NANYANG TECHNOLOGICAL UNIVERSITY
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Neural Architecture Search

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Project Objectives

Neural Architecture Search is a technique for designing optimal neural network architectures by using algorithmic search but are limited in practice by high computational cost.

Thus, the goal of this project is to increase the practical utility of NAS.

Active Selection Strategy

Active selection strategy reduces the cost of evaluating NAS proposed architectures by training with only a subset of most informative data samples.

Steps

Train a reference predictive model on 25% of the training dataset

↓

Compute the sum of absolute error ($\sum| y - \hat{y} |$) between predicted probabilities and ground truth of remaining training samples

↓

Select top 25% of most informative samples (highest absolute error) to be added to randomly selected samples

↓

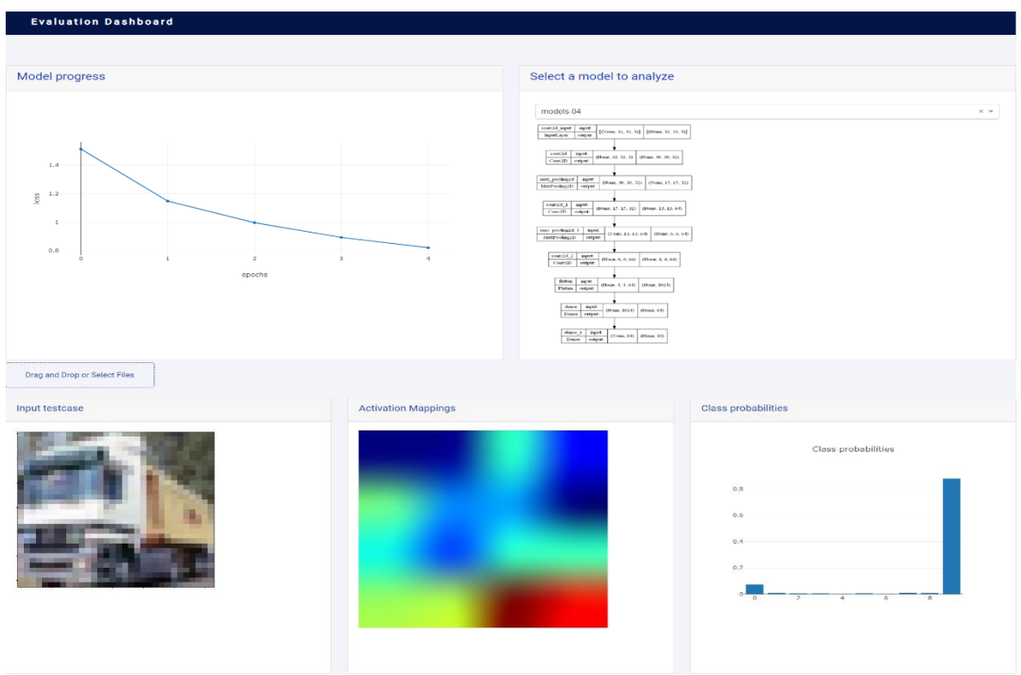
Use selected subset for training during evaluation of NAS

Results

On datasets such as MINIST, active selection strategy allows equivalent performance to be achieved.

Explainable Dashboard

Allows for the evaluation of models during the training process.



Neural Process - NAS

Neural Processes are probabilistic neural networks that are advantageous as they can generalize with limited data, which is important since evaluating architectures is expensive.

Steps

Generate small number of architectures from search space and train them to obtain their validation loss

↓

Neural Process is trained on dataset

↓

Candidate models generated by mutation of existing best performing architectures. Neural Process predicts their performance.

↓

Upper Confidence Bound acquisition function selects a small number of these candidates for evaluation to obtain actual validation loss.

Results

NP-NAS outperforms benchmark NAS search algorithms such as Regularized Evolution on NAS-Bench-101.