

Remarks on the CommAI-env

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A Roadmap towards Machine Intelligence

Tomas Mikolov, Armand Joulin, Marco Baroni

The idea

“We discuss a simple environment that could be used to **incrementally teach** a machine the **basics of natural-language-based communication**, as a pre-requisite to more complex interaction with human users.”

A Roadmap towards Machine Intelligence

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Incremental learning

- Incremental tasks → intelligent machine
 - E.g. *addition* facilitates/enables *subtraction*

Basic tasks for communication?

- Currently, 47 tasks in the CommAI-Env
 - 13 are about repetition
 - 5 about separators/delimiters
 - 3 about conjunction/disjunction/negation
 - 10 about counting
 - 5 about numbers

Here's how the Learner will learn...

Repeat What I Say Multiple Times Separated By Comma [K7]

Example 1:

Teacher: say apple 3 times
comma.

Learner: apple, apple,

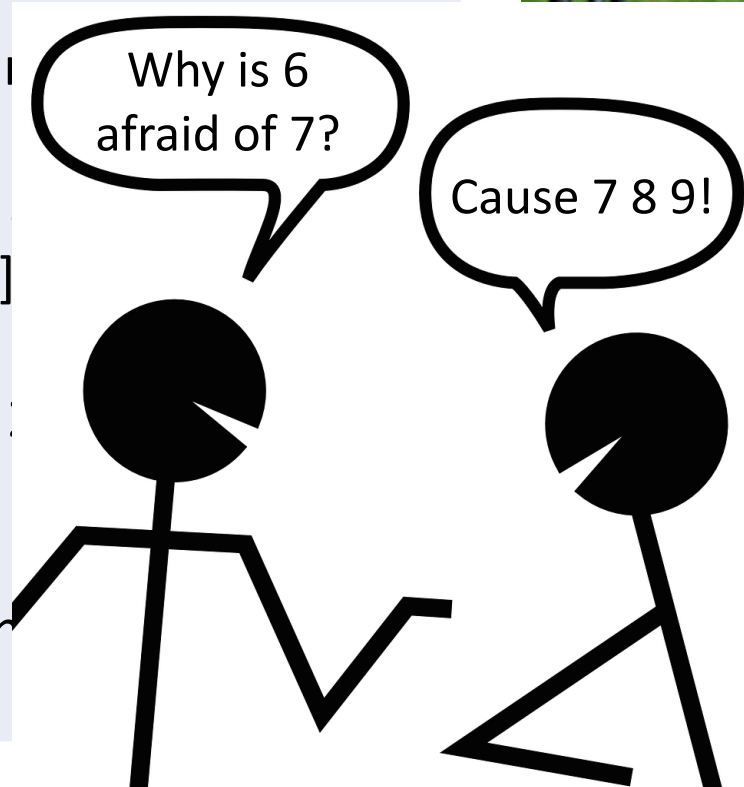
Teacher: correct. [R+1]

Example 2:

Teacher: repeat apple
by comma.

Learner: blablabla.

Teacher: no, correct and
apple.



Incremental learning

- Incremental tasks → intelligent machine
 - E.g. *addition* facilitates/enables *subtraction*

huge methodological issue

easy to underestimate!

- analogy:
bachelor = +HUMAN, +ADULT +MALE, -MARRIED

A word cloud of mathematical and linguistic terms in red text of varying sizes. The largest words are 'objects', 'counting', 'property', and 'repetition'. Other prominent words include 'numbers', 'pick up', 'separators', 'move', 'disjunction', 'digits', 'negation', 'inventory', 'existence', 'verbs', 'Italian conjunction', 'silent individual', 'look', 'lists', 'give', 'turn', and 'guess'.

objects
counting
property
repetition
numbers
pick up
separators
move
disjunction **digits** **negation** **inventory** **existence** **verbs**
Italian conjunction **silent individual** **look** **lists** **give** **turn** **guess**

(Aside: Who will teach the Teacher?)

- how to define a set of tasks that build on one another *and* lead to an intelligent machine that can interact with humans... ***and can be scripted!***

Meaning needs to be grounded

Repeat What I Say [K2]

Teacher: say apple.

Learner: apple.

Teacher: correct.

Teacher: repeat.

Learner: hello world.

Teacher: correct.

Teacher: repeat.

Learner: blabla.

Teacher: wrong.

Look [AJ1]

Teacher: Look to the east
to the east

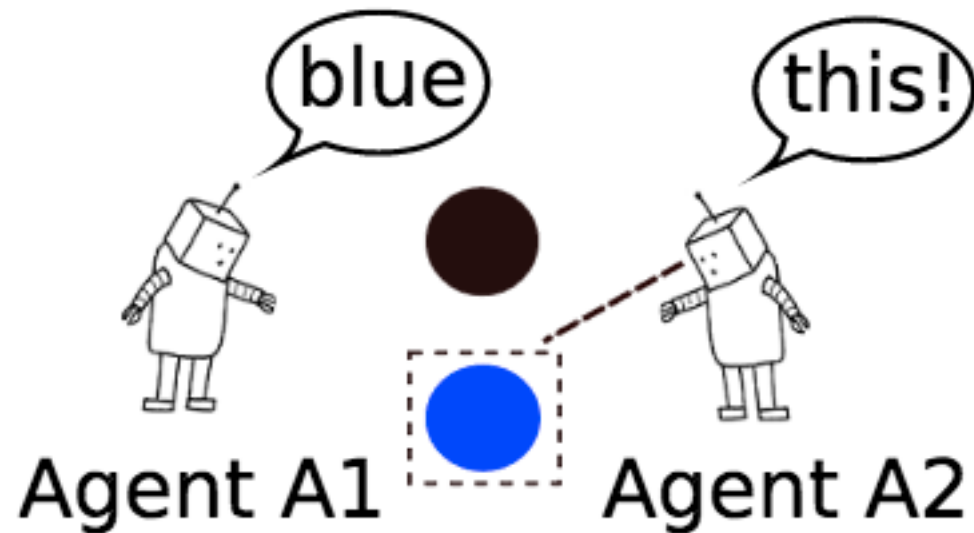
left/right.
left/right
earned [+1].

rd [G2]

Move forward.

Learner: I move forward.

Teacher: You moved [+1].



Lazaridou et al. (2016)

I'm hiring!

2PhD and 3 post-doc positions

reference

+

deep learning

+

Barcelona

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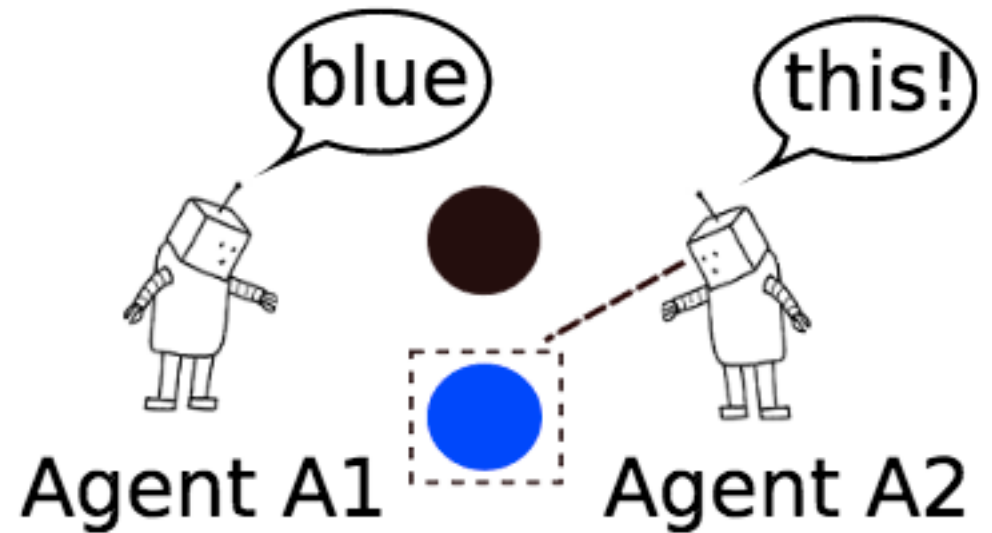
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Basic tasks for communication

- The Learner needs (at least)
 - a vocabulary,
 - a (simple) grammar
 - (simple) dialogue skills
 - reference/grounding capabilities



- **What are basic communication tasks?**
 - identifying objects (reference) (Lazaridou et al. 2016)
 - responding to requests with appropriate answer/action
 - ...

Example: Max Time

Repeat Character [G15]

Description: the learner is asked to repeat the character after the teacher.

Example 1:

Teacher: say a.

Learner: a.

Teacher: correct. [R+1]

Example 2:

Teacher: repeat a.

Learner: blablabla.

Teacher: wrong, correct answer is: a.

Max Time: 1000

Do Not Repeat Character

Description: the learner is asked not to repeat the character after the teacher.

Example 1:

Teacher: do not say a.

Learner:

Teacher: correct. [R+1]

Example 2:

Teacher: don't repeat a.

Learner: blablabla.

Teacher: wrong, be silent.

Max Time: 1000