Lab 3

In [1]:
```
import numpy as np
```

In [1]:
```
from numpy.random  import seed
from numpy.random import randn
from numpy import mean
from numpy import std
```

In [3]:
```
seed(1)
```

In [ ]:
```
# Nonparametric statistical signifance test in python
```

In [2]:
```
data_1 = 10 * randn(90) + 45
data_1
```

```
array([21.63049465, 46.86989613, 45.64715556, 37.17969406, 58.4881185 ,
       45.33289917, 56.65885983, 43.77275075, 38.73091348, 57.90868863,
       45.64505589, 54.66784804, 50.5041855 , 45.89446577, 40.33825621,
       45.44211906, 55.26430836, 42.75016623, 19.4634753 , 27.76668561,
       56.68106023, 47.24616567, 57.21920847, 51.0386996 , 46.38319059,
       46.75498586, 52.83323056, 48.44389684, 53.42705601, 41.54132902,
       61.89293617, 46.64488085, 48.0009188 , 41.71806633, 52.43767167,
       50.85112855, 53.65991801, 51.71649896, 53.96704107, 56.17346275,
       33.71960931, 55.20225345, 54.39484332, 58.24612056, 52.53713584,
       41.95096769, 26.61911753, 25.96983941, 40.96962093, 54.43468921,
       62.403281  , 48.32008984, 45.7092852 , 53.00762161, 64.2473642 ,
       31.66580477, 45.30101106, 45.53293113, 62.3016399 , 41.0586017 ,
       23.52212312, 44.19105824, 55.56480991, 41.07950058, 45.24634515,
       49.74070006, 46.42223569, 47.13847801, 40.11214697, 35.19694954,
       20.31248703, 53.51234998, 43.11968244, 50.38577446, 59.55886145,
       38.74988331, 33.50232556, 34.1392204 , 29.07186017, 40.5219395 ,
       57.16975691, 44.39493033, 35.93513381, 33.62853415, 40.95289011,
       55.32749272, 48.90013265, 50.65342504, 52.41374602, 64.11962748])
```

In [3]:
```
data_2 = 7 * randn(90) + 46
data_2
```

```
array([35.97602368, 49.0755147 , 39.38227339, 48.81338513, 38.486148  ,
       44.02542958, 43.45079914, 41.09023516, 48.74772594, 47.03890523,
       38.86450994, 43.56364265, 48.63863486, 45.94448433, 41.74213806,
       30.36343366, 64.01418985, 41.08377029, 49.56060785, 48.48720137,
       41.08758538, 42.61645442, 54.2729013 , 39.64494226, 45.01385978,
       56.18833306, 49.1809742 , 28.94900771, 50.5221164 , 55.78834714,
       31.73532574, 42.77581929, 45.99098476, 41.65063706, 52.85289214,
       33.48252526, 38.75791361, 40.93900912, 46.78559536, 53.47878568,
       45.15482732, 47.79536704, 56.38789162, 52.52178679, 40.2076798 ,
       62.99600457, 46.18481424, 44.57486965, 50.30277007, 42.46210354,
       44.50423047, 47.41689744, 46.42836057, 56.9400322 , 40.07879144,
       41.47857541, 56.57111219, 50.25177495, 36.39657301, 22.09853372,
       51.62272073, 40.61044674, 42.22328739, 50.64814987, 52.94312551,
       38.37888306, 43.29930924, 45.66726802, 48.74608427, 49.28622428,
       37.51295667, 54.1385746 , 43.69105045, 46.31049595, 52.99913456,
       51.81443819, 44.11562156, 44.78586013, 48.06777537, 37.22096421,
       39.55193515, 46.39734276, 48.61404089, 48.20060367, 44.95956999,
       58.20290126, 48.90836629, 55.02635503, 26.26320508, 48.36176686])
```

In [5]:
```
print('data1: mean=%.3f stdv=%.3f' % (mean(data_1), std(data_1)))
print('data2: mean=%.3f stdv=%.3f' % (mean(data_2), std(data_2)))
```

```
data1: mean=46.186 stdv=10.118
data2: mean=45.549 stdv=7.369
```

In [ ]:
```
# The Mann whitney U test
```

In [8]:
```
from scipy.stats import mannwhitneyu
stat, p = mannwhitneyu(data_1, data_2)
print('Statistics=%.3f, p=%.3f' % (stat, p))
alpha = 0.05
if p > alpha:
    print('Same distribution (fail to reject H0)')
else:
    print('Different distribution (reject H0)')
```

```
Statistics=3677.000, p=0.143
Same distribution (fail to reject H0)
```

In [ ]:
```
#wilcoxon signed rank test
```

In [11]:
```
from scipy.stats import wilcoxon
stat, p = wilcoxon(data_1, data_2)
print('Statistics=%.3f, p=%.3f' % (stat, p))
alpha = 0.05
if p > alpha:
    print('Same distribution (fail to reject H0)')
else:
    print()
```

```
Statistics=1898.000, p=0.547
Same distribution (fail to reject H0)
```

In [ ]:
```
 # one Paired samples
```

In [13]:
```
stat, p = wilcoxon(data_1-data_2)
print('Statistics=%.3f, p=%.3f' % (stat, p))
# interpret
alpha = 0.05
if p > alpha:
    print('Same distribution (fail to reject H0)')
else:
    print('Different distribution (reject H0)')
```

```
Statistics=1898.000, p=0.547
Same distribution (fail to reject H0)
```

In [14]:
```
#Friedman Test (repeated measures ANOVA:
#for more than two paired samples)
from scipy.stats import friedmanchisquare
data1 = 5 * randn(100) + 50
data2 = 5 * randn(100) + 50
data3 = 5 * randn(100) + 52
stat, p = friedmanchisquare(data1, data2, data3)
print('Statistics=%.3f, p=%.3f' % (stat, p))
alpha = 0.05
if p > alpha:
    print('Same distributions (fail to reject H0)')
else:
    print('Different distributions (reject H0)')
```

```
Statistics=6.500, p=0.039
Different distributions (reject H0)
```