

Artificial Intelligence  
Natural Language Processing  
*and*  
Common Sense

Max Forbes





Onagro de asedio



70/70



75+1



0/8



8+1

Teutones  
NecroSoul





```
add_gold_to_self(1000);  
while(true) {  
    build("castle");  
    send_message("ha ha!");  
}
```

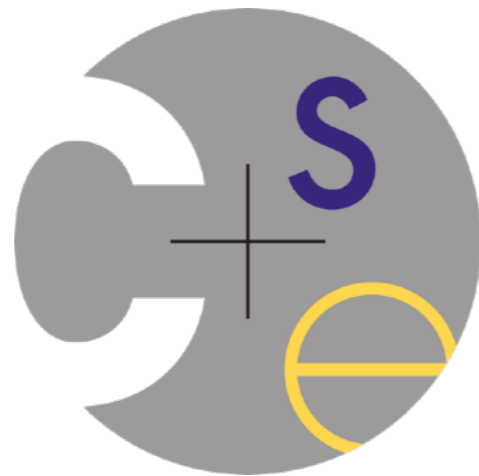
Onagro de asedio

	Teutones
	NecroSoul
	70/70
	75+1
	0/8
	8+1

CONQUERORS



# Me



● —————→  
Middle school (?)

College

Pseudo-adult

Grad school





PULL

**MIDVALE**  
SCHOOL FOR  
THE GIFTED



Act I

What is intelligence?



# Some ideas....

“The mental ability to sustain successful life”

“Doing well at a broad range of tasks”

“Intelligence is the ability to use optimally limited resources – including time – to achieve goals.”

“The capacity to acquire capacity”







Is intelligence one  
single thing?



How do we measure  
**human** intelligence?



*“Innumerable tests are available for measuring intelligence,*

*yet no one is quite certain of what intelligence is,*

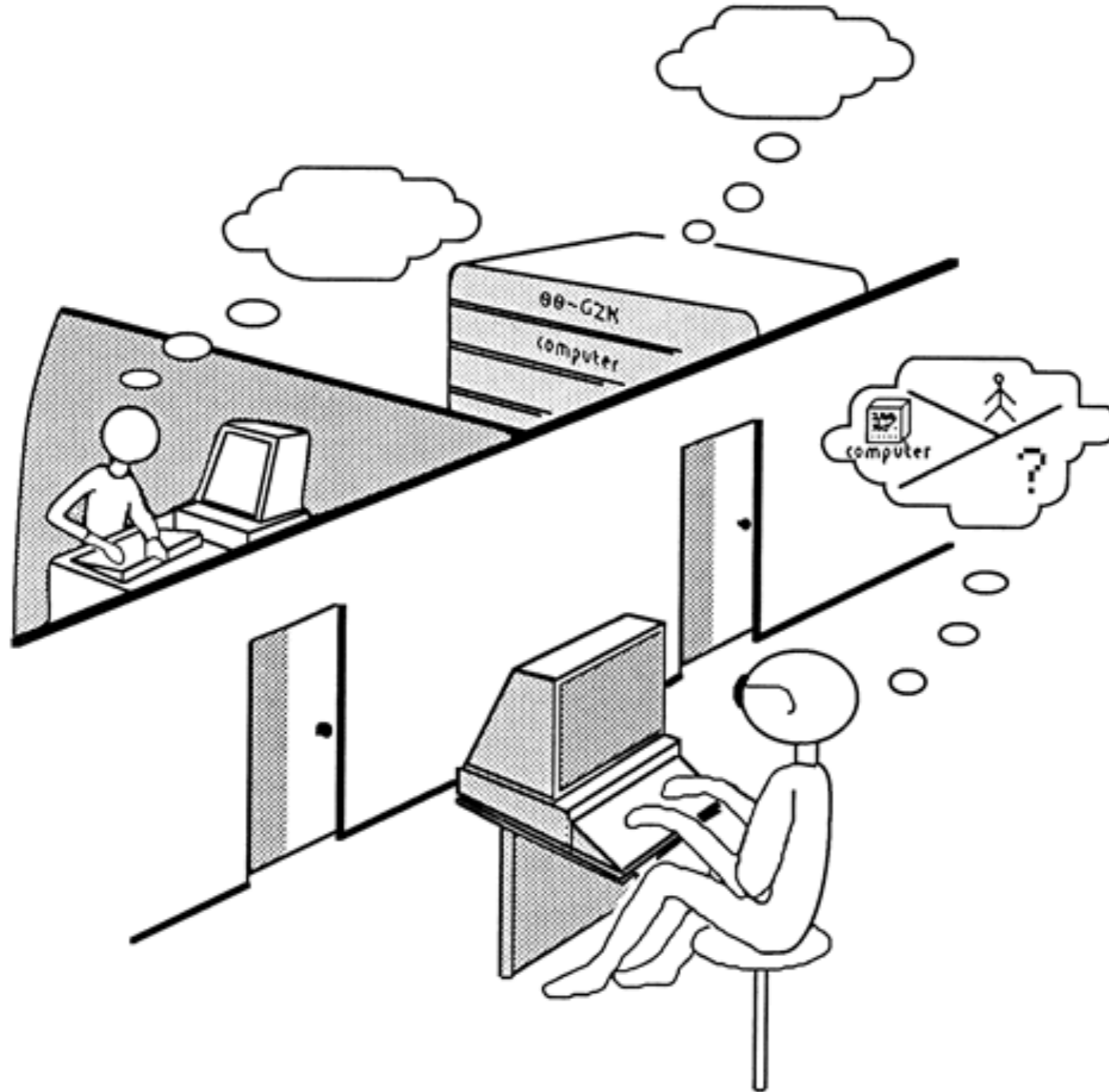
*or even just what it is that the available tests are measuring.” — R. L. Gregory*



How do we measure  
**artificial** intelligence?



# The Turing Test





# The Chinese Room counterargument





# The Chinese Room counterargument





# The Chinese Room counterargument



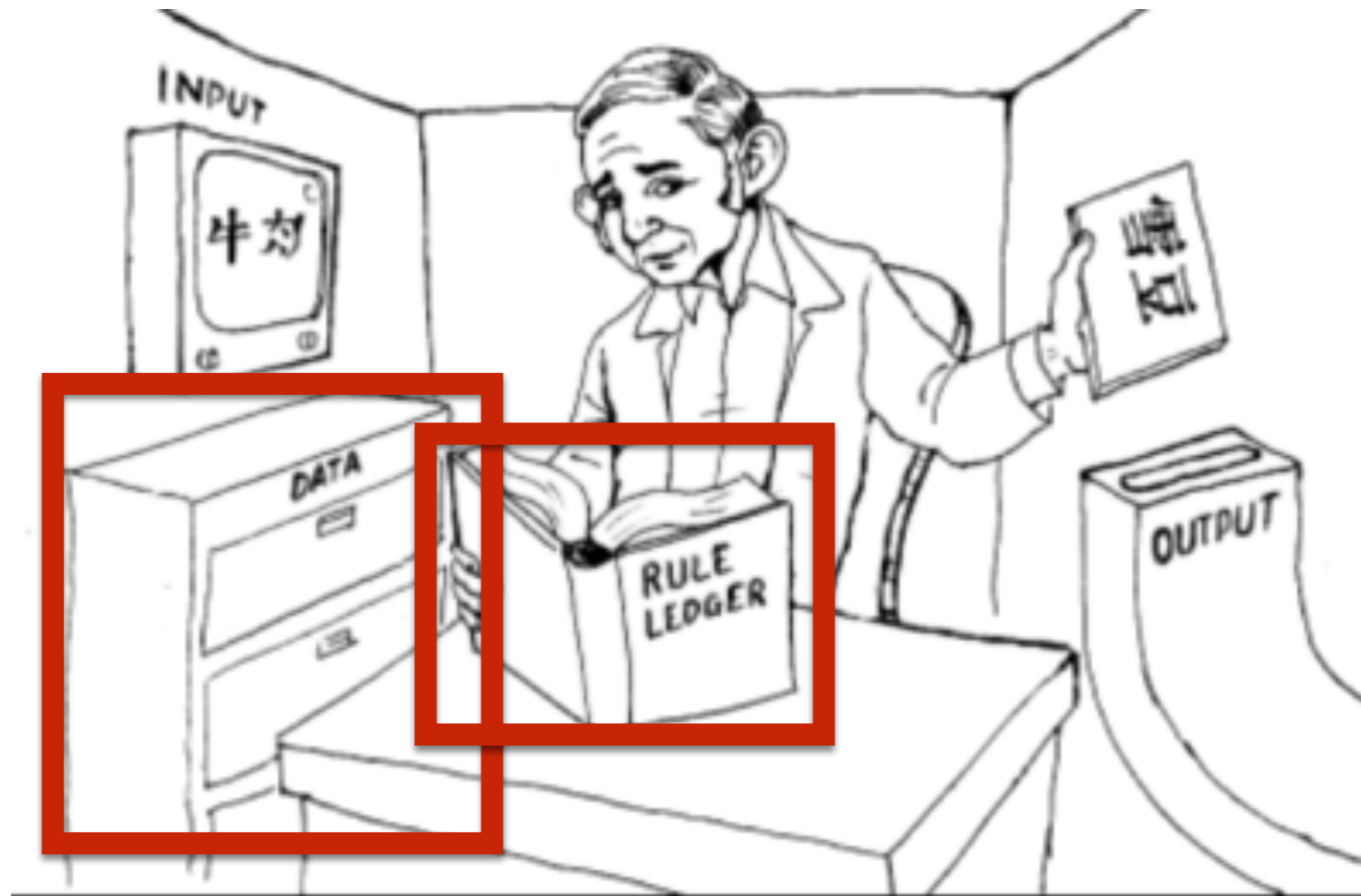


# The Chinese Room counterargument





# The Chinese Room counterargument



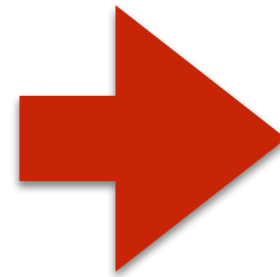
# The Chinese Room counterargument





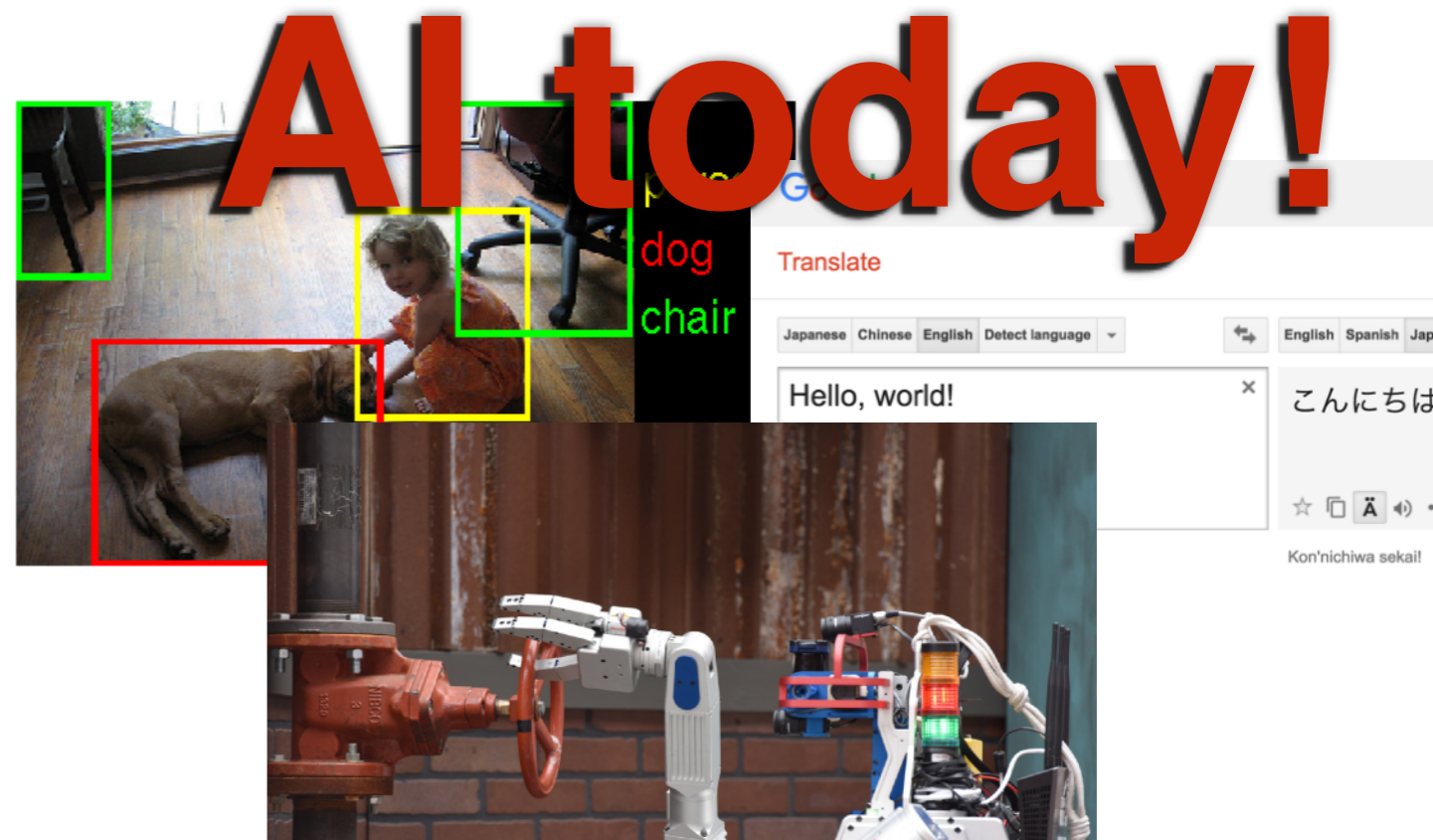
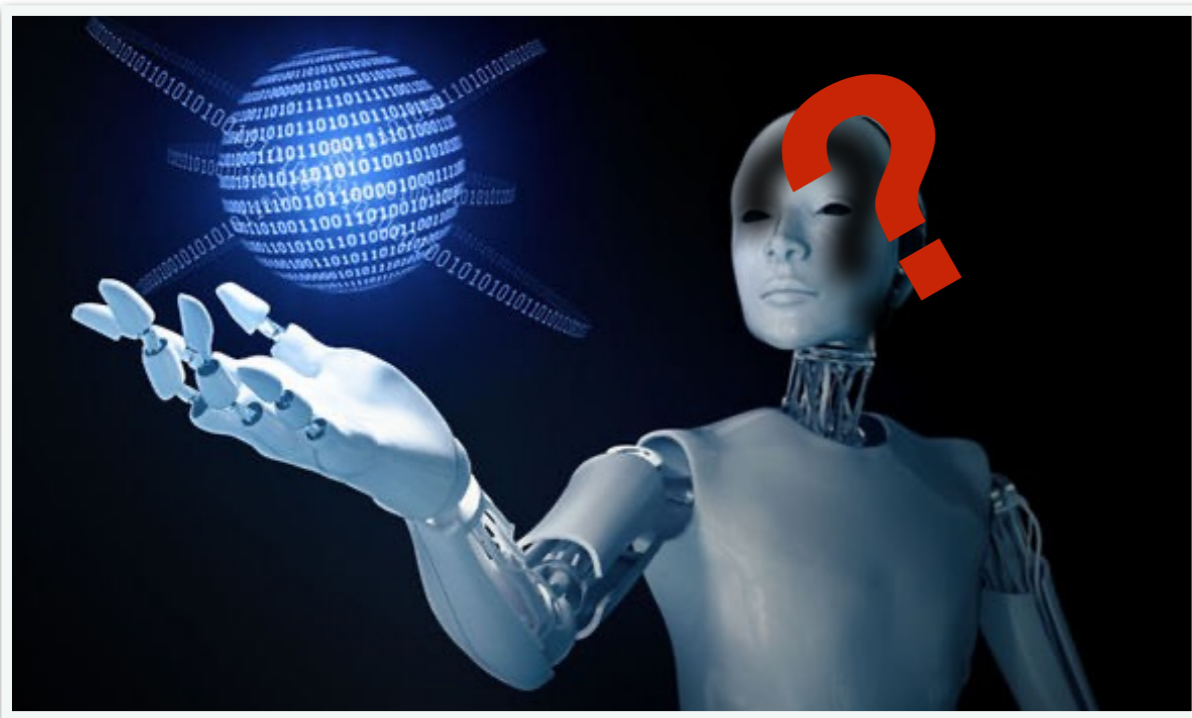
## General intelligence:

- hard to define
- hard to measure
- hard to create



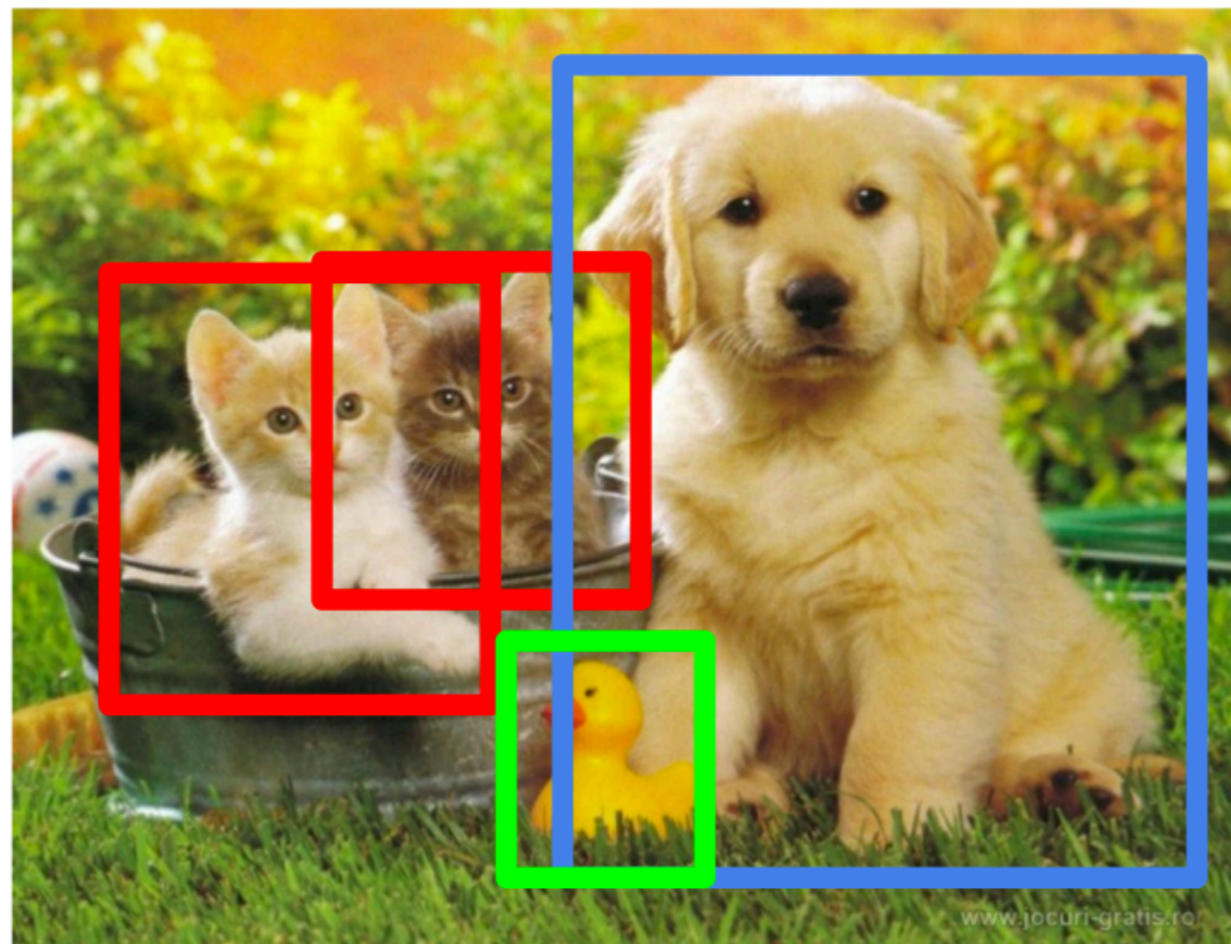
## Specific intelligences:

- easy to define
- easy to measure
- **still lots of work to create**



# Computer vision

## Object Detection



**CAT**, **DOG**, **DUCK**



# Natural Language Processing



Maxwell



Translate

Turn off instant translation



Japanese Chinese English Detect language



English Spanish Japanese

Translate

Hello, world!



こんにちは世界！

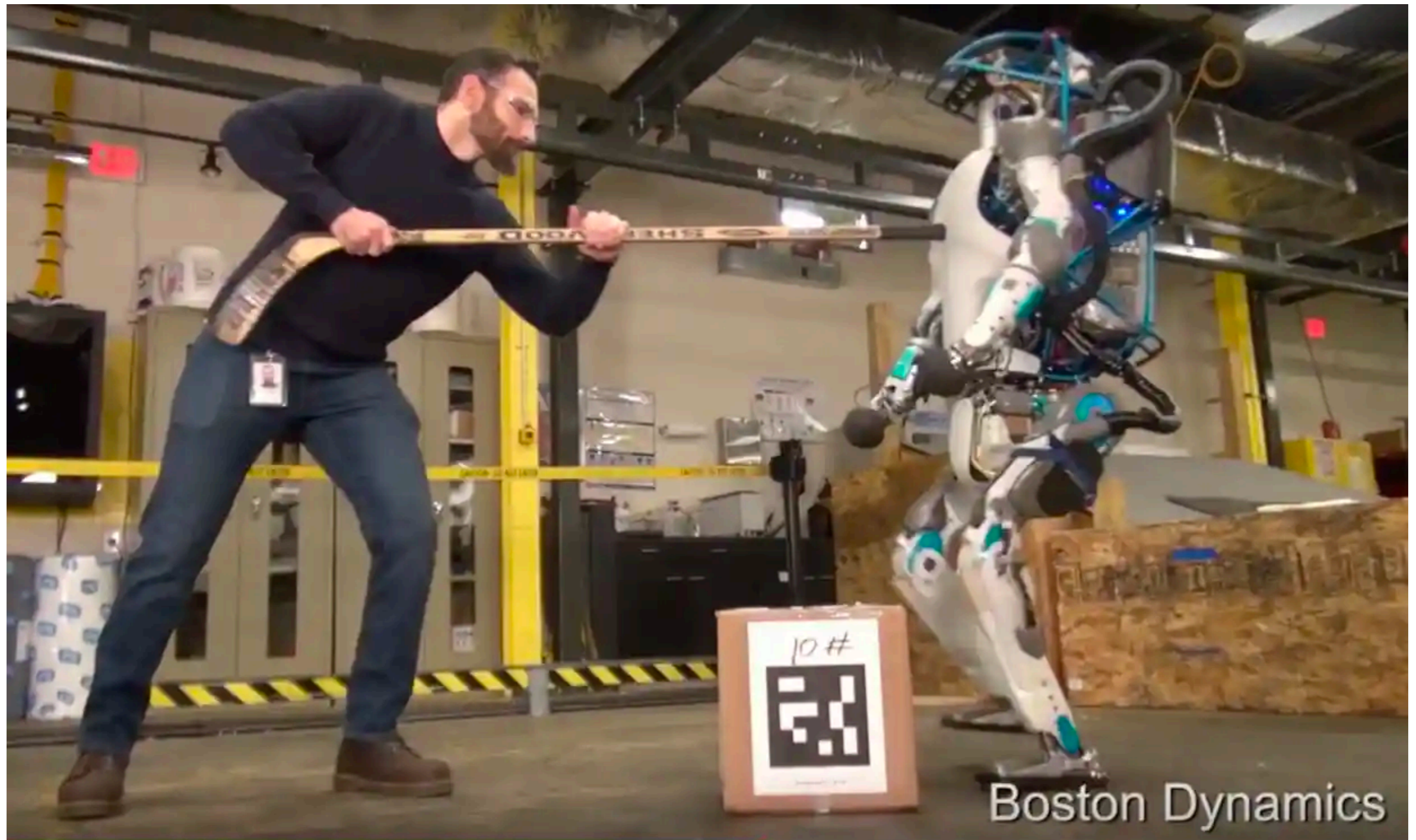


Kon'nichiwa sekai!

See also

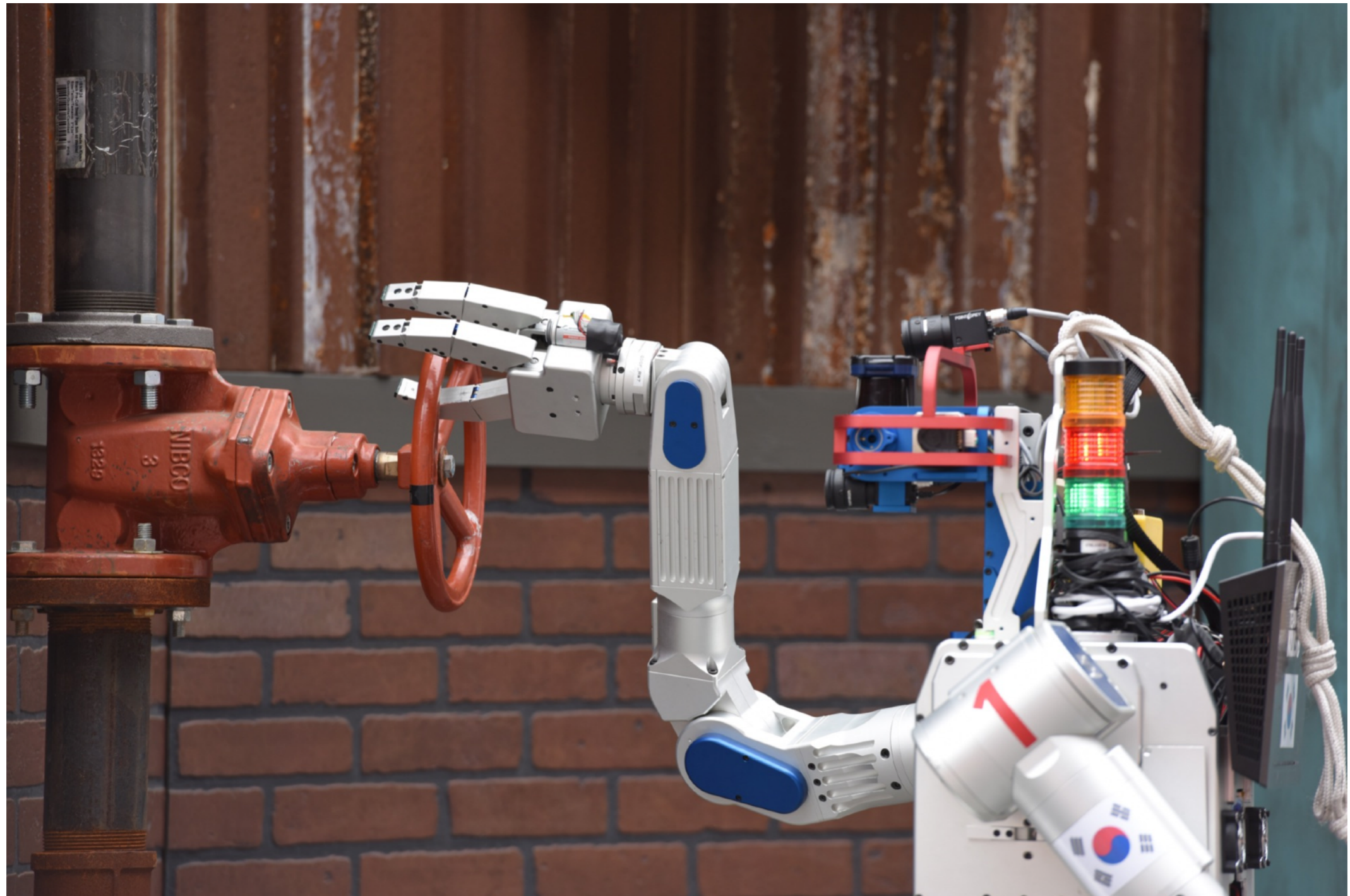
World

# Robotics???





# Robotics: The Final Frontier



Act II

What is Natural Language  
Processing (NLP)?

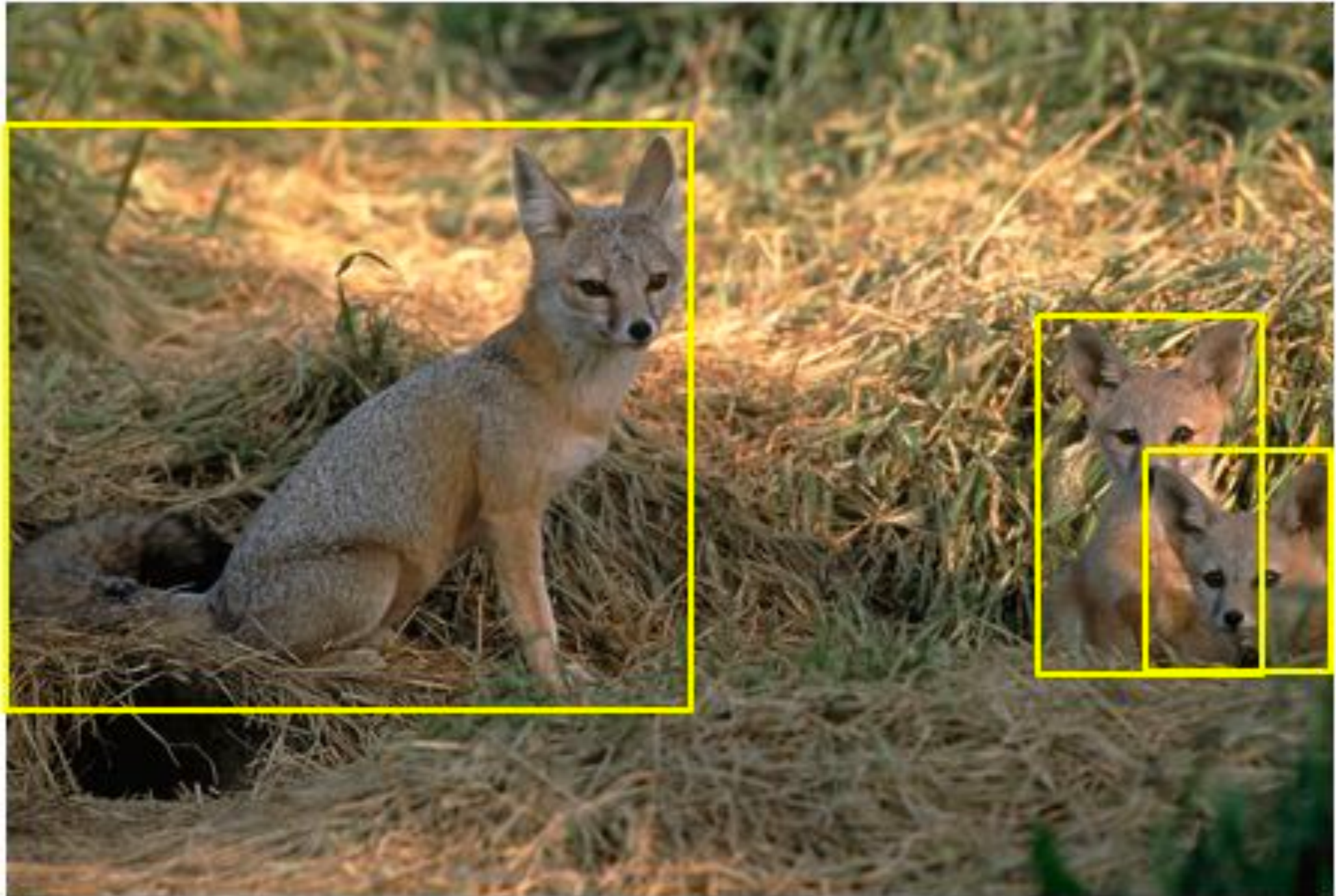


# What is NLP?

**Max's Definition:**

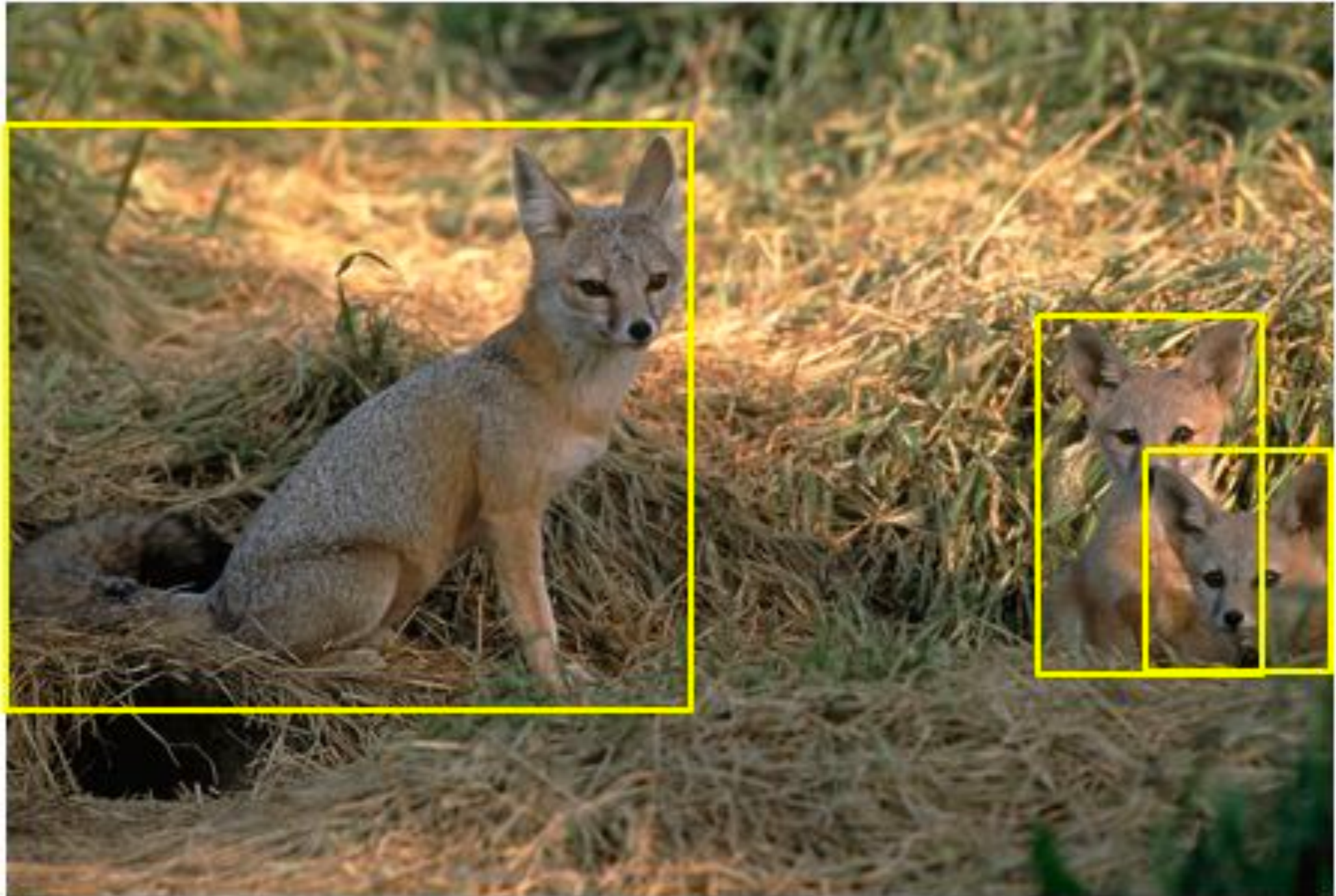
computer tasks that have human language as input, output, or both

# Quiz on what is NLP





# Quiz on what is NLP



**IMAGE CLASSIFICATION**  
(kind of)

**no:** no language



# Quiz on what is NLP





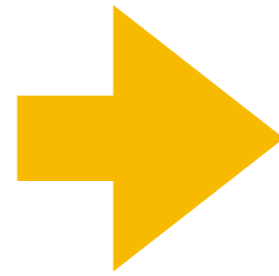
# Quiz on what is NLP



**OBJECT DETECTION**

**no:** labels != natural language

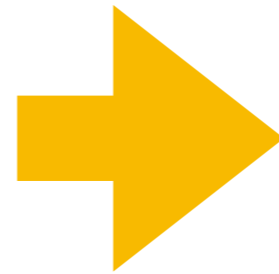
# Quiz on what is NLP



*There is a dog in a man's arms who looks almost unbearably cute.*



# Quiz on what is NLP



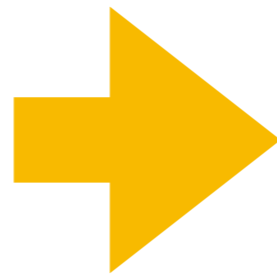
*There is a dog in a man's arms who looks almost unbearably cute.*

**IMAGE CAPTIONING**

**yes:** natural language as output  
(technically people call this “vision + language”)

# Quiz on what is NLP

*Esta aula está  
llena de  
abejas.*

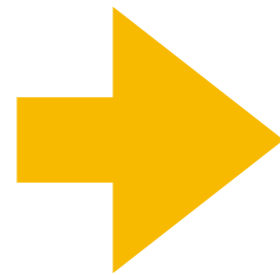


*This  
classroom is  
full of bees.*



# Quiz on what is NLP

*Esta aula está  
llena de  
abejas.*



*This  
classroom is  
full of bees.*

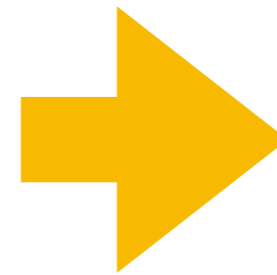
**MACHINE TRANSLATION**

**yes:** natural language as input and output

# Quiz on what is NLP

*The entire kitchen and wait staff saw an ice cream truck and ran outside, leaving me alone in the restaurant. 10 minutes later they all came back with ice cream cones.*

*I still can't believe this actually happened.*

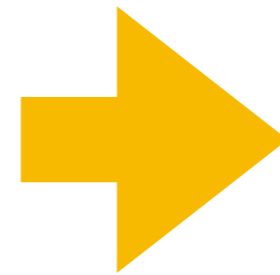




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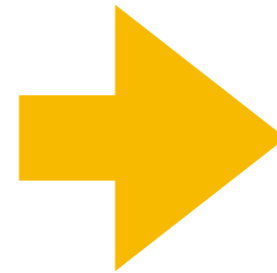


**SENTIMENT ANALYSIS**

**yes:** natural language as input

# Quiz on what is NLP

I sat down and ate the \_\_\_\_\_

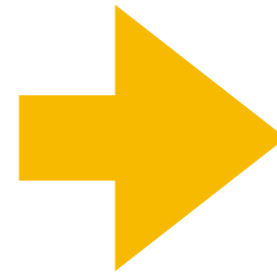


meal (30%)  
sandwich (20%)  
pizza (10%)  
best (8%)  
delicious (7%)  
...



# Quiz on what is NLP

I sat down and ate the \_\_\_\_\_



meal (30%)  
sandwich (20%)  
pizza (10%)  
best (8%)  
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...

**LANGUAGE MODELING**

**yes:** natural language as input  
and output

# Look out for Language Modeling

Fake Article 

nytimes.com

## Why Bitcoin is a great investment

June 6, 2019 - Paul Krugman

As most of my readers know, I'm an optimist.

This belief applies across my life, and to various investments as well. So I am intrigued by the success of cryptocurrencies, such as Bitcoin and Ethereum. The competition they are putting up against the gold standard looks insane, as Bitcoin goes off to the races.

There's no way to fully understand what's going on in the crypto world — and I am not even sure anyone could if you tried to. Still, I can tell you that Bitcoin's recent surge is really an opportunity to buy long-term real assets.

Cryptocurrencies are new and don't even have a useful underlying technology. They will probably fail, probably sooner than later. If people forget about them quickly, it is likely to be because the underlying technology will finally mature and win out. We don't even know whether that will happen in a generation or maybe a century, but it's still possible it might.

**fake news generator**



**Why is NLP = “is there  
language as input or  
output” good / bad?**

# Why is NLP = “is there language as input or output” good / bad?

Good:

---

- **“Computational linguistics”** – studying language itself using statistics with computers

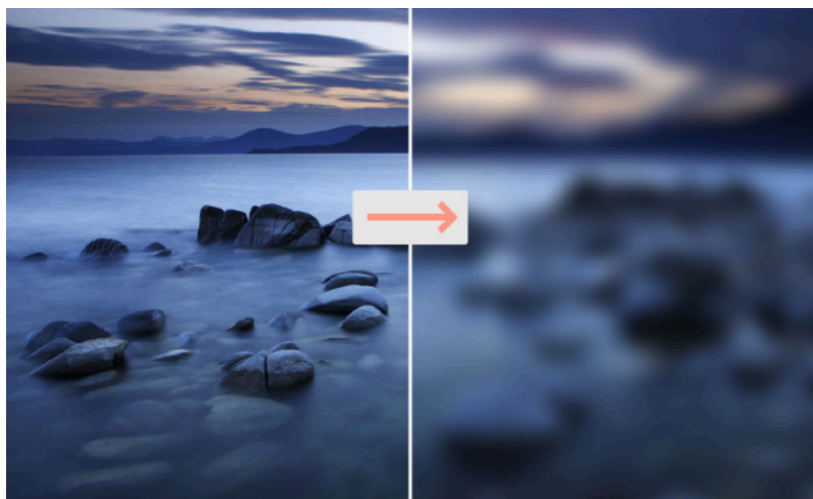


# Why is NLP = “is there language as input or output” good / bad?

Good:

---

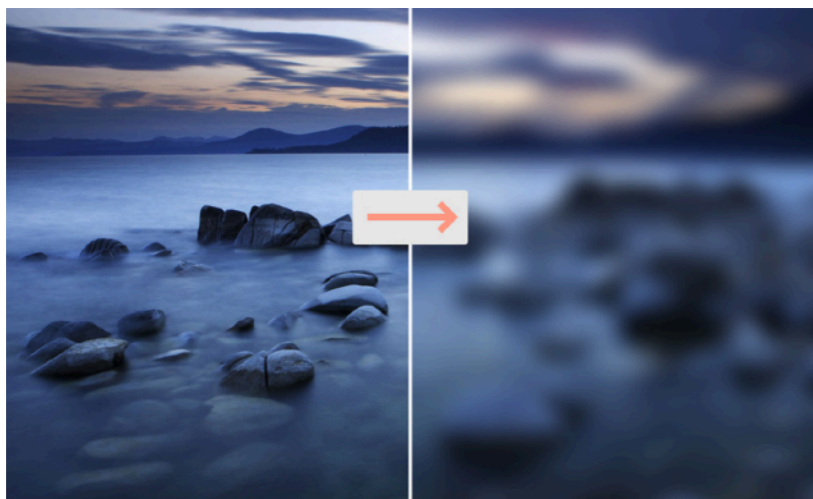
- **“Computational linguistics”** – studying language itself using statistics with computers
- **Discrete symbols** – language requires different ML techniques



# Why is NLP = “is there language as input or output” good / bad?

Good:

- **“Computational linguistics”** – studying language itself using statistics with computers
- **Discrete symbols** – language requires different ML techniques



Bad:

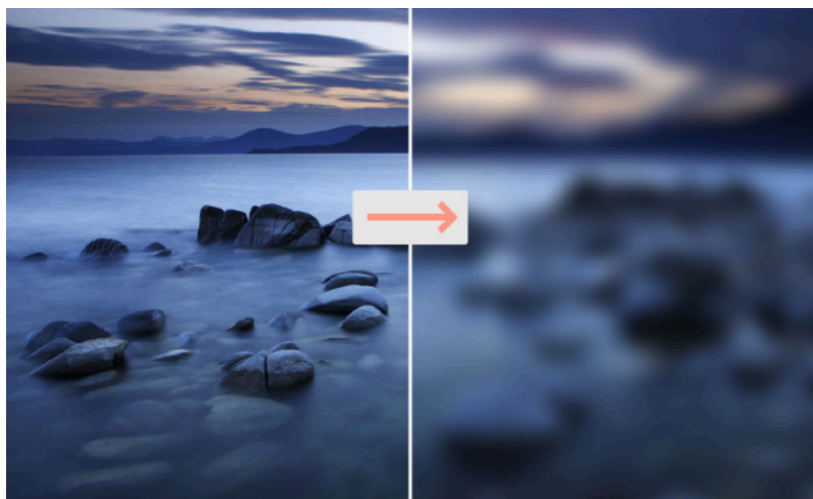
- **“Artificial intelligence”** – language expresses thoughts; is “NLP” just the field for all thinking and reasoning?



# Why is NLP = “is there language as input or output” good / bad?

Good:

- **“Computational linguistics”** – studying language itself using statistics with computers
- **Discrete symbols** – language requires different ML techniques



Bad:

- **“Artificial intelligence”** – language expresses thoughts; is “NLP” just the field for all thinking and reasoning?
- **“You can’t learn language by listening to the radio”** – idea that we need to tie language to experiences to truly learn it (this is called “grounding”)

Act III

# Common Sense in NLP

# COMMONSENSE IN: SYNTACTIC PARSING

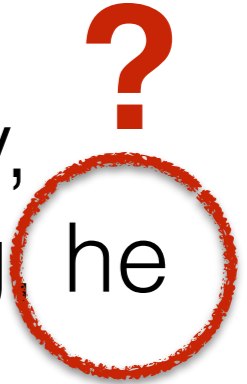
I shot the elephant in my pajamas.





## COMMONSENSE IN: COREFERENCE RESOLUTION

Obama met Jobs to discuss the economy,  
technology, and education. After the meeting, he  
signed a bill to introduce [...]



# COMMONSENSE IN: SPEECH RECOGNITION

“... go ahead and grill the ██████”

dish	0.5
fish	0.3
miss	0.1
...	

?



**VS**



# COMMONSENSE IN: NATURAL LANGUAGE GENERATION

- Preheat the oven to 350 F.
- Tenderize the chicken with a large mallet.
- Season the chicken with the spice mixture.
- Serve chicken on top of a bed of rice.

**Done!?**





## COMMONSENSE IN: AI CHALLENGES

The large ball crashed right through the table because it was made of **steel**.

What was made of **steel**?

---

The large ball crashed right through the table because it was made of **styrofoam**.

What was made of **styrofoam**?

# Questions?

Recap:

Act I

Intelligence and Artificial Intelligence

Act II

What is Natural Language Processing (NLP)?

Act III

Common Sense in NLP

Thank you