

IML project: advanced challenges

Extra tasks are color-coded according to their expected difficulty

interpretability

visualize the behavior and function of individual cnn layers and use it for data exploration. Similar to:

https://github.com/cloudera/CML_AMP_Image_Analysis

uncertainty

use monte carlo dropout to estimate classification confidence. Compare dropout to an ensemble of CNN networks (e.g.: do individual dropout subnetworks point to the same, or different local minima?)

adversarial attacks

create a method to change wav files in a way that's indistinguishable for a human, but produces a confident misclassification from a model that's known in advance

parameter space

examine how much individual layers of the network change during training.

Investigate their re-initialization robustness

(<https://lilianweng.github.io/posts/2019-03-14-overfit/>)

sparsity

use pruning to minimize the size of a network after training. Find pruned networks that achieve similar accuracy when trained from scratch ("lottery tickets")

rotation

examine if long periods of high learning rate lead to sparser networks and better generalization (<https://arxiv.org/abs/2210.05337>). Investigate the impact of weight decay (<https://arxiv.org/abs/2305.17212>): does it lead to sparser networks? Can the effect of rotating the weights be measured?

curvature

calculate the Hessian of a small network. Estimate the network's condition number during training. Measure the impact of architectural components on the condition number and highlight differences between optimizers (if there are any)