Continual Learning Agent from Scratch

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Continual learning – a striking challenge for state-of-the-art ML agents

Continual learning: learning from a not i.i.d., non stationary, not balanced dataset – as natural agents do.

- *Catastrophic forgetting*

Possible solutions: “Remind” the model for previous tasks

- Retrieval based solutions
- Generative solutions

Inspiration:

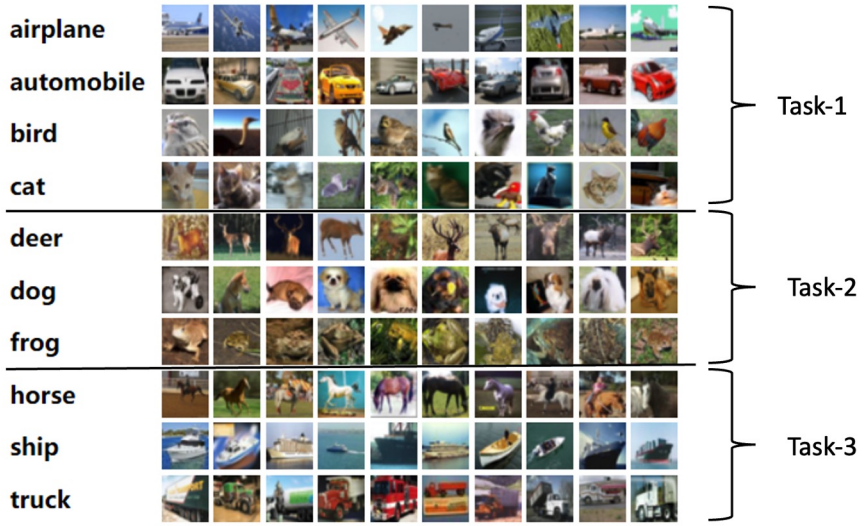
- Continual Learning with Deep Generative Replay

Shin, H., Lee, J. K., Kim, J., & Kim, J. (2017).

- Online Continual Learning with Maximally Interfered Retrieval

Aljundi, R., Caccia, L., Belilovsky, E., Caccia, M., Lin, M., Charlin, L., & Tuytelaars, T. (2019).

Data and expectations



Data

- Cifar-10 cut into sub-tasks
- Sequential training on tasks

Expectations

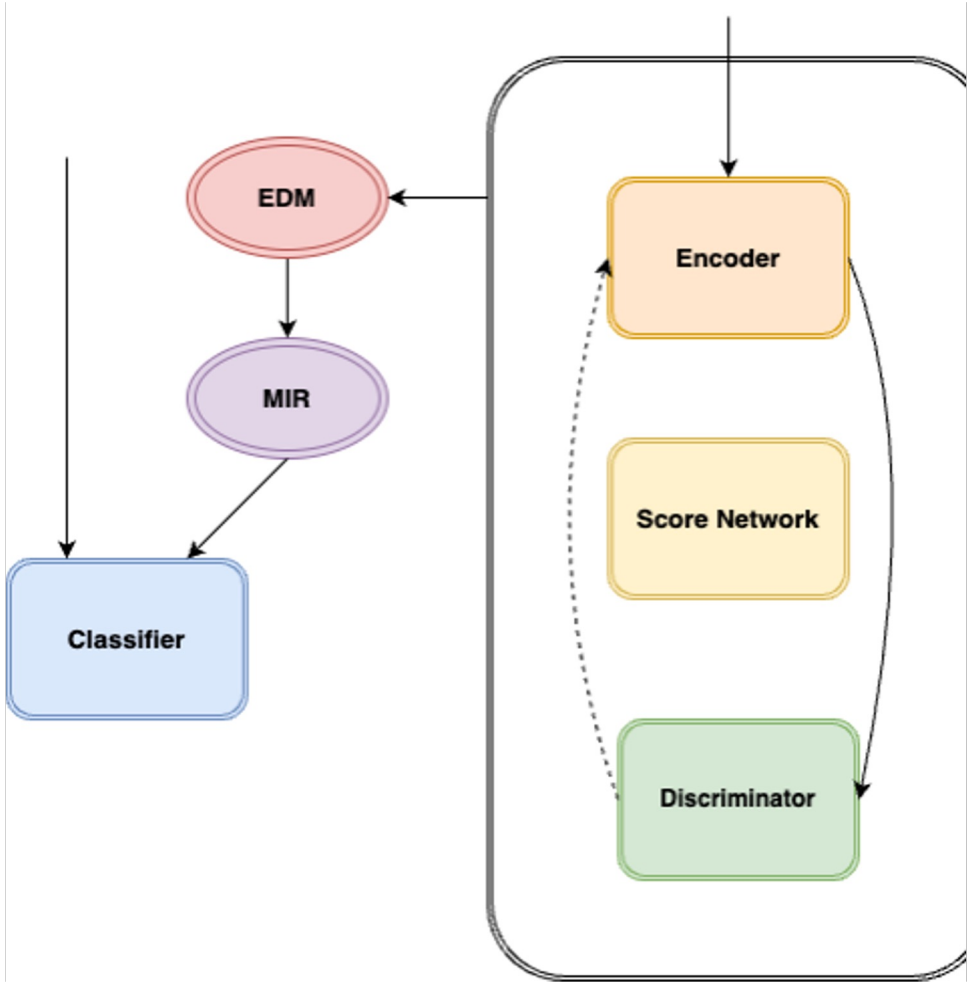
1) forward transfer: the learned tasks should contribute to the better acquisition of the new task.

2) backward transfer (or the lack of forgetfulness): training on new tasks should improve, but at least keep classification performance on previous tasks.

Proposed solution

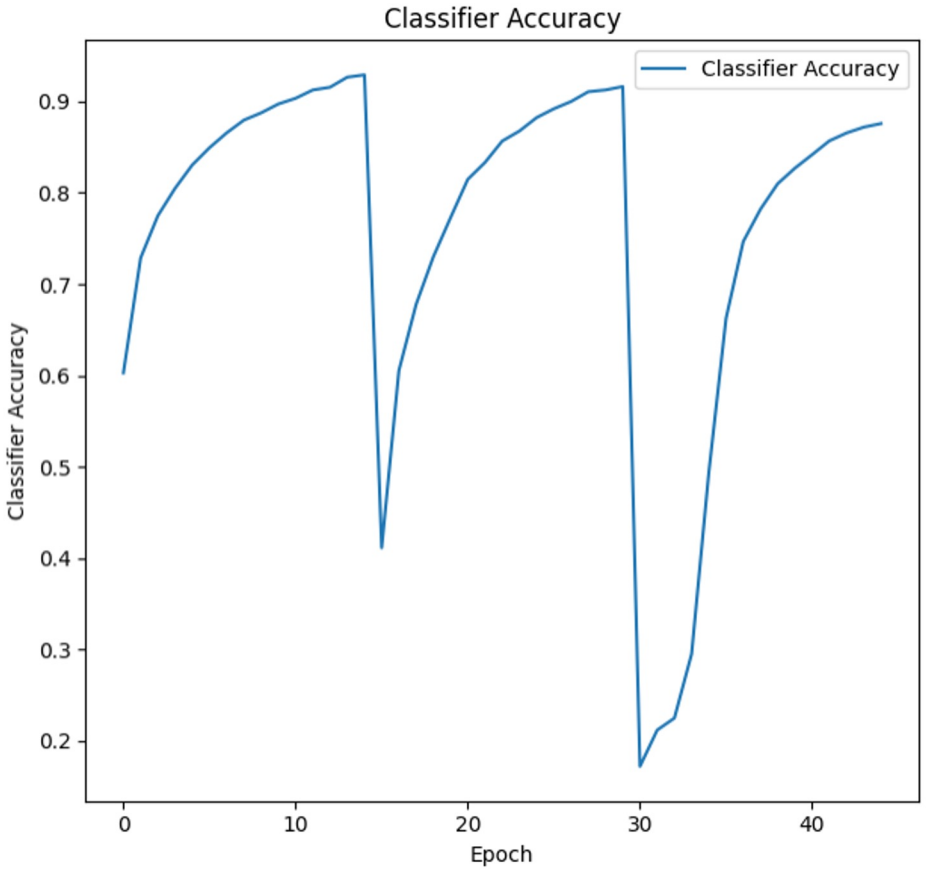
Network architecture:

- **Classifier** (Performance evaluated on it)
- **Generator** (auxiliary architecture that supports the classifier's performance, made of several subparts)
  - Encoder (encodes into latent space)
  - Discriminator (predicts if an image is real/fake)
  - Score Based Diffusion model (iterative refinement of noise based on learnable score function)
  - EDM *
    - Guided Diffusion (diffusion guided by Discriminator)
    - "“What makes the image more realistic”
  - MIR **
    - Retrieve samples with the most interference

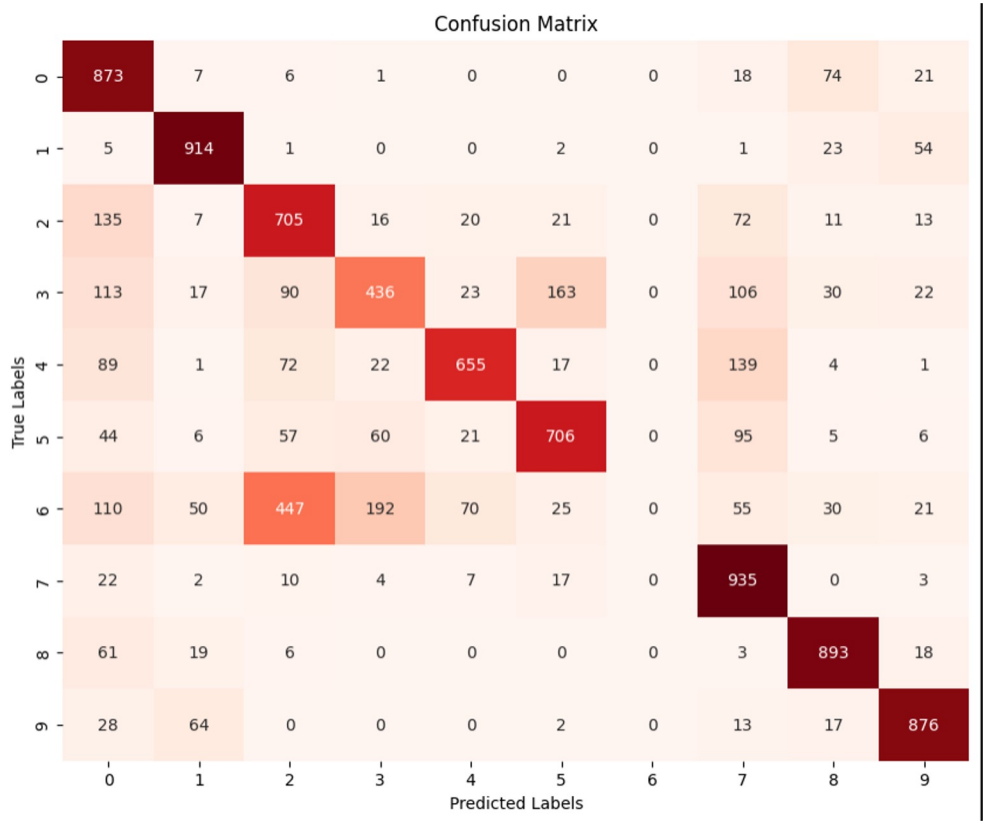


*Refining Generative Process with Discriminator Guidance in Score-based Diffusion Models (DG)
**Online Continual Learning with Maximally Interfered Retrieval

Results



I'm not in the dataset?



Thank you for your kind attention!

Questions?