**Primary References and Codebase:**

* Ross Girshick. “Fast R-CNN”, IEEE International Conference on Computer Vision. 2015.
* S. Ren, K. He, R. Girshick and J. Sun. “Faster R-CNN: Towards Real-Time Object Detection with Region Proposal Networks”, 2017 IEEE Transactions on Pattern Analysis and Machine Intelligence.
* Wieland Brendel, Matthias Bethge. **“**Approximating CNNs with Bag-of-local-Features models works surprisingly well on ImageNet**”,** ICLR 2019 Conference Blind Submission
* Blog Post: [Berkeley DeepDrive](https://deepdrive.berkeley.edu/)**,** [courseraVisual Perception for Self-Driving Cars](https://www.coursera.org/learn/visual-perception-self-driving-cars)
* GITHub codebases: [Faster-R-CNN for Pytorch](https://github.com/jwyang/faster-rcnn.pytorch)

**Architecture Investigation Plan:** We plan to first utilize the architecture used in the above reference. Then, we will explore replacing the Traditional CNN with a BagNet.

**Estimated Compute Needs:** Based on the data set size in the above paper and the benchmarks in this [Fast Simultaneous Object Detection and Segmentation](https://deepdrive.berkeley.edu/project/fast-simultaneous-object-detection-and-segmentation), we estimate that one training run for our initial GAN architecture will take 15 hours on a single Nvidia V100 GPU, which is the GPU resource in the AWS p3.2xlage instance. With spot pricing, which is roughly $1 per hour, we expect $16 per training run. We expect to do a number of provisional runs to tune hyper-parameters. We estimate that this will cost approximate $50. In addition, we expect to do approximately 3 full runs for training other traditional object detection network like Fast-R-CNN, Faster-R-CNN，YOlOv2 and SSD which brings our total estimated computing cost to roughly $200.