

COSC 4368: Fundamentals of Artificial Intelligence
Problem Set 3
Fall 2023

Submission deadline: December 4th, 2023 (until 11.59 pm)

Instruction: submit a report for the two tasks and no coding is required

1) Ethical and Societal Problems of AI (30 points)

Write a short essay of 480-600 words, focusing on the ethical and societal aspects of AI systems. You can choose one from the following topics:

- (a) AI is powerful, but the unethical use of AI can be very harmful. For instance, the AI system can be leveraged to unfairly discriminate against individuals or groups, and it may also leak the privacy of personal data. How should we make AI more ethical?
- (b) Good use of AI can make our society much better in many aspects, e.g., public health, food and poverty. Think about some specific societal problems where AI can be helpful and describe how.
- (c) AI has already emerged in college education. Do you think that AI should be used in the class?

Please read the following evaluation and grading criteria for essays carefully.

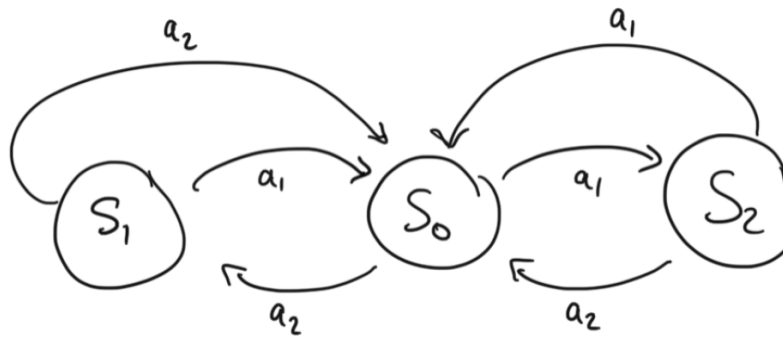
http://facultyweb.ivcc.edu/rrambo/eng1001/evaluation_criteria.htm

Grading: Each of the following categories will be scored on a 0 to 100 scale for your essay; the overall score will be computed as the weighted sum of those scores; finally, $\text{weighted_sum} * 30/100$ will be recorded as your essay score.

- 1. Thesis and Thesis Statement (26%)
- 2. Organization (7%)
- 3. Support and Development of Ideas (18%)
- 4. Insight into the Subject (18%)
- 5. Clarity (12%)
- 6. Style (7%)
- 7. Mechanics (12%)

2) Dynamic Programming for Reinforcement Learning (15 points)

Consider the following MDP:



- The actions have a 0.8 probability of success and with 0.2 probability we remain in the same state. For instance, taking the action a_1 at state s_1 will lead to state s_0 with probability 0.8 and lead to the same state s_1 with probability 0.2; taking the action a_2 at state s_1 will lead to state s_0 with probability 0.8 and lead to the same state s_1 with probability 0.2.
- The immediate reward $R_t = 1$ for all transitions that end up in s_0 , and $R_t = -1$ for all other transitions.

Questions: Evaluate the policy (consider a discount factor $\gamma = 0.9$) based on Bellman Equations

- 1) What is the value function v_π for policy $\pi(s) = a_2$ for any state s ?
- 2) What is the value function v_π for the uniformly random policy (taking every action with equal probability at every state)?
- 3) Same policy evaluation problems for $\gamma = 0.0$? (What do you notice?)