

GAME-BASED GROUNDED LANGUAGE LEARNING

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What is game-based grounded language learning?

The process of enabling machines to learn language via gameplay with humans or one another.



More realistic than corpus-based grounded language learning



Facilitates online (dynamic) learning



Allows humans without technical expertise to play a role in shaping grounded representations

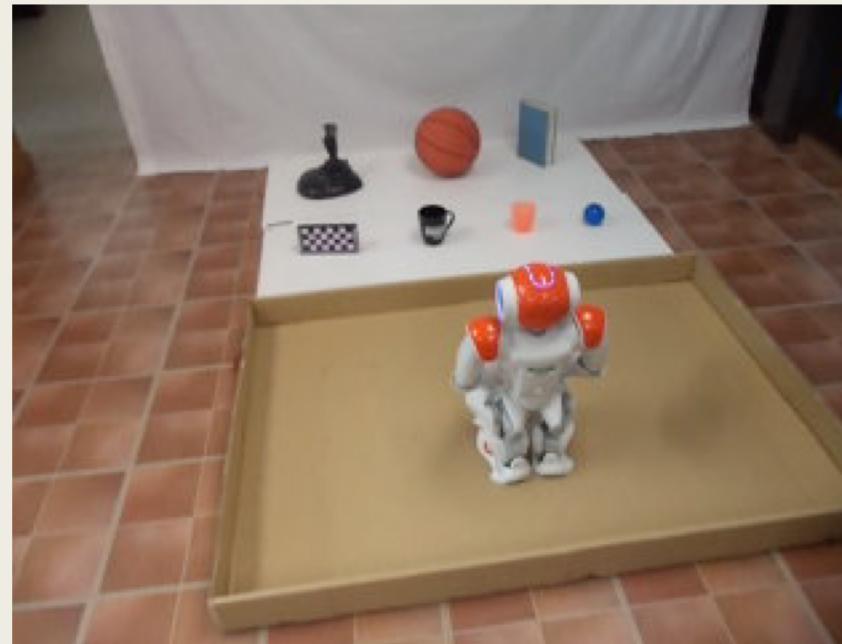


Fun!

Why games?

What does this process look like?

- Parde et al. (early prototype, mid-2014):



- Thomason et al. (2016): https://youtu.be/jLHzRXPCi_w



Two types of games for grounded language learning

- Human-Machine
- Machine-Machine

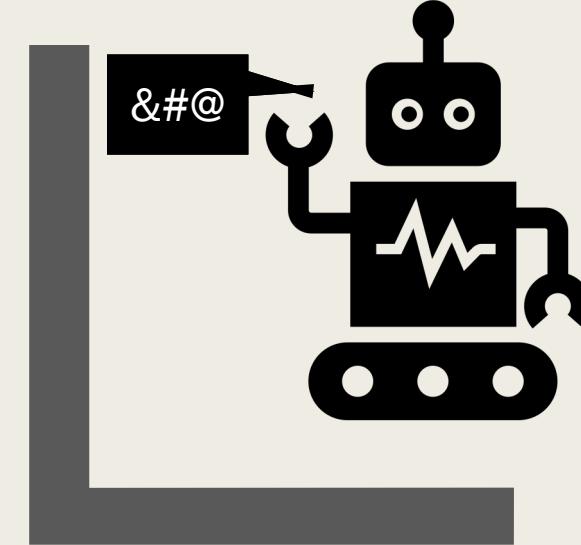
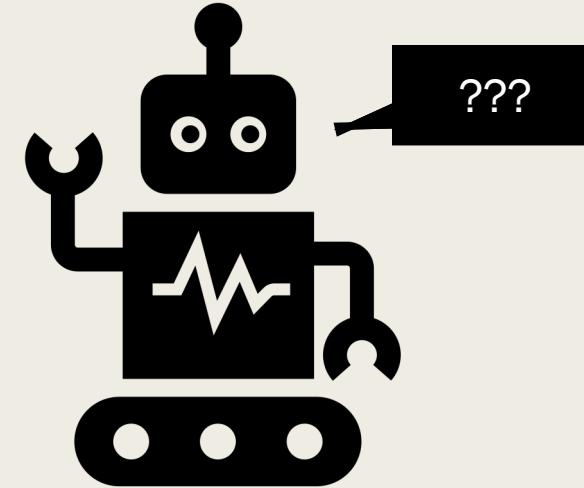
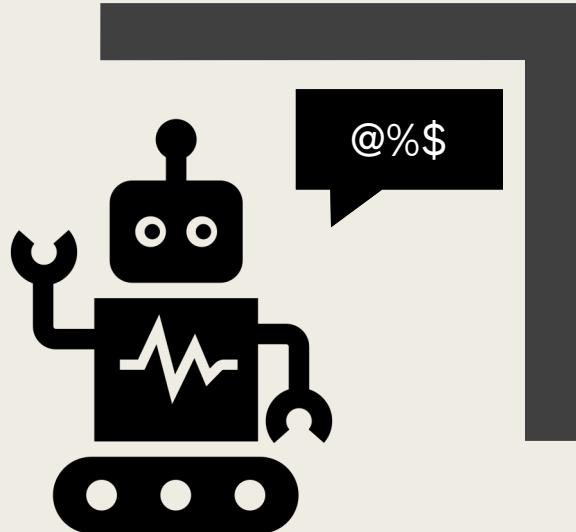
Human-Machine Games



Figure 1: An example game. Player 1 (*left*) sees an image with an object outlined in red (the man) and provides a referring expression for the object (“man in red shirt on horse”). Player 2 (*right*) sees the image and the expression from Player 1 and must localize the correct object by clicking on it (click indicated by the red square). Elapsed time and current scores are also provided.

<http://tamaraberg.com/papers/referit.pdf>

- Goal: Learn language in a more human-like way
- Often resemble early childhood language games
 - *I Spy*
 - *20 Questions*
- Others gamify annotation tasks by adding points and rewards for human players

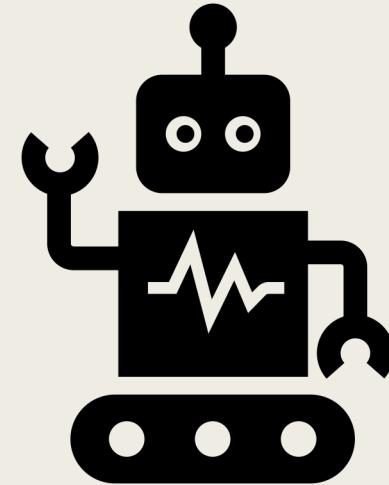


Machine-Machine Games

- Emergent communication
- Can machines learn to communicate with one another via gameplay, in absence of humans?
 - *How is this language defined?*
 - *How does it differ from human-created language?*
- Most often studied in the context of **multi-agent systems**

Emergent Communication

- Can easily get taken out of context!
 - *Facebook AI Creates Its Own Language in Creepy Preview of Our Potential Future:*
<https://www.forbes.com/sites/tonybradley/2017/07/31/facebook-ai-creates-its-own-language-in-creepy-preview-of-our-potential-future/#1a5021ec292c>
 - *An Artificial Intelligence Developed Its Own Non-Human Language:*
<https://www.theatlantic.com/technology/archive/2017/06/artificial-intelligence-develops-its-own-non-human-language/530436/>
- Interesting Lecture:
 - *Can robots invent their own language?, by Luc Steels:* <https://youtu.be/AaVnyn1tSIE>



Resources

- Workshops:
 - *Workshop on Visually Grounded Interaction and Language:* <https://nips2018vigil.github.io/>
 - *Emergent Communication Workshop:* <https://sites.google.com/site/emecon2018/home>
 - *Reinforcement and Language Learning in Text-based Games:* <https://www.wordplay2018.com/>
- GuessWhat?! Dataset: <https://guesswhat.ai/>
- Text-based Language Learning Games:
 - *First TextWorld Problems: A Reinforcement and Language Learning Challenge:* <https://www.microsoft.com/en-us/research/project/textworld/>
 - *Mastering the Dungeon: Grounded Language Learning by Mechanical Turk Descent:* <https://research.fb.com/publications/mastering-the-dungeon-grounded-language-learning-by-mechanical-turker-descent/>

Wrapping up....

- Overview
- Sample Games
- Two Types of Games
 - *Human-Machine*
 - *Machine-Machine*
- Resources