- Name: Sarvesh Surve
- Roll No. 60

Linear Regression

```
import numpy as np
```

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```
class SimpleLinearRegression:
    def __init__(self):
        self.intercept = 0
        self.slope = 0

    def fit(self, X, y):
        x_mean = np.mean(X)
        y_mean = np.mean(y)
        numerator = denominator = 0

        for i in range(len(X)):
            numerator += (X[i] - x_mean) * (y[i] - y_mean)
            denominator += (X[i] - x_mean) ** 2

        self.slope = numerator / denominator
        self.intercept = y_mean - (self.slope * x_mean)
        return self.intercept, self.slope

    def predict(self, X):
        return self.intercept + (X * self.slope)


if __name__ == "__main__":
    X_data = np.array([173, 182, 165, 154, 170]).reshape(-1, 1)
    y_data = np.array([68, 79, 65, 57, 64])

    model = SimpleLinearRegression()
    model.fit(X_data, y_data)
    prediction = model.predict(np.array([161]))

    print("Predicted Value:", prediction)
```

```
Predicted Value: [60.85051546]
```

Multiple Linear Regression

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```
import numpy as np


class MultipleLinearRegression:
    def __init__(self):
        self.coefficients = None

    def fit(self, X, y):
        ones_column = np.ones((X.shape[0], 1))
        X_bias = np.hstack((ones_column, X))
        self.coefficients = np.linalg.inv(X_bias.T @ X_bias) @ X_bias.T @ y
        return self.coefficients

    def predict(self, X):
        X_test = np.hstack((np.ones((X.shape[0], 1)), X))
        return X_test @ self.coefficients


if __name__ == "__main__":
    X_data = np.array([
        [1, 4],
        [2, 5],
        [3, 8],
        [4, 2]
    ])
```

```
y_data = np.array([1, 6, 8, 12])

model = MultipleLinearRegression()
params = model.fit(X_data, y_data)
print(f"Model Parameters: {params}")

prediction = model.predict(np.array([[5, 3]]))
print(f"Predicted Outcome: {prediction}")
```

```
Model Parameters: [-1.69945355  3.48360656 -0.05464481]
Predicted Outcome: [15.55464481]
```