

Project Preferences:

Name: Sonny Jones (u1017628)

[1] (MOST DESIRED) Reinforcement Learning for Road Sign Detection and False Positive Elimination

Background and Interest: I am currently doing research in Reinforcement Learning (RL) and continual deep learning. Currently, I am using it to create adaptive exoskeleton control strategies for walking assistance. I have only applied machine learning techniques to research questions. I want to be able to apply my reinforcement learning experience to solve problems that are pertinent to industry. I think this will set me up with valuable experience that I can leverage for a future career in the industry.

Qualifications:

- Completed Reinforcement Learning Specialization on Coursera offered by the University of Alberta and Alberta Machine Intelligence Institute and the Artificial Intelligence course offered at the University of Utah.
- Currently working with the state-of-the-art temporal difference learning methods
- Implemented Hierarchical Reinforcement Learning (HRL) to solve policy decision problems in adaptive controllers.
- Experience working with discrete and continuous state spaces.
- Familiar with TensorFlow, PyTorch, and Jax/Flax deep learning frameworks.

Project Proposal: For fine-tuning of our pretrained object detection models, we can use the LISA dataset which contains still frames or videos with annotated American traffic signs. We would augment the outputs of the network to be the number of classes we want to predict, and train with a lower learning rate on the LISA set. To reduce false positives, we can utilize the RL algorithm Proximal Policy Optimization (PPO), a policy gradient algorithm that Open uses to optimize control of robotics. This algorithm is considered the state-of-the-art policy gradient method for optimization. I believe this can be applied to improve detection models and improve false positive rates.

[2] Deep Learning for Estimating Lane Line Quality Using Retroreflectometer Ground Truth

Background and Interest: This is an issue in Utah that I have had for years. While driving in Arizona, they have nice reflective lane lines so that in the rain, they can see the road. When driving I15, it is almost impossible to see the lane lines. I think this would be an interesting project to undertake as it would have a large impact on Utah roads and solve an issue that current Utahns probably have with the current road infrastructure. I currently am supervising a project to build image segmentation models for spinal cord segmentation and using those models to automatically label new images. We are currently using a U-Net, an advanced CNN model.

Qualifications:

- Completed Machine Learning and Deep Learning courses offered at the University of Utah
- Currently supervising the training of image segmentation models for spinal cord segmentation and application to new labelled images.
- Familiar with TensorFlow, PyTorch, and Jax/Flax deep learning frameworks

Project Proposal: I believe we could use an image segmentation model to help by selecting the lane lines that are pertinent. We would then take the segment of the image and use a CNN model with a regression output trained on previous images of lane lines and their associated retro reflectometer values to output the respective wear and quality of that line.

[3] (LEAST DESIRED) Deep Learning-Driven 3D Reconstruction, Data Synthesis, and Size Estimation for Road Signs

Background and Interest: During my time in elementary school, I used Blender to build video game scenarios and characters as a side project. It would be interesting to use deep learning techniques to generate different signs and sizes.

Qualifications:

- Completed Machine Learning and Deep Learning courses offered at the University of Utah
- Familiar with TensorFlow, PyTorch, and Jax/Flax deep learning frameworks

Project Proposal: I would like to integrate LLMs into this and have the user prompt via text the sign that they want with dimensions. Then the model will autogenerate the sign in Blender for 3D sign synthesis.