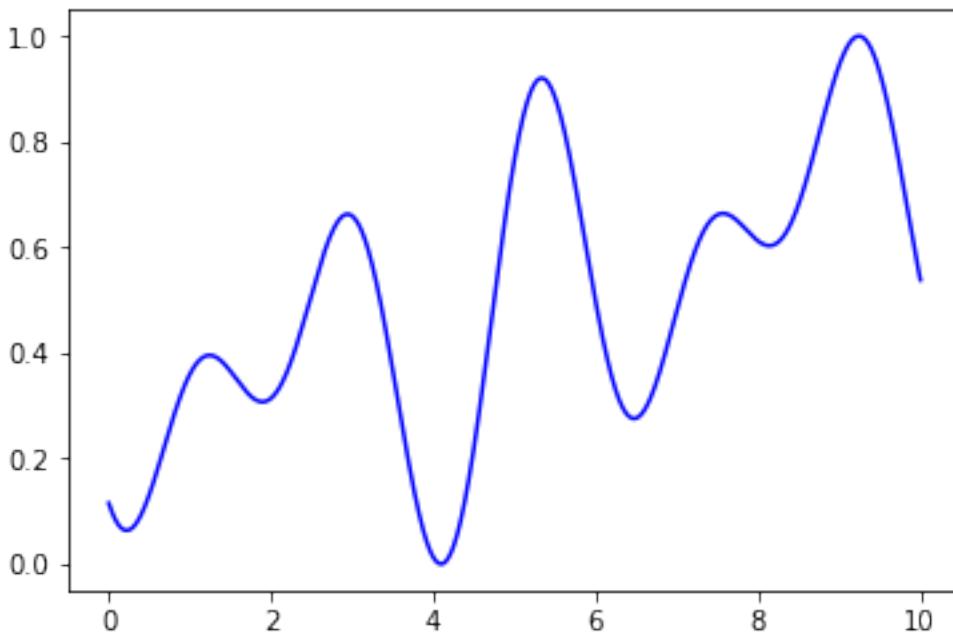


Kai McConnell

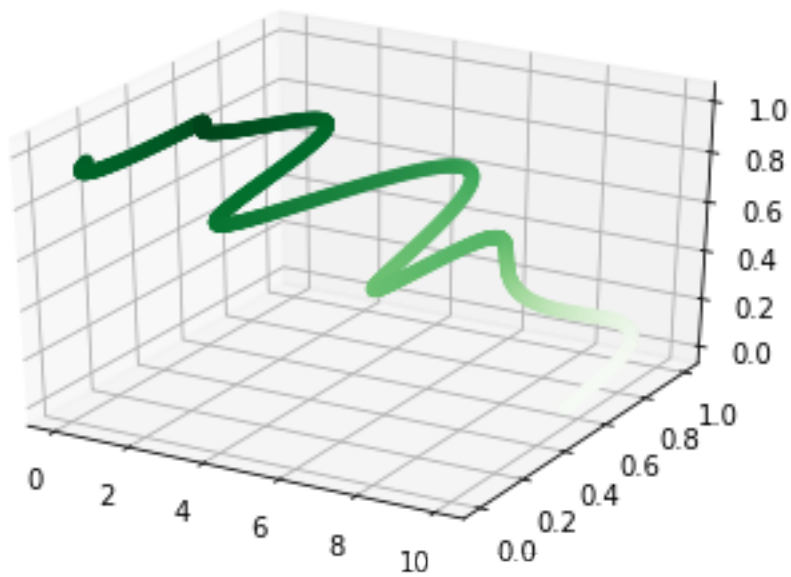
## Project 6 Regression Using Deep Neural Networks

### Create a Dataset

Creating a dataset was not that difficult as the code from the example featured most of what I would need already for the 1 dimensional function.

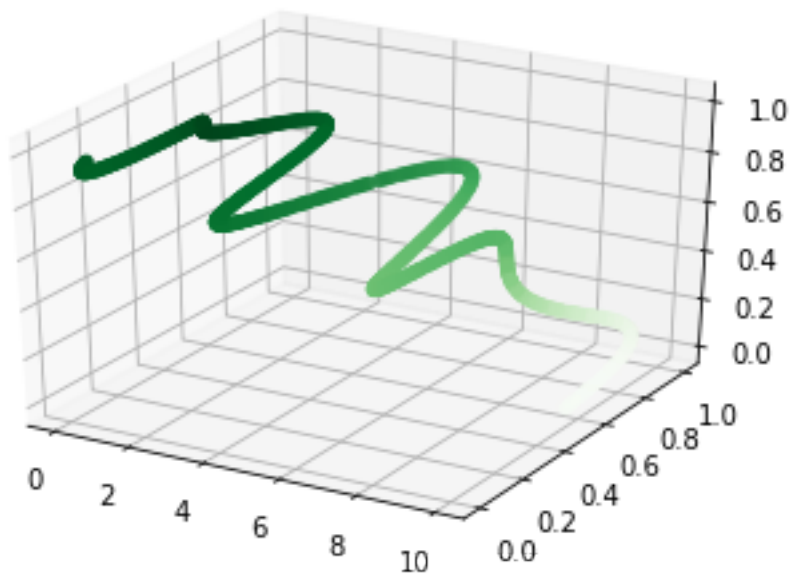


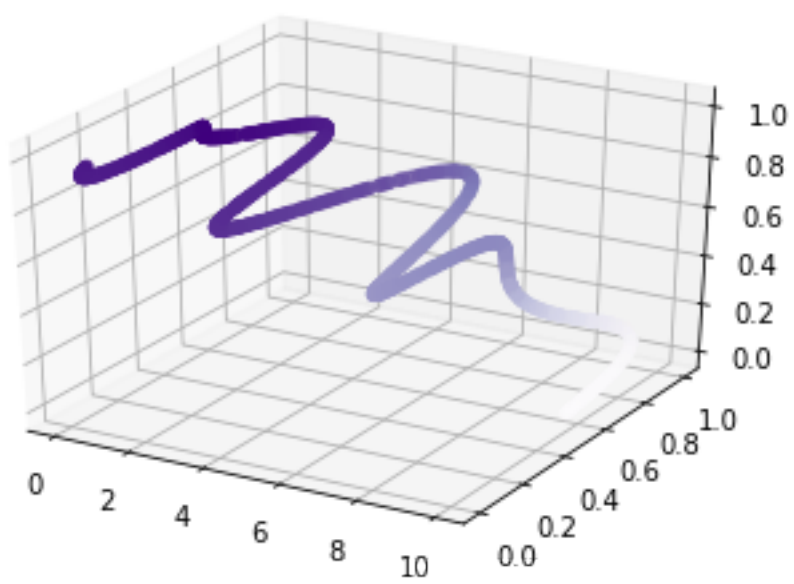
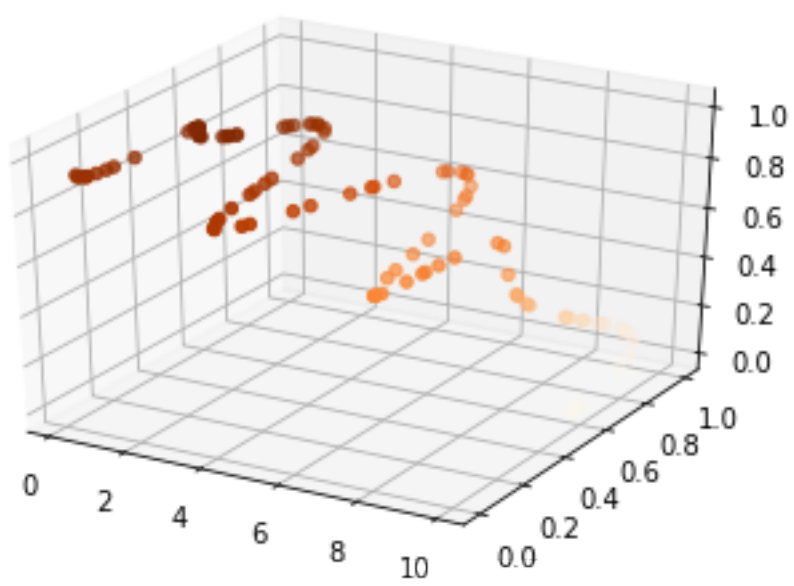
It was slightly challenging to figure out how to add another dimension to the function and turn it into a 2D model. I used the y values assignments as a scaffold to build the z values and made some changes to make sure the values wouldn't be exact copies of each other. This lead to me having 3 sets of values, x values y values and z values and I could successfully model them.

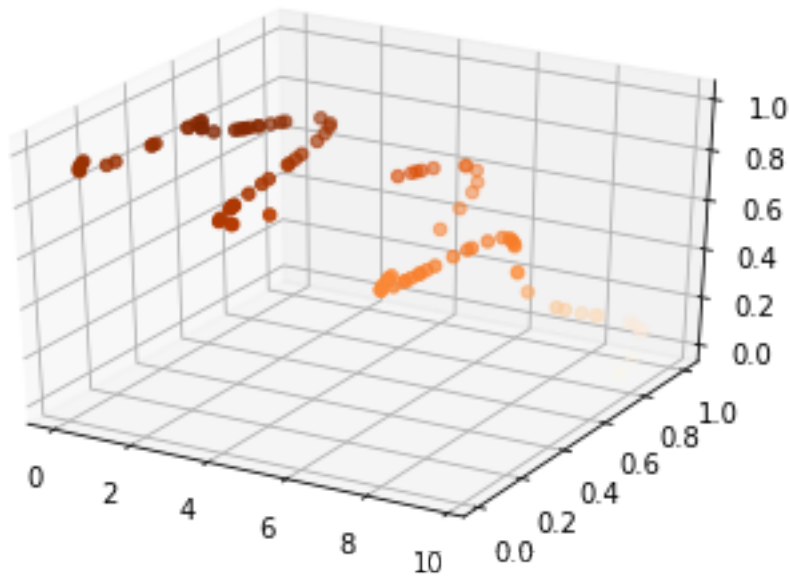


#### Plot the Resulting Dataset

I tried my best to understand what the project told me to do with regards to using a 2 dimensional space to plot it however when I did this with colors I couldn't figure out what was going on so eventually I used matlab peplos's 3d functionality to plot the 3 sets of values in 3D space. This lead to a much more readable image and helped me to analyze and work on my model.







### Create a neural network model

For creating the neural network model I once again used the example as a scaffold for building my 3 dimensional function. I changed very little about the creation of a neural network. I only added new values for the new set of data z. This meant that I now was creating my neural network model using 3 sets of data rather than 2. I treated it as x was the input and y and z were the outputs which resulted in a reasonable model.

### Train the neural network model

I trained my neural network model again in a similar way to the example program but also adding in the z value to the training.

### Visualize the output

I followed my previous work and visualized the new output on a 3 dimensional plain. I played with the epoch value and the learning rate a bunch but found that the original 100000 epoch and 0.0001 learning rate seemed to be the most successful for the neural network. The main things I learned from this assignment were the structure of deep neural networks and how they work to predict multi dimensional datasets. In the end however I found that the neural network struggled more with the 3 dimensional data set and failed to get as close of a prediction rate as the 2 dimensional values. This makes sense since there is multiple outputs with the same input. I

suspect that if I had gone the other way and had  $z$  be the only output but with  $y$  and  $x$  being inputs the deep neural network would have been more successful.

