Benchmarking BoTorch for Hyperparameter Optimization for Reinforcement Learning

Project Presentation - Luou
Wen lw658
BoTorch

- New framework for Bayesian Optimisation research based on PyTorch and GPyTorch

- Algorithms are designed to exploit auto-differentiation and hardware acceleration features of PyTorch

- Implementations of Monte-Carlo acquisition functions in addition to standard acquisition functions

- Sample average approximation for optimising MC acquisition functions

- Compared with existing frameworks on tasks including Hyperparameter Optimization
Hyperparameter Optimization Comparisons

• Tuning 5 parameters of a deep Q-network learning algorithm on the Cartpole task

• Tuning 6 parameter network network surrogate model for the UCI Adult data set

• Tuning 3 parameters of the Stochastic Weight Averaging procedure on the VGG-16 architecture

• All compared less than 10 parameters while Gaussian Processes can handle up to about 30 and more structured models can go up to a few hundred dimensions
Proposed project

• Aim: compare and evaluate performance for higher dimensional problems in reinforcement learning

• Benchmark BoTorch, Cornell-MOE, and GPyOpt acquisition functions on higher dimensional tasks

• Start with Inverted Pendulum Swing-up

• and possibly expand to locomotion tasks

• Compare the change in best observed function values over number of observations
Project plan

- Initialising
  - Get all frameworks installed and running
- Build
  - Replicate implementations of acquisition functions described in the paper
- Benchmark
  - Find / implement RL benchmarking tasks starting with Inverted Pendulum Swing-up
- Report
  - Report on findings
Questions?