

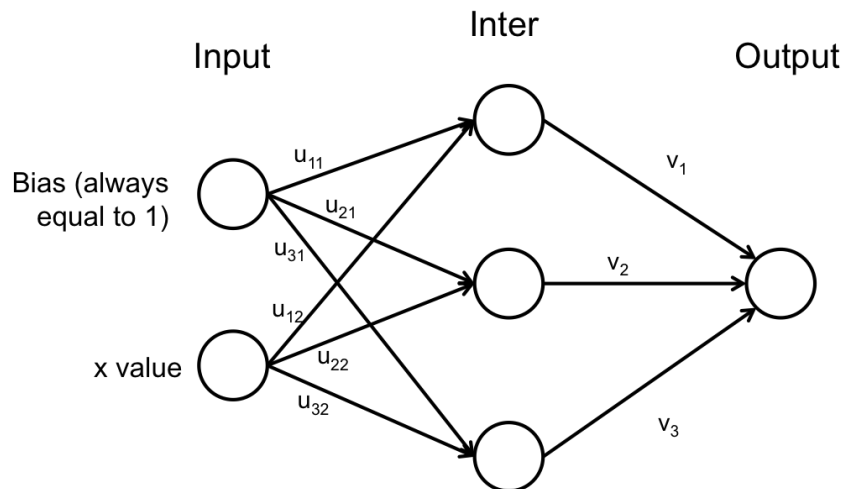
Seminar Week 4: MLP

The point of today's seminar is to implement a MLP that will be able to fit the function:

$$y = 0.6 + \frac{1}{4}\sin(2\pi x) + \frac{1}{4}\cos(4\pi x)$$

1) Create 100 random points x between 0 and 1 and compute the associated y values. Add a little Gaussian noise with standard deviation 0.025 and plot those points on a graph. Complete the first subsection of the Matlab template file (`template.m`) provided.

2) In the second subsection we have started to implement the forward phase of the MLP and the computation of the error. We use only one hidden layer made of $nb_state = 3$ nodes. Please complete the template so that you propagate forward the values. We have used the architecture and notations shown in the Figure below. The sigmoid function is already implemented (referred to as function `g`) and its code is in file `g.m`.



3) Now that you have a working version of the forward phase, you have to implement a working version of the backward phase and of the weight update. Please complete the third subsection of the Matlab template. The error has been given to you. If you implemented it correctly you should see that the error is decreasing until the red dots fit the blue dots. You can use "control + enter" to run the subsection many times. The derivative of the sigmoid function is already implemented (referred to as function `g_diff`) and its code is in file `g_diff.m`.

4) What are the values of the learning rate, η , that you should use? Try decreasing this value. If you want to accelerate the process you can set `nb_iter` to a higher value. Try to figure out manually the best way to have the red dots converge to the blue dots. Create a new subsection and figure out a way for the code to stop automatically when you are happy enough with your manual implementation.

5) Now try also to change the number of states of the hidden layer, it is called `nb_state` within the second subsection. Try with values from 1 to 5. What do you see? How do you understand it?

6) Is this batch or sequential? Please implement the batch version if you think it is sequential, and the sequential version otherwise.