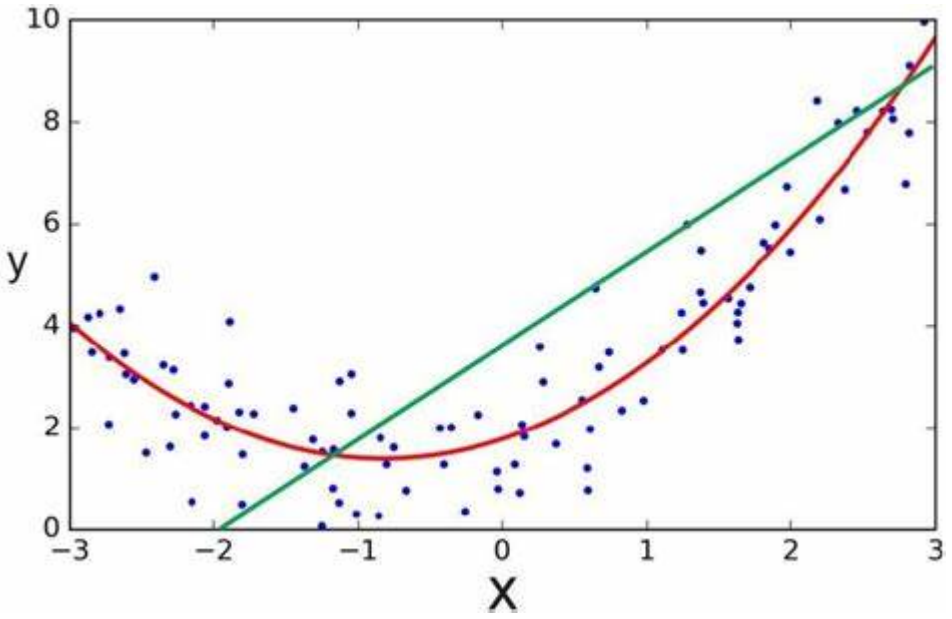
Polynomial Regression

Polynomial regression is an extension of linear regression that allows for modeling more complex relationships between variables. Here's an explanation of polynomial regression



Choose the best fit line: linear or polynomial?

Polynomial regression

1. Equation:

$$y = \beta_0 + \beta_1 x + \beta_2 x^2 + \beta_3 x^3 + ... + \beta_n x^n$$

Where:

- y is the dependent variable
- x is the independent variable
- β_0, β_1, β_2, ..., β_n are the coefficients
- n is the degree of the polynomial

2. Predicted value:

$$\hat{y} = \beta_0 + \beta_1 x + \beta_2 x^2 + \beta_3 x^3 + ... + \beta_n x^n$$

Where ŷ is the predicted value of y

3. Calculate the Cost Function

$$MSE = (1/n) * \Sigma(\hat{y} - y)^2$$

4. Calculate Gradients

$$\partial MSE/\partial \beta i = (2/n) * \Sigma(x^i * (\hat{y} - y))$$

5. Update Weights

$$\beta i = \beta i - learning_rate * \partial MSE/\partial \beta i$$

Advantages:

- Can model nonlinear relationships
- More flexible than simple linear regression
- Can capture more complex patterns in the data

Disadvantages:

- Risk of overfitting, especially with higher-degree polynomials
- Can be sensitive to outliers
- Interpretation becomes more difficult as the degree increases