

OLLSCOIL NA hÉIREANN GAILLIMH
NATIONAL UNIVERSITY OF IRELAND GALWAY

WINTER EXAMINATIONS 2002

Third B.A. University Examination in Information Technology
Third B.Sc. University Examination in Biomedical Science
Higher Diploma in Applied Science (Software Design & Development)

Artificial Intelligence (CT319)

Professor D. Bell
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Dr. A. Golden

Time allowed: **Two hours**

Answer 3 questions. All questions carry equal marks

1. You work for an organisation that wishes to develop a portable biomedical device that monitors patient stress based on measurements of blood pressure, heart rate, and skin conductivity - each of these three variables is measured electronically every 30 seconds and results in specific numbers (such as upper and lower blood pressure in mmHg, beats per 30 seconds and voltage per 30 seconds respectively). In particular your peers want to develop an automated system that can detect the subtle variations in these three parameters that signify genuine 'stress', as distinct from e.g. somebody running up the stairs. Discuss in some detail the design, development and implementation of a specific Neural Network based solution to using this biomedical device, indicating the reasons for your particular recommendation.
2. The Student Health Unit is generally extremely busy during the year, despite the fact that they operate a 'triage' system, where in the first instance a student making an enquiry first of all talks to a nurse, and then, if necessary, sees one of the Unit's GPs. One possible solution to increase the efficiency of the Unit would be to set up a web-based automated 'diagnosis' system. Students waiting to see the nurse, and who aren't clearly in serious difficulties, could communicate with the diagnosis system, which could then provide (i) a check list of answers to common questions for the nurse (ii) suggest potential ailments to the nurse and (iii) make a recommendation if the student should see the doctor immediately (for instance if the symptoms are consistent with meningitis). Discuss in some detail the design, development and implementation of an appropriate Rules Based Expert System solution to this, indicating the reasons for your particular recommendation, and discussing how the student would interact with the Expert System.
3. In many ways the discipline of Artificial Intelligence has become fragmented into different areas of study as regards cognitive function - from low level neurological emulation to high level knowledge representation and symbolic computation. Is this 'fragmentation' justified or is it possible to develop an integrated model of AI given certain conditions?

4. Show, using the basic example of the logic inclusive OR circuit how a Neural Network's components function, and how 'learning' occurs. Explain the difference between supervised and supervised methods of learning as regards Neural Networks Compare and contrast the Back Propogating and Kohonen Self Organising Map algorithms in contemporary neural network design.
5. Explain what is meant by the 'forward' and 'backward' chaining processes in Expert Systems, and give some idea of where each 'inference' approach would be more suitable. Outline the differences in 'cognition function' between a Neural Network, and a Rules Based Expert System.