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Engineering, Built Environment and IT
Department of Computer Science

COS 314

Tutorial 1

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We have discussed various AI techniques such as expert systems, neural networks, amongst others. For each of the following state which AI technique or combination of AI techniques will be the most appropriate to solve the problem. Substantiate your choice in each case:

Questions

1. A system that identifies South African bird species. The system must take in characteristics of the bird to be identified, e.g. colour of feathers, and output the species of the bird (3 marks).
   Sol: *The problem can be solved using an Expert System (2) emulating a South African bird ornithologist. The system input requires very specific bird species characteristics which only an expert would know hence the justification on the application of an expert system. The system will use the characteristics which are specific domain knowledge and cannot be generalised from and thus requires deductive reasoning to arrive at conclusions(1).*

2. A program that recognises musical symbols that have been scanned in from a hand-written music sheet. This program will form a component of a system to convert hand-written musical sheets to digital form. (3 marks)

3. Develop an intelligent computer technician tutor component which generates solutions to problems presented to students. There are two types of questions that students are tested on. The first is of a diagnos- tic nature, given a particular scenario regarding a computer problem, the student must explain in detail how the problem can be solved. The second type of problem requires the student to produce an algo- rithm in a programming language to perform a particular task, given a programming problem specification. (4 marks).

4. A system that recognizes different species of flowers that are scanned in from photographs of the flowers. For each photograph the system must output the type of the flower, e.g. rose, azalea. (3 marks)

5. Develop a system for Malware detection. Malware detection involves determining whether a piece of software (submitted as a file) is malicious or not. The system will firstly be trained using a training set. The training set will contain software and an indication whether the software is malicious or not. The system must learn from this training set and be able to predict whether new software presented to the system is malicious or not. (3 marks).

6. Develop a program for a logistics company that works out a schedule for deliveries for each of the drivers. The program will be used on a hand-held device. This company services the entire country and each driver works in a particular region. Each schedule derived by the program should specify stay-overs and minimize the amount of time the drive spends on the road. The program should also provide a route finding facility that helps the driver plan out the route that will be taken. (4 marks).

7. For each of the following determine as required. (7 marks)

   i) The left-handed golfers I know use left-handed golf clubs. Therefore all left-handed golfers use left-handed golf clubs. (Inductive or Deductive).

ii) Simba is a free range lion. Simba is happy. All free range lions are happy. (Inductive or Deductive).

iii) Simba is a free range lion. All free range lions are happy. Therefore Simba is happy. (Inductive or Deductive).

iv) All of our rain comes from the north. Its raining now. The rain came from the north. (Inductive or Deductive).

v) Most of our rain comes from the north. Its raining now. The rain must have come from the north. (Inductive or Deductive).

vi) All kids like ice-cream. Anele likes milkshakes. Anele is not a kid. (valid or invalid Deduction)

vii) All actors are handsome. Johannes is handsome. Johannes is an actor. (valid or invalid Deduction)

8. Given that a robot that has been built to climb an artificial tree has 2 sensors. A sensor that detects the brightness level at the current branch and a sensor that detects if the current branch is the branch where a bag of gold is hung on. The brightness level of a branch is related to the proximity of the bag of gold as follows: Branches having a distance of 3 steps or less from the bag of gold have a brightness level of 5. All other branches have a brightness level of 0.
   Given the above scenario, is the environment: (4 marks)

   a) static or dynamic ?

   b) deterministic or non-deterministic ?

   c) discrete or continuous ?

   d) observable or partially-observable ?