Projects Proposal:

Reinforcement Learning Sustainability Benchmark

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Projects Scope

The project scope addresses the energy consumption of deep reinforcement learning (DRL) solutions and their impact on the environment and business costs. Beginning with the resurgence of the field following the development of Deep Q-Networks (DQN) by DeepMind in the early 2010s, there have been a number of algorithm proposals over time that with minor modifications to DQN or using a completely different paradigm (such as policy gradient methods) sought to improve the performance achieved by the learning agent.
Although the performance of the various solutions has been extensively studied and tracked, little effort has been directed toward understanding how the tweaks to the DQN introduced to improve performance impacted energy consumption, or what the cost of the alternative approaches developed was, per se and in comparison with previous solutions.
The project will delve into this aspect by trying to identify the trade-off between performance and energy consumption of some of the most widely used DRL algorithms, so that an interested company or individual can evaluate which solution to use based on the needs of the specific use case.

Starting Assets

(Works cited in the APA format)

- Sutton, R. S., & Barto, A. G. (2018). *Reinforcement learning: An introduction.* MIT press.
- Mnih, V., Kavukcuoglu, K., Silver, D., Graves, A., Antonoglou, I., Wierstra, D., & Riedmiller, M. (2013). Playing atari with deep reinforcement learning. *arXiv preprint arXiv:1312.5602.*
- Hessel, M., Modayil, J., Van Hasselt, H., Schaul, T., Ostrovski, G., Dabney, W., ... & Silver, D. (2018, April). Rainbow: Combining improvements in deep reinforcement learning. *In Proceedings of the AAAI conference on artificial intelligence* (Vol. 32, No. 1).
- Kostrikov, I., Yarats, D., & Fergus, R. (2020). Image augmentation is all you need: Regularizing deep reinforcement learning from pixels. *arXiv preprint arXiv:2004.13649.*

Project Example 1

Project Example 2

Minimum Requirements

Ideas

Award Criteria