Aangeboden projecten: Details project

Learning schema-based predictive world models (dr. H.C. van Hoof)
29 Aug 2023

1.1 Proposal
AI Thesis project proposal

1.2 Project Title
Learning schema-based predictive world models

1.3 Project Description

Learning predictive models of the world with Deep Learning techniques has lead to impressive results [e.g. 1]. However, neural networks do not always generalize in predictable ways. Recent work has studied the extraction of a compact set of 'rules' or schemas as a starting point of allowing more predictable generalization [2]. However, this method still depends on a provided encoding of which predicates (properties and relationships between objects) are true at any moment in time.

In this thesis, we want to go one step further. Can we learn a set of rules (schemas) together with the relationships that describe the transitions of an environment? The starting point could be a numerical representation of the object in the environment or even a pixel image.Training neural representations that allow making predictions about or planning in a complex world has been studied in previous work [e.g. 3,4]. However, combining this idea with the learning of a compact set of schemas is a novel idea, that can conceivably lead to co-authoring a paper on the topic.

[1] Ha & Schmidhuber. World Models. 2018.
[2] Liberman, Bonet & Geffner. Learning First-Order Symbolic Planning Representations That Are Grounded. 2022.
[3] Kipf, Van der Pol & Welling. Contrastive learning of structured world models. 2019.
[4] Van der Pol, Kipf, Oliehoek & Welling. Plannable Approximations to MDP Homomorphisms: Equivariance under Actions. 2020.

1.4 Work environment

The Amsterdam Machine Learning Lab (AMLab) is a large lab with more than 40 members. Supervision will be performed by David Kuric (PhD candidate) and Herke van Hoof (assistant professor). We will aim to have a weekly meeting to discuss this project. If desired, more contact in between is of course possible.

1.5 Expectations

The project is likely to be challenging, but also offers the potential of interesting and publishable results. We think an ambitious and independent student would be a great match for this project.

Duration

MSc AI: 8 months

This project is exclusively for MSc AI students

1.11 Project Contact
dr. Herke van Hoof (h.c.vanhoof@uva.nl, IVI)

1.12 Number of Students
1

2. Research Tags

Please choose a maximum of three individual tags.
Note: it is not possible to submit the form if more than 3 research tags are selected

2.1 Amsterdam Machine Learning Lab Reinforcement Learning, Geometric Deep Learning