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"...dare to dream; care to win..."

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EE932 Assignment-2 Solution

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eMasters in Communication Systems, IITK
EE932: Introduction to Reinforcement Learning
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Question 4:

Suppose γ = 0.9 and the reward sequence is R_1 = 2 followed by an infinite sequence of 7, 7, ... What are G_0 and G_1?

Solution:

$G_1 = R_2 + \gamma R_3 + \gamma^2 R_4 + \gamma^3 R_5 + \cdots \infty$

$\Rightarrow 7 + 0.9 * 7 + 0.9^2 * 7 + 0.9^3 * 7 + \cdots \infty$

$= 7 + 7[0.9 + 0.9^2 + 0.9^3 + \cdots \infty]$ – Geometric series of 0.9

Sum of Geometric series of $n + n^2 + n^3 + \cdots \infty = \frac{n}{1-n}\ if\ |n| < 1, n$ is the ratio of a term to its previous

In this case n=0.9<1

$\therefore G_1 = 7 + 7 * \left[\frac{0.9}{1 - 0.9}\right] = 7(1 + 9) = 70$

$\boldsymbol{G_1 = 70}$

$\boldsymbol{G_{t-1} = R_t + \gamma G_t}$

$G_0 = R_1 + 0.9G_1 = 2 + 0.9 * 70 = 65$

$\boldsymbol{G_0 = 65}$

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