Polynomial Regression Impl001

Gavin Simpson

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1 Resources

Github Repository: `github.com/GDSimpson3/Polynomial-regression-001-impl`

2 Dynamic Orders

2.1 Dynamic Exponents 3SLOTS 6PARAM DSQuadratic

Works on a simple Quadratic Dataset

Uses 6 Parameters:

Symbol	Meaning
Ca	Coefficient A
Ea	Exponent A
Cb	Coefficient B
Eb	Exponent B
Cc	Coefficient C
Ec	Exponent C

Table 1: Mapping of symbols to coefficient and exponent terms

Uses the Gradient Descent to find the best exponents and Coefficients
Currently was able to bring MSE down to **3** with **20,000** iterations
It currently uses 3 static slots in the form of

$$Cax^{Ea} + Cbx^{Eb} + Ccx^{Ec}$$

as the models Regression line formula

2.2 Loss Function

The loss function that we're applying the Gradient Descent to, which is the mean squared Error.

2.2.1 Mean Squared Error

Mean Squared Error:

$$\text{MSE(parameters)} = \frac{1}{n}\sum_{i=1}^{n}(\hat{y}_i - y_i)^2$$

MSE Of a Bivariate Linear Regression line

$$\text{MSE(m,b)} = \frac{1}{n}\sum_{i=1}^{n}(mx_i + b - y_i)^2$$

MSE Of a Multivariate Polynomial Regression Line

$$\text{MSE(a,b,c)} = \frac{1}{n}\sum_{i=1}^{n}(ax_i^2 + bx_i + c - y_i)^2$$

MSE Of a Multivariate Polynomial Regression Line

$$\text{MSE(Ca,Ea,Cb,Eb,Cc,Ec)} = \frac{1}{n}\sum_{i=1}^{n}(Cax_i^{Ea} + Cbx_i^{Eb} + Ccx_i^{Ec} - y_i)^2$$

2.2.2 Partial Derivatives

Partial Derivatives of a Simple linear regression line

$$\frac{\partial \text{MSE(m,b)}}{\partial \text{m}} = \frac{2}{n}\sum_{i=1}^{n}(mx_i + b - y_i - y_i)^1 x_i$$

$$\frac{\partial \text{MSE(m,b)}}{\partial \text{b}} = \frac{2}{n}\sum_{i=1}^{n}(mx_i + b - y_i)^1$$

Partial Derivatives of a Simple Quadratic regression line

$$\frac{\partial \text{MSE(a,b,c)}}{\partial \text{a}} = \frac{2}{n}\sum_{i=1}^{n}(ax_i^2 + bx_i + c - y_i)^1 x_i^2$$

$$\frac{\partial \text{MSE(a,b,c)}}{\partial \text{b}} = \frac{2}{n}\sum_{i=1}^{n}(ax_i^2 + bx_i + c - y_i)^1 x_i$$

$$\frac{\partial \text{MSE(a,b,c)}}{\partial \text{c}} = \frac{2}{n}\sum_{i=1}^{n}(ax_i^2 + bx_i + c - y_i)^1$$

Generic Partial Derivatives of a Dynamic Polynomial regression line

with respect to Coefficient N

$$\frac{\partial \text{MSE(Cn,En)}}{\partial \text{Cn}} = \frac{2}{n} \sum_{i=1}^{n} (Cnx_i^{En} ... - y_i)^1 x_i^{En}$$

with respect to Exponent N

$$\frac{\partial \text{MSE(Cn, En,......)}}{\partial \text{En}} = \frac{2}{n} \sum_{i=1}^{n} (Cnx_i^{En} ... - y_i)^1 Cn[(x_i^{En}) \ln(x_i)]$$

2.3 NTerms

Aim: Making it dynamic so that it can compute upto N terms