EE 104 – Documentation

# Regression

The polynomial used for many of the regression methods is shown below.

Chart, line chart

Description automatically generated

Fitting this polynomial turned out to be relatively simple. All regression methods seemed to work well. The regression was taken using the window from x (-5,2).

Graphical user interface, chart, line chart

Description automatically generated

# Polynomial Regression

Polynomial regression was done using numpy’s polyfit tool. Using this package we were able to get a completely perfect fit.

Graphical user interface

Description automatically generated with medium confidence

# Ridge Regression

Sklearn’s Ridge regression is used to fit the same polynomial. In this case a pipeline is used to tell the ridge regression method how many polynomial features the data set has. When noting 3 polynomial features the ridge regression also yields a perfect result.

Graphical user interface, text, application

Description automatically generated

# Linear Regression

The linear regression package from sklearn is used to fit this polynomial as well. As expected with linear regression a perfect fit is not possible, however the trend can still be predicted.

Graphical user interface

Description automatically generated

As can be seen from the figure above the general trend is correct however the coefficient of determination is very low.

# Damped Sine Wave

An arbitrary damped sine wave is fit as well. The sine wave used is shown below. The window is limited to x: (-2,3) and y(-2,2).

Graphical user interface, application

Description automatically generated

Since fitting the entire function is not possible using the previously mentioned regression methods, we will use polynomial regression to fit the first curve of the sine wave using limits

x: (-.7,.3).

Using a polynomial regression with a high enough order can yield a perfect fit for any individual curve. It is however impossible to fit the entire function since we do not have a method to fit continuously oscillating functions outside of the fitting window.

## First Curve Fit

We are able to perfectly fit this curve with a high enough polynomial regression. It can be expected that the regression fails outside this window

Chart

Description automatically generated

## Fitting the First Curve Fit

Fitting the previous curve fit also yields perfect results.

A picture containing chart

Description automatically generated

## Sinusoidal with noise fitting

Pandas is used to retrieve data from a csv file for an arbitrary sinusoidal tone. The original tone is normalized and plotted below.

Graphical user interface, text, application

Description automatically generated

Noise is added to this tone, which is then curve fit using ridge regression. In the figure below there is too much noise for the fit to work perfectly, but it does seem to represent where the wave crosses the x-axis correctly.

Graphical user interface, text, application, email

Description automatically generated

# Multivariable Regression

Sklearn’s optimize package contains a curve fitting tool that is able to guess the inputs to a multivariable function. An arbitrary multivariable function is created and the curve fit tool is tested with different guesses.

Graphical user interface, text, application, email

Description automatically generated

Graphical user interface, application

Description automatically generated