Teaching Your MAML

Motivation
We want general AI! But how do we train it? Let’s look to humans!

Approach
Introduce a **teacher model** that changes problem difficulty **in response to student progress** during meta training.

The Nitty Gritty
1) Task distribution has difficulty $\psi$ with current parameters $\omega$
2) Perturb $\omega$ with meta train step
3) Approximate gradient $\nabla \omega$
4) Teacher does gradient descent over task space parameters!

Experiments
Three meta learning experiments:
1) MNIST classification$^{[1]}$
2) Omniglot 5 way 1 shot classification$^{[2]}$
3) Omniglot 20 way 1 shot classification$^{[2]}$

Compare teacher-aided model to regular MAML$^{[3]}$.

Models
Three layer conv net with batch norm and max pooling used for all 3 experiments.

Results
Adaptive teacher seems to help generalize!

Discussion
1) MAML already really hard to train.$^{[4]}$
2) Hard to find best teacher hyperparameters.
3) Still need to know “hardest” problem.
4) Unclear how much teacher helps.
5) Experiments were pretty similar.

Future!
Extend to:
1) Continuous task parameter space
2) Regression and reinforcement learning problems
3) Lifelong settings

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$^{[1]}$ Yann LeCun, Corinna Cortes, and CJ Burges. "MNIST handwritten digit database"$^{[2]}$ Brenden Lake et al. "One shot learning of simple visual concepts."


$^{[4]}$ Andreas Antoniou, Harrison Edwards, and Amos Storkey. "How to train your MAML."