To obtain the best fit line over single feature scattered datapoints using Linear Regression

In [ ]:
```
# 1.    Load the basic libraries and packages

import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

In [ ]:
```
# 2.    Load the dataset

dataset = pd.read_csv("/content/Dataset.csv")
dataset.head()
```

Out[ ]:

| | x | y |
|---|---|---|
| **0** | 24.0 | 21.549452 |
| **1** | 50.0 | 47.464463 |
| **2** | 15.0 | 17.218656 |
| **3** | 38.0 | 36.586398 |
| **4** | 87.0 | 87.288984 |

In [ ]:
```
# 3.    Analyse the dataset

dataset.describe()
```

Out[ ]:

| | x | y |
|---|---|---|
| **count** | 700.000000 | 699.000000 |
| **mean** | 54.985939 | 49.939869 |
| **std** | 134.681703 | 29.109217 |
| **min** | 0.000000 | -3.839981 |
| **25%** | 25.000000 | 24.929968 |
| **50%** | 49.000000 | 48.973020 |
| **75%** | 75.000000 | 74.929911 |
| **max** | 3530.157369 | 108.871618 |

In [ ]:
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# 4. Pre-process the data

dataset = dataset.dropna()
```

In [ ]:
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# 5. Visualize the Data

plt.scatter(dataset['x'],dataset['y'])
plt.xlabel('x')
plt.ylabel('y')
plt.show()
```

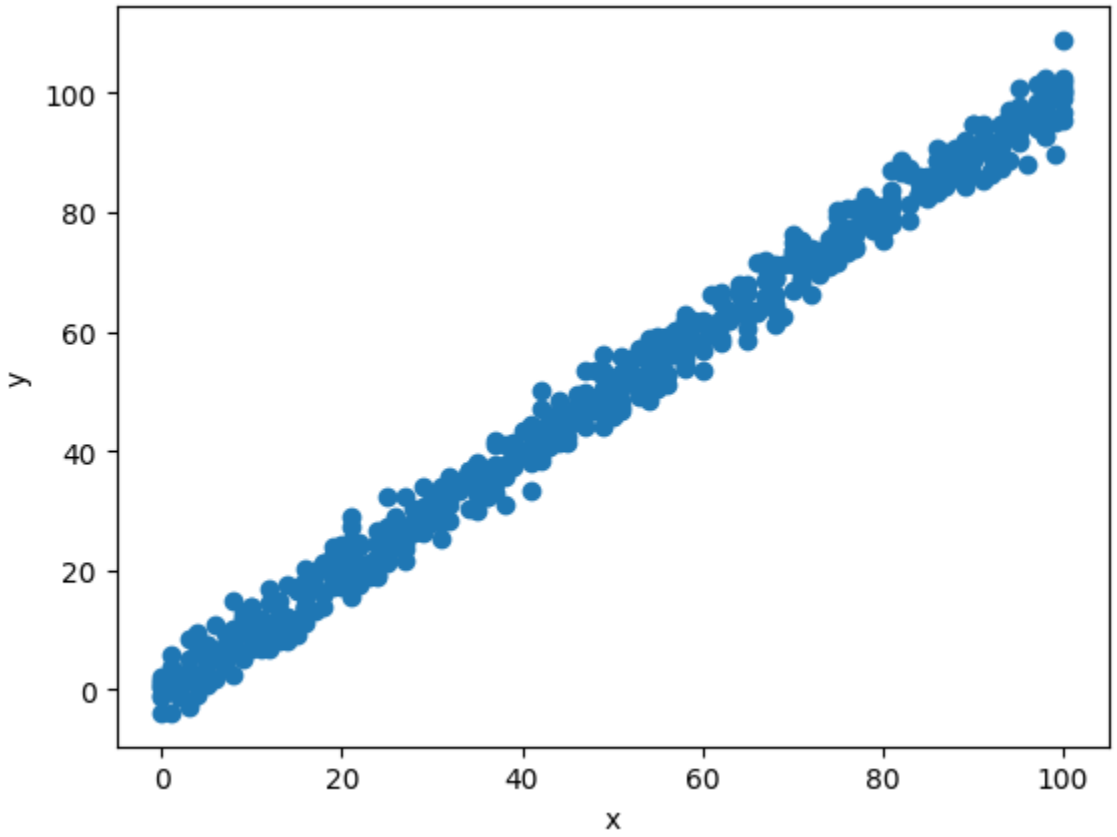


In [ ]:
```python
# 6.    Separate the feature and prediction value columns

x_feature = np.array(dataset['x'])
y_feature = np.array(dataset['y'])
```

In [ ]:
```python
# 7.Write the Hypothesis Function

def Hypothesis(theta_array , x) :
  return theta_array[0] + theta_array[1]*x
```

In [ ]:
```python
# 8. Write the Cost Function

def  Cost_Function(theta_array,x,y , m):
  total_cost = 0
  for i in range(m):
    total_cost += (Hypothesis(theta_array,x[i]) - y[i])**2
  return total_cost/(2*m)
```

In [ ]:
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# 9. Write the Gradient Descent optimization algorithm

def Gradient_Descent(theta_array , x, y , m ,alpha) :
  summation_0 = 0
  summation_1 = 0

  for i in range(m):
    summation_0 += (Hypothesis(theta_array,x[i]) - y[i])
    summation_1 += ((Hypothesis(theta_array,x[i]) - y[i])*x[i])

  new_theta0 = theta_array[0] - (alpha/m)*summation_0
  new_theta1 = theta_array[1] - (alpha/m)*summation_1

  new_theta = [new_theta0 , new_theta1]

  return new_theta
```

In [ ]:
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# 10.   Apply the training over the dataset to minimize the loss
```

```
def Training(x, y, alpha, epochs):
    theta_0 = 0
    theta_1 = 0
    theta_array = [theta_0, theta_1]
    m = len(x)
    cost_values = []

    for i in range(epochs):
        theta_array = Gradient_Descent(theta_array, x, y, m, alpha)
        loss = Cost_Function(theta_array, x, y, m)
        cost_values.append(loss)
        y_new = theta_array[0] + theta_array[1]*x

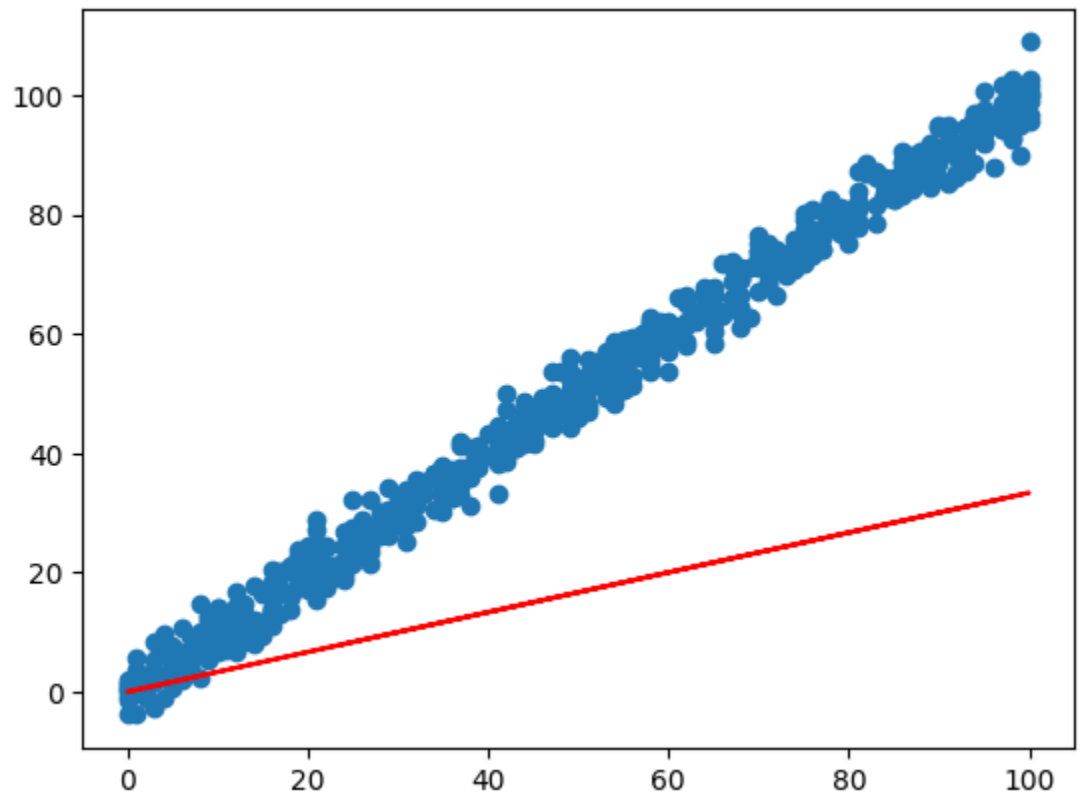
        if(i == epochs-1 or i == 0):
          plt.plot(x, y_new , 'r')
          plt.scatter(x, y)
          plt.show()

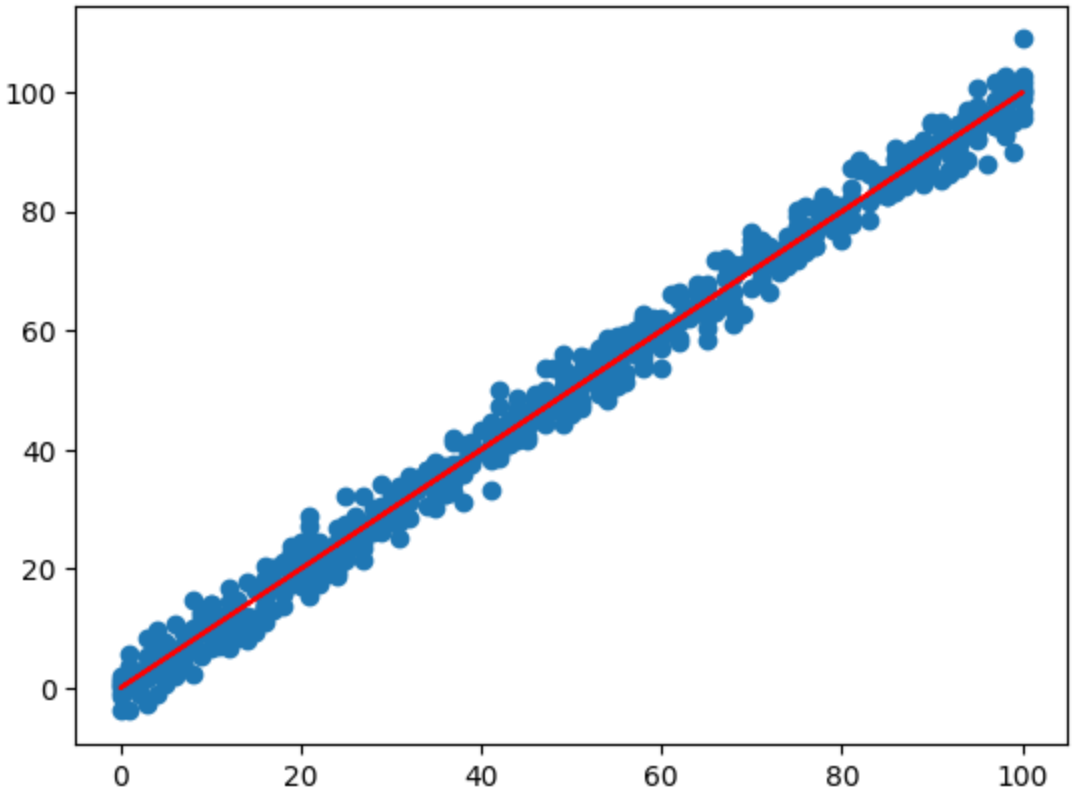
    print(theta_array)
    x = np.arange(0, epochs)
    plt.plot(x, cost_values)
    plt.xlabel('Epochs')
    plt.ylabel('Cost')
    plt.show()
```

In [ ]:

```
# 11.   Find the best fit line to the given dataset

alpha = 0.0001
epochs = 100
Training(x_feature  , y_feature , alpha , epochs)
```



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[0.014658108311688386, 0.9988297525870707]
```