A data-driven decision-making library for PyTorch

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Abstract

TorchRL is an open source data-driven, general, decision-making library for PyTorch.
- Supports a wide range of RL domains: single-agent and multi-agent RL, online and offline RL, off-policy and on-policy RL, Model-free and Model-based RL.
- It is a PyTorch domain library, similar to TorchVision or TorchAudio, aiming to better support the RL community within the PyTorch ecosystem.

Motivation

Creating a truly general Reinforcement Learning (RL) library has historically proven very challenging due to several factors:

- **Algorithmic Complexity**: RL algorithms comprise numerous heterogeneous components that need to be combined.
- **Dynamic Data Requirements**: Components have varying input and output data requirements. Libraries are forced to sacrifice flexibility to ensure good integration.
- **Specialized Use Cases**: Frameworks should accommodate specialized sub-domains (e.g. Offline RL, MARL) without redundancy.
- **Scaling Complexity**: Efficient scaling poses greater challenges compared to supervised learning.
- **Long-Term Support**: Historically, frameworks have lacked sustained support, affecting viability over time.

TorchRL Design Principles

TorchRL design principles tackle RL implementation challenges to keep PyTorch on the forefront of RL research and applications:

- **Standalone Components**: Low-level abstractions to solve independent, limited-scope RL problems.
- **Efficient Data Carrier**: Flexible and efficient communication between components, irrespective of their data requirements, with a new data carrier, the TensorDict.
- **Breadth over Depth**: Diversity of well-tested components to be used as the building blocks to cover a wide spectrum of RL sub-domains.
- **Minimal Core Dependencies**: primarily PyTorch and TensorDict.
- **Reliability and Long Term Support**: Within the PyTorch ecosystem, adhering to quality standards, ensuring maintenance.

TorchRL Algorithms

TorchRL training logic example

TorchRL Environments and Datasets

TorchRL ecosystem

- TorchRL has seen rapid growth since its initial release.
- The library has more than 140 collaborators and contributors.
- Has an active community on GitHub and Discord.
- Over 20 applied research teams from academia and industry have adopted TorchRL as a backend.
- The library features rich documentation, tutorials, a knowledge-base with RL insights, and state-of-the-art code implementations.