Tuesday: Polynomial Regression

Agenda

Specific Learning Outcomes

- Explain the concept of Polynomial Regression
- Understand when to use Polynomial Regression when doing predictive analytics
- Perform Polynomial Regression on a dataset and carry out optimization on it.
- Interpret the results after a performing Polynomial Regression and draw a meaningful conclusion

Overview

In the previous session, we were dealing with two variables that were correlated (i.e they had a mutual relationship) but what if we know there is a correlation but the relationship is not linear? This is where polynomial regression comes in handy. As you may be wondering, what exactly is polynomial regression?

Polynomial regression is a form of regression analysis in which the relationship between the independent variable x and the dependent variable y can be expressed in the nth degree polynomial of x

Depending on how the data looks like, we can apply polynomial regression on the data to fit a polynomial equation to it.

When to use Polynomial Regression

Consider that you are given a dataset and after doing analysis and visualization on the dataset you get a graph which resembles the following graph
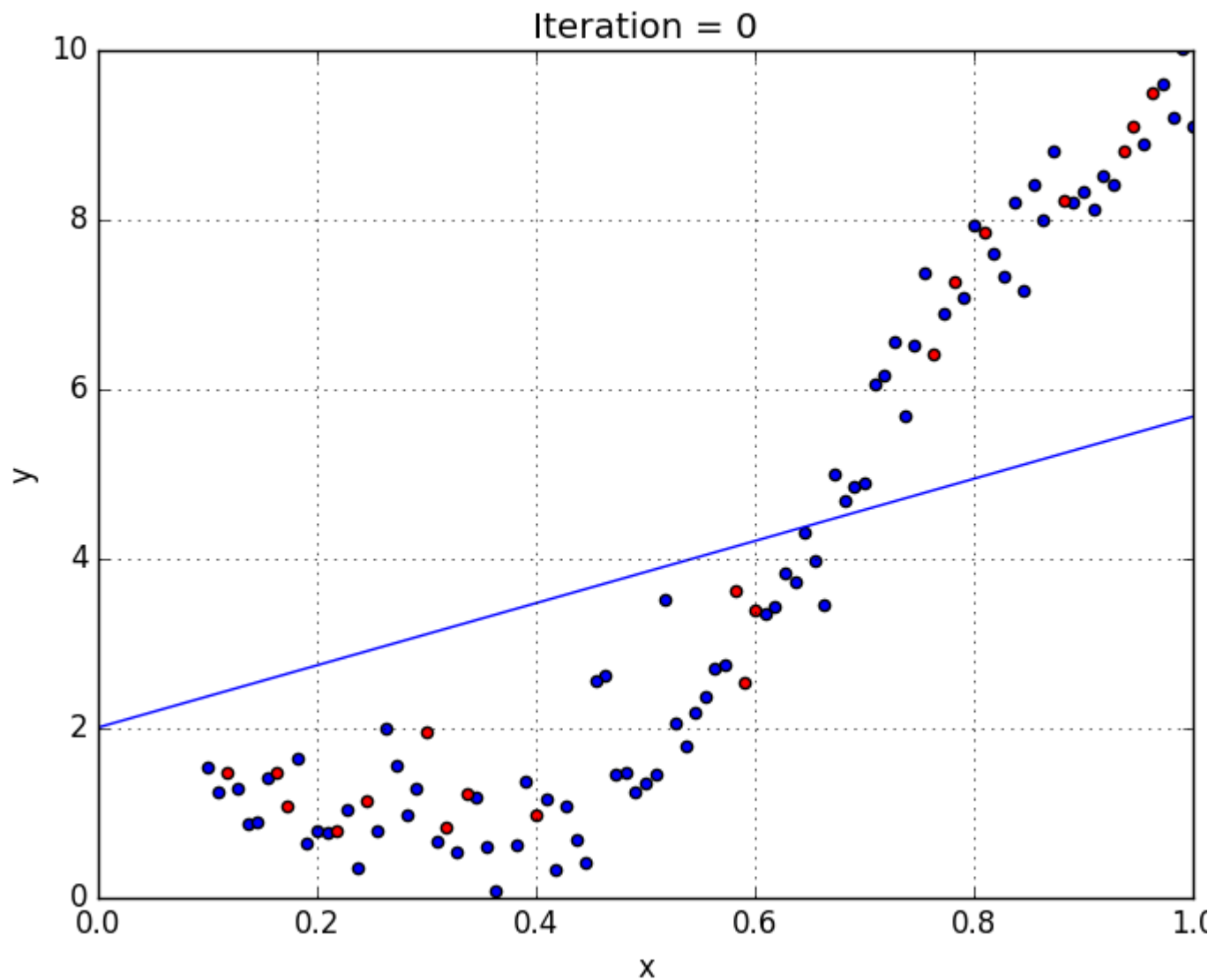
After subjecting the graph to linear regression, you get the best line of fit as shown in the graph above. Hence, it becomes rather difficult to fit a linear regression on the graph with a low-value error because the line does not fit very well and as a result, it fails to capture the patterns in the data. This is a perfect example of **under-fitting.**

To solve a case of under-fitting, we increase the complexity of our model by generating a higher-order equation of our original equation. Here, our original equation was a linear equation, given by

$y = b_0 + b_1x$

Once we transform it to a high-order equation we get;

$y = b_0 + b_1x + b_2x^2$

Then we continue to fit this equation in our dataset to see if capture the patterns in our data. This process is what we call polynomial regression and the equation that we transformed is called the polynomial equation.

In summary, we use polynomial regression when simple linear regression straight line does not fit well.

Exercises

Polynomial Regression Exercise [**Link (https://colab.research.google.com/drive/1lOCL9L7DtB7HX6GxlNEMtn3nm-vM8lkK)**]

Suggested Readings

Polynomial Linear regression.[**Link   (https://medium.com/@lucamel7/polynomial-linear-regression-1f8117f6de2e)**]

Introduction to Polynomial Regression.[**Link   (https://www.youtube.com/watch?v=Qnt2vBRW8lo)**]