

Homework 1 (15 points)

Due 09/10/20 before class

Note: Clearly justify your answer to each of the following questions. For this homework assignment, all the questions are required for both undergraduate and graduate students.

1. Episodic vs. continuing tasks (5 points)

Consider a Markov decision process in which one is interested in maximizing the total expected return (i.e., $\gamma = 1$). However, suppose that at the end of each time step there is a probability $\alpha > 0$ that the process ends. Show that this is equivalent to using an infinite-stage discounted-return criterion.

2. Asset Selling (10 points)

Consider the problem of selling an asset over multiple periods. At each period an offer becomes available. We assume that offers at different periods are independent and that they can take n values v_1, \dots, v_n with corresponding probability p_1, \dots, p_n . The process continues until an offer is accepted. The return for selling the asset in period k at a price v is $\gamma^k v$ where γ is a discounted factor. The objective is to maximize the expected discounted return. Model the problem as a Markov decision process. Clearly define the state space, the action space, the transition probabilities, and the reward function. Give the Bellman optimality equation for solving the optimal value function.