CAVIA: Fast Context Adaptation via Meta-Learning

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Meta-Learning for Fast Adaptation:
- Learn how to map $x$ to $y$, on new tasks, fast and with little data.
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- MAML (Finn et al. 2017): learns model initialisation st. new task can be learned within a few gradient updates
CAVIA: Fast **Context Adaptation via** Meta-Learning

- Less prone to overfitting compared to MAML
- Easy to parallelise
- Interpretable
- Many tasks / benchmarks only require **task identification**
Updating all model parameters at test time isn’t necessary!
- Many tasks and current benchmarks only require task identification.
- Many parameters + few data points can lead to overfitting.
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- Many tasks and current benchmarks only require **task identification**.
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Solution: Adapt only part of the network!

MAML (Finn et al. 2017)  

CAVIA
Context parameters:
Task-specific *input parameter vector*. Updated at test time via gradient descent. Represents task embedding.
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Task-specific input parameter vector.
Updated at test time via gradient descent.
Represents task embedding.

Network parameters:
Shared across tasks.
Meta-trained, fixed at test time.
CAVIA

Fast Context Adaptation via Meta-Learning
Many tasks / benchmarks only require task identification.
CAVIA: Sine Curve Experiments

Task defined by amplitude + phase

Before update

Gradient update

After update

CAVIA: 2 params

MAML: ~ 1500 params
Could be re-used for related / auxiliary tasks, or distributed systems
Context parameters are interpretable

Could be re-used for related / auxiliary tasks, or distributed systems
CAVIA: Mini-Imagenet Experiments

Model parameters: > 30,000
Context parameters: 100

Less prone to overfitting compared to MAML
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Code:  github.com/lmzintgraf/cavia
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