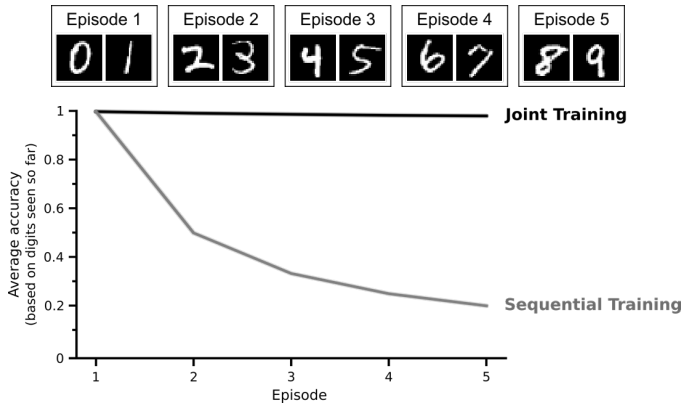
Baylor College of Medicine

Brain-inspired replay in artificial neural networks

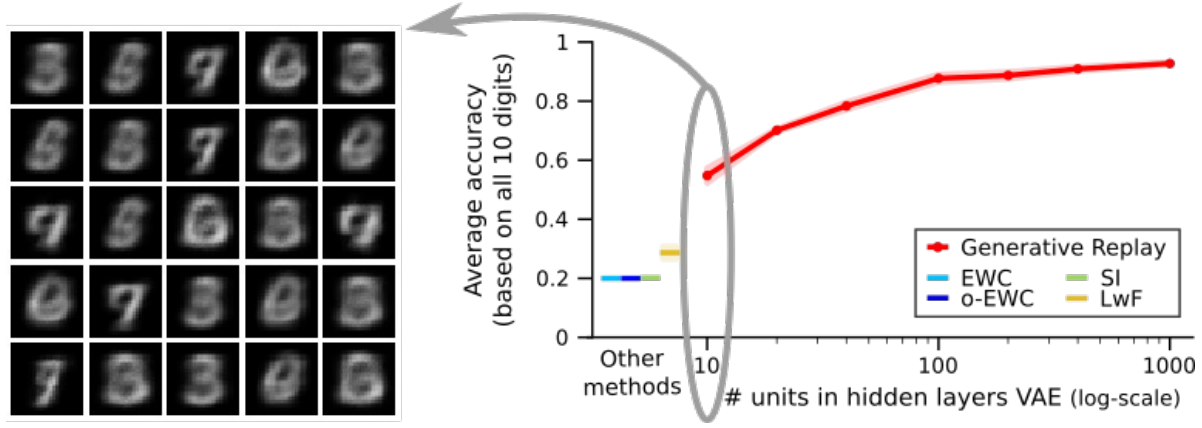
Gido M. van de Ven, Andreas S. Tolias | Baylor College of Medicine, Houston | #60

***Incremental MNIST*: toy example**



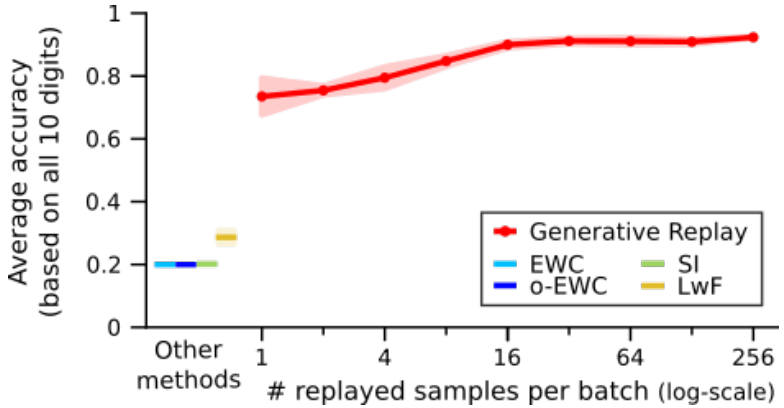
- Artificial neural networks (ANNs) suffer from catastrophic forgetting
- Biological neural networks are far superior in continual learning
- The brain replays previous experiences to stabilize memories
- Replay can also solve catastrophic forgetting in ANNs, but it is believed not to be a scalable solution as (1) large amounts of data would have to be stored and (2) constantly retraining on all previous tasks is considered very inefficient

How good does replay need to be?



→ *A perfect memory (storing everything) is not needed, a low quality generative model could suffice*

How much replay is needed?

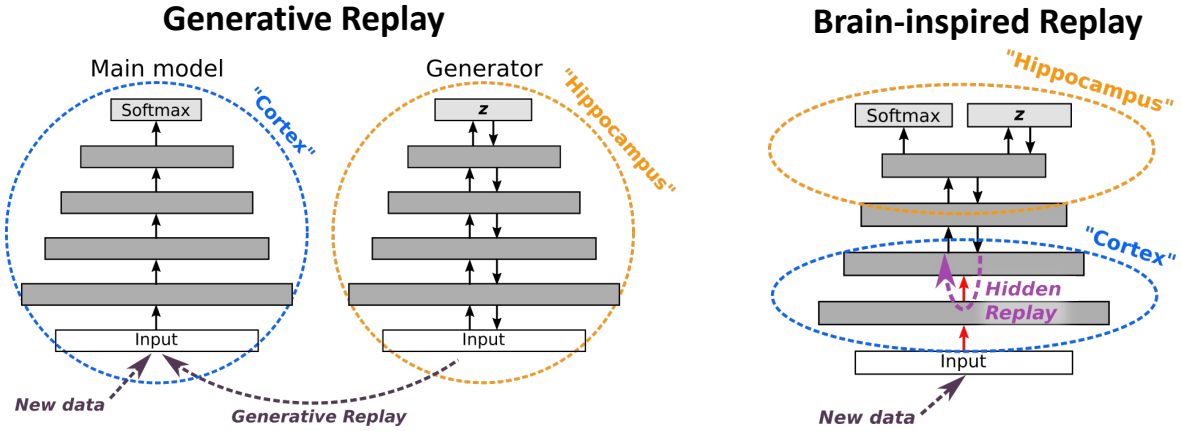


→ *Fully replaying previous tasks is not needed, replaying only a few examples could suffice*

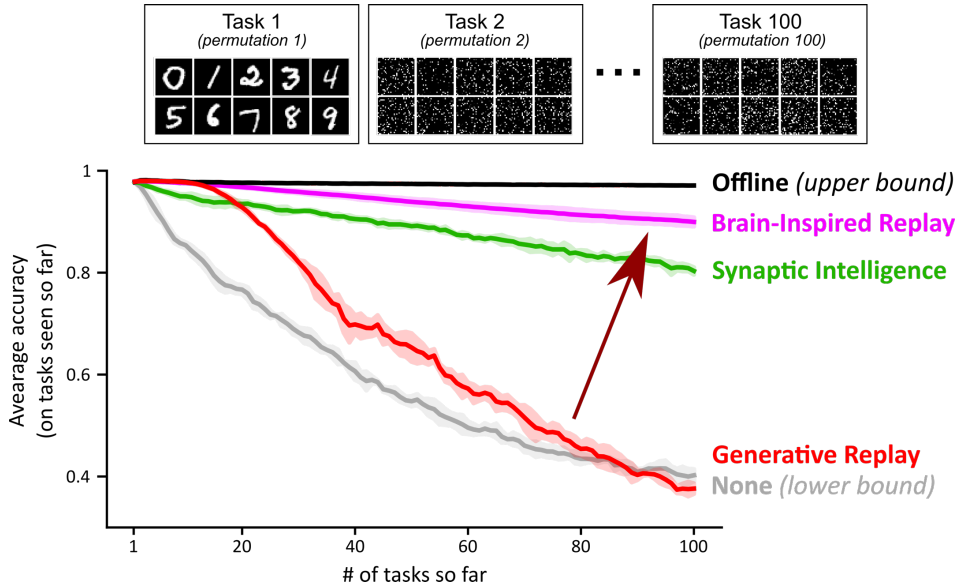
Brain-inspired replay in artificial neural networks

Gido M. van de Ven, Andreas S. Tolias | Baylor College of Medicine, Houston | #60

- Nevertheless, standard generative replay does not scale to problems with many tasks or with complex inputs
- With several brain-inspired modifications (details at the poster!), generative replay *is* able to scale to such problems



Permuted MNIST: scaling to many tasks



Incremental CIFAR100: scaling to complex inputs