Review: MODRL

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1 Paper Profile

- Title: Multi-Objective Deep Reinforcement Learning
- Authors: Hossam Mossalam, Yannis M. Assael, Diederik M. Roijers, Shimon Whiteson
- Organisation: University of Oxford, CS Dept.
- Publish Year: Oct 2016
- URL: https://arxiv.org/pdf/1610.02707.pdf

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3 Proposal

In this paper, they have proposed two things, which are vanilla DOL(Deep Optimistic Linear Support Learning) and standard benchmarks in MORL(Multi-Objective Reinforcement Learning) domain. First one is related to solve high-dimensional multi-objective decision problems where relative importance of the objectives are not known in advance. Also, since this is allegedly the first paper regarding MODRL ever, they have demonstrated their approaches on the novel benchmarks.

4 Introduction

- Recent advances in RL has been focusing on Single Objective Learning. [1-16]
- Since in general it is not clear how to evaluate available trade-offs among objectives in advance, it is appropriate to construct a **coverage set(CS)** which contains at least one optimal policy for each possible utility function.
- They have found that the reason why DL was not applicable for Markov Decision Processes(MDPs). One reason is that it is not clear how neural networks account for unknown preferences and the resulting sets of value vectors.
- Making use of Outer Loop Approach[19], they achieved to learn an approximate coverage set of policies , which is represented by a neural network, by evaluating a sequence of scalarised single-objective problems.
- Outer loop approach is that it repeatedly calls a single-objective problems and finds an optimal policy followed by the termination after finite number of calls to that subroutine. Then it produces an approximate CS.
- 3 propositions
  - OLS and its compliant
  - Deep OLS Learning(DOL)
  - DOL with Full/Partial Reuse

5 Background

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