

Final Project Proposal: Transfer Learning and Satellite Imagery

DS6203 Section 11

Jiarong Che, Jiajun Wu, Diana Holcomb

Problem: We plan to use transfer learning to train a model to successfully detect objects in satellite imagery. Time and success-dependent, we hope to identify some classes that the model has difficulty distinguishing between, and see if we can make an optimizations to better detect the correct class.

Reason: This topic is of interest to the team from a disaster relief perspective. We're also interested in using our new deep learning and PyTorch skills that we learned in class to analyze this dataset. Finally, the dataset is relatively recent, so there is a lot of unexplored territory and opportunity. Hopefully we can do something new, interesting, and unique.

Dataset: xView dataset - 1419 images, 42.8 GB, 60 classes, ~800,000 instances

- <http://xviewdataset.org/>
- <https://github.com/DIUX-xView>
- https://insights.sei.cmu.edu/sei_blog/2019/01/deep-learning-and-satellite-imagery-diux-xview-challenge.html

Network: Most of the current literature points to CNN being the most successful, so we plan to begin with CNN using PyTorch, using the standard form of the network. If the performance is bad, then we will customize. We also like PyTorch because we can run it with python3.

Reference Materials: We plan to use our student access to ACM and IEEE to find computer vision articles dealing with transfer learning. We also plan to research overhead imagery-specific data cleaning and preprocessing techniques, using GIS StackExchange, academic papers, and Github.

Performance Metrics: We plan to use accuracy (did detect/did not detect or wrong detection) and average precision (i.e. did it identify a boat, but the bounding box cuts the boat in half?). xView has a custom performance metric known as mAP (mean average precision -

https://medium.com/@jonathan_hui/map-mean-average-precision-for-object-detection-45c121a31173) that we will investigate as well.

Schedule:

April 10: Finish the data preprocessing

April 17: Finish the code for network and/or customize the network

April 24: Finish the group and individual reports