

Unnatural Language Processing: Entering the Machine-to-Machine Communication Era

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ACL 2022 Next Big Idea Panel



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A brief history of deep-learning-based NLP

- From designing and training your own network from scratch for each distinct task...
- ... to using a large pre-trained network “as-is” for a new task by hacking its interface

A brief history of deep-learning-based NLP

- From designing and training your own network from scratch for each distinct task...
- ... to using a large pre-trained network “as-is” for a new task by hacking its interface
 - E.g., “prompt engineering”:
 - Turn GPT2 into slot filling system by querying it with template such as “*X was born in [MASK]*”

(Near) futurology



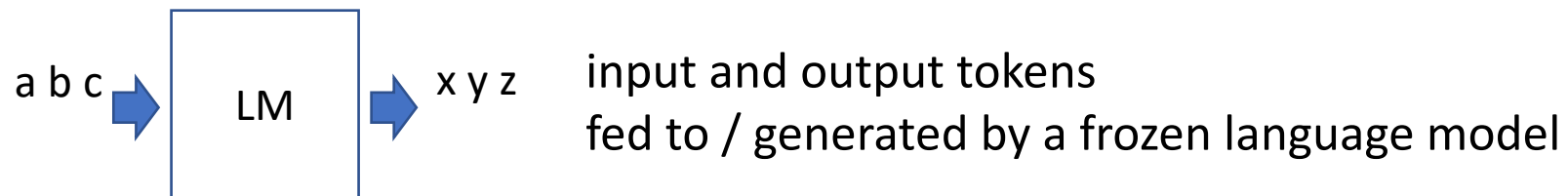
this is my
Next Big Idea 😊

- **Frozen pre-trained networks that autonomously interact by hacking each other's interfaces to solve new tasks together**
 - I.e., by relying on a machine-to-machine interface protocol
- A few scenarios:
 - Net-powered online services from different providers
 - Net-powered smart apps in a household
 - Net-powered robots, self-driving cars
- Assume initially all network architectures are embedded into language models
 - so that interface protocol amounts to machine-to-machine language translation

How should neural networks communicate

- Through a *learned* interface protocol
 - Too time-consuming to code an interface protocol by hand for each possible network combination and task
- Through an *easily generalizable* interface protocol
 - Different tasks
 - Your smart fridge telling Alexa 4.0 that milk is running out
 - Alexa 4.0 telling the fridge to lower the temperature
 - Different network combinations
 - The fridge telling Alexa 4.0 that milk is running out
 - Alexa 4.0 buying milk from a smart supermarket app

A learned interface between two language models

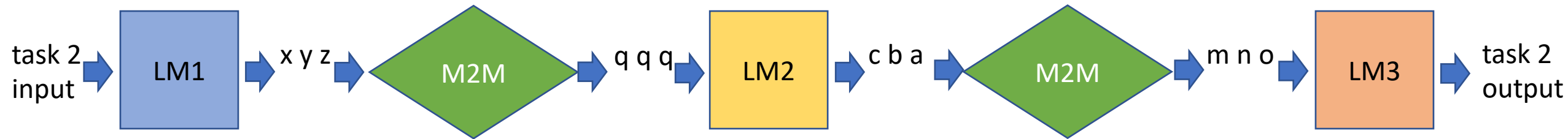


a machine-to-machine translation module

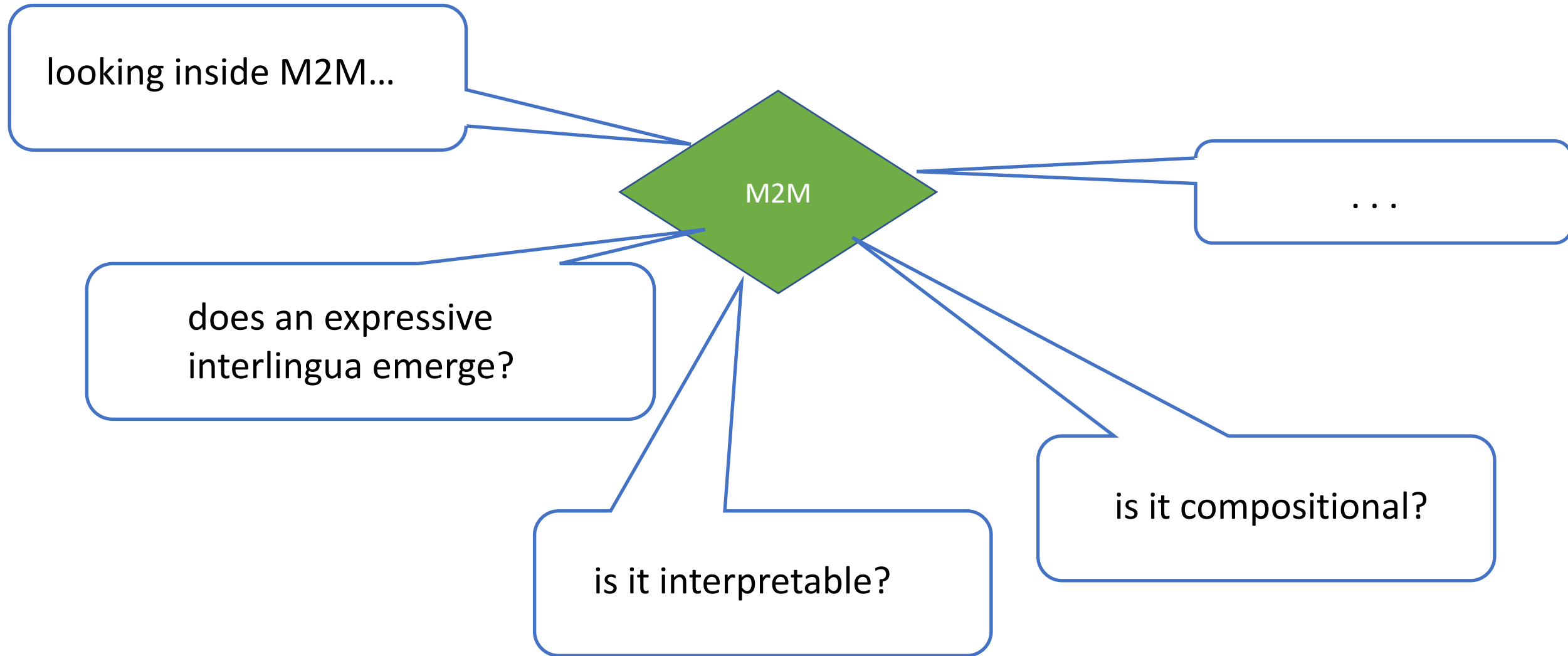
the only component of the system to be trained

task success as main training signal

Plug in a third LM to perform new task:
M2M should require just minimal
task- and LM-specific tuning



Unnatural Language Processing

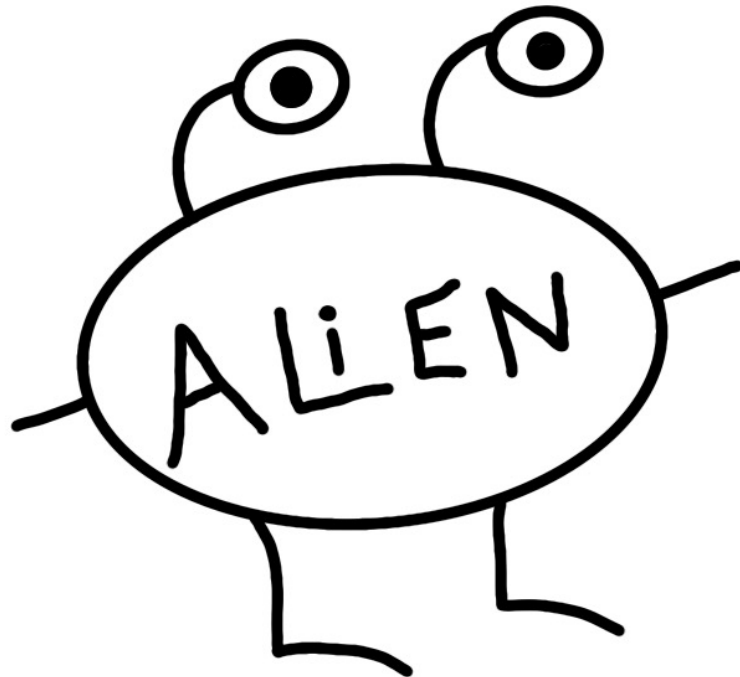


Getting there step by step...

- Prompt engineering
 - Especially automated prompt induction methods
 - <http://pretrain.nlpedia.ai/>
- Adapters
 - See He et al. ICLR 2022 on prompting/adapters commonalities
 - <https://github.com/adapters/adapters>
- “Socratic models”
 - <https://socraticmodels.github.io/>
- Deep net emergent communication
 - <https://github.com/vermashresth/awesome-emergent-languages>



THANK YOU!!!!



Autonomous **L**inguistic **E**mergence
in Neural **N**etworks: a 5-year ERC-
funded project on machine-to-
machine communication, starting
now at COLT... get in touch if you're
interested!

<https://marcobaroni.org/alien/>