

INTELLIGENT CONTROL

Homework 2: Identification of a dynamical system

You are given a discrete dynamical system:

$$x_{k+1} = f(x_k), x_0 = [-2, 0, -1]^T$$

where $f: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ is an unknown smooth and bounded function. You are also given measurements of the system response for the first 1000 steps in the file data_NN.mat, as well as the plot of the data in the following figure.

1. Train an Artificial Neural Network so that it approximates the unknown function $f(\bullet)$ based on the data of the file.
2. Illustrate the approximation error over the whole data set of the file.
3. Finally, estimate the first 200 steps employing the trained ANN with initial condition $x_0 = [-1.9, 0, -0.9]^T$, illustrate the result and save the response in a file data_VAL.mat (or other file types).

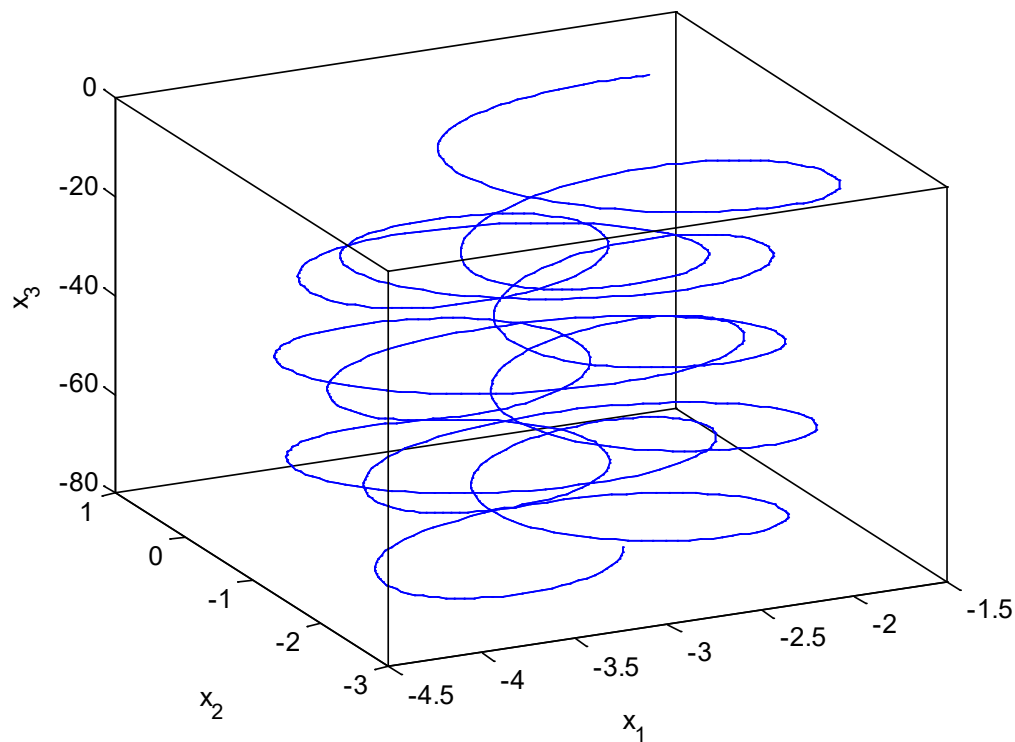


Figure 1: Graphical illustration of the response included in the file data_NN.mat.