Presenting Data

Project 2

Mann-Whitney Test

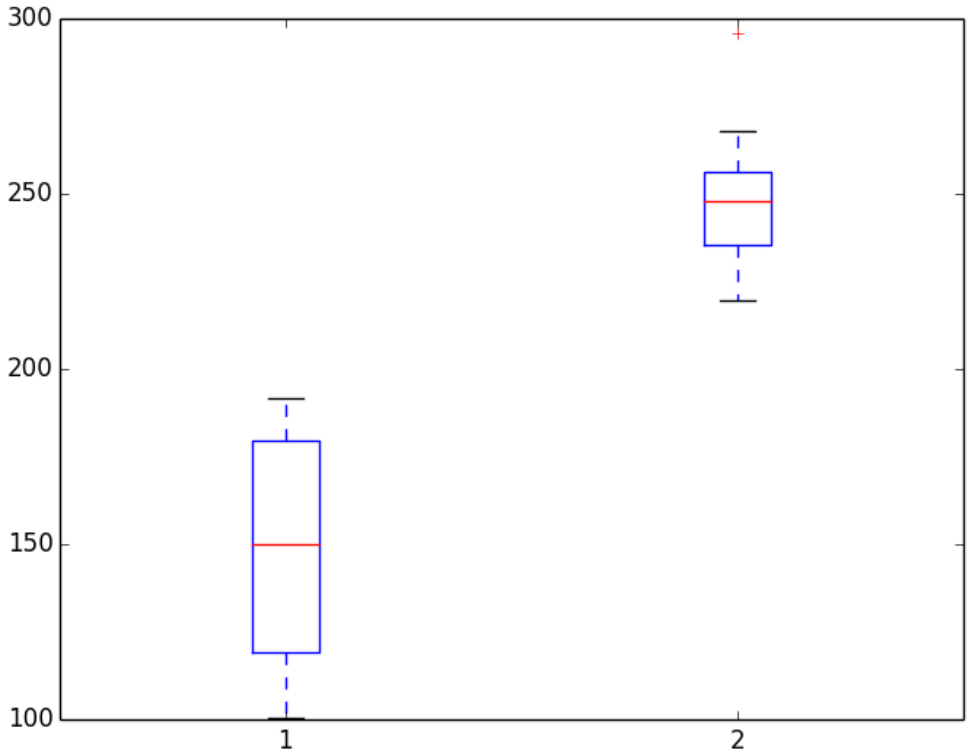
Null Hypotheses: H_0
Alternate Hypothesis: H_A

Mann-Whitney tells you whether the observed data are explainable by random chance.

The lower the p-value the more significant the result (less likely that H_0 is rejected by chance.)

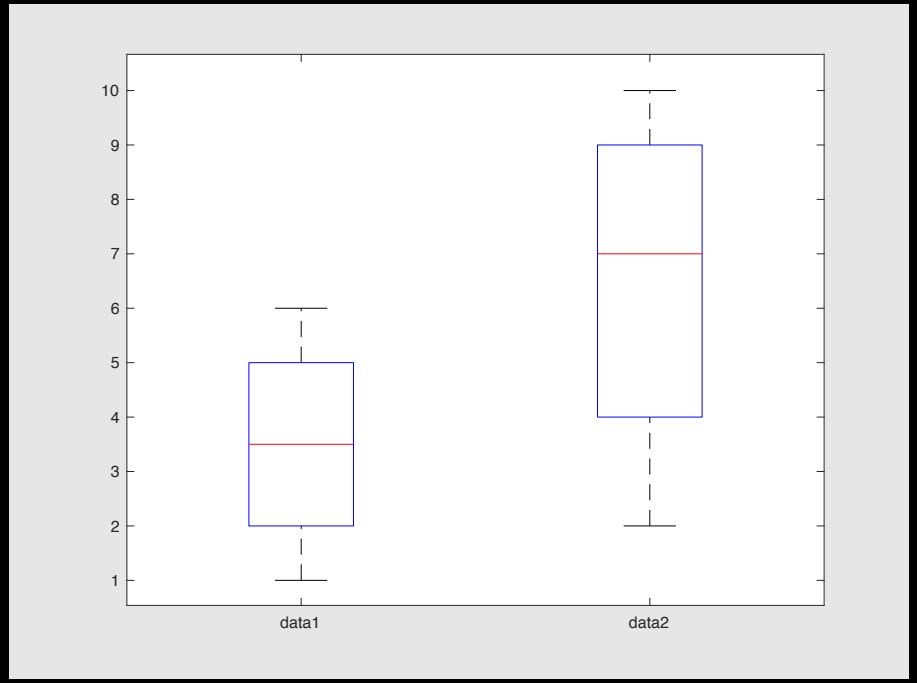
```
import matplotlib.pyplot as plt # For matlab style plots
from scipy.stats import * # For ranksums (Mann-Whitney test)
import numpy as np


# Make some fake experiment data to plot
data1 = np.random.rand(10) * 100 + 100

#Make some fake experiment data to plot
data2 = np.random.rand(10) * 100 + 200


#Package the example experiments together
data = [data1, data2]
data = [data1, data2]
```

```
# Plot the interquartile box plot and
# print the Mann-Whitney result and p-
value
plt.figure()

plt.boxplot(data, notch=False, sym='+',
vert=True, whis=1.5, positions=None,
widths=None, patch_artist=False,
bootstrap=None, usermedians=None,
conf_intervals=None)

plt.show()

# Calculate the p-value using the Mann-
Whitney test
p = ranksums(data1, data2)

print p
```

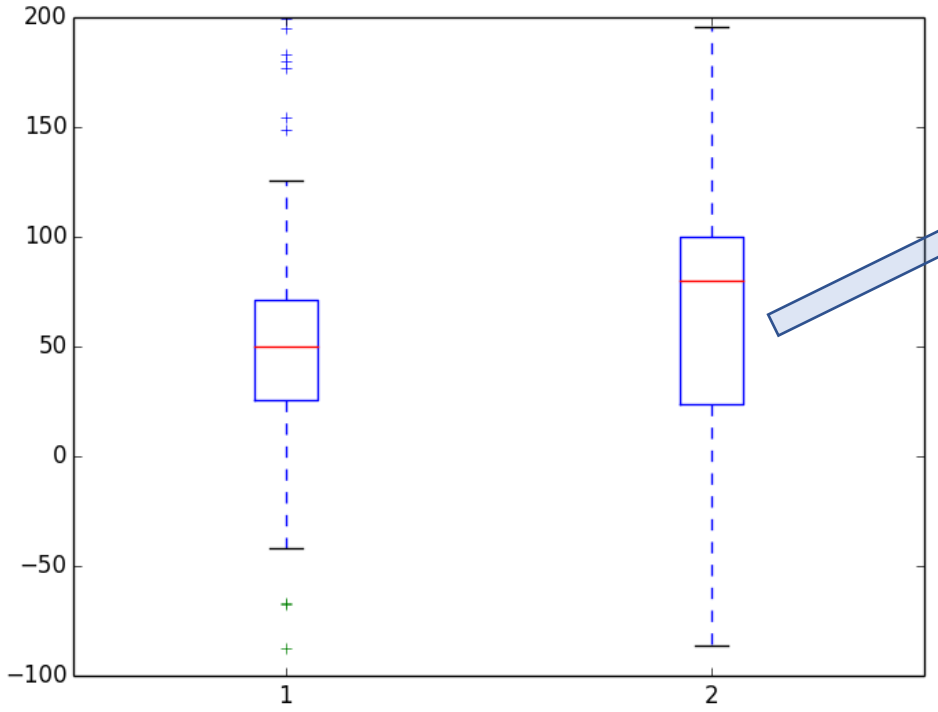


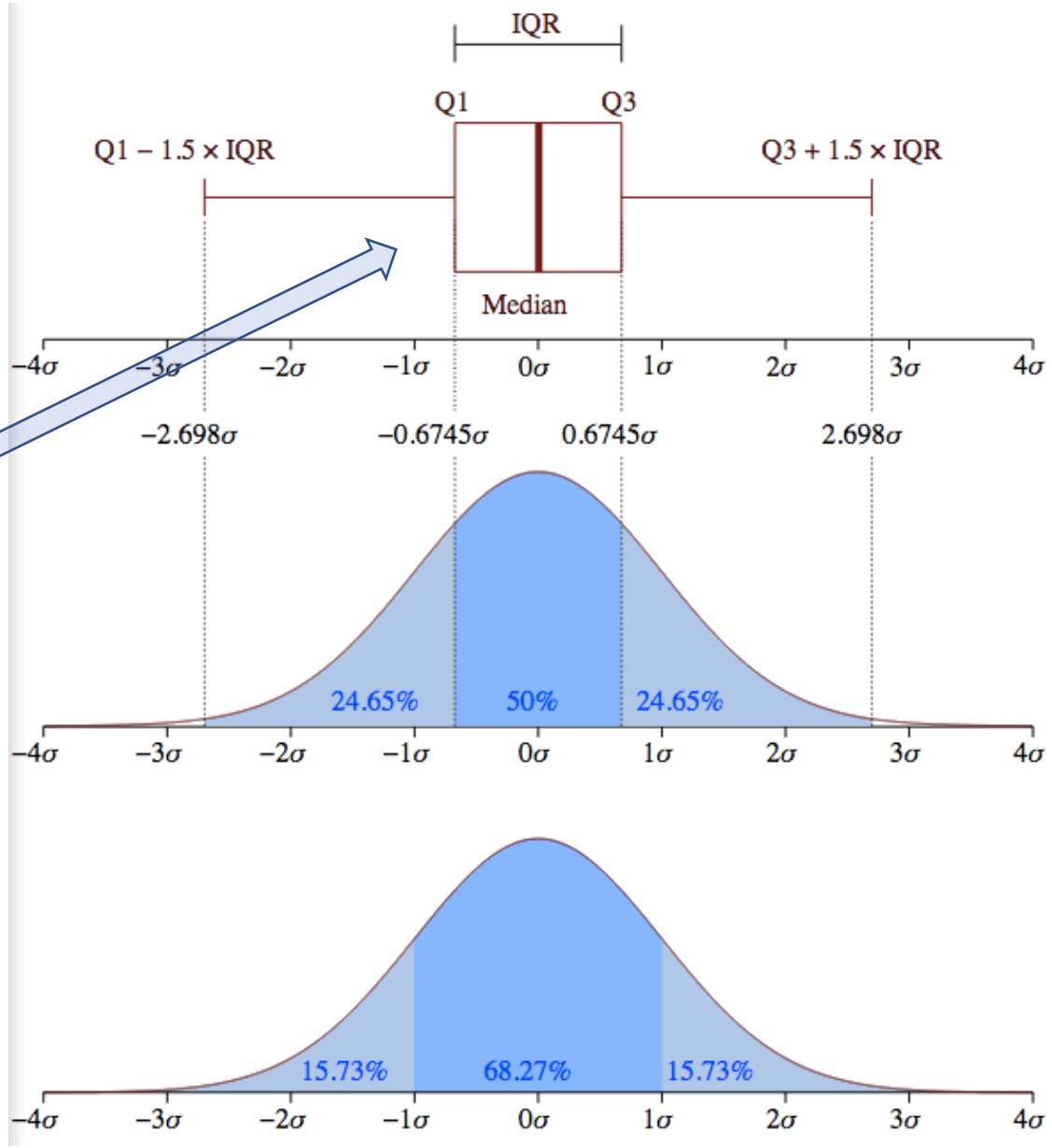
In Matlab:

```
>> data1 = [1,2,3,4,5,6]

data1 =

     1     2     3     4     5     6

>> data2 = [2,4,6,8,9,10]

data2 =

     2     4     6     8     9    10

>> boxplot([data1',data2'],'Notch','off','Labels',{'data1','data2'})
>>
```



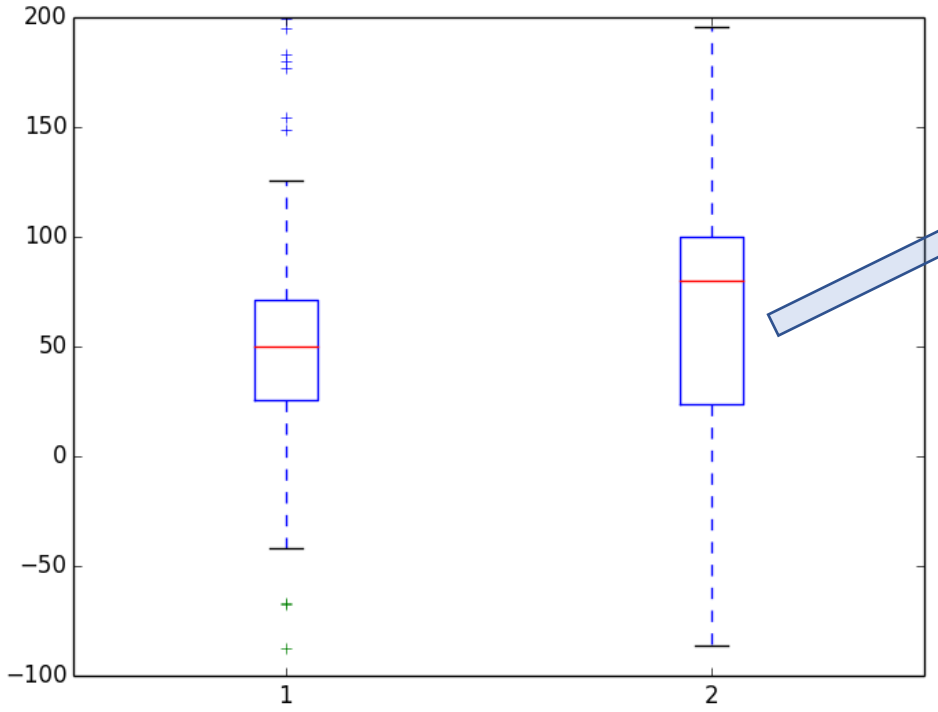
Interquartile Box Plots

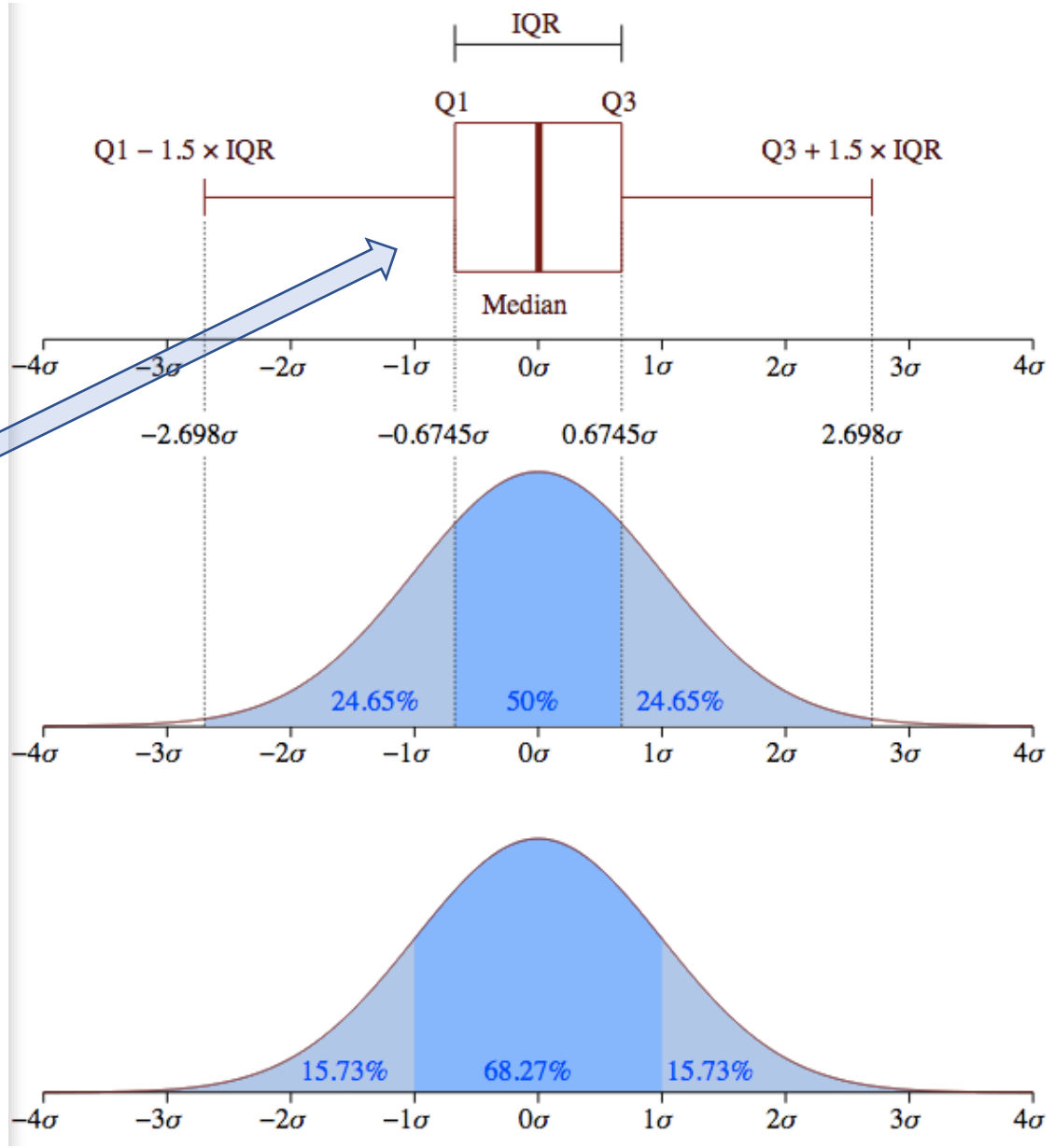




Wikipedia 2017

Interquartile Box Plots



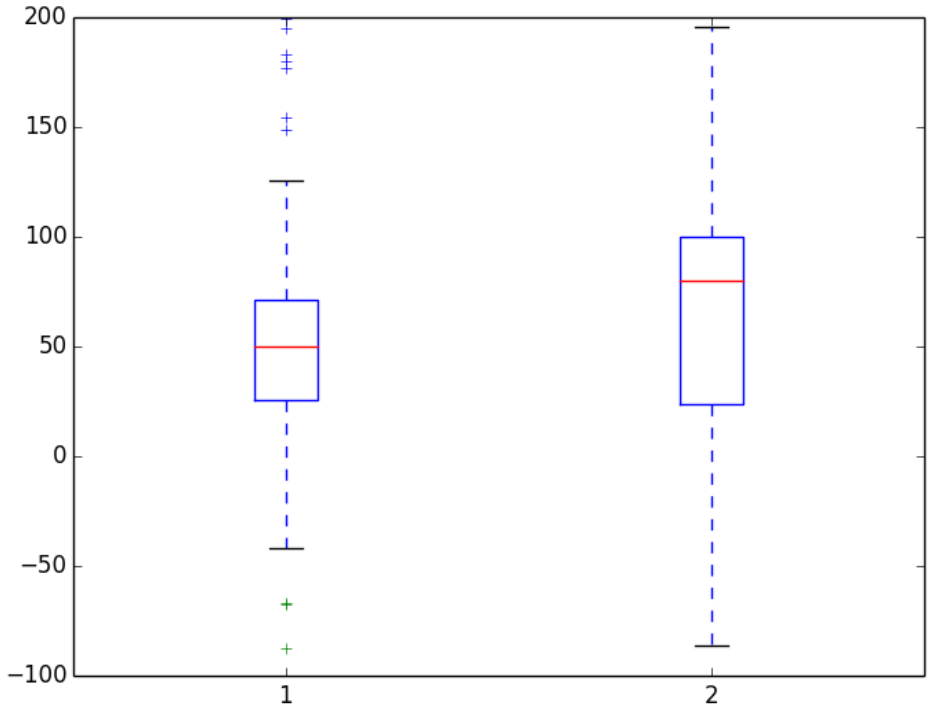


Wikipedia 2017

P-value

```
(-2.2545631335274923, 0.024160763692949783)
```

Interquartile Box Plots



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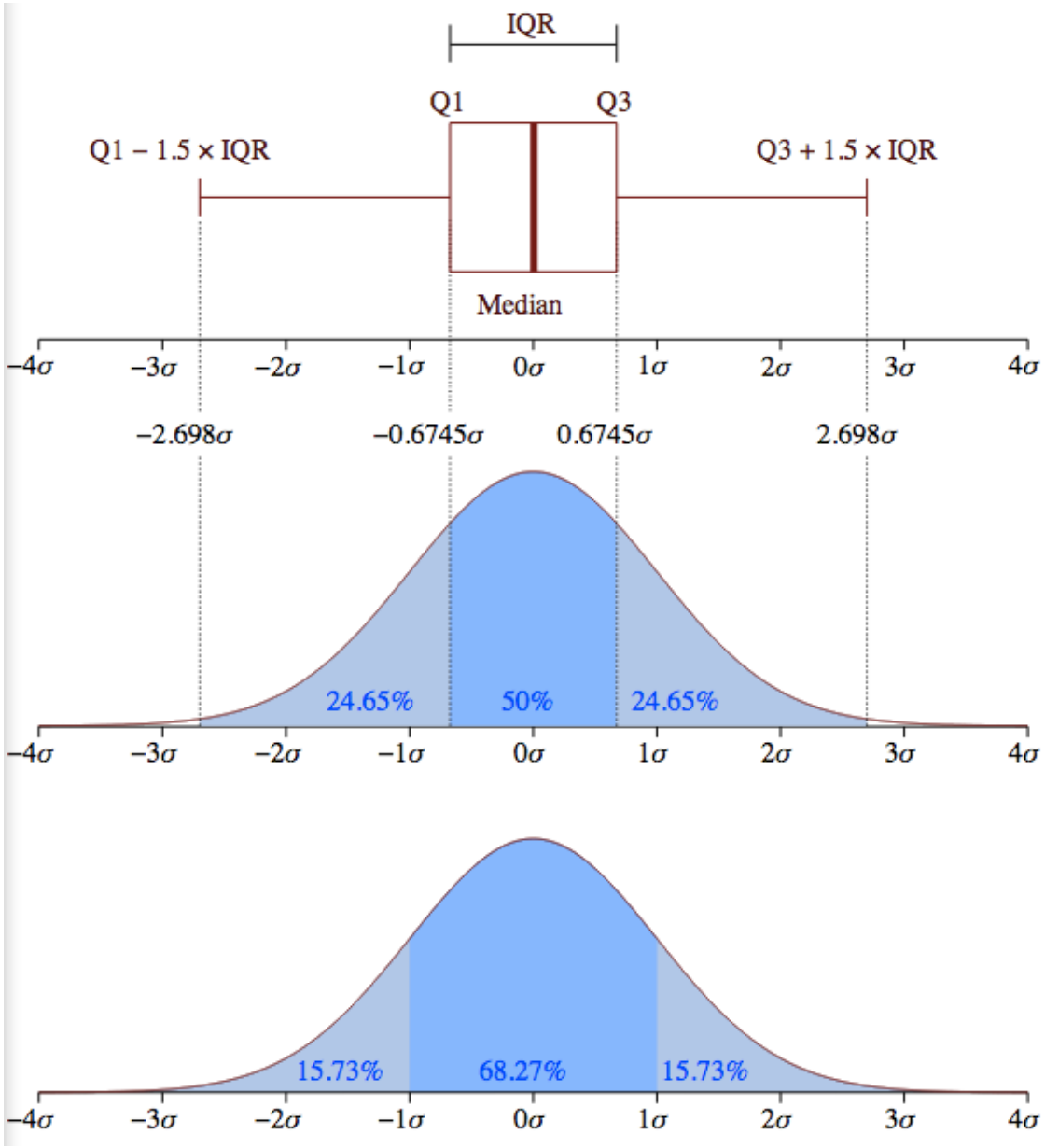
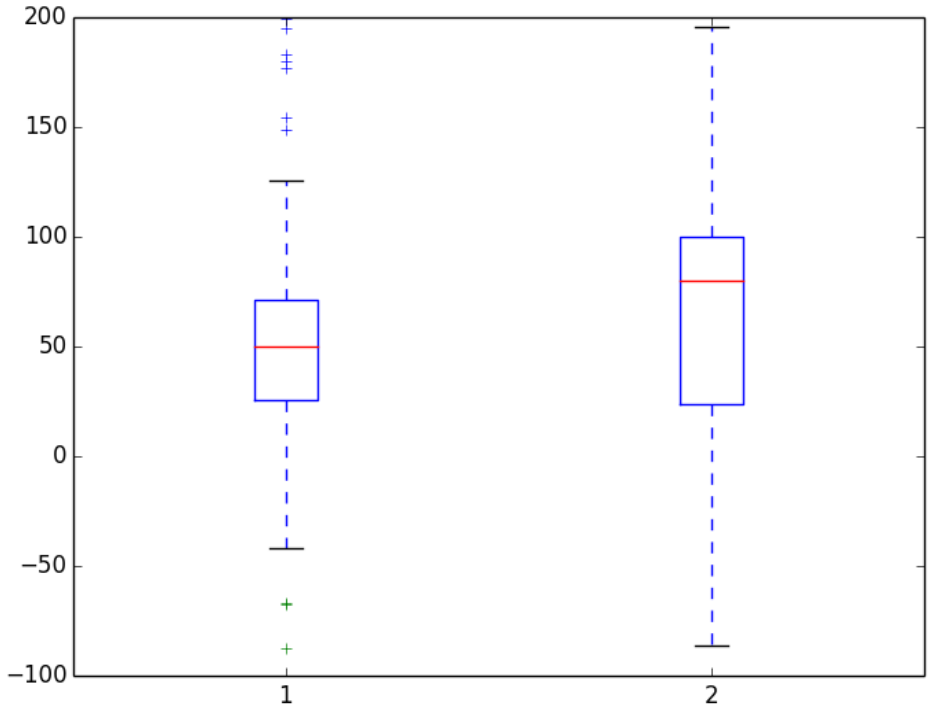


Wikipedia 2017

Interquartile Box Plots



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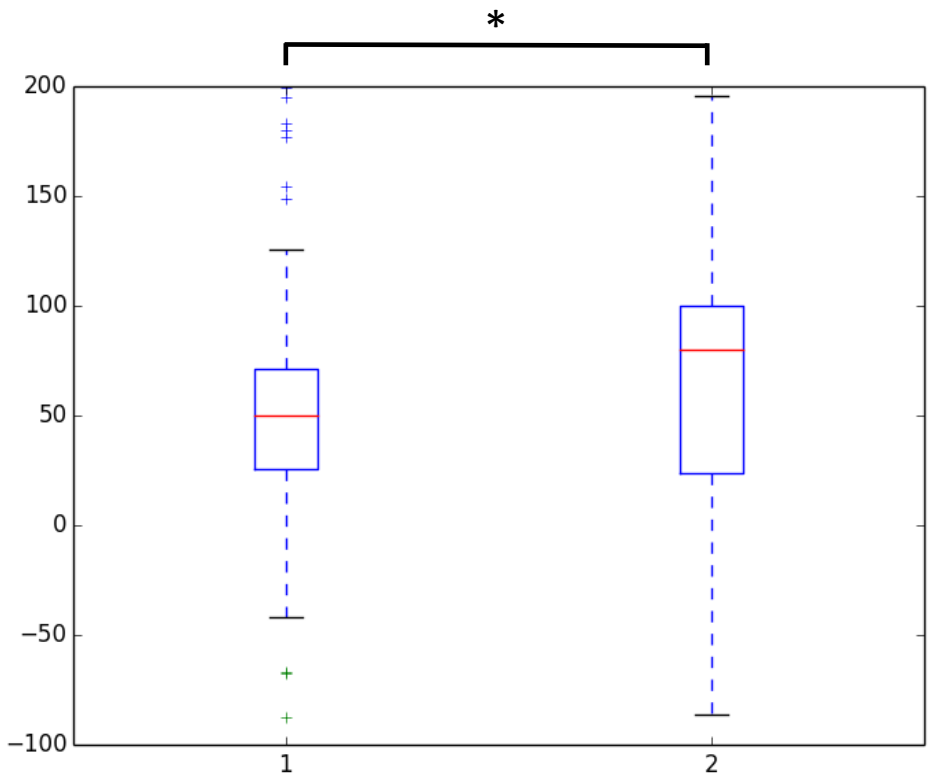
ns	P > 0.05
*	P ≤ 0.05
**	P ≤ 0.01
***	P ≤ 0.001
****	P ≤ 0.0001

Interquartile Box Plots



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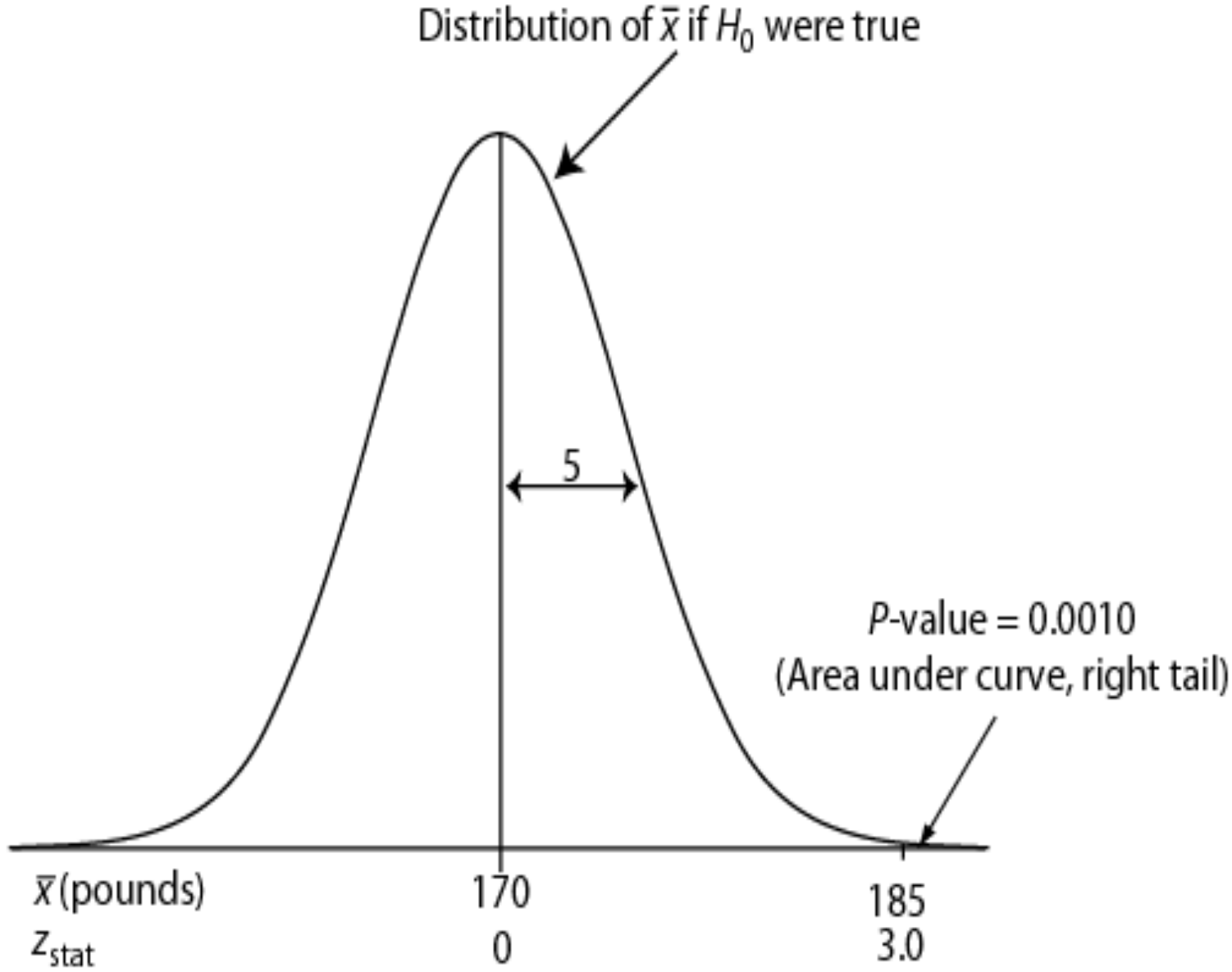
Distribution of $\bar{x}$ if H_0 were true
5
P-value = 0.0010
(Area under curve, right tail)
$\bar{x}$ (pounds)
z_{stat}
170
0
185
3.0