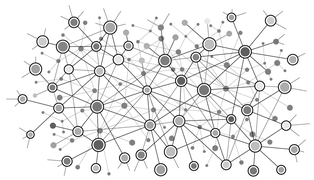
More or Less: When and How to Build Convolutional Neural Network Ensembles

Abdul Wasay & Stratos Idreos

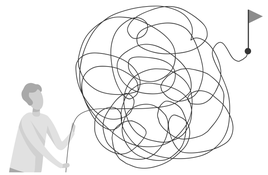
DASlab

NN Design is hard

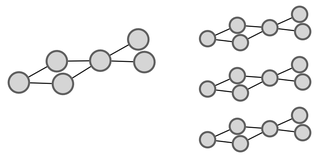
Given a parameter budget (neurons), how to design a convolutional neural network to optimize holistically for accuracy, training cost, and inference cost?



Complex neural network design landscape



Complicated relationships b/w design and metrics



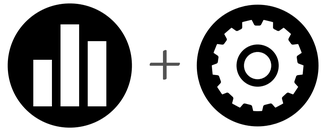
Unexplored ensemble vs. single network space

Deep Collider: Robust Empirical Analysis

Fair

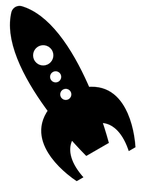
Analyzing design space under a parameter budget

Holistic



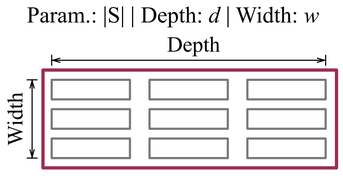
Accuracy + training time + inference time + memory usage

Extensive

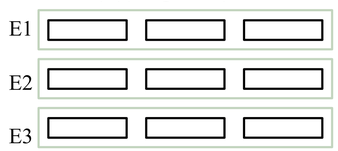


3 design classes + 5 data sets + 6 architectures + >150 configurations

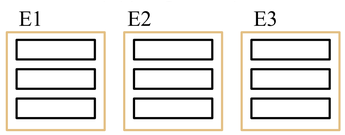
Single Network Model



Depth-equivalent ensemble (DeQ)

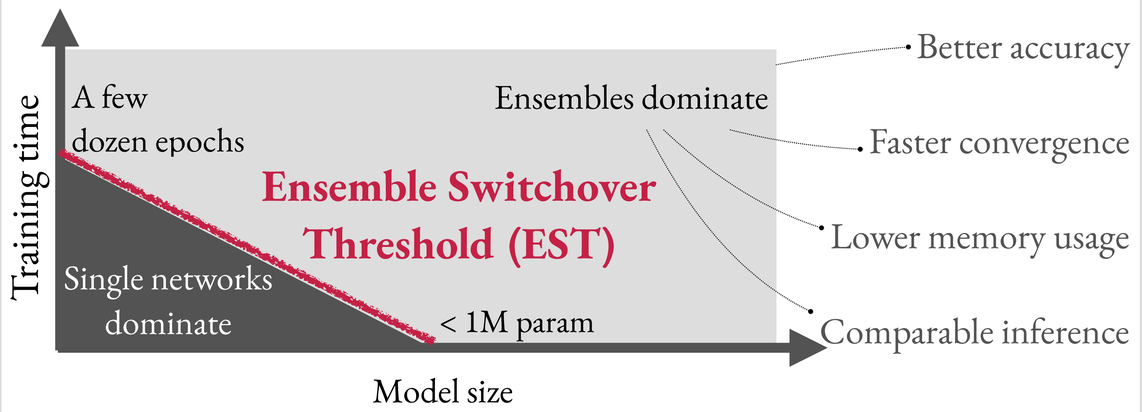


Width-equivalent ensemble (WeQ)



Tractable exploration of the design space under a parameter budget while isolating the effects of: (i) depth, (ii) width, and (iii) number of networks.

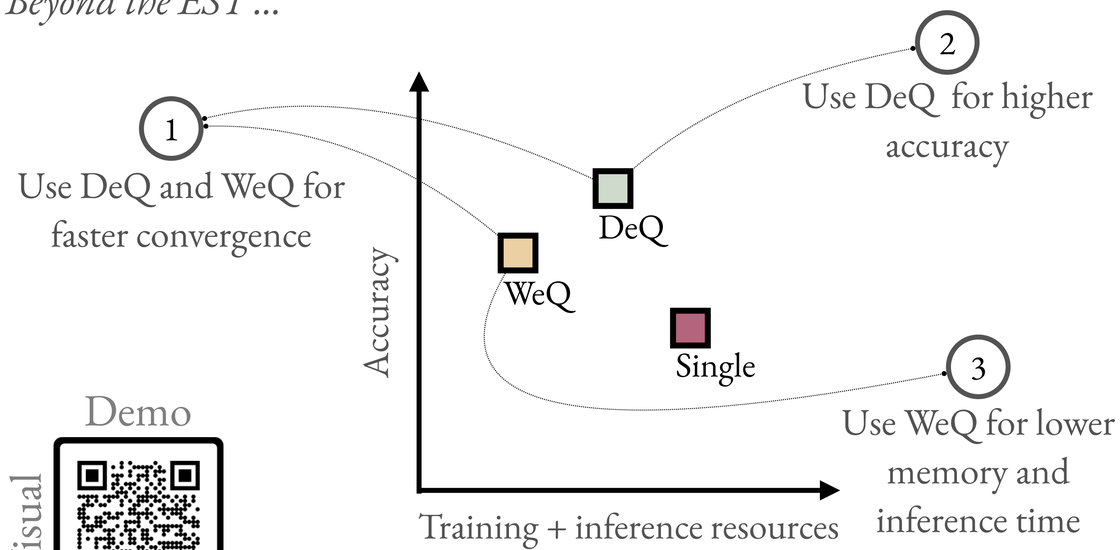
New Insights



Ensembles of convolutional models dominate single network models for a significantly wider range of use cases than previously understood

New Design Guidelines

Beyond the EST ...



Demo

Visual