Project Proposal
STAT 447C

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Overview: Basic Requirements

(Verdugo 2024) []

Team: The team will contain me (and nobody else.)

Project Themes: From the List

The project will be investigating the "Bayesian vs Frequentist" paradigm, specifically with the context of Reinforcement Learning.

This comparison will be conducted by writing a posterior inference-based method from scratch. The proposal includes a "Toy Example" of this process for the data type in question. Effectively, this also tackles Bayesian inference method over a non-standard data type.

So, in short, the project themes being addressed are "Bayesian vs Frequentist," "Bayesian inference method over a non-standard data type" with the implementation being an idea I had inspired by some similar works in the field. The "baseline" to which it will be compared is a standard frequentist reinforcement learning method. I have already implemented this in R as a weekend project to be better-prepared. In addition I have developed some Python scripts for parsing the data type in question into a utilizable structure.

Repository

There is a working link to a public repo containing commits from all team members.

Click here for the link to my entire 447 Repository.

Overview: Project

The idea behind this project is to experiment with an implementation of Bayesian Q-Learning as explored in (Dearden, Friedman, and Russell 1998), and contrast its performance in environments of varying complexity against a frequentist counterpart. Specifically, we will contrast the Bayesian method to the "classical" example presented in (Watkins and Dayan 1992), with a Boltzmann exploration policy with temperature as a hyper-parameter to the model, see (Tokic and Palm 2011). These will be the main documents examined in the literature review and utilized throughout the paper, though more may be added as necessary.

In the project, I plan to discuss the statistical mechanics behind Q-Learning in the literature review. However, there will be more focus on the Bayesian implementation (which will be new to me) throughout the remainder of the literature review and implementation.

Bibliography

Dearden, Richard, Nir Friedman, and Stuart Russell. 1998. "Bayesian q-Learning." www.aaai.org.

Tokic, Michel, and Günther Palm. 2011. "Value-Difference Based Exploration: Adaptive Control Between Epsilon-Greedy and Softmax." *Adaptive and Natural Computing Algorithms*, 233–42.

Verdugo, Manny. 2024. "I-c Zoned / Flex Retail Space for Sublease at 711 - 48 Avenue SE Unit 11, Calgary AB." NAI Advent.

Watkins, Christopher J. C. H., and Peter Dayan. 1992. "Q-Learning." *Machine Learning* 8: 279–92.