

# lab1

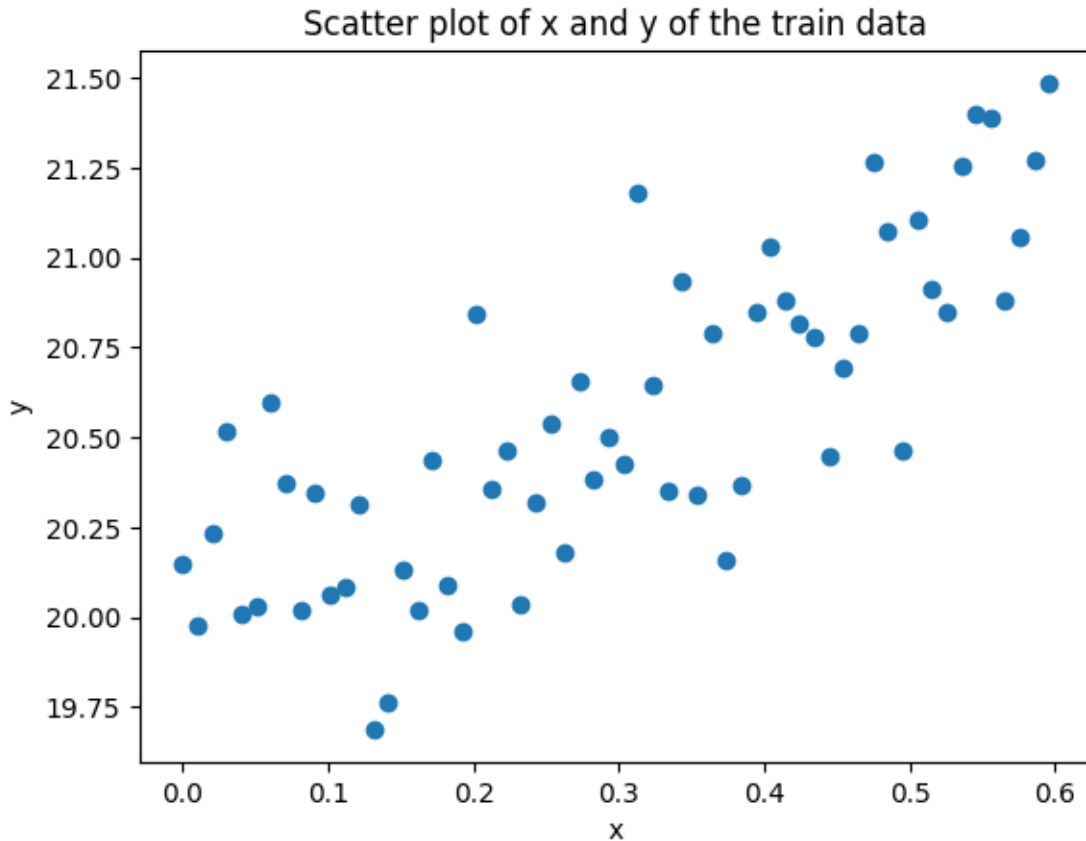
March 11, 2024

```
[1]: import numpy as np
import matplotlib.pyplot as plt
```

```
[2]: # a.          lab1_train.csv.

train_data = np.genfromtxt("lab_1_train.csv", delimiter=",", skip_header=1)
x_train = train_data[:, 1]
y_train = train_data[:, 2]

plt.scatter(x_train, y_train)
plt.title('Scatter plot of x and y of the train data')
plt.xlabel('x')
plt.ylabel('y')
plt.show()
```



```
[8]: def mean_squared_error(actual_values, predicted_values):
    if len(actual_values) != len(predicted_values):
        raise ValueError("Input lists must have the same length.")

    squared_errors = [(actual - predicted) ** 2 for actual, predicted in
↪ zip(actual_values, predicted_values)]
    mse = sum(squared_errors) / len(actual_values)

    return mse

def linear_regression(x, m, b):
    return m * x + b

def compute_gradients(x, y, m, b):
    y_pred = linear_regression(x, m, b)
    dm = (1/len(x)) * np.sum((y_pred - y) * x)
    db = (1/len(x)) * np.sum(y_pred - y)
    return dm, db
```

```
m = 0
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b = 0
learning_rate = 0.01
iterations = 1000

for epoch in range(iterations):
    dm, db = compute_gradients(x_train, y_train, m, b)
    m = m - learning_rate * dm
    b = b - learning_rate * db

    # b. . Mean Squared Error ↵
    ↵
    mse = mean_squared_error(linear_regression(x_train, m, b), y_train)
    print(f"Epoch {epoch + 1}/{iterations}, MSE: {mse}, Weights: {m, b}")

```

```

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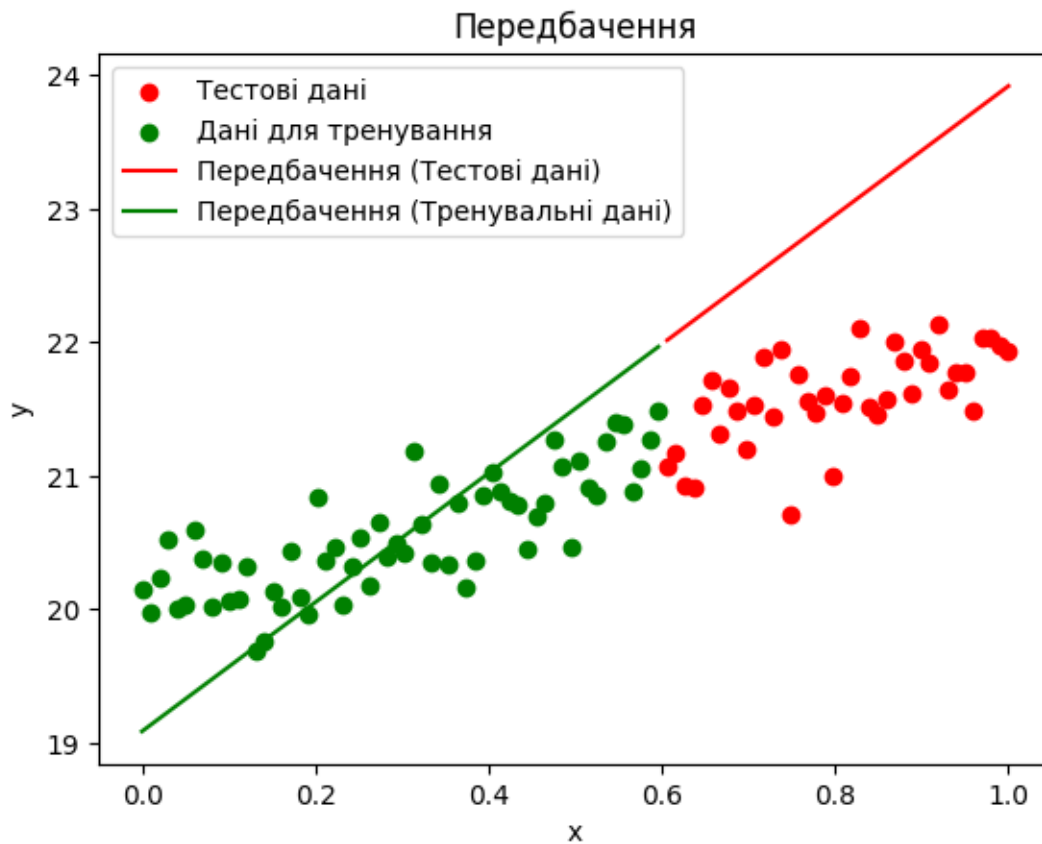
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```
[9]: test_data = np.loadtxt('lab_1_test.csv', delimiter=',', skiprows=1)
x_test = test_data[:, 1]
y_test = test_data[:, 2]

#
predictions_test = linear_regression(x_test, m, b)

#
predictions_train = linear_regression(x_train, m, b)

# d. lab1_train.csv, lab1_test.csv ,
plt.scatter(x_test, y_test, color='red', label='Тестові дані')
plt.scatter(x_train, y_train, color='green', label='Дані для тренування')
plt.plot(x_test, predictions_test, color='red', label='Передбачення (Тестові дані)')
plt.plot(x_train, predictions_train, color='green', label='Передбачення (Тренувальні дані)')
plt.xlabel('x')
plt.ylabel('y')
plt.title('Передбачення')
plt.legend()
plt.show()
```



```
[10]: # c. , lab1_test.csv.  
mse_test = mean_squared_error(predictions_test, y_test)  
print(f'Mean Squared Error on Test Set: {mse_test}')
```

Mean Squared Error on Test Set: 2.070421131177159

```
[ ]:
```