Faster DNN Training With Selective Backpropagation

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Background

Can we speed up training by only backpropogating useful examples?

Motivation

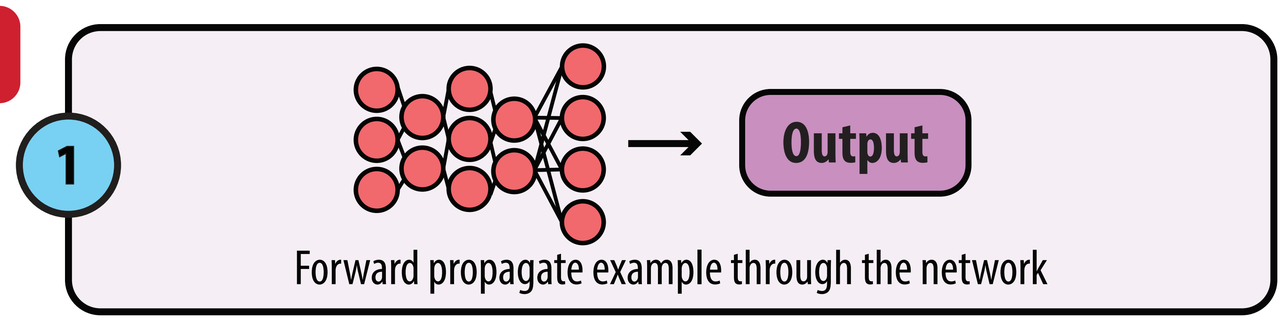
- Train network to target accuracy quickly
- Get a faster signal from training (e.g., for hyperparameter search)
- Cherry-pick useful training examples from ever-growing datasets

Opportunity

- Fast inference (e.g., with accelerators) => explore dataset cheaply

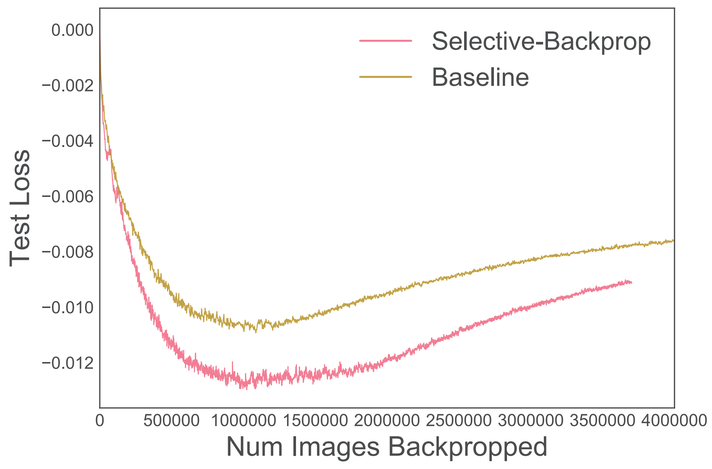
Approach

- Isolate useful examples using inference (the output of the forward pass)
- Reduce cost of inference using hardware-accelerators or model compression
- Reduce no. of backwards passes by only training on "surpising" examples

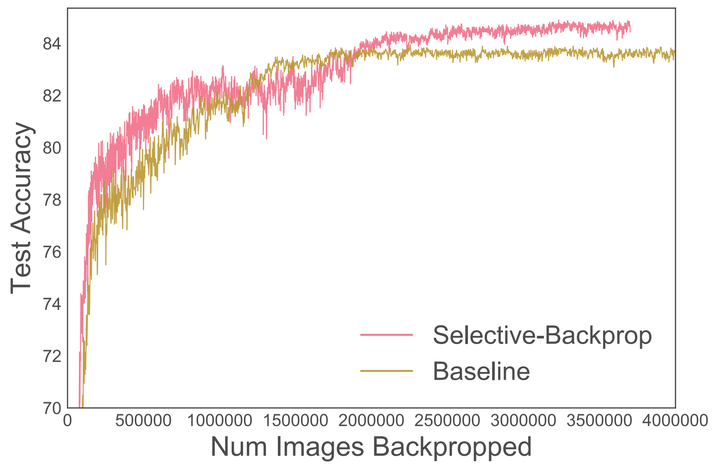


Selective Backprop gives more accuracy with fewer training examples

CIFAR10

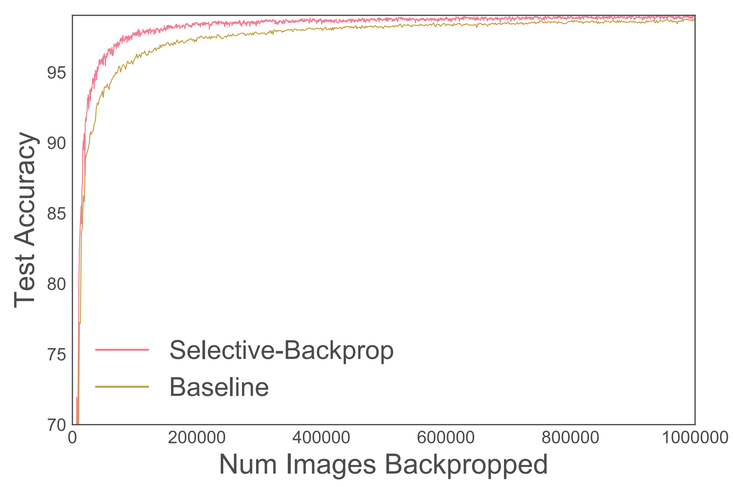


- Baseline does not filter examples
- Selective Backprop (SB) filters >45% of examples



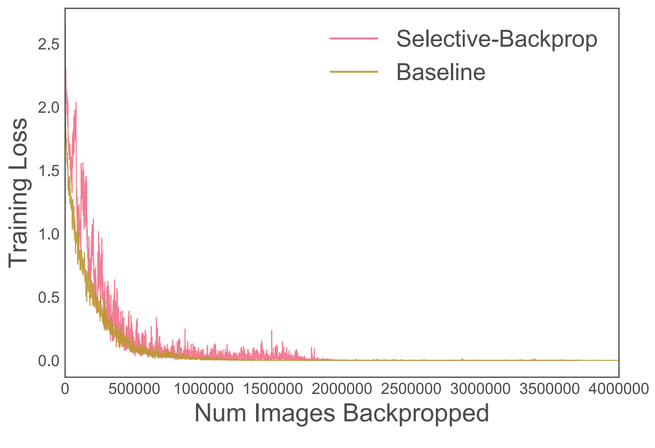
- SB reduces test loss with fewer examples
- Achieves X% of accuracy with Y fewer examples

MNIST



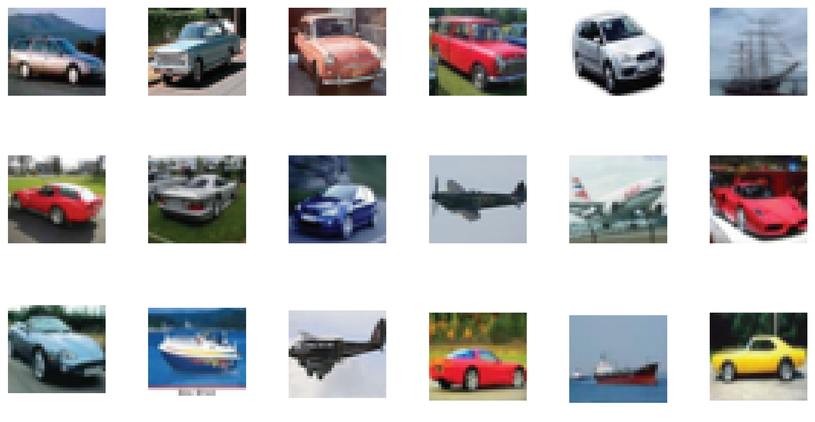
- SB filters 85% of examples of MNIST
- Achieves X% of accuracy with Y fewer examples

Diving into CIFAR10

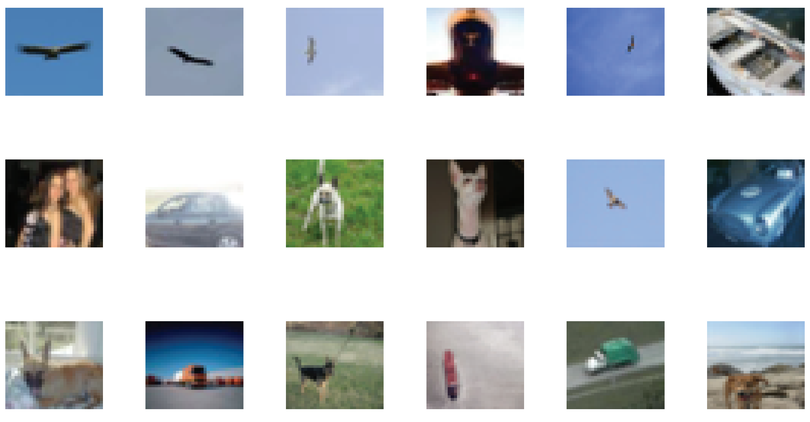


SB chooses to train images with higher loss

Easy Examples



Hard Examples



Next Steps: Use Selective Backprop to Improve Wall-Clock Time