Mathematics of Big Data: Project Proposal

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1   RLTools for Complex Controls Problems

Deep Reinforcement Learning (RL) is beginning to be deeply used in robotics and controls engineering as it provides more efficient learning capabilities without extremely long training times often needed for physical systems. RLTools provides a Deep RL library for continuous control, specifically applied to the classic Pendulum problem, where the adjustment of a motorized cart is controlled in order to keep an inverted pendulum upright [EAL23]. I am hoping to implement the results of this library using the contents of the paper cited below and the MuJuCo physics engine and datasets. In order to extend the work of this paper, I hope to use Deep RL to improve the solving speed of the triple inverted pendulum, which is a vastly more complex model often used for robotic arms and other applications.

Since Deep RL "datasets" grow as the model is trained, the ultimate size of the "dataset" used for the existing model is 10,240,000. I plan to develop a dataset similar in size through the training of my own RL model based on and utilizing RLTools, focusing on its application to the triple pendulum problem, a problem that modern reinforcement models have yet to be applied to.

References

[EAL23] Jonas Eschmann, Dario Albani, and Giuseppe Loianno. Backproptools: A fast, portable deep reinforcement learning library for continuous control. *arXiv preprint arXiv:2306.03530*, 2023.