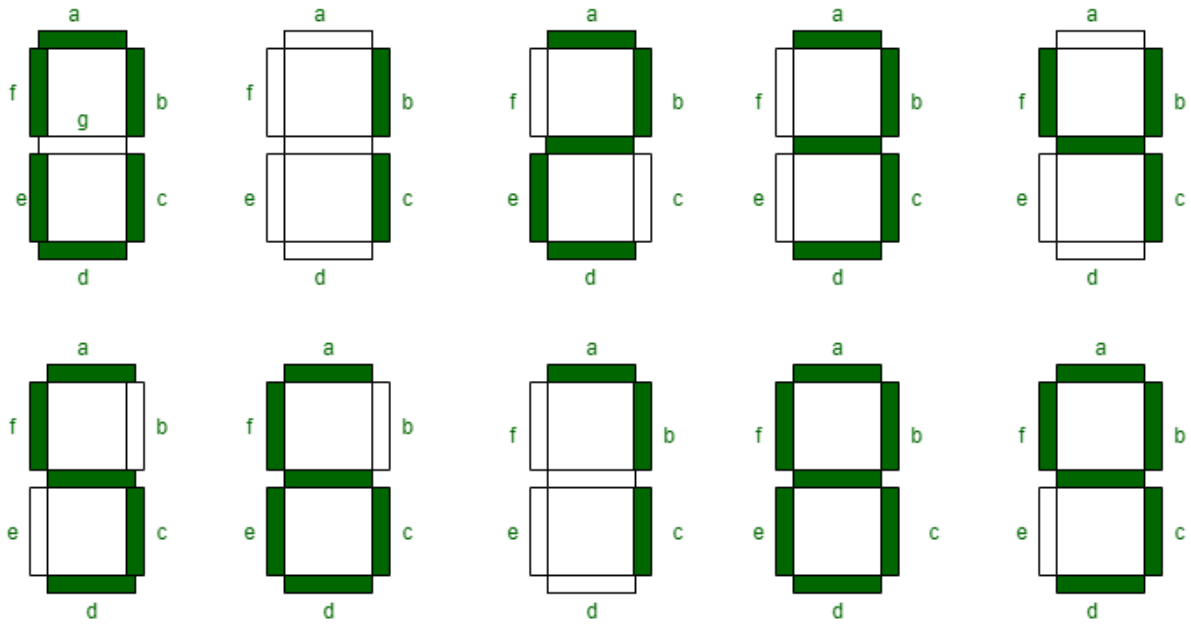
CS401: Machine Learning & AI

Assignment 4: Learning to classify 7-segment LED digits



This assignment involves modifying the Pluto notebook “Simple NN.jl” along the lines described below.

The task

The 10 digits 0 to 9 can be represented on an LED using the above pattern of segments. Your task is to train a neural network to take a binary representation of the display as input and produce the number it represents as output. For example, the number “1” can be represented as the seven-element integer vector [0 1 1 0 0 0 0], “2” as [1 1 0 1 1 0 1], and so on. The output classification can be represented as a 10-element vector, such that the input representing “2” will produce the output vector [0 0 1 0 0 0 0] and a “3” input will give an output of [0 0 0 1 0 0 0]. Note that the elements of the output vector can be within a 0.1 tolerance of the target value.

You will need to:

(1) Modify the network architecture to allow a 7-bit input and a 10-bit output;
(2) Modify the training loop so that the 10 vectors representing each LCD display are randomly presented during a given training iteration;

(3) Note that the shape of both the input and output data is different from the sine example used in the original notebook, so the training code will need to be modified to deal with this;
(4) Create a visualisation of the network's performance using the HTML controls feature.

Upload

You should submit two files: (1) a PDF of the completed notebook, and (2) the ".jl" version of the notebook.

The following naming convention MUST be used:
<given name>_<family name>_<student ID>_assign_1.pdf
<given name>_<family name>_<student ID>_assign_1.jl

So, in my case this would be:
ronan_reilly_12345678-assign_1.pdf
ronan_reilly_12345678-assign_1.jl