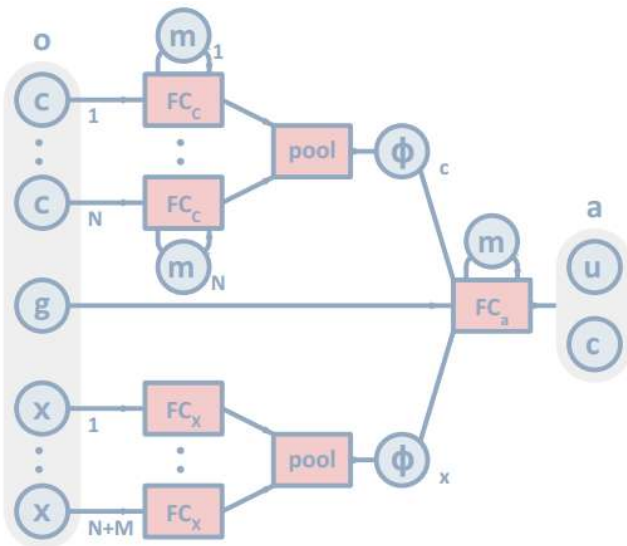


# Do you speak robot-ish? Interpreters may soon be in the house

19 March 2017, by Nancy Owano



Overview of the policy architecture, mapping observations to actions at every point time. FC indicates a fullyconnected processing module that shares weights with all others of its label. *pool* indicates a softmax pooling layer. Credit: arXiv:1703.04908 [cs.AI]

(Tech Xplore)—OpenAI is a non-profit artificial intelligence research company. In describing their work, they state that they are "working towards the next set of breakthroughs." That is no exaggeration.

What if you are told machine learning is so yesterday in language processing. "By capturing [statistical patterns](#) in large corpora, machine learning has enabled significant advances in [natural language processing](#)," wrote Igor Mordatch, Pieter Abbeel in their [paper](#) "Emergence of Grounded Compositional Language in Multi-Agent Populations," now on *arXiv*.

However, they stated, just capturing statistical patterns is not enough for agents to intelligently interact with humans. With that in mind, they

investigated if and how, "grounded compositional language can emerge as a means to achieve goals in multi-agent populations."

The authors noted that "Development of agents that are capable of communication and flexible language use is one of the long-standing challenges facing the field of [artificial intelligence](#)." Looks as if they are taking up that challenge.

In a recent blog post, Igor Mordatch, Pieter Abbeel, Ryan Lowe, Jon Gauthier and Jack Clark, wrote about their new research where agents develop their own language.

In the language of the *New York Post*, their work has proved successful "in getting robots to lay the [groundwork](#) for creating their very own language."

Or, consider the sobering headline from *Wired*: "It Begins: Bots Are Learning to Chat in Their Own Language."

Actually, do not let the word chat shock you, as their conversational drift hardly reflects dialogues about being and nothingness.

Cade Metz, *Wired*, wrote about the machines; he said researcher Igor Mordatch was "building [virtual](#) worlds where software bots learn to create their own language out of necessity."

Focus on that word, *necessity*.

"Our hypothesis," according to the blog post, "is that true [language](#) understanding will come from agents that learn words in combination with how they affect the world, rather than spotting patterns in a huge corpus of text."

The team explained that if the AI agents achieve a goal, they are rewarded. "We train them using reinforcement learning," they said, where they develop a shared language to help achieve goals.

The blog said the agents exist "in a simple, 2-D world, and are able to take actions such as moving to locations, looking at things, or saying things to communicate with other agents."

Robots talk about how to accomplish tasks. The robots have to move from one point to another, and they need to talk to each other for success.

A video on their paper "Emergence of Grounded Compositional Language in Multi-Agent Populations," title of video was posted on March 16.

The video captions point out that if it is a single agent achieving goals, then no communication is necessary, but two agents communicate movement goals. For example, a blue agent goal is to get the red agent to go to the blue landmark.

What's next: "We hope that this research into growing a language will let us develop machines that have their own language tied to their own lived experience," the researchers said in the blog.

Yes, but what will the communications topics be like? Watch and wait. "We think that if we slowly increase the complexity of their environment, and the range of actions the agents themselves are allowed to take, it's possible they'll create an expressive language which contains concepts beyond the basic verbs and nouns that evolved here."

*New York Post* said that Open AI's next project is developing a robot-to-English translator.

To be sure, the bloggers referred to a next project, where "Ryan Lowe and Igor Mordatch are going to investigate ways to connect the invented languages with English via having the agents communicate with English-speaking [agents](#). This will automate the translation of their [language](#) into ours."

**More information:** \* Learning to communicate: [openai.com/blog/learning-to-communicate/](https://openai.com/blog/learning-to-communicate/)

\* Emergence of Grounded Compositional Language in Multi-Agent Populations, arXiv:1703.04908 [cs.AI] [arxiv.org/abs/1703.04908](https://arxiv.org/abs/1703.04908)

## Abstract

By capturing statistical patterns in large corpora, machine learning has enabled significant advances in natural language processing, including in machine translation, question answering, and sentiment analysis. However, for agents to intelligently interact with humans, simply capturing the statistical patterns is insufficient. In this paper we investigate if, and how, grounded compositional language can emerge as a means to achieve goals in multi-agent populations. Towards this end, we propose a multi-agent learning environment and learning methods that bring about emergence of a basic compositional language. This language is represented as streams of abstract discrete symbols uttered by agents over time, but nonetheless has a coherent structure that possesses a defined vocabulary and syntax. We also observe emergence of non-verbal communication such as pointing and guiding when language communication is unavailable.

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