# Homework #2

# TD( λ )

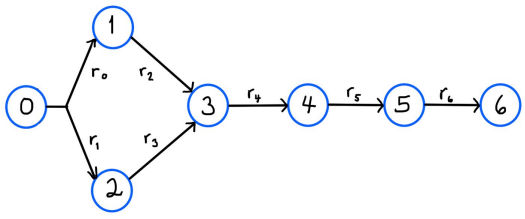
## Problem

### Description

Recall that the TD( λ ) estimator for an MDP can be thought of as a weighted combination of the k-step estimators $E_k$ for k ≥ 1.

$$TD(\lambda) = \sum_{k=1}^{\infty} (1-\lambda)\,\lambda^{k-1} E_k$$

Consider the MDP described by the following state diagram. (Assume the discount factor is $\gamma = 1$.)




### Procedure

- Find a value of λ, strictly less than 1, such that the TD estimate for λ equals that of the TD(1) estimate. Round your answer for λ to three decimal places.
- This HW is designed to help solidify your understanding of the Temporal Difference algorithms and k-step estimators. You will be given the probability to State 1 and a vector of rewards [r0, r1, r2, r3, r4, r5, r6]
- You will be given 10 test cases for which you will return the best lambda value for each. Your answer must be correct to 3 decimal places. You may use any programming language and libraries you wish.

## Examples

The following examples can be used to verify your calculation is correct.

- Input: probToState = 0.81, valueEstimates = [0.0, 4.0, 25.7, 0.0, 20.1, 12.2, 0.0], rewards = [7.9, -5.1, 2.5, -7.2, 9.0, 0.0, 1.6], Output: 0.6227
- Input: probToState = 0.22, valueEstimates = [0.0, -5.2, 0.0, 25.4, 10.6, 9.2, 12.3], rewards = [-2.4, 0.8, 4.0, 2.5, 8.6, -6.4, 6.1], Output: 0.4956
- Input: probToState = 0.64, valueEstimates = [0.0, 4.9, 7.8, -2.3, 25.5, -10.2, -6.5], rewards = [-2.4, 9.6, -7.8, 0.1, 3.4, -2.1, 7.9], Output: 0.2055

## Resources

The concepts explored in this homework are covered by:

- Lectures
    - Lesson 3: TD and Friends
- Readings
    - Sutton (1988)

## Submission Details

### The due date is indicated on the Canvas page for this assignment.

Make sure you have set your timezone in Canvas to ensure the deadline is accurate.

To complete the assignment calculate answers to the specific problems given and submit the results on Canvas. You have a maximum of 10 attempts.