

Final Exam 2012

ARTIFICIAL INTELLIGENCE

Questions: 5 – Total marks: 10 – Time: 120 minutes – Open book

Question 1 (4 marks): Consider the following statements:

- For the AI course at HCMUT, a student obtains a good final result if he/she performs well in the tutorials and the assignments.
- A student performs well in the assignments if he/she does so in the tutorials.
- John does not obtain a good final result.
- Mary performs well in the tutorials.

- (a) Represent these statements using predicate logic. (1 m)
- (b) Convert the obtained formulas into the conjunctive normal form. (1 m)
- (c) Use the refutation-resolution method to:
 - Prove it is not true that John performs well in both the tutorials and the assignments. (1 m)
 - Find who obtains a good final result. (1 m)

Question 2 (1 mark): Use existential graphs and their inference rules to prove the soundness of the resolution rule in propositional logic. That is to prove that $(P \vee Q)$ and $(\neg P \vee R)$ derive $(Q \vee R)$.

Question 3 (3 marks): For a Game Programming competition in the AI course at HCMUT, the performance of a program developed by a team depends on how well the team members learn about game algorithms in the course and how good their programming skills are. Actually, good programming skills are helpful for students to learn game algorithms. Statistical data show that 80% of those teams whose members learn well game algorithms and have good programming skills produce good game programs. Meanwhile that percentage is only 20% for those whose members only learn well game algorithms or only have good programming skills, and drops to 10% for those whose members are bad in both. Besides, for the percentage of teams whose members learn well game algorithms, it is 70% among those whose members have good programming skills, but it is only 50% among those whose members are not good in programming. In fact 90% of teams participating in the competition have their members with good programming skills.

- (a) Construct a Bayesian network from these statistical data. (1 m)
- (b) How likely does a team perform well in the competition if its members have good programming skills? (1 m)
- (c) What is the probability that the members of a team learn well game algorithms, given a good performance of that team in the competition? (1 m)

Question 4 (1 mark): Propose a voting model of 10 voters for the concept “tall person” in Vietnam and derive the corresponding fuzzy set. For the domain of the fuzzy set, assume a discrete height range from 0 to 2 meters, with the step of 0.1 meter each.

Question 5 (1 mark): As given in the table below, the signs of a bottle of fake wine are shown by the presence/absence of a quality label on the bottle, the color, scent, and taste of the wine. Use the candidate-elimination algorithm to learn the concept FAKE WINE. Are the obtained hypotheses consistent with the given data? Explain your answer.

No.	Quality Label	Color	Scent	Taste	FAKE WINE
1	No	Clear	Sour	Inspid	Yes
2	Yes	Clear	Sour	Inspid	Yes
3	No	Turbid	Fervid	Acrid	No
4	Yes	Clear	Fervid	Acrid	No
5	No	Turbid	Sour	Inspid	Yes

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