# MF850

## Problem Set 5

**Due date:** See Blackboard.

**Instructions:** You submit on Blackboard. You may solve this assigment in groups of two. A submission is constituted by answers to the problems along with the code used. A file called `hw5.py` should contain your code, or your entry point if you separate your code into multiple files. This file should run without errors from a fresh instance/REPL. In other words, submissions in notebook format are not accepted (but you may of course develop in them before creating the submission).

Please contact the instructor or a TA if you have questions regarding these instructions or if you find the problem formulation unclear.

**Problem 5.1** The goal of this problem is to accomplish overfitting to get a feeling for how it can happen.

(a) Train a neural network on a dataset `hw.make_dataset()` to $\geq 98\%$ accuracy.

What is the test set performance? You can get a test set by `hw.make_dataset(test=True)`.

*Hint:* You can reuse your or my code from the previous homework.

*Hint:* You can call `hw.make_dataset(version=x)` for values `x in range(3)`. This gives a consistent dataset for consistent choices of `x`.

(b) Illustrate which points in the training and test sets that are correctly classified using a scatter plot.

(c) Illustrate the decision boundary, i.e., the line separating the two predictions by your model.

*Hint:* Using `numpy.meshgrid` to create points in which to evaluate your model. Classify each of the points as 0 or 1 and plot using `pyplot.contourf`.

(d) Can you create a better classifier manually?