S-Prompts

Learning with Pre-trained Transformers: An Occam's Razor for Domain Incremental Learning

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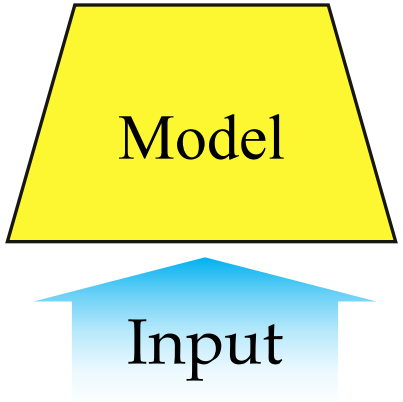
Problem

Exemplar-free Domain-incremental learning

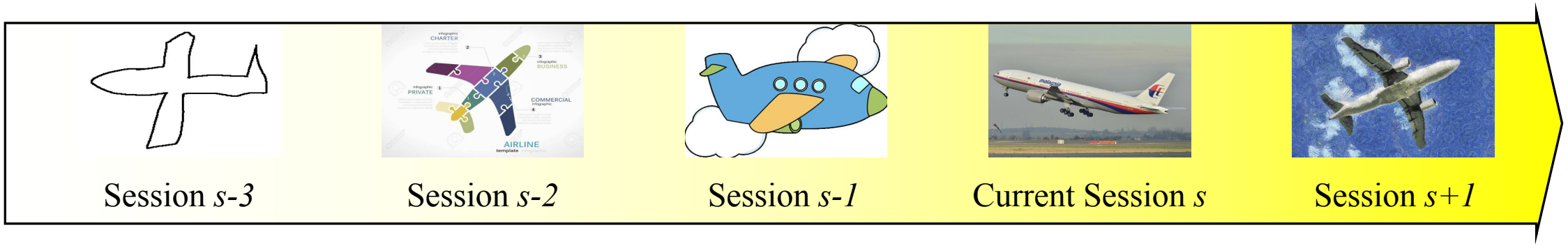
Goal: Incrementally learning knowledge of various domains in sequence.

Conditions:

Large Domain Gaps
No exemplars

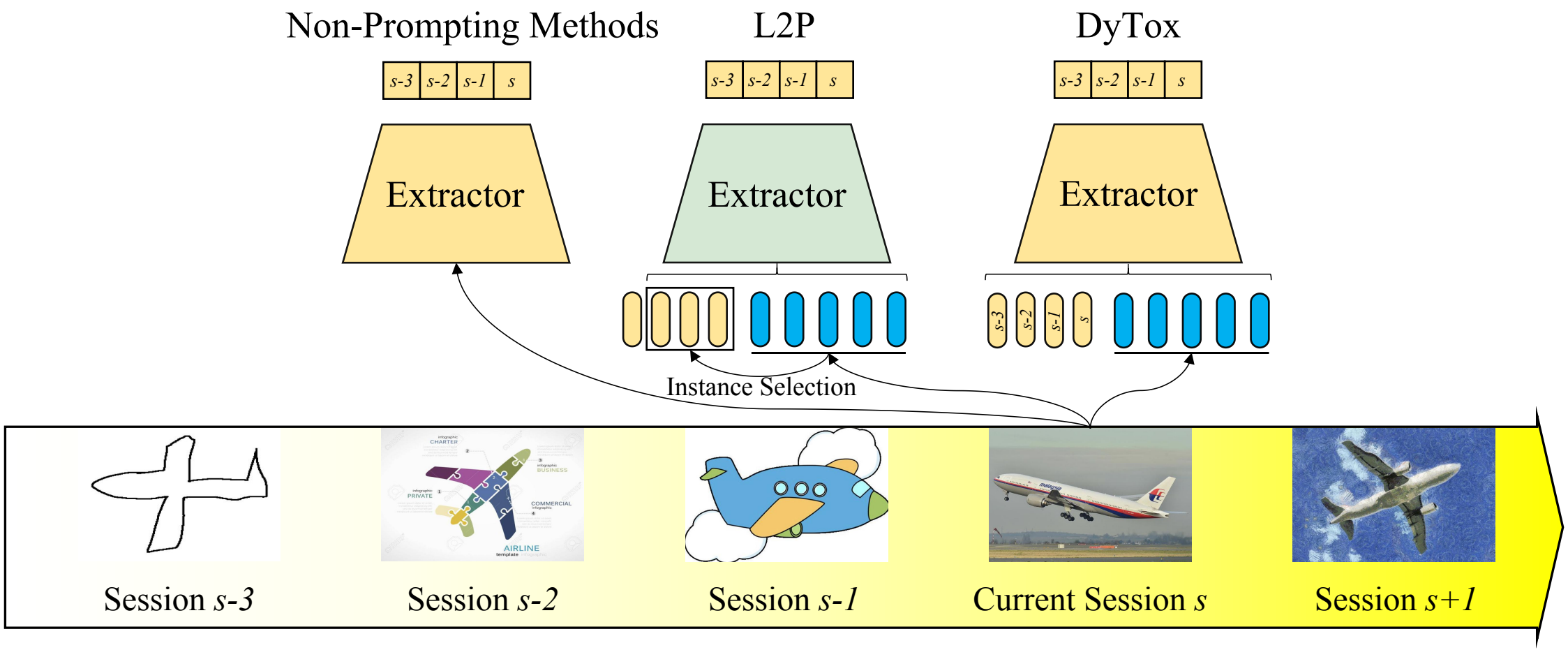


Data Stream



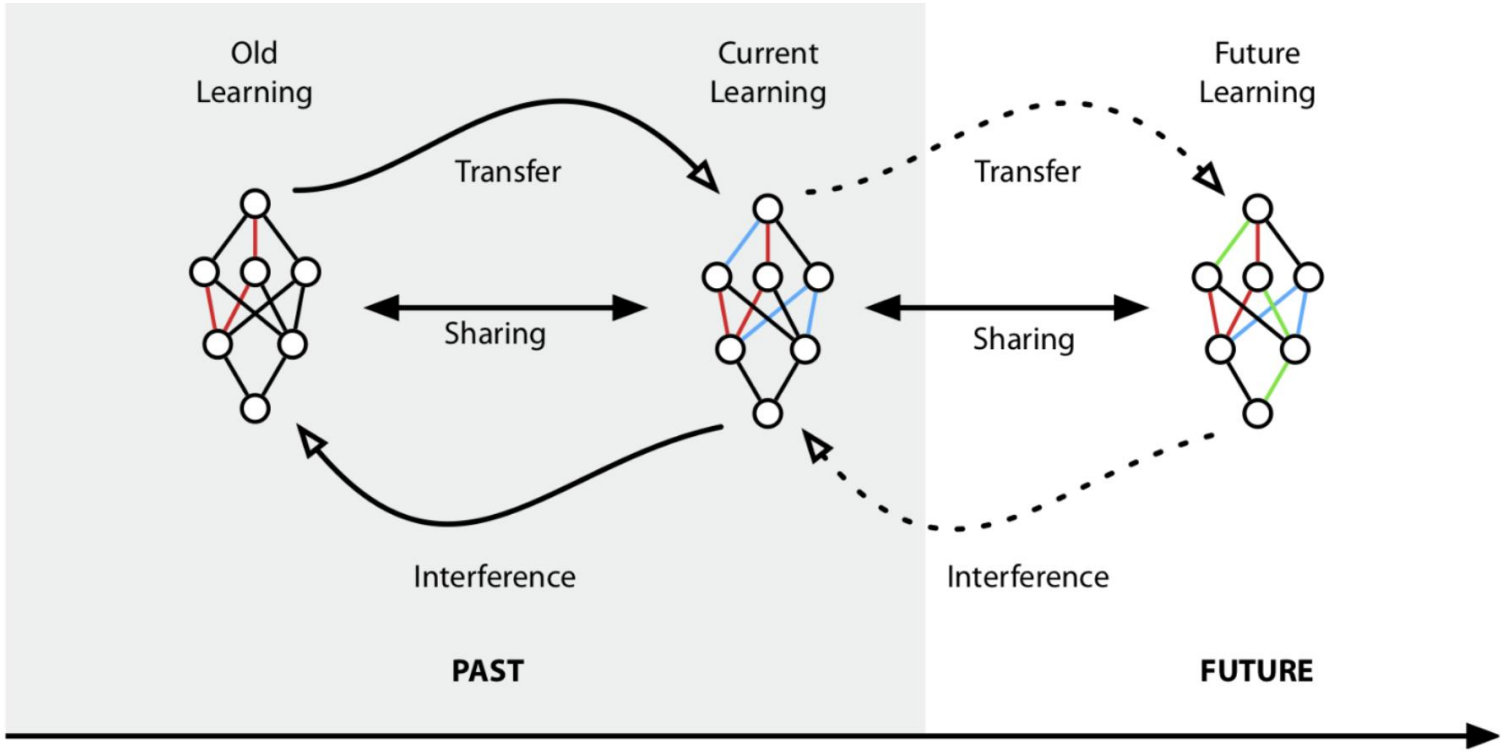
Common Learning Paradigm

Knowledge Accumulation



Common Learning Paradigm

The Stability-Plasticity Dilemme



Tug-of-War: one side's gain is equivalent to the other's loss

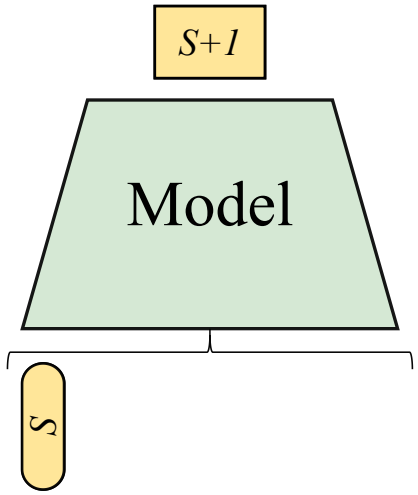
Image credit:Khetarpal, K., Riemer, M., Rish, I. and Precup, D., 2020. Towards continual reinforcement learning: A review and perspectives. arXiv preprint arXiv:2012.13490.

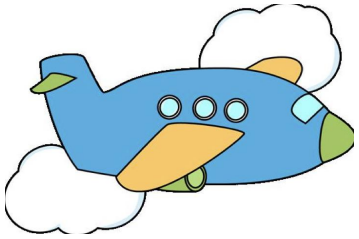
S-Prompts paradigam

Key idea： Learning the prompts independently across domains

Classifiers Pool

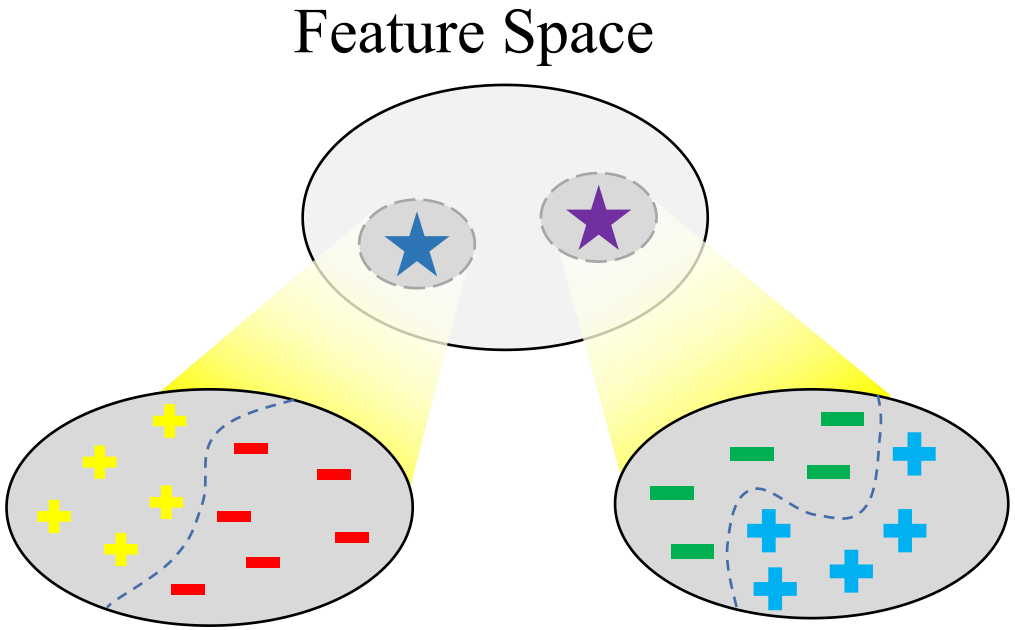
Prompts Pool





Session s

Session $s+1$



Experimental Results

Main Results

- Continual Deepfake Detection Benchmark [1]
  Relative gain over the best of real competitors ~44% improvement
- CORe50 [2]
  Relative gain over the best of real competitors ~14% improvement
- DomainNet [3]
  Relative gain against the best competitor ~33% improvement

[1] Li, C., Huang, Z., Paudel, D.P., Wang, Y., Shahbazi, M., Hong, X. and Van Gool, L., 2022. A Continual Deepfake Detection Benchmark: Dataset, Methods, and Essentials. arXiv preprint arXiv:2205.05467.
[2] Lomonaco, V. and Maltoni, D., 2017, October. Core50: a new dataset and benchmark for continuous object recognition. In Conference on Robot Learning (pp. 17-26). PMLR.
[3] Peng, X., Bai, Q., Xia, X., Huang, Z., Saenko, K. and Wang, B., 2019. Moment matching for multi-source domain adaptation. In Proceedings of the IEEE/CVF international conference on computer vision (pp. 1406-1415).

Contributions

Contributions:

1. A rule-breaking learning paradigm that learns the prompts independently domain by domain to play a win-win game for DIL.
2. A new paired language-image prompting scheme to enhance CLIP's transfer learning ability.

Code link：

https://github.com/iamwangyabin/S-Prompts

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