

In [1]:

```
import numpy as np
import pandas as pd
from matplotlib import pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
from scipy import stats

plt.style.use('seaborn-whitegrid')
```

Задача 1

Объясняемая переменная y зависит от двух категориальных факторов A и B , причём фактор A имеет 3 уровня, а фактор B - 4 уровня. Результаты наблюдений приведены в таблице: $y = [[2.68, 3.29, 2.88, 4.45], [4.12, 4.96, 5.09, 5.22], [5.52, 4.50, 5.42, 5.29]]$ С помощью двухфакторного дисперсионного анализа проверьте влияние каждого из факторов на переменную y .

In [96]:

```
y = [[2.68, 3.29, 2.88, 4.45],
      [4.12, 4.96, 5.09, 5.22],
      [5.52, 4.50, 5.42, 5.29]]
m = 3
k = 4
n = m*k
```

In [10]:

```
A1_mean = np.mean(y[0])
A2_mean = np.mean(y[1])
A3_mean = np.mean(y[2])
A_mean = [A1_mean, A2_mean, A3_mean]
A = 0
for n in A_mean:
    A += (n - np.mean(y))**2
SA12 = len(y[0])*A
SA12
```

Out[10]:

7.8407166666666654

In [20]:

```
B1 = [y[0][0],y[1][0],y[2][0]]
B2 = [y[0][1],y[1][1],y[2][1]]
B3 = [y[0][2],y[1][2],y[2][2]]
B4 = [y[0][3],y[1][3],y[2][3]]
B1_mean = np.mean(B1)
B2_mean = np.mean(B2)
B3_mean = np.mean(B3)
B4_mean = np.mean(B4)
B_mean = [B1_mean, B2_mean, B3_mean, B4_mean]
B = 0
for n in B_mean:
    B += (n-np.mean(y))**2
SB12 = len(B1)*A
SB12
```

Out[20]:

5.8805374999999999

In [88]:

```
def b_mean(n):
    b = B_mean[n]
    return b
```

In [89]:

```
SW2 = 0
n = 0
for j in range(len(A_mean)):
    g = y[j]
    n = 0
    for h in g:
        a_mean = A_mean[j]
        SW2 += (h - a_mean - b_mean(n) + np.mean(y))**2
        n +=1
SW2
```

Out[89]:

1.9298833333333327

In [90]:

```
sigmaA2 = SA12/(3-1)
sigmaA2
```

Out[90]:

3.9203583333333327

In [91]:

```
sigmaB2 = SB12/(4-1)
sigmaB2
```

Out[91]:

1.9601791666666664

In [92]:

```
sigmaW2 = SW2/((3-1)*(4-1))
sigmaW2
```

Out[92]:

0.32164722222222214

In [93]:

```
FA = sigmaA2/sigmaW2
FA
```

Out[93]:

12.188379262995173

In [100]:

```
alpha = 0.05
kA1 = m - 1
kA2 = n - m
FA_crit = stats.f.ppf(1 - alpha, kA1, kA2)
FA_crit
```

Out[100]:

4.25649472909375

In [94]:

```
FB = sigmaB2/sigmaW2  
FB
```

Out [94]:

6.094189631497587

In [99]:

```
alpha = 0.05  
kB1 = k - 1  
kB2 = n - k  
FB_crit = stats.f.ppf(1 - alpha, k1, k2)  
FB_crit
```

Out [99]:

4.25649472909375

ответ: факторы не влияют

In []: