Eidgenössische Technische Hochschule Zürich
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Distributed Computing

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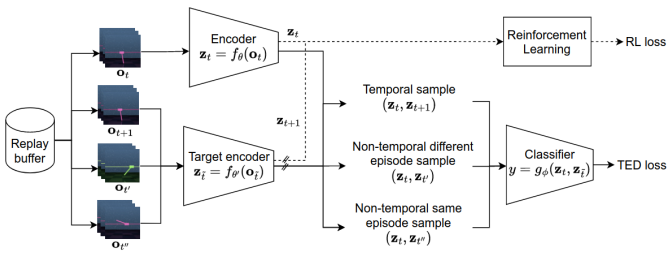
Representation Learning for Reinforcement Learning (RL4RL)

Reinforcement learning (RL) agents often struggle with complex environments and are unable to generalise to out-of-distribution variations. Recent work by Dunion et al. [1] tries to address this issue using temporal disentanglement (TED). TED works as a self-supervised auxiliary task that encourages disentangled representations of the encoder based on the sequential nature or RL observations. Dunion et al. [1] claim that this leads to faster adaption to changes in environment variables and better generalization to unseen values of task-irrelevant variables.

In the field of disentanglement, Klindt et al. [2] developed a novel VAE loss, called SlowVAE, that achieves SOTA performance for disentanglement on data exhibiting temporal sparse coding.



We are specifically interested in the benefit that SlowVAE or similar methods could bring over TED as auxiliary task in a reinforcement learning setting.

In this thesis, the goal is to further improve the performance of the SlowVAE agent. This can by achieved by changes to the SlowVAE loss computation, using more knowledge of the environment and ensuring well-distributed input data.

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References

[1] Mhairi Dunion et al. “Temporal disentanglement of representations for improved generalisation in reinforcement learning”. In: *arXiv preprint arXiv:2207.05480* (2022).

[2] David Klindt et al. “Towards nonlinear disentanglement in natural data with temporal sparse coding”. In: *arXiv preprint arXiv:2007.10930* (2020).