5. Can Perceptrons Identify Scale Tonics?

5.1 Issue

The lecture indicates that perceptrons can 'classify patterns'. How can one take advantage of this possibility? We will explore this issue by showing how 'pattern classification' can be operationalized into 'identifying the tonic note of a major or of a harmonic minor scale'.

5.2 Task

The purpose of this activity is install the Rosenblatt software from the website, and then to use it to explore the kind of perceptron that might be capable of taking a scale as input, and responding with the tonic of that scale. A short lecture will begin the activity so that this task makes sense.

5.3 Materials

Ideally students will bring to class a portable computer that they will be using through the term for the exercises. Students who do not bring their computer to class will observe the software installation on another computer. Students who do not bring their computer to class will be able to use the software installed on the satellite machines in BSB P-116. Other materials – in particular the training set – are available from Week 3 of the course website.

5.4 Procedure

All software is available from links that appear on the home page for the course exercises. Students will be directed to the URL of this material: http://www.bcp.psych.ualberta.ca/~mike/Book3/Exercises/index.html . Students will then download and install the Rosenblatt software following a similar procedure to that used to install the James software earlier in the course.

5.4.1 Go to Week 3 of the website and (if necessary) download the file ScaleTonic.net. The instructors will provide information about the best location for saving this file.

5.4.2 Open the Rosenblatt program. Load the ScaleTonics.net training set. Proceed to the next phase of the program by pressing the button for setting training parameters.

5.4.3 Select the radio button for 'Gradient Descent Rule (Gaussian output)'. Select the radio button for 'Hold Thresholds Constant'. All other settings can remain at their default values. Press the 'Start Training' button. Does your network converge? How long does it take to do so?

5.4.4 Press the 'Test Recall' button. Double click the line at the top that reads 'Create A Summary In Excel'. Remembering that Input 1 is 'A', Input 2 is 'A#', and so on up to Input 12 is 'G#', examine the connection weights. Is your perceptron discovering a similar solution to the problem that was discovered by the perceptron in the mini-lecture? Answering this question might require you to play around in Excel for a bit!

5.4.5 Go back to the program and try running it with different settings. Can other activation functions solve this problem? If so, do they arrive at a similar solution?

5.4.6 Class discussion and conversation throughout this exercise is expected!