PSYCHOLOGY 452 MIDTERM EXAM
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Part I: *Choose any TEN of the following terms, and write a short (2-3 sentence) definition for each. The definition should indicate what the term means, and should also indicate why the term is important to or of interest to cognitive science. Remember, ONLY 10 DEFINITIONS are required. Each definition is marked out of 3 points.*

Pattern Space	Error Space	Bias (of an activation function)
Value Unit	Integration Device	Threshold Device
Network "Energy"	Inner product of two vectors	Delta Rule
Gradient Descent Rule	Hebb Learning	Distributed Associative Memory

Part II*: Choose any one of the following questions, and write a short answer (3-4 pages) for it. Make sure that your answer is clear and concise, and also make sure that you deal with the question directly. Your answer will be marked out of 35 points.*

1. Galileo wrote that "Philosophy is written in that great book which ever lies before our eyes ... We cannot understand it if we do not first learn the language and grasp the symbols in which it is written. The book is written in the mathematical language". At the computational level, it is clear that artificial neural networks are mathematical objects. What are the advantages of using mathematics to describe these networks? What can we learn about networks that would otherwise be hidden had not mathematics been used? Illustrate your answer with examples.

2. Consider the following algorithmic level issue: A researcher is faced with solving a pattern classification problem, and has decided to use a connectionist model. However, the researcher cannot decide between using a Hopfield network and a distributed associative memory. In your capacity as a consultant to this scientist, discuss the pros and cons of both architectures, in the context of various factors that the scientist must face before a final decision about network type can be made. Illustrate your answer with examples.

3. At the implementational level, connectionists would argue that their approach to cognitive science is far more biologically plausible than that of classical cognitive scientists. Critically evaluate the pros and cons of this position, given your advanced understanding of a variety of different neural network architectures. Illustrate your answer with examples.