## 1. Introduction

In this report, I tried to estimate a line model on data using the stochastic gradient descent (SGD) algorithm. Stochastic gradient descent is widely used in machine learning and optimization problems. I prepared this report to understand how the stochastic gradient descent algorithm works and to make an estimate on data using a line model.

## 2. Creating a Dataset

If we want to estimate a line model using the stochastic gradient descent algorithm, we must first create a dataset. Before preparing this report, I created a dataset that I assumed was on a real line. I randomly selected points in this dataset and added them to the line as noise.

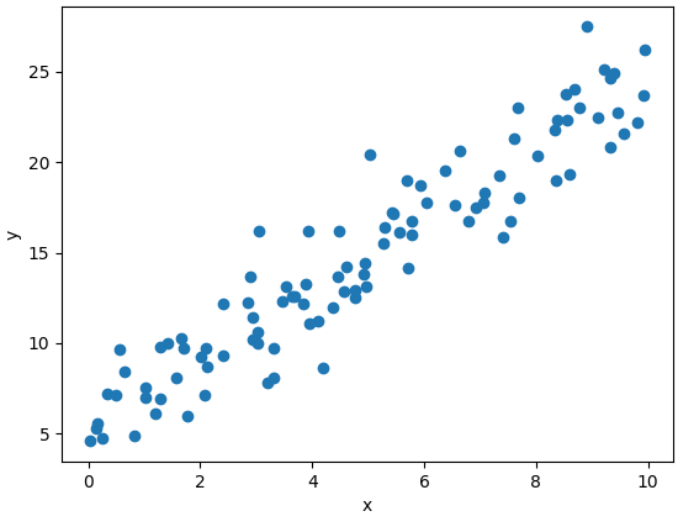


**Figure 1**

## 3. Line Model and Algorithm

In the line model, the slope and the intercept are the two parameters used to represent the line. The line class in the report performs the functions required to make predictions, calculate the gradient, and update the model.

The stochastic gradient descent algorithm provides more accurate results by updating the gradients throughout the training. In each step of this training, a data point is selected, the gradients are calculated, and the model is updated. In the algorithm used in this report, the process is repeated until the number of epochs I have determined. All gradient calculations and update operations performed are performed stochastically at a single point, as opposed to all data points.

### 4. Model Training and Prediction

In order to train the model, the data set is first created and the line model is defined. The training process is performed using the stochastic gradient descent algorithm. In each epoch step, the gradient is calculated on all data points and the model is updated. Basically, the loss function decreases and the correct prediction rate increases with each step of the training.

After the training is completed, I can predict whether the random points I took from the data set are on the line or not. The line model calculates the y values using the x values in the data set to make this prediction.

### 5. Results and Visualization

Visualization is important to evaluate the performance of the model obtained after the training process is completed. I used the matplotlib library in Python to visualize my model. Thanks to this library, I was able to see the performance of the model by seeing the points and the line in the data set on top of each other.

After visualization, I saw that the success rate of the model I trained was high.

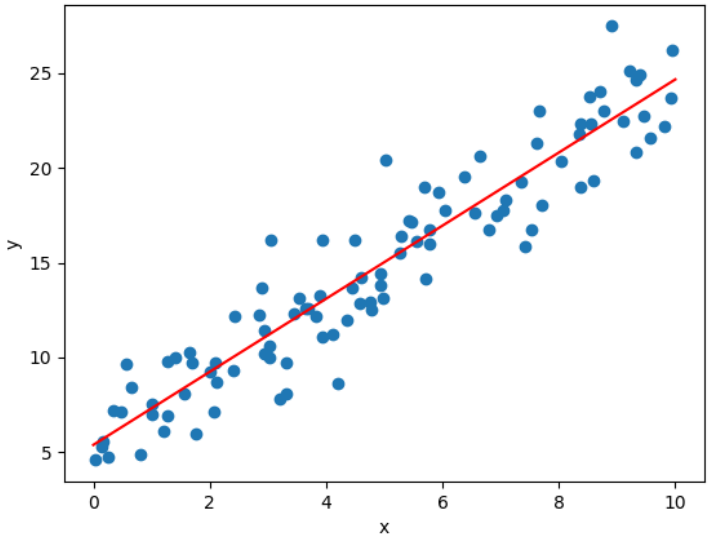


**Figure 2**

### 6. Conclusion and Summary

In this report I prepared, I explained the process of making line model estimation using the stochastic gradient descent algorithm. I showed that the model is constantly updated using gradients with the stochastic gradient descent algorithm and that training is done iteratively. As a result of the report, I visualized that the model I trained successfully showed the line on the points in the data set. In the report, I explained the basics of the stochastic gradient descent algorithm and how to make line model estimation.