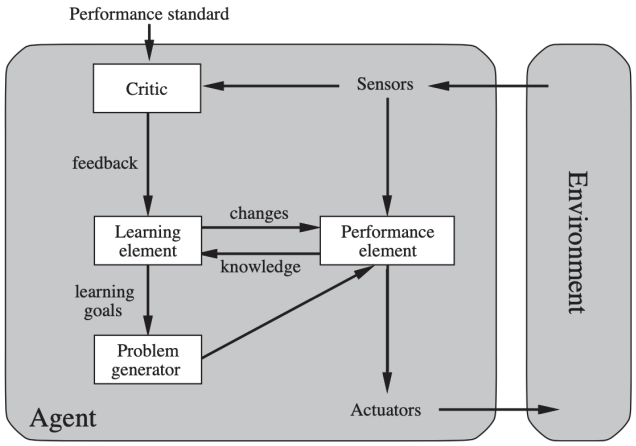
ARTIFICIAL INTELLIGENCE COMP813

AUCKLAND UNIVERSITY OF TECHNOLOGY
M4 EXERCISES

Learning Approaches

Question 1. *Learning problems*

The following is a general model for a learning agent. Use the key elements in this model to discuss two learning problems given below.



(a) Consider the problem faced by an infant learning to speak and understand a language. Explain how this process fits into the general learning model. Describe the percepts and actions of the infant, and the types of learning the infant must do. Describe the subfunctions the infant is trying to learn in terms of inputs and outputs, and available example data.

(b) Discuss the case of learning to play tennis (or some other sport with which you are familiar). Is this supervised learning or reinforcement learning?

Question 2. *Consider the following data set comprised of 4 binary input attributes (A1, A2, A3, and A4) and one binary output:*

Example	$A1$	$A2$	$A3$	$A4$	y
x_1	*1*	*0*	*0*	*0*	*1*
x_2	*1*	*0*	*1*	*1*	*1*
x_3	*0*	*1*	*0*	*0*	*1*
x_4	*0*	*1*	*1*	*0*	*0*
x_5	*1*	*1*	*0*	*1*	*1*
x_6	*0*	*1*	*0*	*1*	*0*
x_7	*0*	*0*	*1*	*1*	*1*
x_8	*0*	*0*	*1*	*0*	*0*

Use the algorithm in the lecture to learn a decision tree for these data. Show the computations made to determine the attribute to split at each node.

Question 3. *Weka - A machine learning app*

(a) *If necessary, install Weka on your machine. If you are using an AUT machine, Weka might have been already installed. You can find Weka easily by searching for it, and it is freely available.*

(b) *Convert the data below into* `.arff` *format. You can find information about this by going to* `http://www.cs.waikato.ac.nz/~ml/weka/arff.html`. *Make sure that your result has a* `.arff` *extension* only*, or Weka will not be able to recognize it.*

Example	A_1	A_2	A_3	A_4	y
x_1	*1*	*0*	*0*	*0*	*1*
x_2	*1*	*0*	*1*	*1*	*1*
x_3	*0*	*1*	*0*	*0*	*1*
x_4	*0*	*1*	*1*	*0*	*0*
x_5	*1*	*1*	*0*	*1*	*1*
x_6	*0*	*1*	*0*	*1*	*0*
x_7	*0*	*0*	*1*	*1*	*1*
x_8	*0*	*0*	*1*	*0*	*0*

(c) *Open Weka, and click on the Explorer button. Then, go to the Preprocess tab, and click Open File. Find your file and load it.*

(d) *Go to the Classify tab. Under 'Classifier', click the Choose button, and find the ID3 algorithm. Under 'Test options', select 'Use training set'. Then click on 'Start'.*

Hint: if ID3 is not available by default, you just need to install the simpleEducationalLearningSchemes package. See more details here `https://stackoverflow.com/questions/48888463/weka-3-8-package-installation-what-are-the-steps-to-add-id3`

(e) *Make a decision tree of the data given in this question by hand. Compare your tree with the one generated by Weka. How do they differ?*