FacetGrid(fifa, col="Preferred Foot")
plt.show()
```



We can draw a univariate plot of `Potential` variable on each facet as follows-

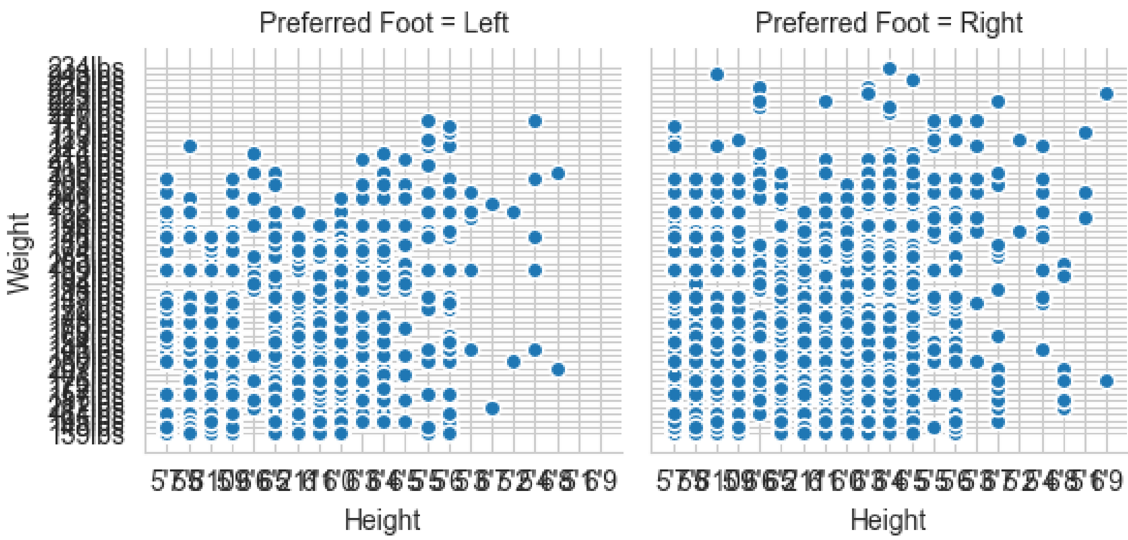
In [301…

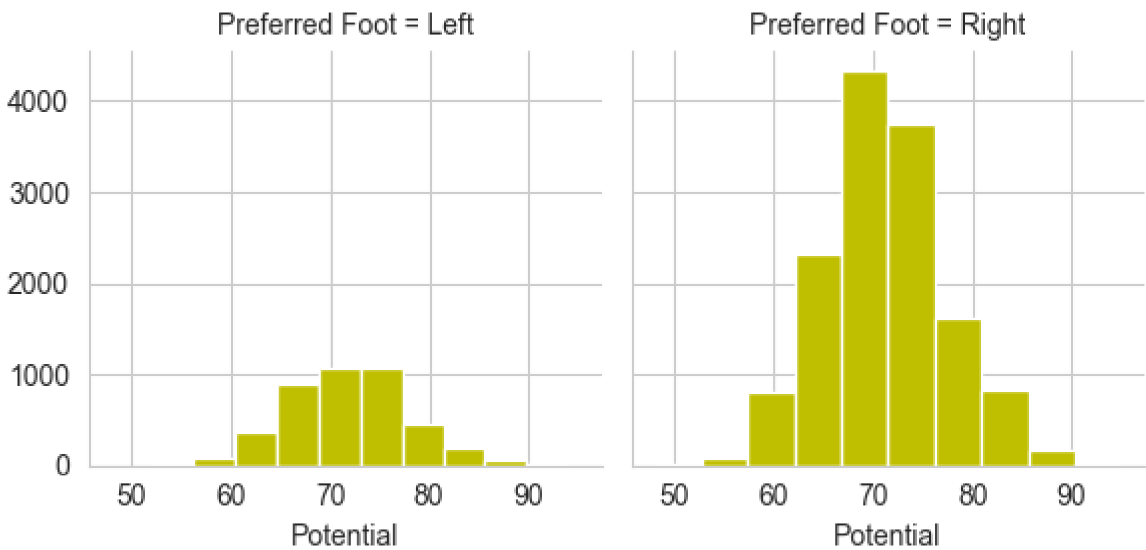
```
g = sns.FacetGrid(fifa, col="Preferred Foot")
g = g.map(plt.hist, "Potential")
plt.show()
```



In [308…

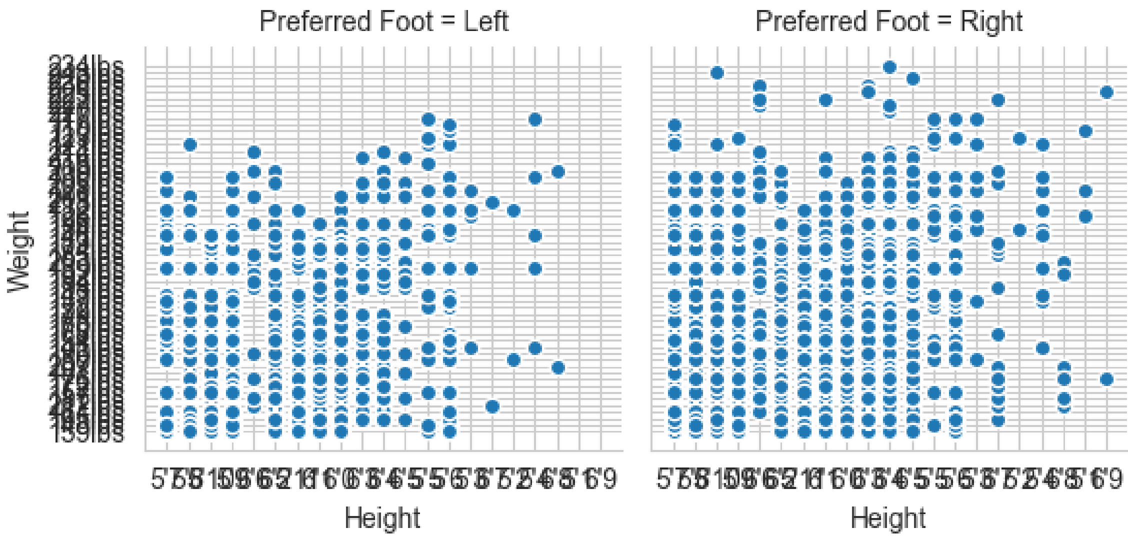
```
g = sns.FacetGrid(fifa, col="Preferred Foot")
g = g.map(plt.hist, "Potential", bins=10, color="y")
plt.show()
```





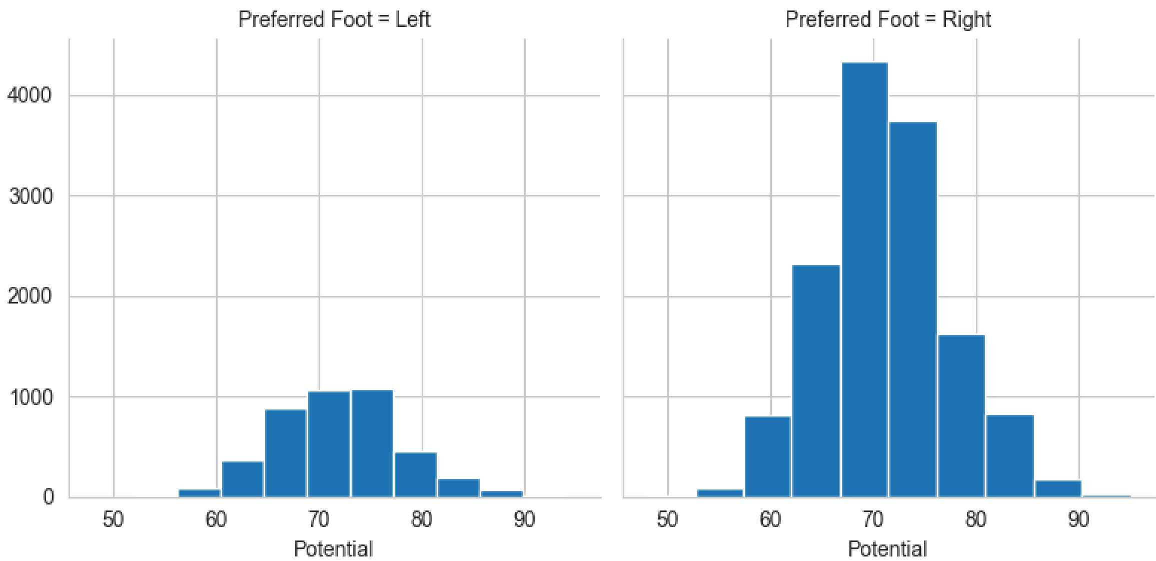
We can plot a bivariate function on each facet as follows-

In [310…
```
g = sns.FacetGrid(fifa, col="Preferred Foot")
g = (g.map(plt.scatter, "Height", "Weight", edgecolor="w").add_legend())
plt.show()
```



The size of the figure is set by providing the height of each facet, along with the aspect ratio:

In [318…
```
g = sns.FacetGrid(fifa, col="Preferred Foot", height=4, aspect=1)
g = g.map(plt.hist, "Potential")
plt.show()
```



Seaborn `Pairgrid()` function

- This function plots subplot grid for plotting pairwise relationships in a dataset.
- This class maps each variable in a dataset onto a column and row in a grid of multiple axes.
- Different axes-level plotting functions can be used to draw bivariate plots in the upper and lower triangles, and the the marginal distribution of each variable can be shown on the diagonal.

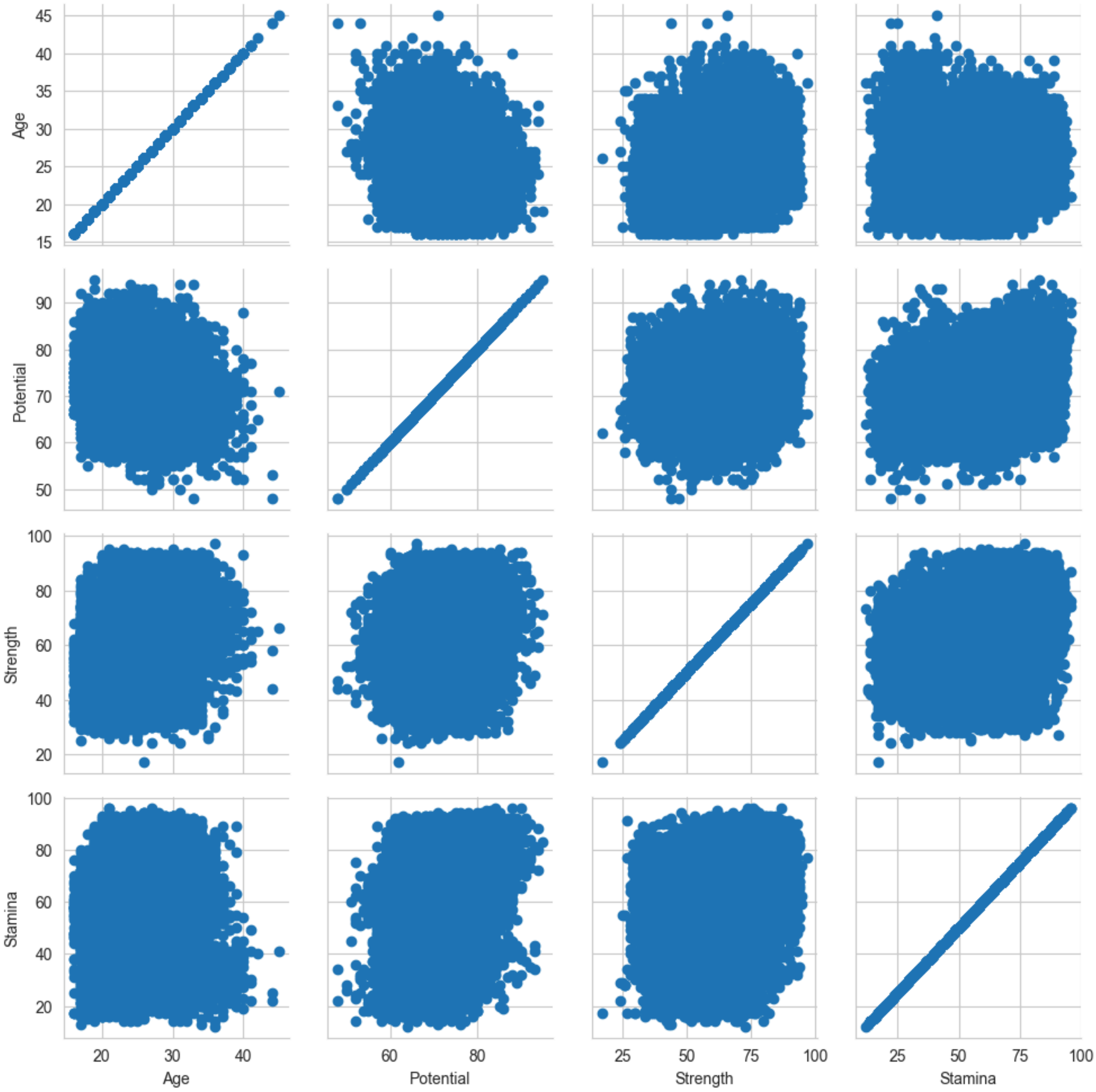
- It can also represent an additional level of conditionalization with the hue parameter, which plots different subets of data in different colors.
- This uses color to resolve elements on a third dimension, but only draws subsets on top of each other and will not tailor the hue parameter for the specific visualization the way that axes-level functions that accept hue will.

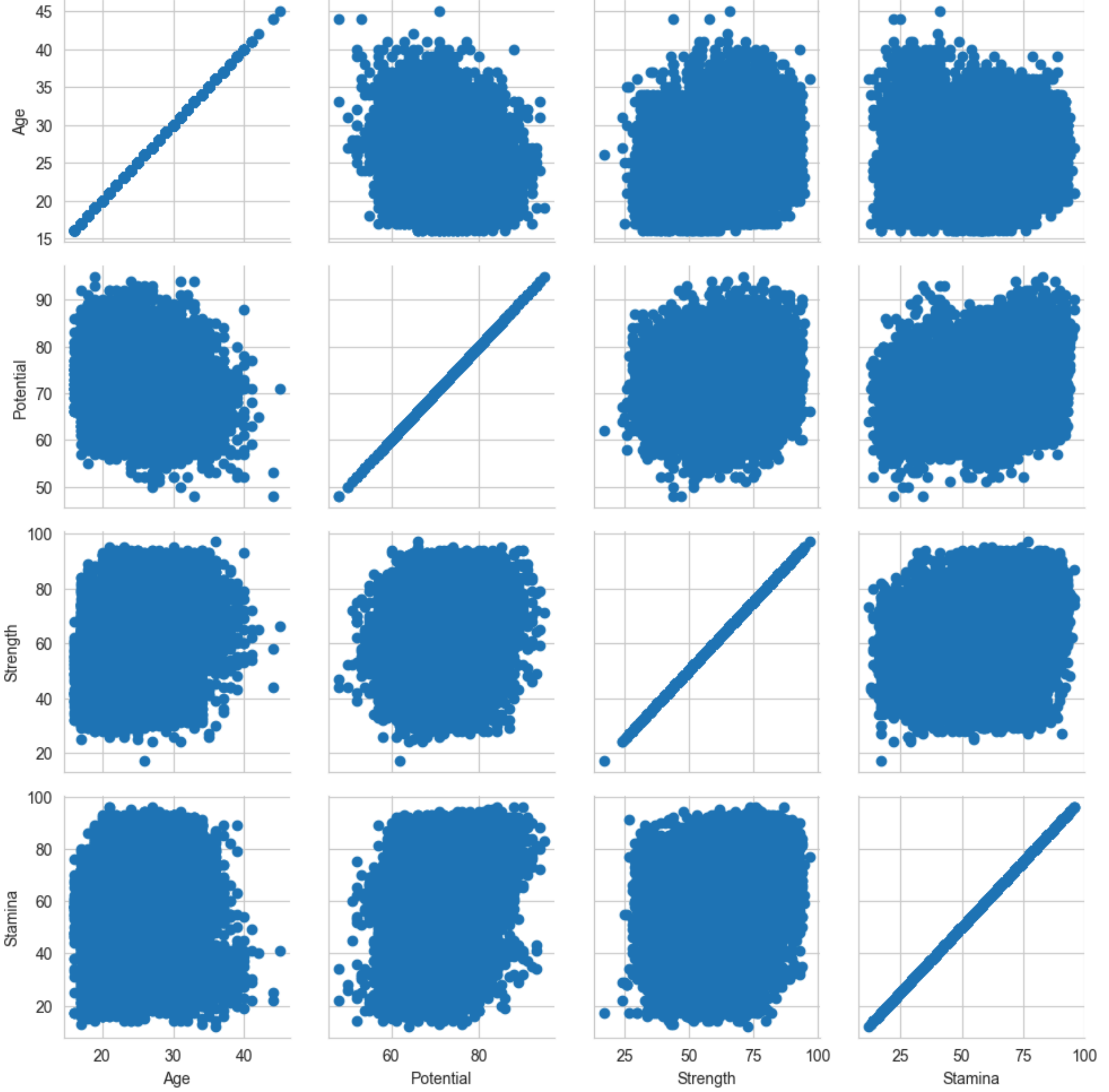
In [325…

```
fifa_new = fifa[['Age', 'Potential', 'Strength', 'Stamina', 'Preferred Foot']]
```

In [327…

```
g = sns.PairGrid(fifa_new)
g = g.map(plt.scatter)
plt.show()
```

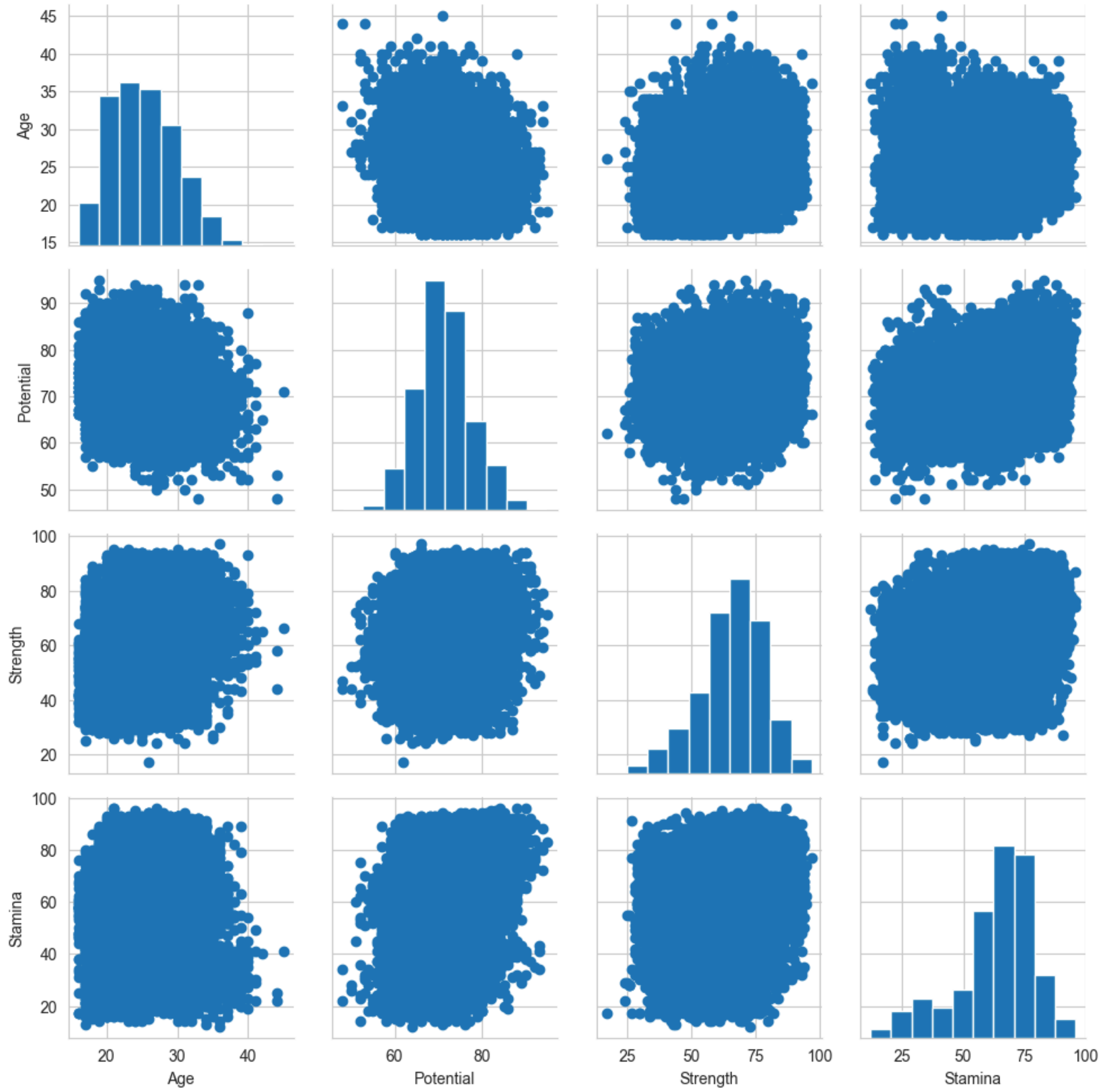




We can show a univariate distribution on the diagonal as follows-

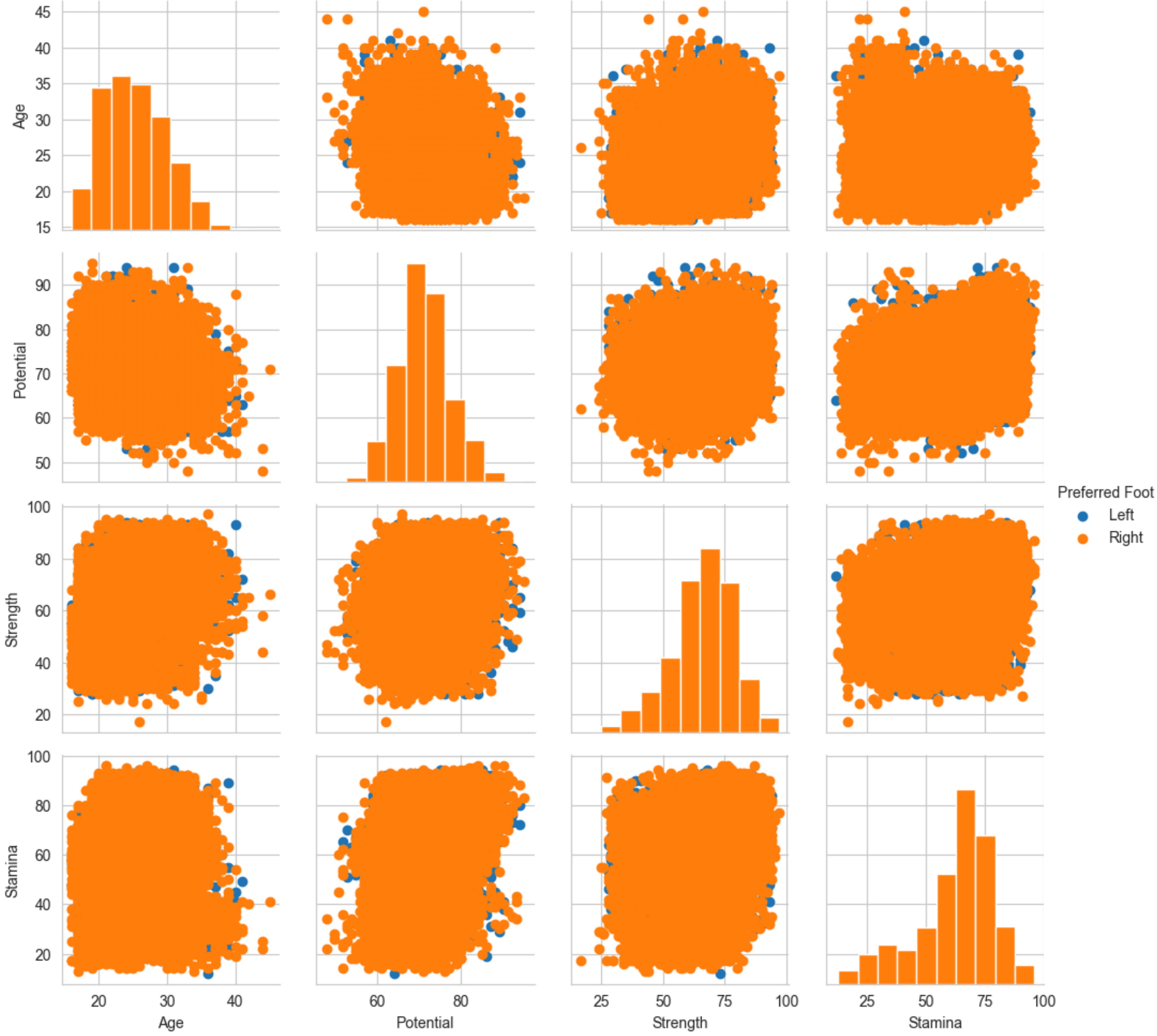
In [330…

```
g = sns.PairGrid(fifa_new)
g = g.map_diag(plt.hist)
g = g.map_offdiag(plt.scatter)
plt.show()
```



We can color the points using the categorical variable `Preferred Foot` as follows -

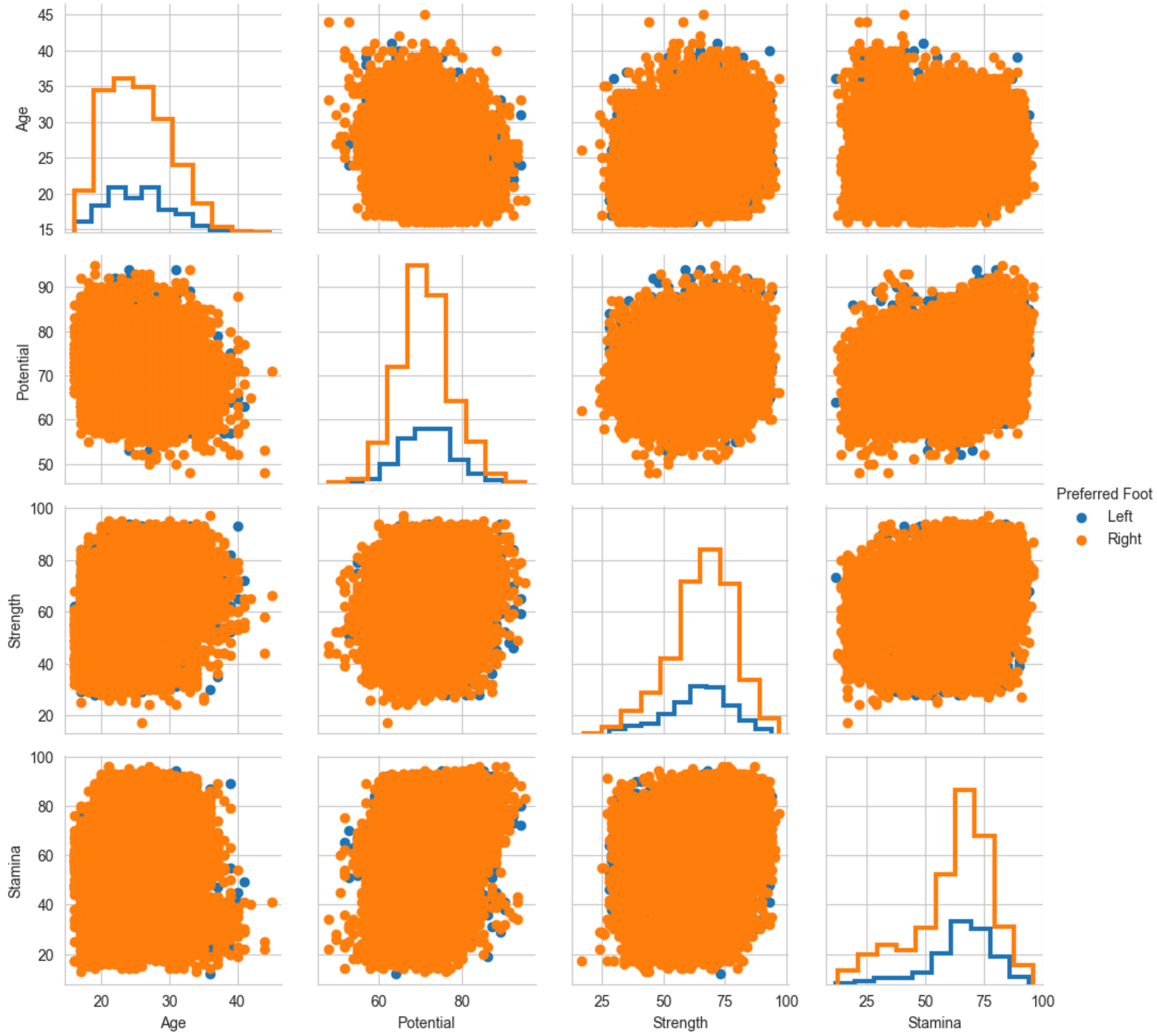
In [333…
```
g = sns.PairGrid(fifa_new, hue="Preferred Foot")
g = g.map_diag(plt.hist)
g = g.map_offdiag(plt.scatter)
g = g.add_legend()
plt.show()
```



We can use a different style to show multiple histograms as follows-

In [336…

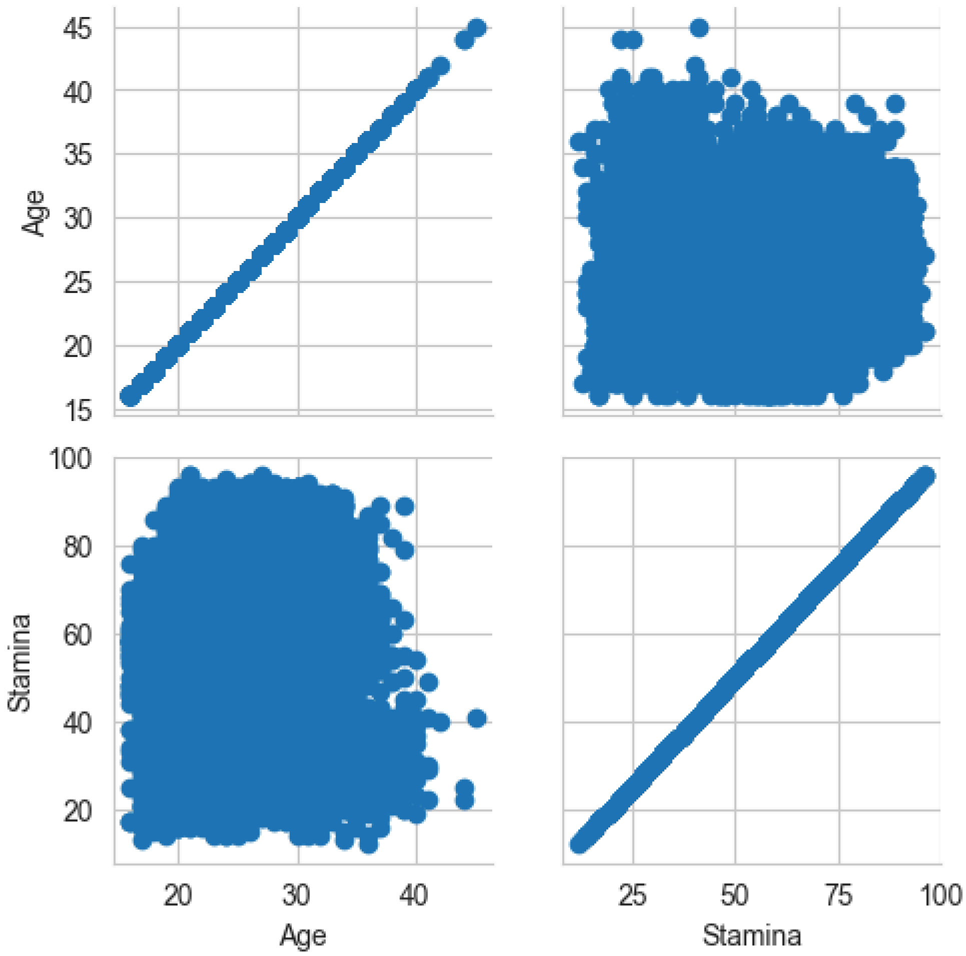
```
g = sns.PairGrid(fifa_new, hue="Preferred Foot")
g = g.map_diag(plt.hist, histtype="step", linewidth=3)
g = g.map_offdiag(plt.scatter)
g = g.add_legend()
plt.show()
```



We can plot a subset of variables as follows-

In [339…

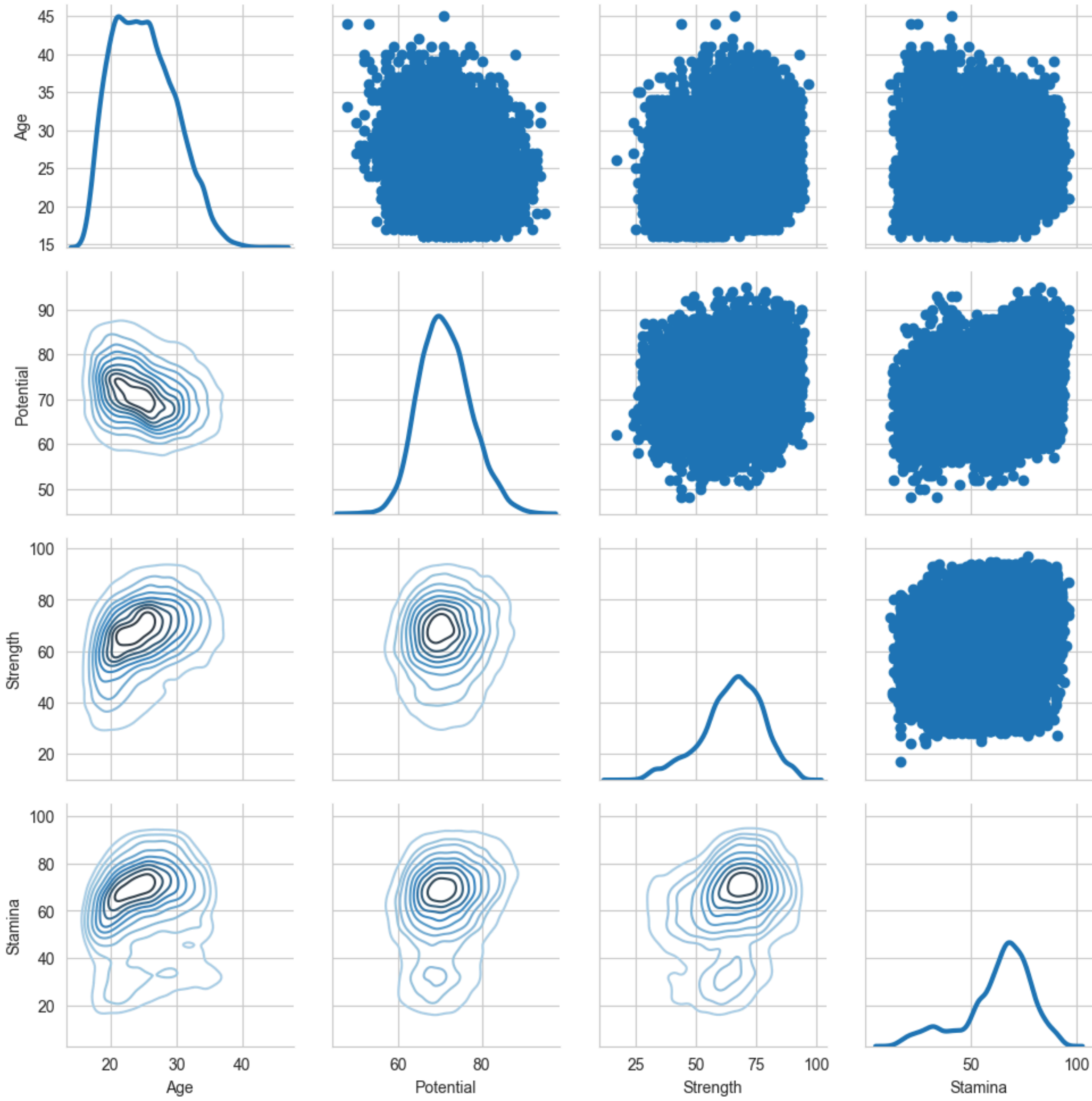
```
g = sns.PairGrid(fifa_new, vars=['Age', 'Stamina'])
g = g.map(plt.scatter)
plt.show()
```



We can use different functions on the upper and lower triangles as follows-

In [342…

```
g = sns.PairGrid(fifa_new)
g = g.map_upper(plt.scatter)
g = g.map_lower(sns.kdeplot, cmap="Blues_d")
g = g.map_diag(sns.kdeplot, lw=3, legend=False)
plt.show()
```

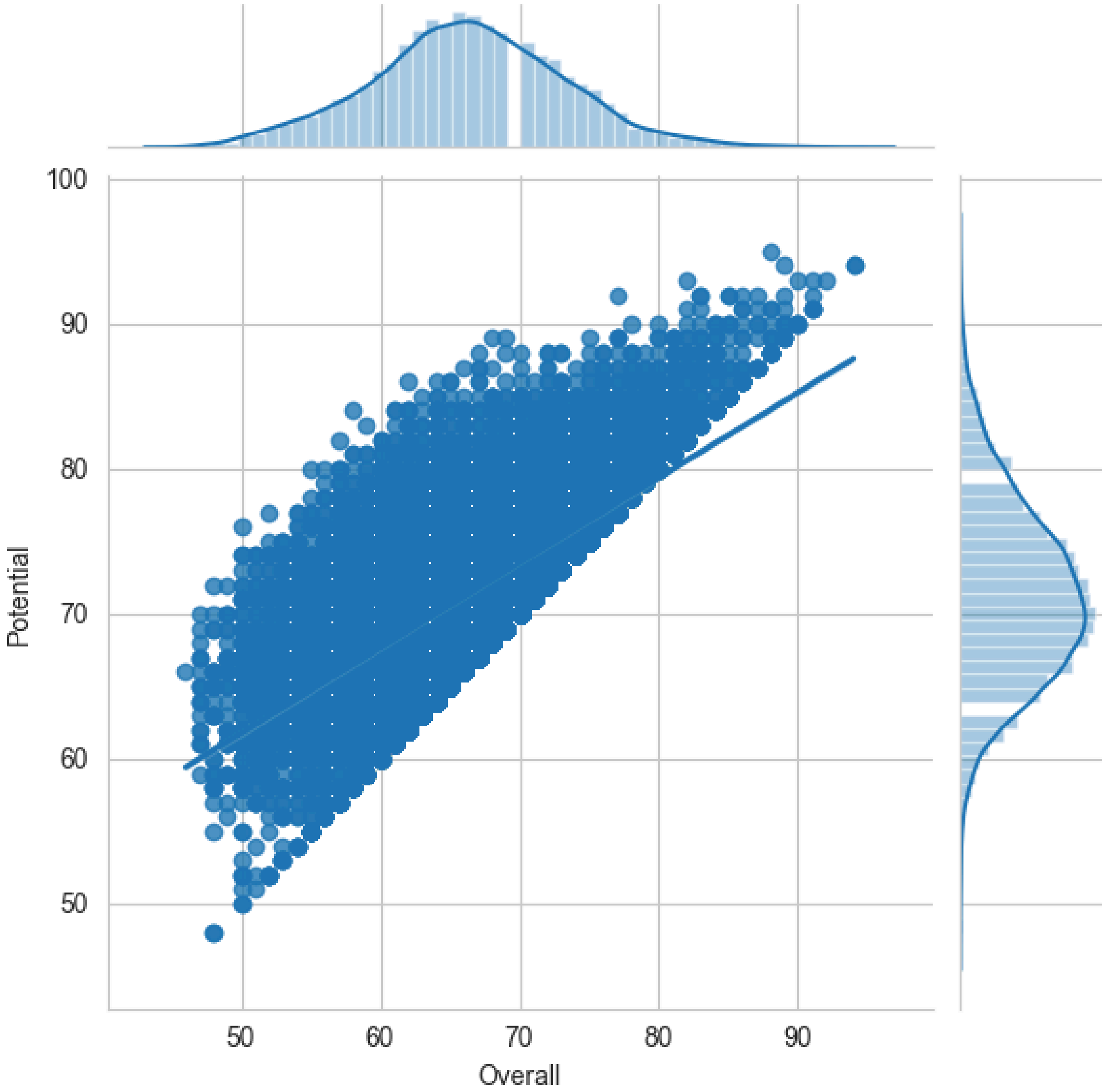


Seaborn `Jointgrid()` function

- This function provides a grid for drawing a bivariate plot with marginal univariate plots.
- It set up the grid of subplots.

In [346...

```
g = sns.JointGrid(x="Overall", y="Potential", data=fifa)
g = g.plot(sns.regplot, sns.distplot)
plt.show()
```



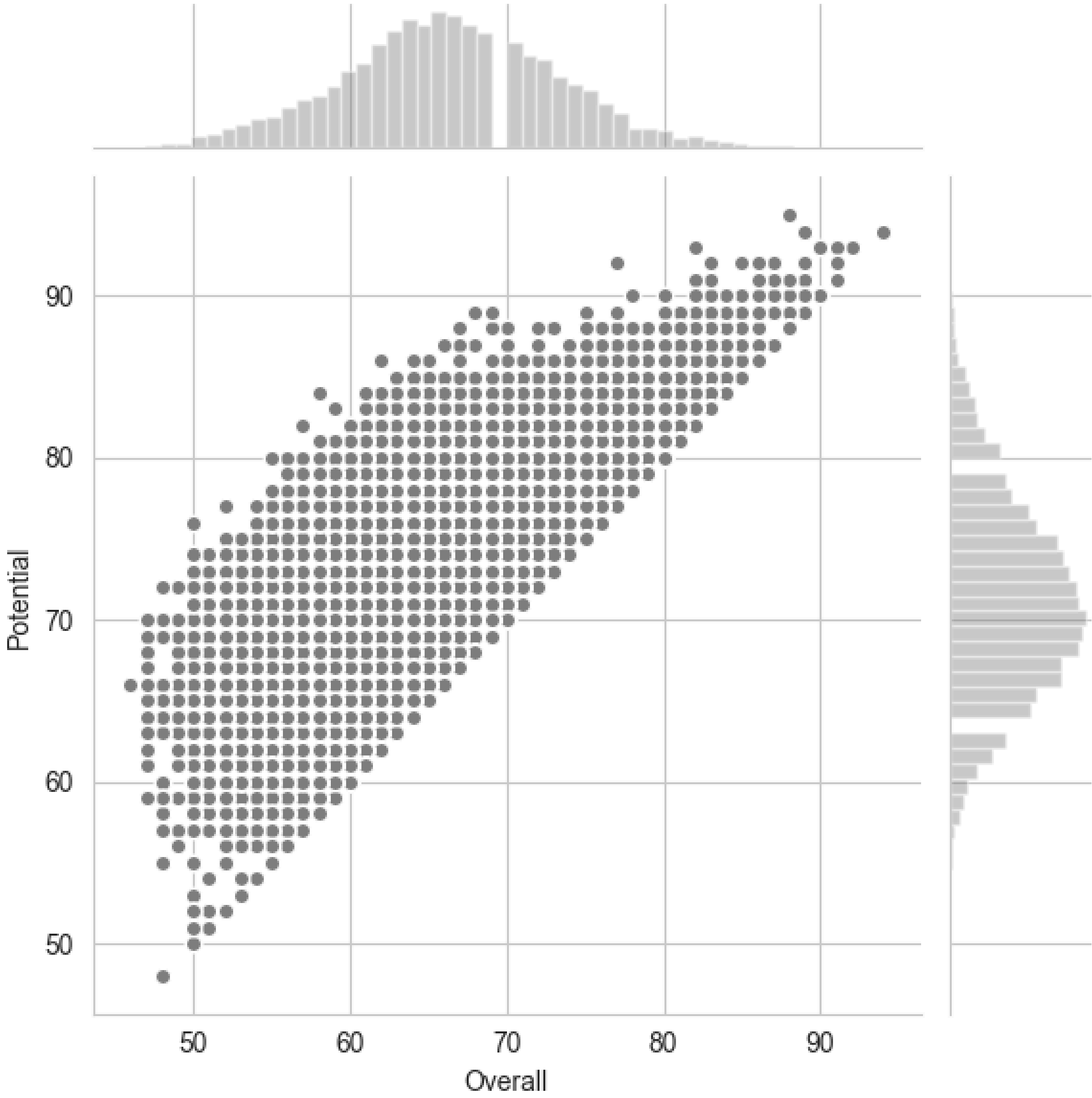
We can draw the join and marginal plots separately, which allows finer-level control other parameters as follows -

In [350…

```
import matplotlib.pyplot as plt
```

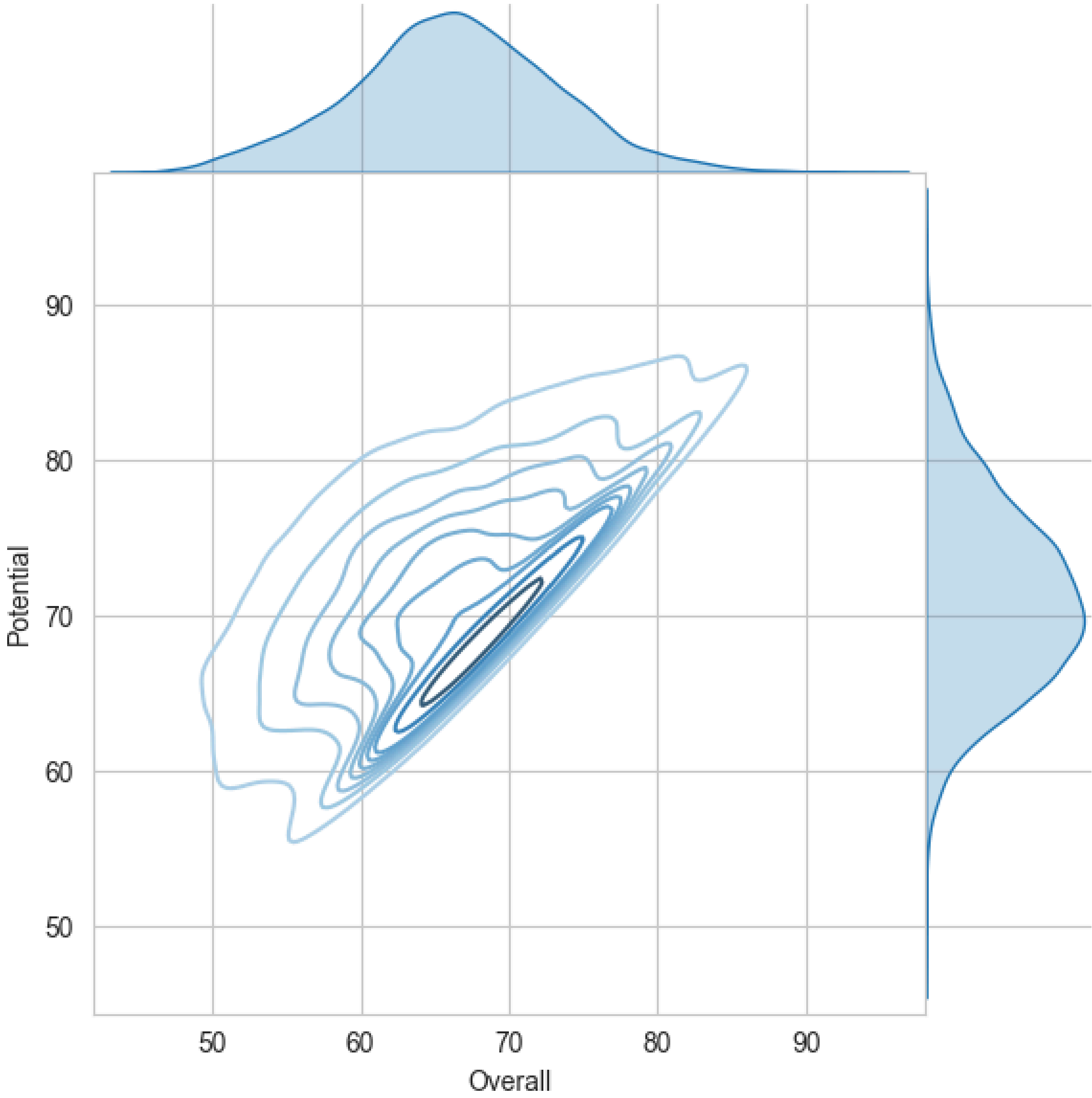
In [352…

```
g = sns.JointGrid(x="Overall", y="Potential", data=fifa)
g = g.plot_joint(plt.scatter, color=".5", edgecolor="white")
g = g.plot_marginals(sns.distplot, kde=False, color=".5")
plt.show()
```



We can remove the space between the joint and marginal axes as follows -

In [355…
```
g = sns.JointGrid(x="Overall", y="Potential", data=fifa, space=0)
g = g.plot_joint(sns.kdeplot, cmap="Blues_d")
g = g.plot_marginals(sns.kdeplot, shade=True)
plt.show()
```



We can draw a smaller plot with relatively larger marginal axes as follows -

In [ ]:
```
g = sns.JointGrid(x="Overall", y="Potential", data=fifa, height=5, ratio=2)
g = g.plot_joint(sns.kdeplot, cmap="Reds_d")
g = g.plot_marginals(sns.kdeplot, color="r", shade=True)
plt.show()
```

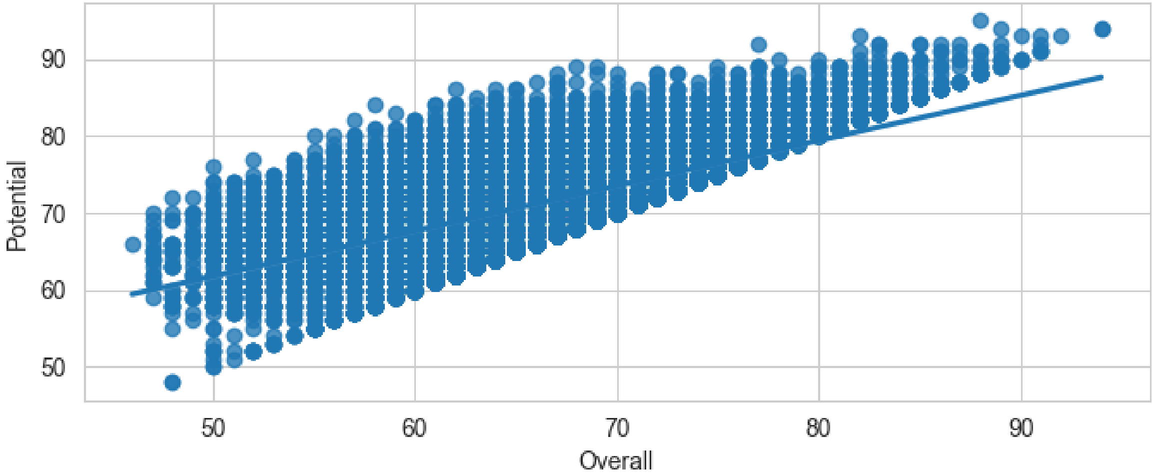
Controlling the size and shape of the plot

- The default plots made by `regplot()` and `lmplot()` look the same but on axes that have a different size and shape.
- This is because `regplot()` is an "axes-level" function draws onto a specific axes.
- This means that you can make multi-panel figures yourself and control exactly where the regression plot goes.
- If no axes object is explicitly provided, it simply uses the "currently active" axes, which is why the default plot has the same size and shape as most other matplotlib functions.

- To control the size, we need to create a figure object ourself as follows-

In [382…

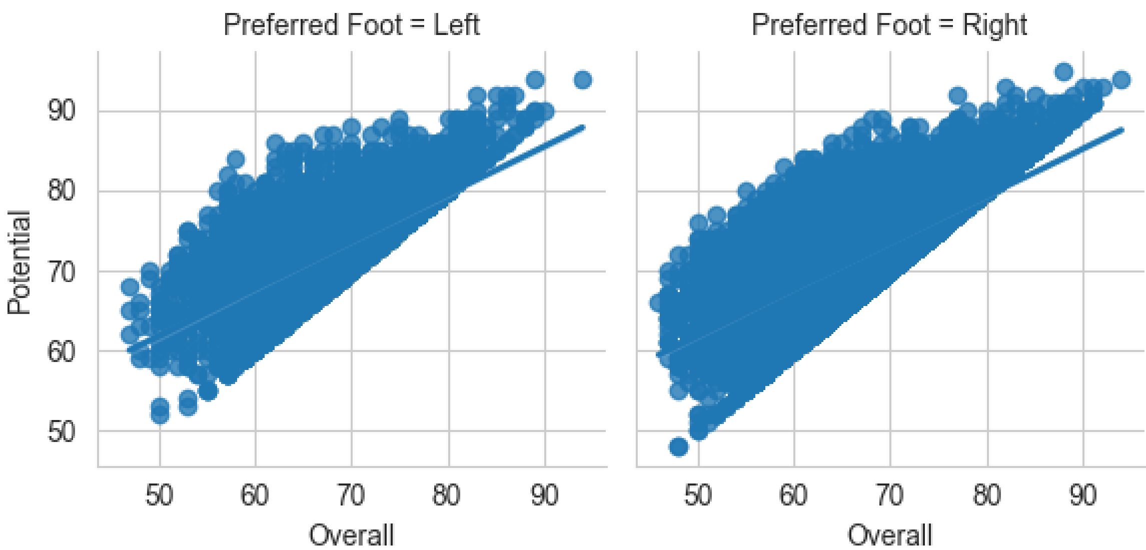
```
f, ax = plt.subplots(figsize=(8, 3))
ax = sns.regplot(x="Overall", y="Potential", data=fifa)
plt.show()
```



In contrast, the size and shape of the `lmplot()` figure is controlled through the FacetGrid interface using the size and aspect parameters, which apply to each facet in the plot, not to the overall figure itself.

In [392…

```
sns.lmplot(x="Overall", y="Potential", col="Preferred Foot", data=fifa, col_wrap
plt.show()
```



Seaborn figure styles

- There are five preset seaborn themes: `darkgrid`, `whitegrid`, `dark`, `white` and `ticks`.
- They are each suited to different applications and personal preferences.
- The default theme is darkgrid.

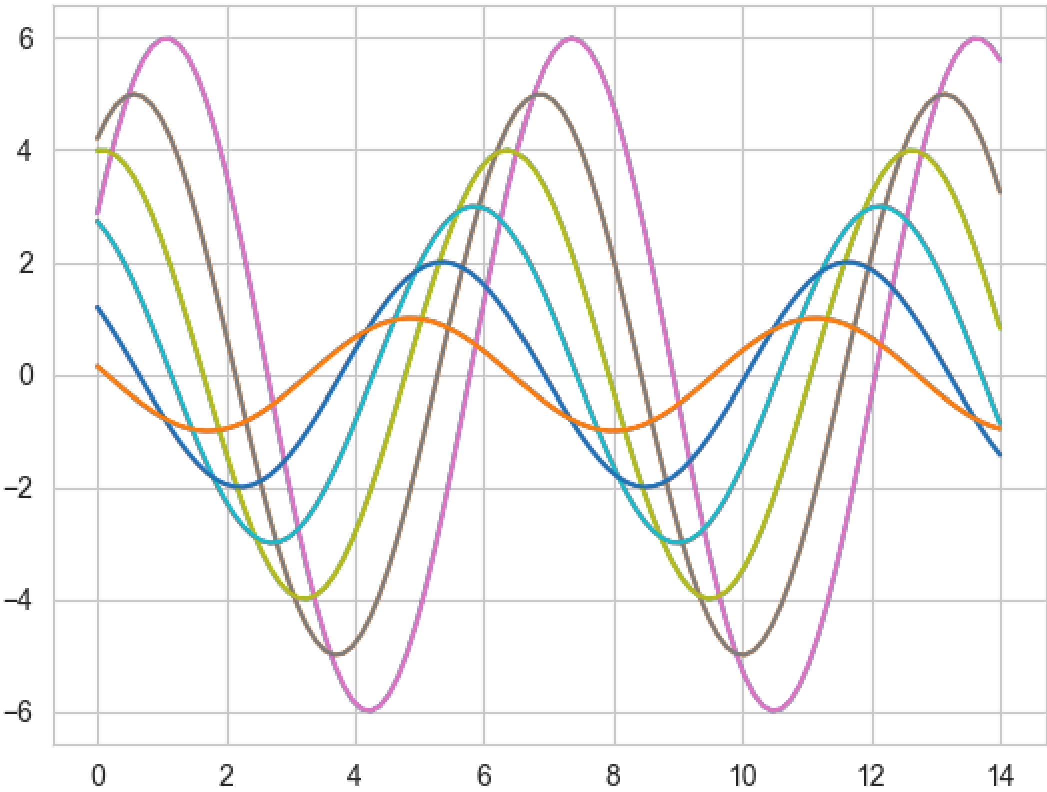
- The grid helps the plot serve as a lookup table for quantitative information, and the white-on grey helps to keep the grid from competing with lines that represent data.
- The whitegrid theme is similar, but it is better suited to plots with heavy data elements:

I will define a simple function to plot some offset sine waves, which will help us see the different stylistic parameters as follows -

In [397…
```
def sinplot(flip=1):
    x = np.linspace(0, 14, 100)
    for i in range(1, 7):
        plt.plot(x, np.sin(x + i * .5) * (7 - i) * flip)
```

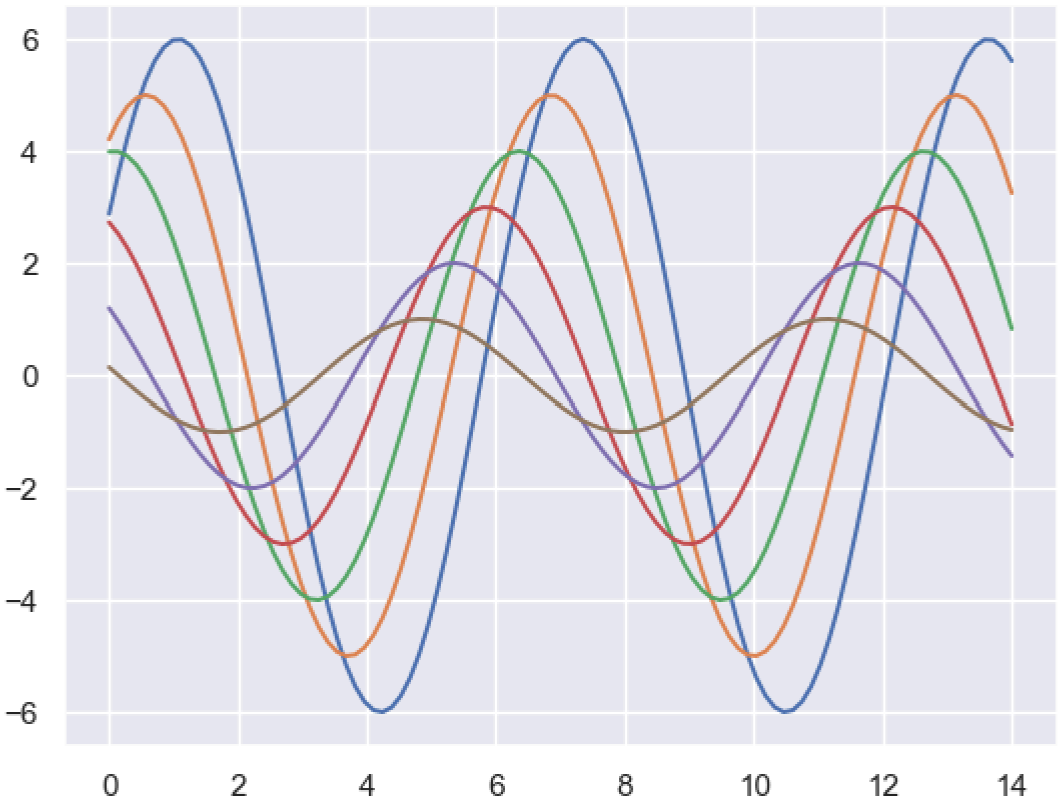
This is what the plot looks like with matplotlib default parameters.

In [400…
```
sinplot()
plt.show()
```



To switch to seaborn defaults, we need to call the `set()` function as follows -

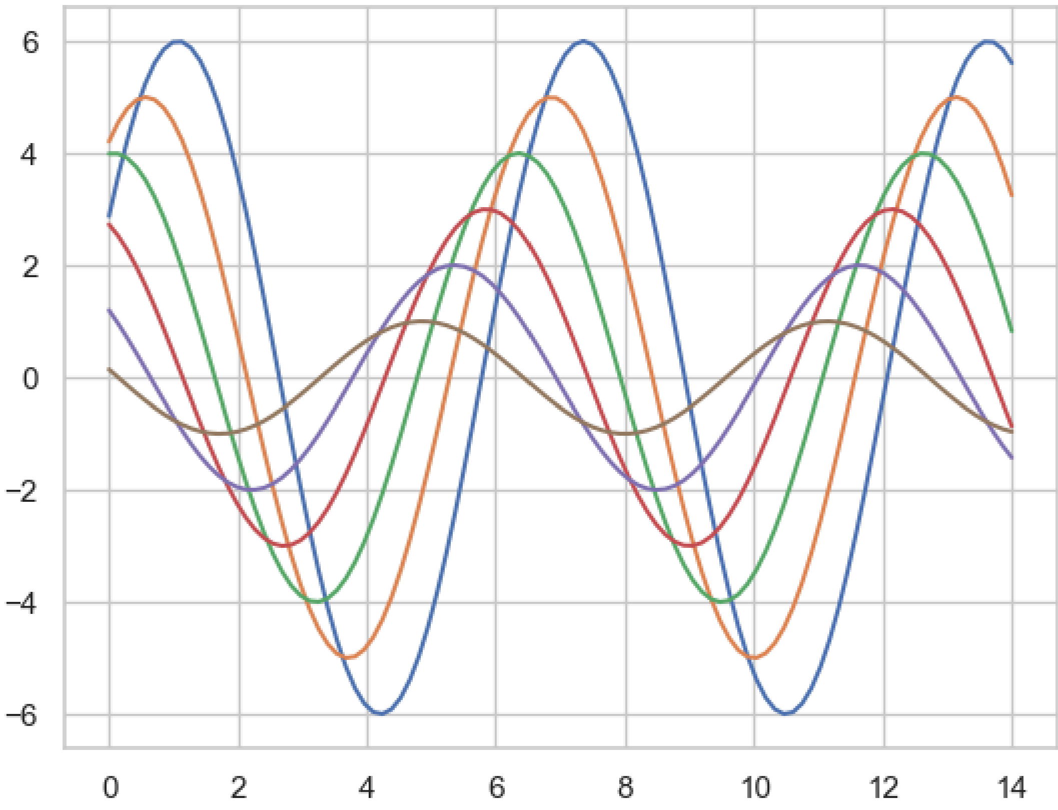
In [403…
```
sns.set()
sinplot()
plt.show()
```



- We can set different styles as follows -

In [406…

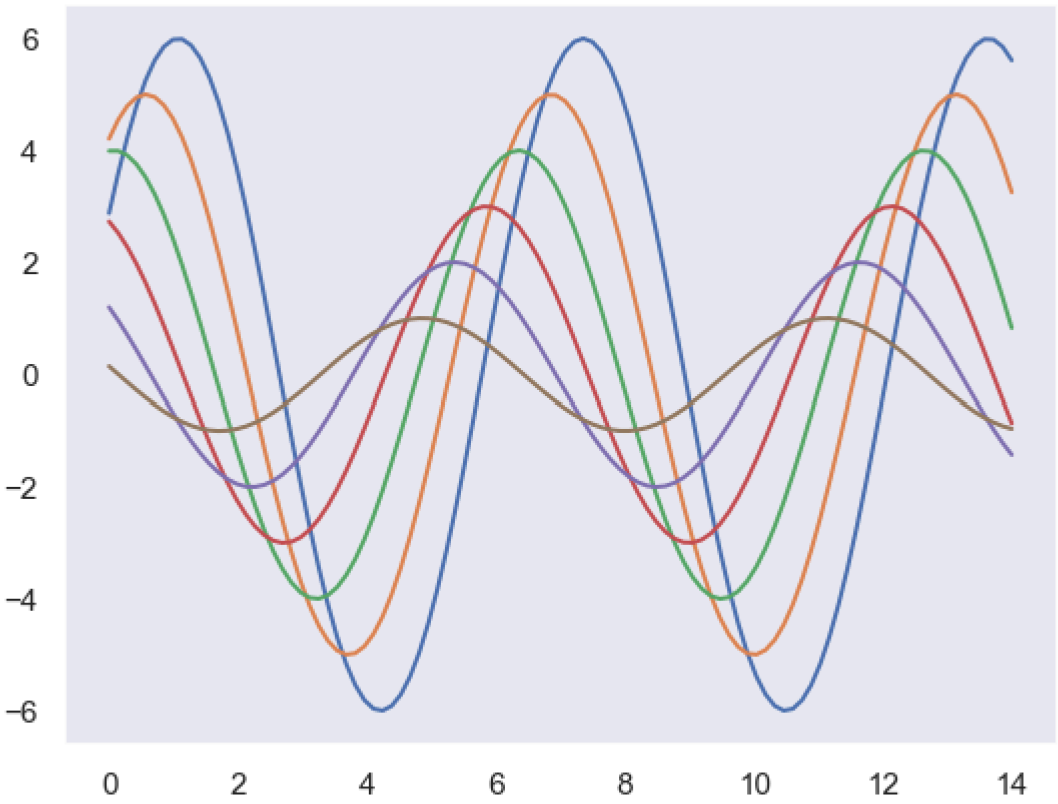
```
sns.set_style("whitegrid")
sinplot()
plt.show()
```



In [409…

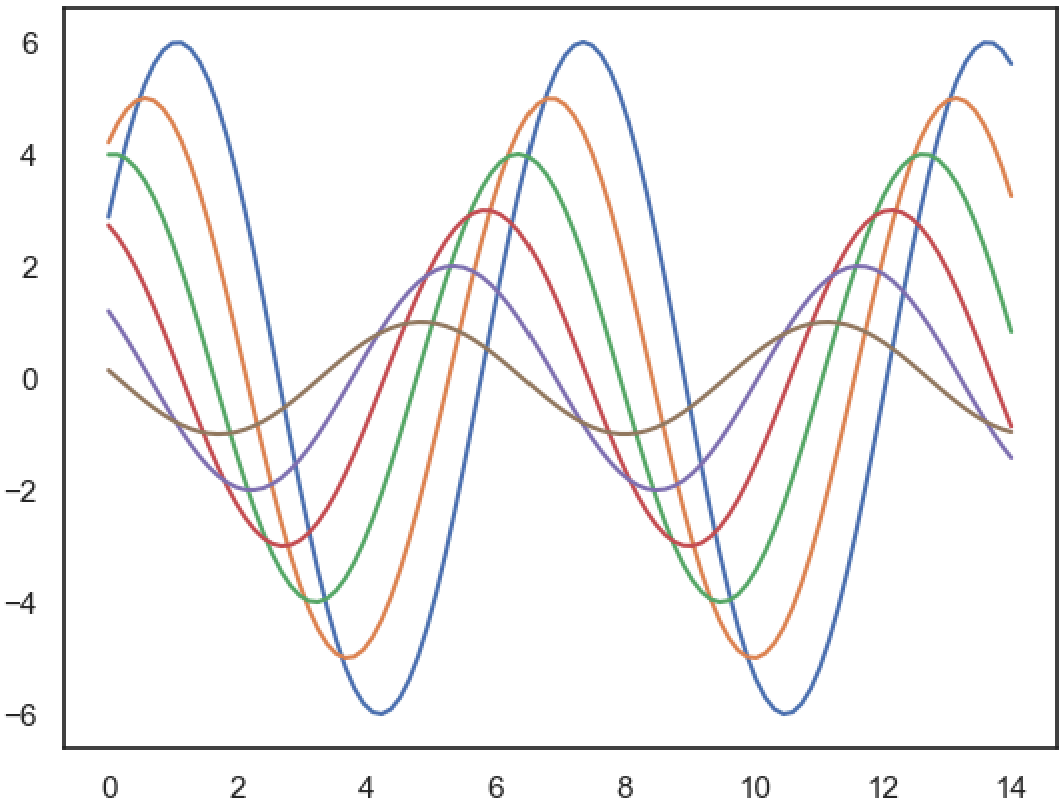
```
sns.set_style("dark")
sinplot()
```

```
plt.show()
```



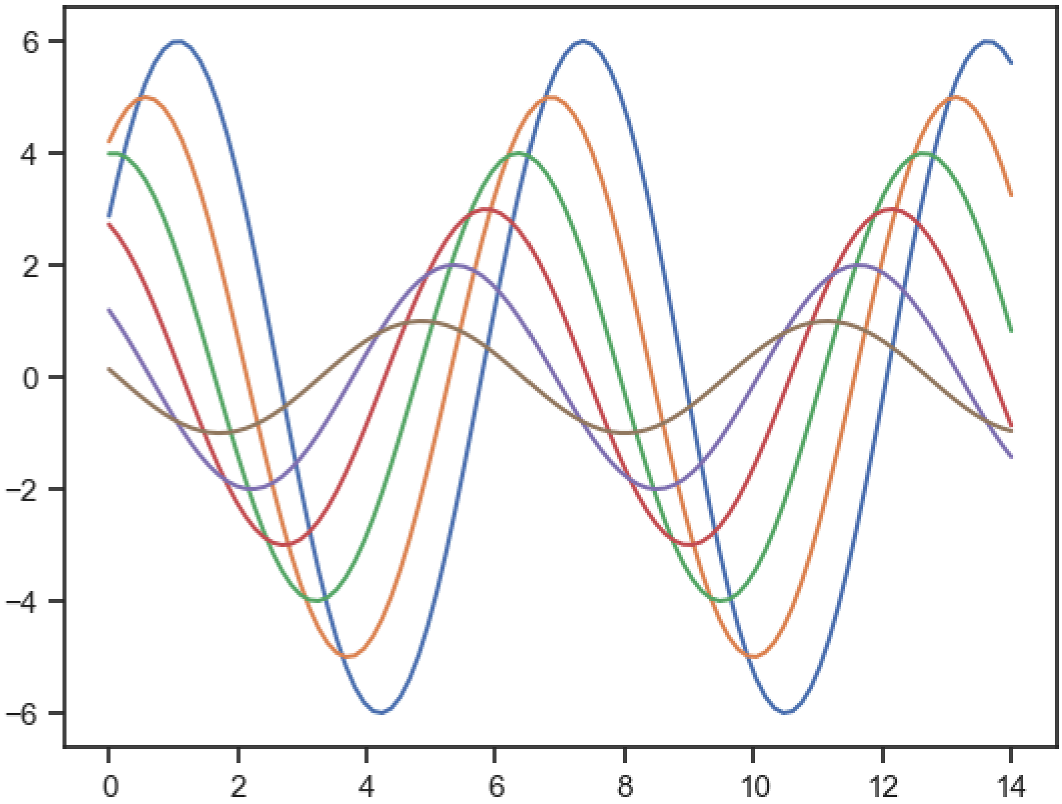
In [411…

```
sns.set_style("white")
sinplot()
plt.show()
```



In [413…

```
sns.set_style("ticks")
sinplot()
plt.show()
```




```
In [ ]:
```

```
In [ ]:
```