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Python Boxplot

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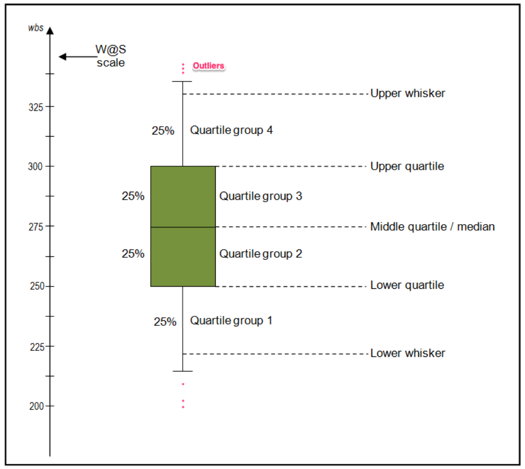
Boxplot is a chart that is used to visualize how well a dataset is distributed using quartiles. It shows the minimum, maximum, median, first quartile and third quartile in the data set.

What is a boxplot?

Box plot is way to graphically depict groups of numerical data through their quartiles.

From the below image you can see what information we generally get from a box plot.



(https://www.machinelearningplus.com/wp-content/uploads/2020/04/representation.png)

How to interpret the box plot?

The bottom of the (green) box is the 25% percentile and the top is the 75% percentile value of the data.

So, essentially the box represents the middle 50% of all the datapoints which represents the core region when the data is situated. The height of the boxplot is also called the Inter Quartile Range (IQR), which mathematically is the difference between the 75th and 25th percentile values of the data.

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The thick line in the middle of the box represents the median. Whereas, the upper and lower whisker marks 1.5 times the IQR.

But, why whiskers matter?

Because, the points that lie outside the whiskers, that is, (1.5 x IQR) in both directions are generally considered as outliers.

Lets create an artificial dataset and visualize the data using box plot. For creating an artificial dataset I used random.rand() command from numpy which generates random values between 0-1 to each element in the array.

And I speciified the length of the Dataframe to be 50×3 as argument in the function

```
 import pandas as pd
import numpy as np
df = pd.DataFrame(np.random.rand(50, 3), columns=['A', 'B', 'C'])
df.head()
```

	A	B	C
0	0.160039	0.288336	0.489377
1	0.947344	0.897678	0.356333
2	0.486124	0.928932	0.263846
3	0.022501	0.700835	0.298088
4	0.742429	0.503843	0.296938

The dataset contains 50 randomly selected values between 0-1 in each column.

Looking into this data and finding it's distribution will take an ample amount of time, thats where using a distribution plot like boxplot comes in handy.

Basic boxplot using pandas library

Since, we are dealing with a pandas dataframe, you can create the boxplot using the `pandas` library directly.

`df` is the DataFrame we cretaed before, for plotting boxplot we use the command `DataFrame.plot.box()` .

```
# Boxplot with Pandas
df.plot.box(title='Boxplot with pandas');
```

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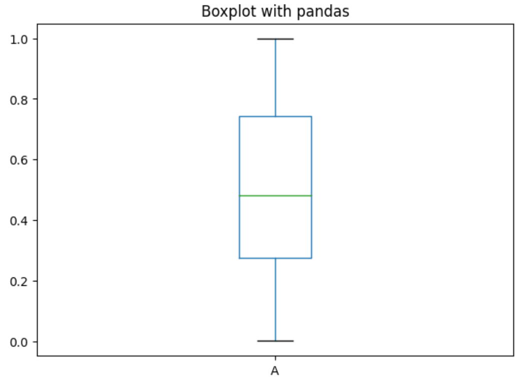


[https://www.machinelearningplus.com/wp-content/uploads/2020/04/simple-boxplot.png]

From this you can see the median value for each distribution and also the different quartile groups.

Plotting a boxplot using matplotlib

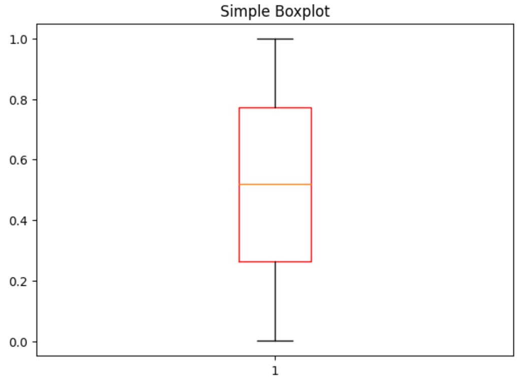
For using matplolib, first you need to import the matplotlib library. If you want you can alter the default parameters by using the function plt.rcParams.update() function.

Then, use plt.boxplot(data) for plotting the data.

```
# Load package
import pandas as pd, numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
plt.rcParams.update({'figure.figsize':(7,5), 'figure.dpi':100})

# Creating dataset
df = pd.DataFrame(np.random.rand(500, 1), columns=['A'])

# plot
plt.boxplot(df['A'], boxprops=dict(color='red'))
plt.title('Simple Boxplot');
```

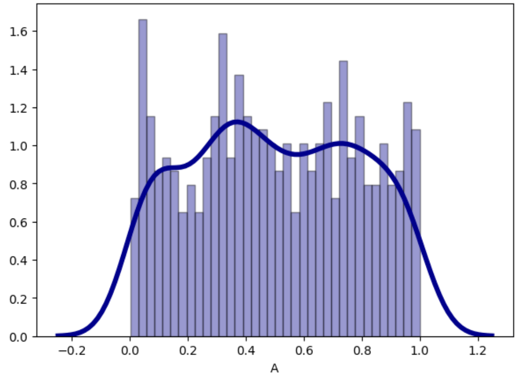


[https://www.machinelearningplus.com/wp-content/uploads/2020/04/matplotlib-boxplot.png]

Alternately, you can visualize the distribution with a combination of histogram and density plot. This is straightforward to create with seaborn .

```
# Histogram and density
import seaborn as sns

sns.distplot(df['A'], hist=True, kde=True,
             bins=int(180/5), color = 'darkblue',
             hist_kws={'edgecolor':'black'},
             kde_kws={'linewidth': 4});
```



[https://www.machinelearningplus.com/wp-content/uploads/2020/04/normal-density-plot.png]

Notched Boxplot in matplotlib

The notched boxplot allows you to evaluate confidence intervals (by default 95% confidence interval) for the medians of each boxplot.

To create the notch, set notch=True in the plt.boxplot function.

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