Artificial Intelligence: Assignment 5

Due date: March 29 (Wednesday)

Problem 1 (2 points)
Read Chapter 18 and answer the following questions:
(a) What are the main advantages and drawbacks of using Occam's razor in learning?
(b) What are the main limitations of the decision-tree learning?

Problem 2 (3 points)
Suppose we are trying to learn the concept of "scientist," based on the following examples:

	IQ	good hacker?	has publications?	hobby
positive	160	yes	no	sci-fi
positive	100	yes	no	music
positive	100	yes	yes	tennis
positive	160	no	yes	tennis
positive	130	yes	yes	tennis
positive	100	yes	yes	music
positive	130	no	yes	music
positive	160	no	no	music
positive	160	yes	yes	sci-fi
negative	130	yes	no	sci-fi
negative	130	no	no	sci-fi
negative	100	no	yes	tennis
negative	130	yes	no	music
negative	100	no	no	music

Use these data to construct a decision tree; you should compute the information gains to decide which attributes are more important. For each node of the tree, indicate the corresponding information gain.

Problem 3 (5 points)
Implement a program for building decision trees. It should read a file with training and test examples, use the training examples to build a tree, and then classify the test examples. The only required output is the classification of the test examples; it does *not* have to include the tree itself. The input format is as follows:

```
<classification> <attribute> <attribute> ... <attribute>
   ...
<classification> <attribute> <attribute> ... <attribute>

<attribute> <attribute> ... <attribute>
   ...
<attribute> <attribute> ... <attribute>
```

The training examples are above the blank line, and the test examples are below. `<classification>` is either "`positive`" or "`negative`," and each `<attribute>` is a string of lower-case letters. The length of an attribute is at most twenty characters; successive attributes are separated by one or more spaces. For instance, the following file includes three training examples and two test examples:

```
positive   smart     hacker     nopapers   scifi
positive   average   hacker     papers     music
negative   average   nohacker   nopapers   music

average   hacker     papers     music
smart     nohacker   nopapers   scifi
```