

Summary of: Emergence of Language with Multi-agent Games: Learning to Communicate with Sequences of Symbols

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Key Points :

- The article explores the development of a communication protocol between agents in a referential game, where they learn to communicate through interaction and develop a language consisting of symbol sequences.
- The authors compare two training approaches - reinforcement learning and a differentiable relaxation using the Gumbel-softmax estimator. The differentiable relaxation approach is found to be faster to converge and produces more effective protocols.
- Injecting prior information about natural language improves the resulting protocol, and the learned language exhibits properties similar to natural languages, such as compositionality and variability.

Comparison:

Table 1: Comparison of the grounded protocol with the natural language and the artificial language

Model	Comm. success (%)	Number of updates	Omission score
With KL regularization	52.51	11600	0.258
Without regularization	95.65	27600	0.193
Imaginet	52.51	16100	0.287

Overall Summary:

In summary, the grounded protocol without regularization yielded the highest communication success rate. The communication loss did not appear to have a substantial impact on the performance of the image captioning models. Additionally, it was found that the straight-through Gumbel-softmax estimators outperformed reinforcement learning when applied to the referential game task.

Future Scope:

1. Investigate the benefits of using a differentiable relaxation, such as the straight-through Gumbel-softmax estimator, for developing communication protocols in multi-agent systems.