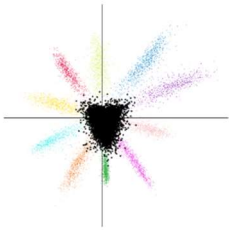
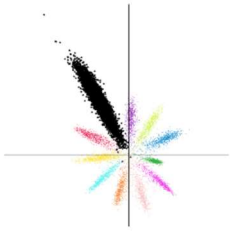
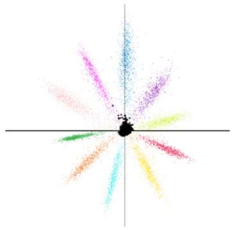
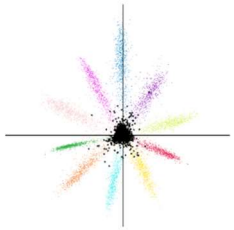
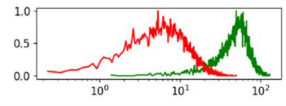
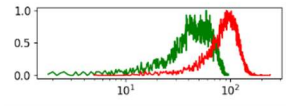
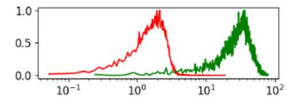
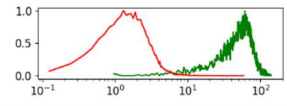
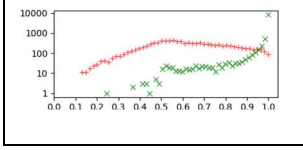
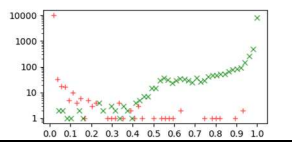
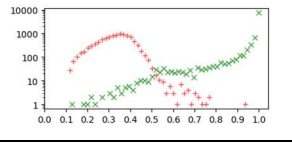
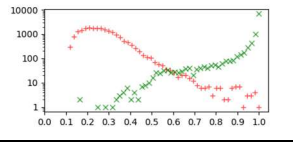
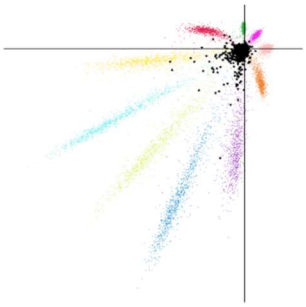
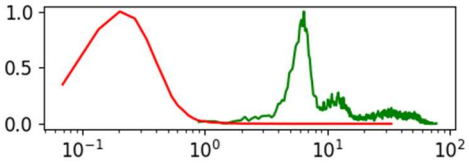
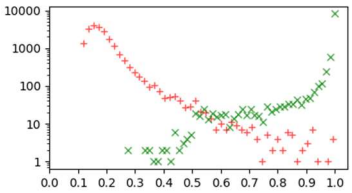
First, reproduce the MNIST example from the paper, training Lenet++ with MNIST as known, letters as known unknowns and cifar as unknown unknowns.

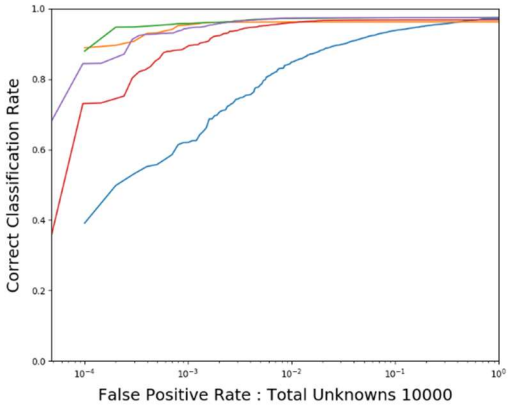
SoftMax	Background	Open-Set	Objectosphere
			
			
			

Second, extend the into the objectosphere LeNet+++ model in the paper so that it incorporates a center-loss for known classes with the same training/testing setup.









Compare your new results with the original results in the paper. Discuss your findings, including any assumptions made and any issues encountered. Include 2D figures of the resulting model's behavior in the 2D feature representation and discuss a bit about what they show you.

All of plot show the results after 20 iterations and 64 batch size. The paper shows 70 iterationsand 128 batch size. I chose lower number because I do not have time to run all required iterations.

In compare to original result, the center loss has lower distinction between unknown and known classes. In other words, Objectosphere (original) work slightly better than Objectosphere with center loss (new result). I think, it happens because I did not run it for long time. We should compare them after 200 iterations.