# Comp 3301 Project Proposal

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Our project will consider the theory used to develop particular reinforcement learning algorithms and how they can be used to classify/recognize images. The project will begin with a discussion of the basic terminology associated with reinforcement learning including (but not limited to) action space, state space, reward distributions, policies, etc. We will then provide a mathematical framework into which these notions fit. From here, there will be a discussion of classical reinforcement learning algorithms such as the epsilon-greedy approach to k-armed bandits, policy iteration, Q-learning, and the SARSA algorithm. We will also consider some theoretical aspects of these algorithms as well as some potential optimizations. The project will then conclude with a demonstration of how a subset of these algorithms can be applied to classify/recognize images of digits. We will provide graphs which contrast the algorithms against each other. In particular, we will provide graphs which indicate how a given algorithm performs against another algorithm with respect to our performance metric. The current references that will be used for our project are listed below. It should, however, be noted that these references are subject to change with the exception of the preliminary material.

## Contributions

All group members contributed to the decision of the project topic and also to the description of the project above. Below is the list of references that will currently be used to construct our project along with the corresponding group member who found the reference.

**Patrick King**

1. Sutton, Richard S., and Andrew Barto. “Chapters 2-7.” Reinforcement Learning: An Introduction, The MIT Press, Cambridge, Massachusetts ; London, England, 2020, pp. 25–158.
2. Yi, Weixi, et al. *Boundary-RL: Reinforcement Learning for Weakly-Supervised Prostate Segmentation in TRUS Images*, https://arxiv.org/pdf/2308.11376.pdf.

**Michael Gregory:**


1. Le, Ngan, et al. “Deep Reinforcement Learning in computer vision: A comprehensive survey.” Artificial Intelligence Review, vol. 55, no. 4, 2021, pp. 2733–2819, https://doi.org/10.1007/s10462-021-10061-9.


**Logan Peach:**


1. Hafiz, Abdul Mueed. “Image classification by Reinforcement Learning with two-state q-learning.” *Handbook of Intelligent Computing and Optimization for Sustainable Development*, 2022, pp. 171–181, https://doi.org/10.1002/9781119792642.ch9.
2. Chen, Tianshui, et al. “Recurrent attentional reinforcement learning for multi-label image recognition.” *Proceedings of the AAAI Conference on Artificial Intelligence*, vol. 32, no. 1, 2018, https://doi.org/10.1609/aaai.v32i1.12281.
3. Mathe, Stefan, et al. “Reinforcement learning for visual object detection.” *2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2016, https://doi.org/10.1109/cvpr.2016.316.
4. Wang, Zhenxin, and Sayan Sarcar. “Outline Objects using Deep Reinforcement Learning. “ 2018, https://arxiv.org/pdf/1804.04603.pdf.