**Technical information**

* Program written in Python 3 (version: 3.6.4)
* Program written and compiled using Windows (version: 10-10.0.17134-SP0)
* The following modules are used in this program:
  + matplotlib (version: 2.0.2)
    - Both the main module and the submodule ‘pyplot’.
  + numpy (version: 1.14.2)
  + math (version: N/A)

As the program heavily relies on these three modules, it is imperative that these are installed prior to using the .exe file. Without these modules installed, the .exe will not work. You can check whether you have these modules installed by using the following command in your command prompt:

import math, matplotlib.pyplot as plt, numpy as np

If this doesn’t yield any errors, you’re good to go!  
If it gives you an error such as this:



… you should first solve this issue by installing the missing module. Several ways of installing Python modules are described [**on this website**](https://docs.python.org/3/installing/index.html). Feel free to ask for help if you encounter any issues while installing the required packages.

**Chapter 04**

**Exercise 01: general information**

In this exercise, you will explore the properties of the activation function. Specifically, the aim of this exercise is to let you play around with the parameters in the following logistic activation function:



In this function, the activation level can be described by a logistic function. However, it might be hard to image how activation and input in a unit are related. To visualize this, we made a program that lets you define values for the three parameters we see in the formula: β, ini, and θ.

Steps to use the program:

1. Download ‘exc\_01.exe’
2. Open command prompt (Windows) / terminal (Mac / Linux)
3. Type ‘cd’ followed by the path to ‘exc\_01.exe’ in the prompt and hit enter
   * Example of how this more or less looks:
     + C:\Users\Pieter>cd C:\Users\Pieter \Modeling\code\exercises ch04
4. Type ‘python exc\_01.exe’ and follow the instructions provided by the program

**Exercise 01: objective:**

Explore the impact of different parameter values. Study the plots resulting from the .exe file thoroughly until you understand how input is transformed to a certain activation level using an activation function. Also note that different activation function are available, so the input can be transformed in different manners depending on the modelers approach to this!

Oefening 2:

The following setup works:  
  
Input pattern:  
 [0.99 0.01 0.99 0.01 0.99 0.01]   
Output pattern:  
 [0.99 0.99 0.01 0.01]  
Original weight matrix:   
 [[0.71, -3.26, -1.29, -2.81, -2.47, 1.51], [1.88, -4.77, -4.32, 1.64, -2.2, 1.56],   
 [-3.33, -2.05, -1.24, -1.64, 4.96, -3.97], [0.53, 3.55, 1.07, -0.12, -4.83, -2.53]]  
Define a constant which influences how large the weight change each trial will be: 1.5