# AI Methods

# Coursework 2

The coursework should be handed into the Documentation Administrator (Wendy Field) by 3:00pm on Thursday 30th April 1998.
***Every*** page should have on it

- The page number
- Your name
- Your login
- The course code and name (i.e. G5BAIM – Artificial Intelligence Methods (AIM)).
- The lecturers name (i.e. Graham Kendall)

## Assignment

Given the following truth table

| | | | | |
|---|---|---|---|---|
| Input | 0 | 0 | 1 | 1 |
| Input | 0 | 1 | 0 | 1 |
| Required Output | 0 | 1 | 1 | 1 |

You should show how a perceptron can learn to produce the required outputs. In doing so assume the following

- There are three input neurons ($i_0..i_2$). $i_0$'s activation is always –1.
  The activation of $i_1$ and $i_2$ is set to the relevant input values from the truth table.
- There is one output neuron; O.
- The initial weights, $w_0..w_2$, are 0.3, 0.2 and 0.1.
- The learning rate is set at 0.1
- The activation of the output unit is defined as follows

$$O = Step_0\left(\sum_{j=0}^{2} I_j W_j\right)$$

Where $Step_0(x)$ is defined as returning 1 if x>0 else return 0

1. Show the following figures for each stage of learning
   - The Epoch Number
   - The values of $i_0..i_2$
   - The required output
   - The values of $w_0..w_2$
   - The value received by the output neuron; O
   - The value returned from the $step_0(x)$ function
   - The error value produced (using the calculation shown in the lectures and in the notes)

   Produce your answer in a format similar to this

| **Epoch** | **$I_0$** | **$I_1$** | **$I_2$** | **Reqd Output** | **$W_0$** | **$W_1$** | **$W_2$** | **O** | **$Step_0(x)$** | **Error** |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -1 | 0 | 0 | 0 | -0.2 | 0.5 | 0.3 | ?? | ?? | ?? |
| Etc. | | | | | | | | | | |

   Produce a graph showing where the linear separability line currently lies before training begins and after each epoch.

2. What is the effect if you change the learning rate to 0.05 and 0.2?
3. What is the effect of changing the required output for the [1,1] input to zero.