# Linear Regression with Multiple Variables

In Github, there is a link for a dataset (Here). This file contains hiring statics for a firm such as experience of candidate, his written test score and personal interview score. Based on these 3 factors, HR will decide the salary. Given this data, you need to build a machine learning model for HR department that can help them decide salaries for future candidates. Using this predict salaries for following candidates,

- **2 yr experience, 9 test score, 6 interview score**
- **12 yr experience, 10 test score, 10 interview score**

In [ ]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn import linear_model
```

In [ ]:

```
#df    =    pd.read_csv('https://raw.githubusercontent.com/codebasics/py/master/ML/2_linear
# or
df = pd.read_csv('./data/hiring.csv')
df
```

Out[ ]:

| | experience | test_score(out of 10) | interview_score(out of 10) | salary($) |
|---|---|---|---|---|
| **0** | NaN | 8.0 | 9 | 50000 |
| **1** | NaN | 8.0 | 6 | 45000 |
| **2** | five | 6.0 | 7 | 60000 |
| **3** | two | 10.0 | 10 | 65000 |
| **4** | seven | 9.0 | 6 | 70000 |
| **5** | three | 7.0 | 10 | 62000 |
| **6** | ten | NaN | 7 | 72000 |
| **7** | eleven | 7.0 | 8 | 80000 |

## Data Preprocessing

Replacing NaN values to zero in `experience` column.

In [ ]:

```
df.experience = df.experience.fillna('zero')
df
```

Out[ ]:

| | experience | test_score(out of 10) | interview_score(out of 10) | salary($) |
|---|---|---|---|---|
| **0** | zero | 8.0 | 9 | 50000 |
| **1** | zero | 8.0 | 6 | 45000 |
| **2** | five | 6.0 | 7 | 60000 |

|   | experience | test_score(out of10) | interview_score(out of 10) | salary($) |
|---|---|---|---|---|
| **3** | two | 10.0 | 10 | 65000 |
| **4** | seven | 9.0 | 6 | 70000 |
| **5** | three | 7.0 | 10 | 62000 |
| **6** | ten | NaN | 7 | 72000 |
| **7** | eleven | 7.0 | 8 | 80000 |

In [ ]:

```
df['test_score(out of 10)'] = \
          df['test_score(out of 10)']  \
          .fillna(df['test_score(out of 10)'].median())
df
```

Out[ ]:

|   | experience | test_score(out of 10) | interview_score(out of 10) | salary($) |
|---|---|---|---|---|
| **0** | zero | 8.0 | 9 | 50000 |
| **1** | zero | 8.0 | 6 | 45000 |
| **2** | five | 6.0 | 7 | 60000 |
| **3** | two | 10.0 | 10 | 65000 |
| **4** | seven | 9.0 | 6 | 70000 |
| **5** | three | 7.0 | 10 | 62000 |
| **6** | ten | 8.0 | 7 | 72000 |
| **7** | eleven | 7.0 | 8 | 80000 |

In [ ]:

```
# Installing    word2number
# import sys
# !pip install word2number

# Convert numeric words to numbers
from word2number import w2n

df.experience = df.experience.apply(w2n.word_to_num)
df
```

Out[ ]:

|   | experience | test_score(out of 10) | interview_score(out of 10) | salary($) |
|---|---|---|---|---|
| **0** | 0 | 8.0 | 9 | 50000 |
| **1** | 0 | 8.0 | 6 | 45000 |
| **2** | 5 | 6.0 | 7 | 60000 |
| **3** | 2 | 10.0 | 10 | 65000 |
| **4** | 7 | 9.0 | 6 | 70000 |
| **5** | 3 | 7.0 | 10 | 62000 |
| **6** | 10 | 8.0 | 7 | 72000 |
| **7** | 11 | 7.0 | 8 | 80000 |

# Applying Linear Regression

In [ ]:

```
model = linear_model.LinearRegression()
model.fit(df.drop('salary($)',axis='columns'), df['salary($)'])
```

Out[ ]:

```
LinearRegression()
```

In [ ]:

```
m1, m2, m3 = model.coef_
c = model.intercept_
print('Coefficients, \
        \n\tm1 = {},  \
        \n\tm2 = {},  \
        \n\tm3 = {}'.format(m1, m2, m3))
print('Intercept, c = ', c)
```

```
Coefficients,
        m1 = 2812.954876273655,
        m2 = 1845.7059679767092,
        m3 = 2205.2401746724886
Intercept, c =  17737.26346433771
```

# Predicting salaries

- **2 yr experience, 9 test score, 6 interview score**

In [ ]:

```
ans1 = model.predict([[2, 9, 6]])
print('The salary for candidate with 2yr experience, \
9 test score, 6 interview score will be ${}'.format(ans1))
```

```
The salary for candidate with 2yr experience, 9 test score, 6 interview score will be
$[53205.96797671]
```

In [ ]:

```
y1 = m1*2 + m2*9 + m3*6 + c
print('\ty1 = m1*x1 + m2*x2 + m3*x3 + c =\n\t', y1)
```

```
        y1 = m1*x1 + m2*x2 + m3*x3 + c =
          53205.96797671034
```

- **12 yr experience, 10 test score, 10 interview score**

In [ ]:

```
ans2 = model.predict([[12, 10, 10]])
print('The salary for candidate with 12yr experience, \
10 test score, 10 interview score will be ${}'.format(ans2))
```

```
The salary for candidate with 12yr experience, 10 test score, 10 interview score will
be $[92002.18340611]
```

In [ ]:

```
y2 = m1*12 + m2*10 + m3*10 + c
print('\ty2 = m1*x1 + m2*x2 + m3*x3 + c =\n\t', y2)
```

```
        y2 = m1*x1 + m2*x2 + m3*x3 + c =
          92002.18340611353
```

# Scatter plots

In [ ]:

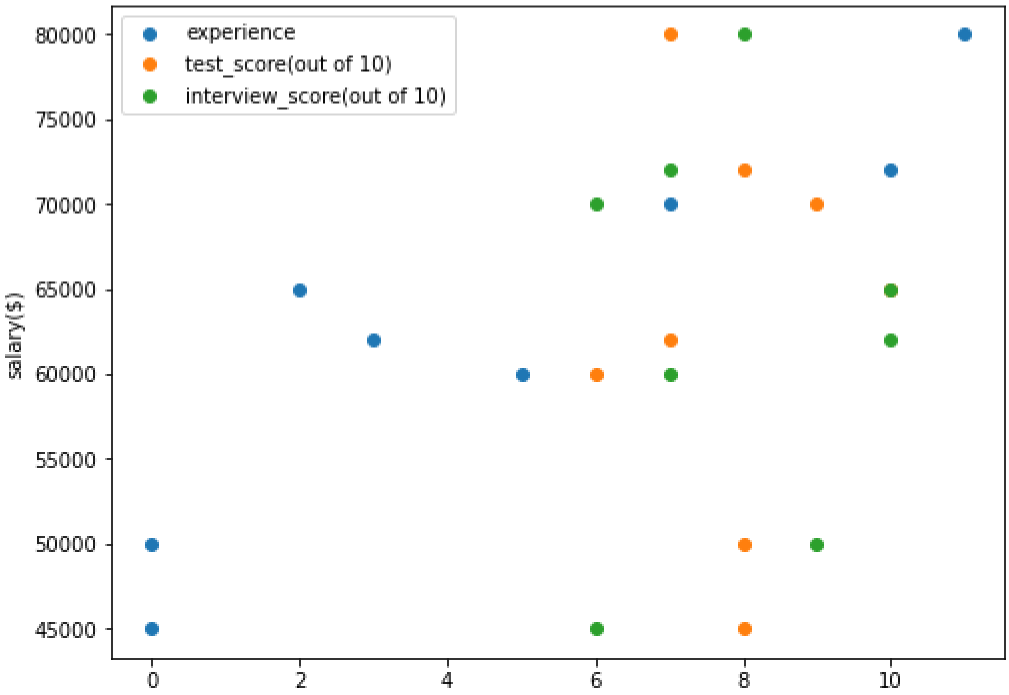
```
plt.figure(figsize=(8, 6))

plt.scatter(df.experience, df['salary($)'], label='experience')
plt.scatter(df['test_score(out of 10)'], \
        df['salary($)'], label='test_score(out of 10)')
```

```
plt.scatter(df['interview_score(out of 10)'], \
          df['salary($)'], label='interview_score(out of 10)')

plt.ylabel("salary($)")
plt.legend()
```

```
Out[ ]: <matplotlib.legend.Legend at 0x27778d04fa0>
```


experience
test_score(out of 10)
interview_score(out of 10)
salary($)