CS499
Assignment 5
Nov 15, 2006

1. This assignment is worth 10% of your overall course grade.

2. The assignment is in two parts. **Part (a) is due Nov 20.** Part(b) is due Nov 29.

3. This assignment must be done individually. Please do not discuss either the questions or answers with others.

PART A: TRIAL WRITEUP (10 Points)
As part of this assignment you will be assigned to a team. Each team will be assigned to argue either the pro or con of one of these two issues:

i. Is commander Data intelligent? self-aware? sentient?

ii. Does Commander Data have rights? If Data creates art, who owns it? If Data kills someone, who is responsible?

We have handed out to you some cards, with numbers. Here is how to tell what team you are part of based on these numbers:

1. PRO (i)
2. CON (i)
3. PRO (ii)
4. CON (ii)

As homework, you need to read 2 readings from the list provided below, at least one must be non-Asimov. Then, write a short (roughly half a page) list of three supporting arguments for the position you have been assigned. Your arguments can either be direct support or refutations of likely counter-arguments that the opposing team will make. For each of your points, please provide some support based on a reading. 1 point of extra credit can be earned on this assignment if you bring in an additional credible source to support your argument and provide a citation.
Here is a list of suggested readings. They have been grouped roughly into the positions they would be useful for. However, you can read items from other groups and use parts of them to support your position or make counter-arguments to their points in order to support your position.

**PRO Intelligence (i)**
- Turing’s “Computing Machinery and Intelligence”
- From our Asimov book
  - Our intelligent tools
  - Intelligences together
  - The laws of humanics
  - Cybernetic organism

**CON Intelligence (i)**
- Searle’s “Minds, brains and programs”
- Nagel’s “What it’s like to be a bat?”
- Turing’s “Computing Machinery and Intelligence” – common counterarguments are presented.
- Roger Penrose “Can a computer have a mind”

**PRO Rights (ii)**
- Transhuman democracy
- Citizen Cyborg
- From our Asimov book
  - Bicentennial Man
  - Evidence

**CON Rights (ii)**
- From our Asimov book
  - Robots I have known
  - Future Fantastic
  - The Friends we make

This half page writeup is due Monday Nov 20 before the start of the trial. In addition, participation in the trial will be worth 2 points towards assignment 5a.
PART B: (4 pts)

Question 1.

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Suppose a decision tree learner is used to learn a decision tree from that data. There are three attributes, A, B and C. The teacher indicates based on the value of the attributes if the case is either “Flag” or “No Flag”. Please explain which attribute will be selected to be at the root of the decision tree and why.

In the interest of simplifying calculations, please feel free to use the following approximations:

\[
\log_2 (1/3) = -3/2 \\
\log_2 (2/3) = -3/5 \\
\log_2 (3/4) = -1/3
\]
PART B:

Question 2: (4 pts) Suppose an attribute A subdivides the training set of examples “TRAIN-SET” into 2 subsets. Each subset, TS-i, has Pi positive examples and Ni negative examples, such that the following condition holds:

\[ \frac{P_1}{P_1+N_1} = \frac{P_2}{P_2+N_2} \]

What is the information gain in choosing A as the root of the decision tree?

What if there are k subsets and not just two subsets. What would be the information gain due to choosing attribute A as the root, if for any two subsets Ts-I and Ts-j of these k subsets: (extra credit 2 pts)

\[ \frac{P_i}{P_i+N_i} = \frac{P_j}{P_j+N_j} \]