Jessica Kwok

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Reading Response for EM Paper

The paper is focuses on using the relational neural expectation maximization algorithm to perform unsupervised discovery of objects and their interactions. The rationale behind choosing this specific algorithm is that the authors argued that instead of viewing the physical environment as a whole, it is significantly more effective for intelligent agents to be able to decompose a complex visual into primitives of a compositional system. In addition, the authors argued that it is important that the artificial agents can learn physical interactions between objects from raw visual images in a purely unsupervised fashion, since relying on object-representations from external sources through supervised learning is usually unavailable in real world scenarios.

The Relational Neural Expectation Maximization (R-NEM) approach, through a two-step iterative process (the Expectation step and the Maximization step), learns a separate distributed representation for each object by grouping pixels in the input that belong to the same object together (perceptual grouping) and representation learning. Since each piece of information contains only that of an object, it can form a representation of the visual scene by composing the objects in an unsupervised way.

The paper evaluated its algorithm on three different physical tasks, which includes bouncing balls with variable mass, with invisible curtain, and the Arcade learning Environment. They found out that the R-NEM either performed better or similarly on this dataset, comparing to other unsupervised learning algorithms. They also found out that R-NEM does indeed capture the physical dynamics of different environments more accurately than other methods. In addition, it is able to generalize the environment with different number of objects and predict movements and collisions of them.

GitHub Repo of the paper: <https://github.com/sjoerdvansteenkiste/Relational-NEM>

Link of the paper: https://openreview.net/pdf?id=ryH20GbRW