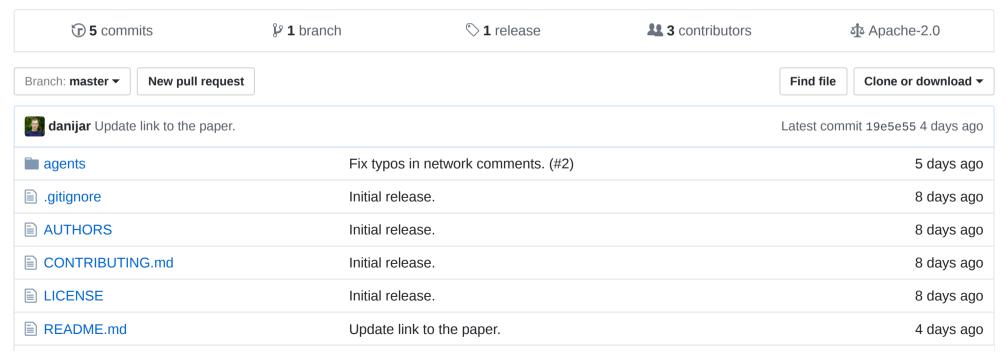
tensorflow / agents

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Efficient Batched Reinforcement Learning in TensorFlow

#reinforcement-learning #tensorflow #multi-processing #artificial-intelligence #python #vectorized-computation #control







TensorFlow Agents

This project provides optimized infrastructure for reinforcement learning. It extends the OpenAI gym interface to multiple parallel environments and allows agents to be implemented in TensorFlow and perform batched computation. As a starting point, we provide BatchPPO, an optimized implementation of Proximal Policy Optimization.



Please cite the TensorFlow Agents paper if you use code from this project in your research:

```
@article{hafner2017agents,
  title={TensorFlow Agents: Efficient Batched Reinforcement Learning in TensorFlow},
  author={Hafner, Danijar and Davidson, James and Vanhoucke, Vincent},
  journal={arXiv preprint arXiv:1709.02878},
  year={2017}
}
```

Dependencies: Python 2/3, TensorFlow 1.3+, Gym, rumamel.yaml

Instructions

Clone the repository and run the PPO algorithm by typing:

```
python3 -m agents.scripts.train --logdir=/path/to/logdir --config=pendulum
```

The algorithm to use is defined in the configuration and <code>pendulum</code> started here uses the included PPO implementation. Check out more pre-defined configurations in <code>agents/scripts/configs.py</code>.

If you want to resume a previously started run, add the --timestamp=<time> flag to the last command and provide the timestamp in the directory name of your run.

To visualize metrics start TensorBoard from another terminal, then point your browser to http://localhost:2222:

```
tensorboard --logdir=/path/to/logdir --port=2222
```

To render videos and gather OpenAl Gym statistics to upload to the scoreboard, type:

```
python3 -m agents.scripts.visualize --logdir=/path/to/logdir/<time>-<config> --outdir=/path/to/outdir/
```

Modifications

We release this project as a starting point that makes it easy to implement new reinforcement learning ideas. These files are good places to start when modifying the code:

File	Content
scripts/configs.py	Experiment configurations specifying the tasks and algorithms.
scripts/networks.py	Neural network models defined as TensorFlow RNNCells.
scripts/train.py	The executable file containing the training setup.
ppo/algorithm.py	The TensorFlow graph for the PPO algorithm.

To run all unit tests, type:

```
python3 -m unittest discover -p "*_test.py"
```

For further questions, please open an issue on Github.

Implementation

We include a batched interface for OpenAI Gym environments that fully integrates with TensorFlow for efficient algorithm implementations. This is achieved through these core components:

- agents.tools.wrappers.ExternalProcess is an environment wrapper that constructs an OpenAl Gym environment inside of an external process. Calls to step() and reset(), as well as attribute access, are forwarded to the process and wait for the result. This allows to run multiple environments in parallel without being restricted by Python's global interpreter lock.
- agents.tools.BatchEnv extends the OpenAl Gym interface to batches of environments. It combines multiple OpenAl Gym environments, with step() accepting a batch of actions and returning a batch of observations, rewards, done flags, and info objects. If the individual environments live in external processes, they will be stepped in parallel.
- agents.tools.InGraphBatchEnv integrates a batch environment into the TensorFlow graph and makes its step() and reset() functions accessible as operations. The current batch of observations, last actions, rewards, and done flags is stored in variables and made available as tensors.
- agents.tools.simulate() fuses the step of an in-graph batch environment and a reinforcement learning algorithm together into a single operation to be called inside the training loop. This reduces the number of session calls and provieds a simple way to train future algorithms.

To understand all the code, please make yourself familiar with TensorFlow's control flow operations, especially tf.cond(), tf.scan(), and tf.control_dependencies().

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