We've made a lot of progress in RL

OpenAI Five
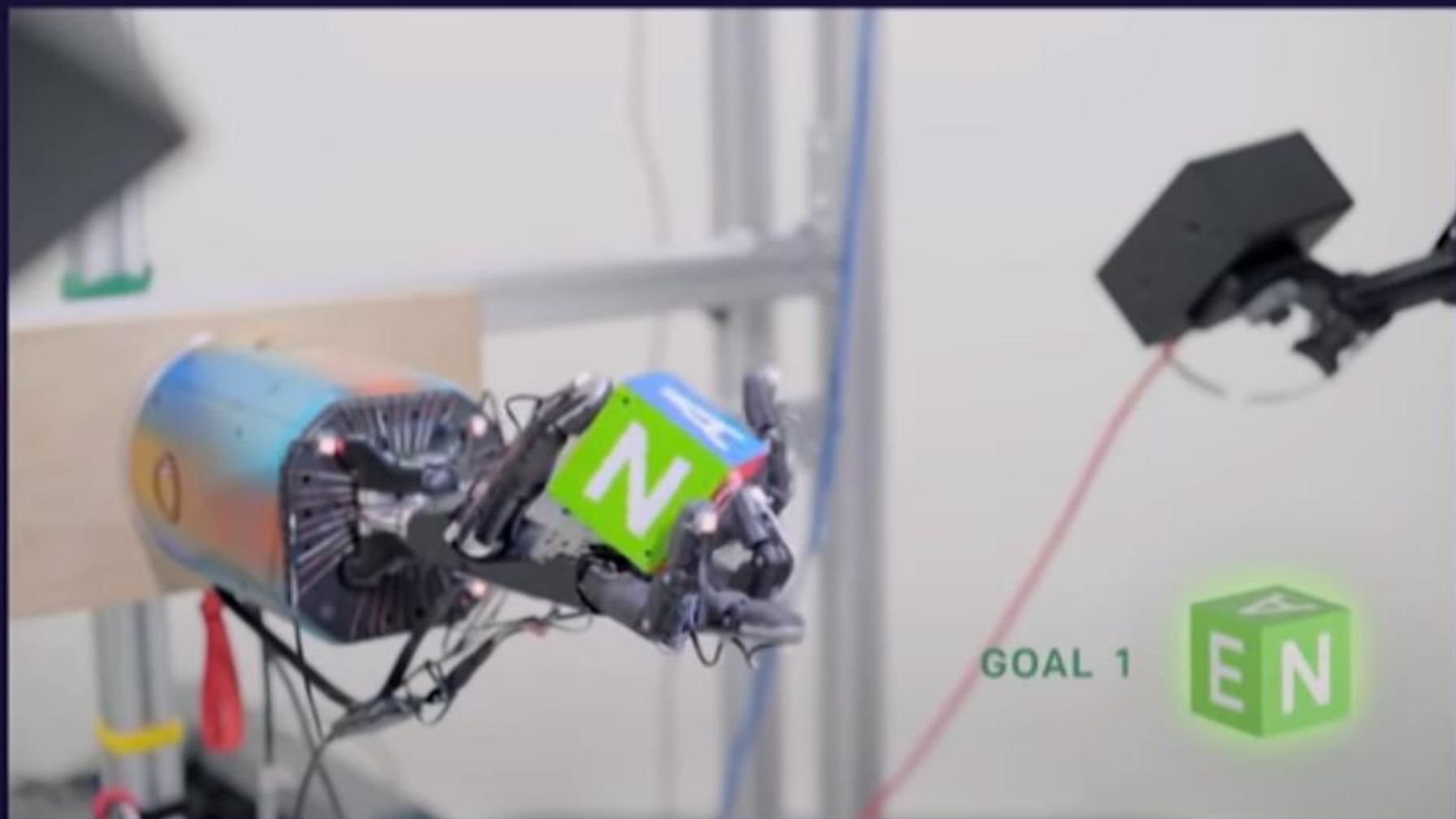
OpenAI Five

OpenAI Five

Finals on April 13

Showcase new capabilities

Play the current champions, OG

"RL cannot be applied to the real world"

Exploration

Agents that don't explore don't learn
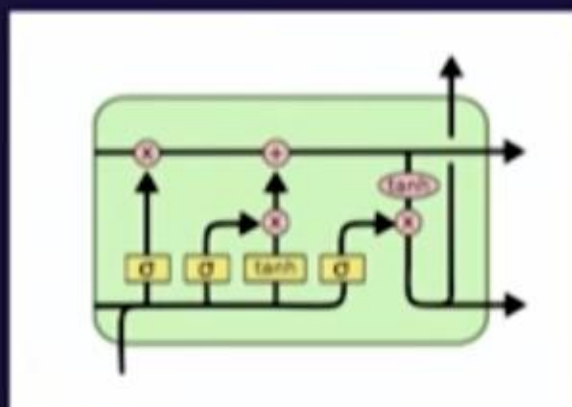
Curiosity helps

Exploration

Unsupervised Learning

Unsupervised learning: Why now?
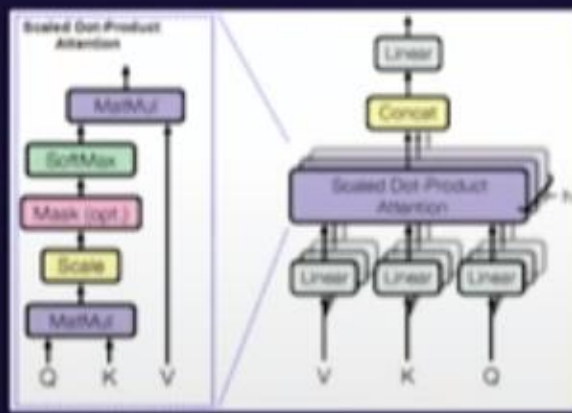

Past — Not enough compute + LSTM = **Does not work**

Present — Enough compute + Transformer = **Works**

Predicting the Next Word Well Enough

We've trained a large-scale unsupervised language model which generates coherent paragraphs of text, achieves state of the art performance on many language modeling benchmarks, and performs rudimentary reading comprehension, machine translation, question answering, and summarization —

Predicting the Next Word Well Enough

We've trained a large-scale unsupervised language model which generates coherent paragraphs of text, achieves state of the art performance on many language modeling benchmarks, and performs rudimentary reading comprehension, machine translation, question answering, and summarization — all without task specific training. **These results, which have now been published in the journal Machine Learning: Interspeech, are remarkable. "Our platform is not just a neural network. It is a very simple program, and it operates at the level of natural language processing.**

Dictionary

```
d = dict()
>>> d['a'] = 1
>>> d['b'] = 2
>>> d['c'] = 123
>>> d['a']
1
```
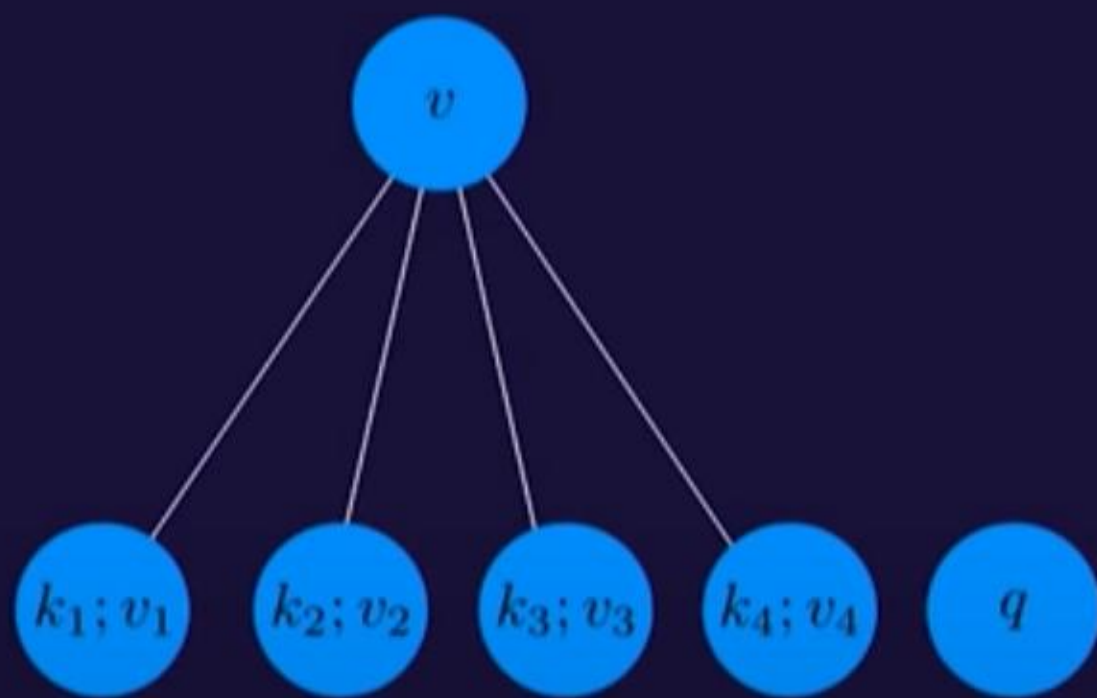
Attention predicts the next word

We've trained a large-scale unsupervised language model which generates coherent paragraphs of text, achieves state of the art performance on many language modeling benchmarks, and performs rudimentary reading comprehension, machine translation, question answering, and summarization —

When predicting the next word, easy to "reference the past"

Path to GPT-2

Sentiment Neuron (2017)
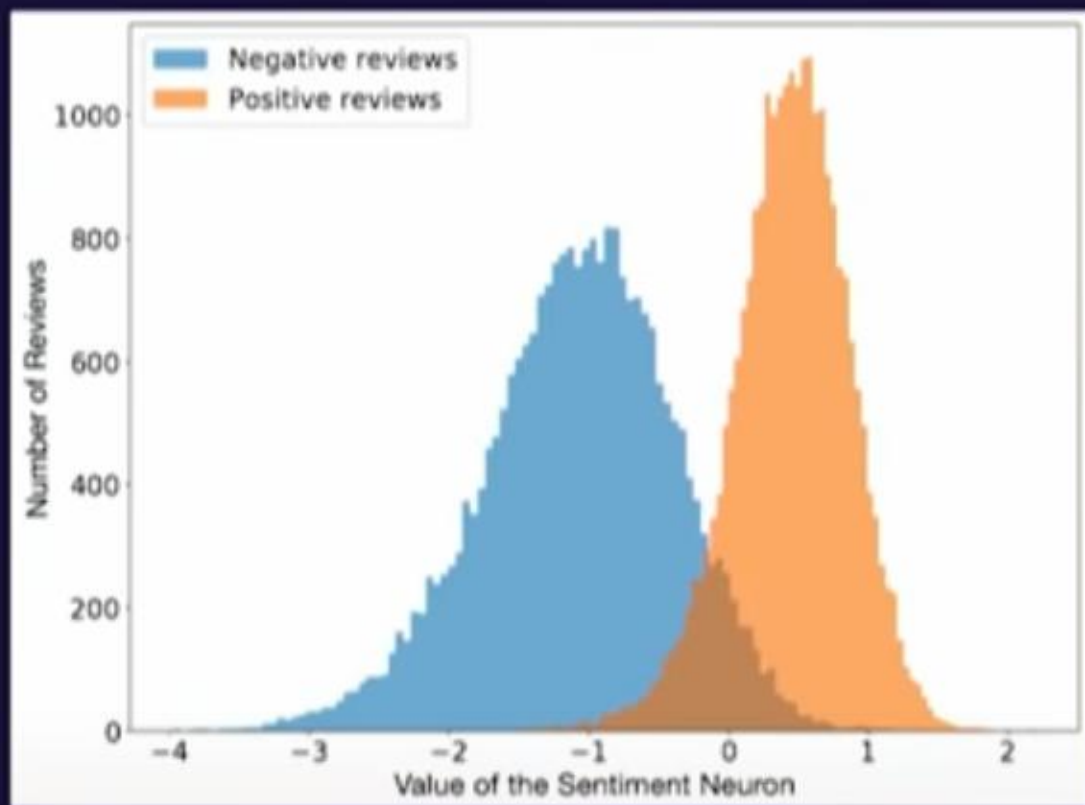
LSTM

Dataset = Amazon reviews

4 Pascal GPUs for a month

GPT (2018)

12-layer transformer

Books corpus

8 Pascal GPUs for a month

| Dataset	Task	SOTA	Ours
SNLI	Textual Entailment	89.3	89.9
MNLI Matched	Textual Entailment	80.6	82.1
MNLI Mismatched	Textual Entailment	80.1	81.4
SciTail	Textual Entailment	83.3	88.3
QNLI	Textual Entailment	82.3	88.1
RTE	Textual Entailment	61.7	56.0
STS-B	Semantic Similarity	81.0	82.0
QQP	Semantic Similarity	66.1	70.3
MRPC	Semantic Similarity	86.0	82.3
RACE	Reading Comprehension	53.3	59.0
ROCStories	Commonsense Reasoning	77.6	86.5
COPA	Commonsense Reasoning	71.2	78.6
SST-2	Sentiment Analysis	93.2	91.3
CoLA	Linguistic Acceptability	35.0	45.4
GLUE	Multi Task Benchmark	68.9	72.8

GPT-2 (2019)

1.5B transformer

WebText = lots of variety

100 Voltas for a week

GPT-2 (2019)

Bigger models works better
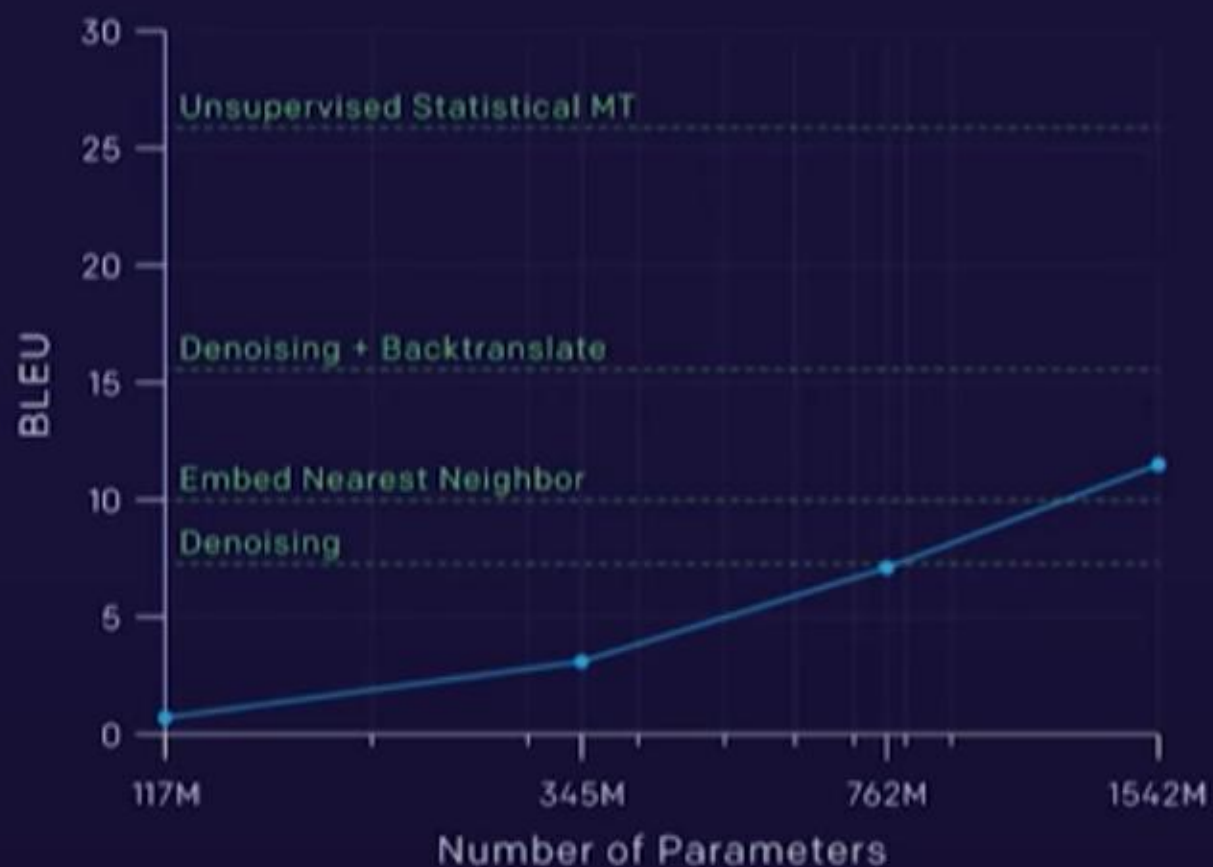
GPT-2 (2019)

Bigger models works better
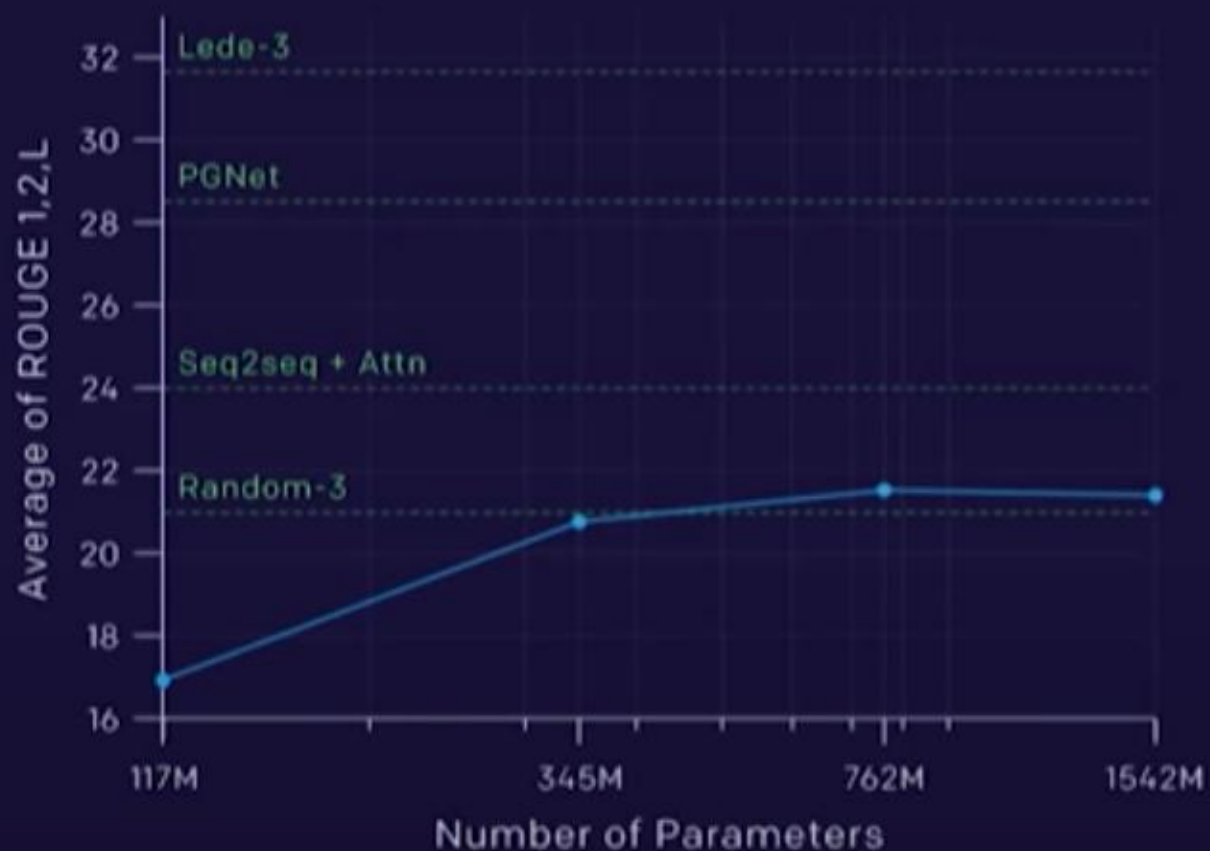
GPT-2: Big Improvement Across the Board

Dataset	Metric	Our Result	Previous Record	Human
Winograd Schema Challenge	accuracy (+)	70.70%	63.7%	92%+
LAMBADA	accuracy (+)	63.24%	59.23%	95%+
LAMBADA	perplexity (-)	8.6	99	~1-2
Children's Book Test Common Nouns (validation accuracy)	accuracy (+)	93.30%	85.7%	96%
Children's Book Test Named Entities (validation accuracy)	accuracy (+)	89.05%	82.3%	92%
Penn Tree Bank	perplexity (-)	35.76	46.54	unknown
WikiText-2	perplexity (-)	18.34	39.14	unknown
enwik8	bits per character (-)	0.93	0.99	unknown
text8	bits per character (-)	0.98	1.08	unknown
WikiText-103	perplexity (-)	17.48	18.3	unknown

GPT-2 achieves state-of-the-art on Winograd Schema, LAMBADA, and other language modeling tasks.

Winograd Schema Challenge

The trophy doesn't fit into the brown suitcase
because **it** is too large.

Correct answer: it = trophy

Model answer: it = trophy

The trophy doesn't fit into the brown suitcase
because **it** is too small.

Correct answer: it = suitcase

Model answer: it = suitcase

Question Answering

Question	Generated Answer	Correct	Probability
Who wrote the book the origin of species?	Charles Darwin	✓	83.4%
Who is the founder of the ubuntu project?	Mark Shuttleworth	✓	82.0%
Who is the quarterback for the green bay packers?	Aaron Rodgers	✓	81.1%
Panda is a national animal of which country?	China	✓	76.8%
Who came up with the theory of relativity?	Albert Einstein	✓	76.4%
When was the first star wars film released?	1977	✓	71.4%
What is the most common blood type in sweden?	A	✗	70.6%
Who is regarded as the founder of psychoanalysis?	Sigmund Freud	✓	69.3%
Who took the first steps on the moon in 1969?	Neil Armstrong	✓	66.8%
Who is the largest supermarket chain in the uk?	Tesco	✓	65.3%
What is the meaning of shalom in english?	peace	✓	64.0%
Who was the author of the art of war?	Sun Tzu	✓	59.6%
Largest state in the us by land mass?	California	✗	59.2%
Green algae is an example of which type of reproduction?	parthenogenesis	✗	56.5%
Vikram samvat calender is official in which country?	India	✓	55.6%
Who is mostly responsible for writing the declaration of independence?	Thomas Jefferson	✓	53.3%
What us state forms the western boundary of montana?	Montana	✗	52.3%
Who plays ser davos in game of thrones?	Peter Dinklage	✗	52.1%
Who appoints the chair of the federal reserve system?	Janet Yellen	✗	51.5%
State the process that divides one nucleus into two genetically identical nuclei?	mitosis	✓	50.7%
Who won the most mvp awards in the nba?	Michael Jordan	✗	50.2%
What river is associated with the city of rome?	the Tiber	✓	48.6%
Who is the first president to be impeached?	Andrew Johnson	✓	48.3%
Who is the head of the department of homeland security 2017?	John Kelly	✓	47.0%
What is the name given to the common currency to the european union?	Euro	✓	46.8%
What was the emperor name in star wars?	Palpatine	✓	46.5%
Do you have to have a gun permit to shoot at a range?	No	✓	46.4%
Who proposed evolution in 1859 as the basis of biological development?	Charles Darwin	✓	45.7%
Nuclear power plant that blew up in russia?	Chernobyl	✓	45.7%
Who played john connor in the original terminator?	Arnold Schwarzenegger	✗	45.2%

Summarization example

The 2008 Summer Olympics torch relay was run from March 24 until August 8, 2008, prior to the 2008 Summer Olympics, with the theme of "one world, one dream". Plans for the relay were announced on April 26, 2007, in Beijing, China. The relay, also called by the organizers as the "Journey of Harmony", lasted 129 days and carried the torch 137,000 km (85,000 mi) – the longest distance of any Olympic torch relay since the tradition was started ahead of the 1936 Summer Olympics.

After being lit at the birthplace of the Olympic Games in Olympia, Greece on March 24, the torch traveled to the Panathinaiko Stadium in Athens, and then to Beijing, arriving on March 31. From Beijing, the torch was following a route passing through six continents. The torch has visited cities along the Silk Road, symbolizing ancient links between China and the rest of the world. The relay also included an ascent with the flame to the top of Mount Everest on the border of Nepal and Tibet, China from the Chinese side, which was closed specially for the event.

Q: What was the theme?
A: "one world, one dream".

Q: What was the length of the race?
A: 137,000 km

Q: Was it larger than previous ones?
A: No

Q: Where did the race begin?
A: Olympia, Greece

Q: Is there anything notable about that place?
A: birthplace of Olympic Games

Q: Where did they go after?
A: Athens

Q: How many days was the race?
A: seven

Q: Did they visit any notable landmarks?
A: Panathinaiko Stadium

Q: And did they climb any mountains?
A:

Target answers: unknown or yes
Model answer: Everest

GPT-2: Programming with Words

To summarize:

append TL;DR

To translate French to English, do:

fr_1 = en_1
fr_2 = en_2
....
fr_n =

No Fine-Tuning So Far

All results shown require no additional training data

GPT-2: Cool Sample

Recycling is good for the world.
NO! YOU COULD NOT BE MORE WRONG!!

Recycling is NOT good for the world. It is bad for the environment, it is bad for our health, and it is bad for our economy. I'm not kidding. Recycling is not good for the environment. It is destructive to the earth and it is a major contributor to global warming. Recycling is not good for our health. It contributes to obesity and diseases like heart disease and cancer. Recycling is bad for our economy. It increases the cost of a product, and in turn, the price of everything that is made with that product. Recycling is not good for our nation. We pay a tremendous price for the privilege of having the world's most advanced and efficient recycling system. Recycling is a huge, colossal waste of time, energy, money, and resources. And THAT is why we need to get back to basics and get back to basics in our recycling efforts. One of the best ways to start is to look at the process of creating a paper product. When you make a paper product, it is basically a long chain of materials. Everything from the raw materials (wood, cardboard, paper, etc.), to the reagents (dyes, solvents, etc.) to the printing equipment (chemicals, glue, paper, ink, etc.), to the packaging, to the packaging materials (mercury, chemicals, etc.) to the processing equipment (heating, cooling, etc.), to the packaging materials, to the packaging materials that are shipped overseas and to the packaging materials that are used in the United States. Each step along the way creates tons of waste that we constantly have to clean up. The process of making a paper product is a very wasteful one. But the end result is something that all of us need to consume. And if we want to keep the recycling process running efficiently, then we really need to think about each and every step that goes into making a paper product.

GPT-2-small: Samples from r/ML

[-] po-handz 15 points 5 days ago

US stocks closed flat on Tuesday as a solid rally faded on concerns about US-China trade talks. Markets came under pressure after Bloomberg News reported that some US officials fear China is walking back its trade pledges. Investors will turn their attention on Wednesday to the conclusion of the Federal Reserve's two-day meeting and press conference from Fed chief Jerome Powell.

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   [-] Shevizzle [S] 30 points 5 days ago*

   OUTPUT:

   > The Fed is expected to decide on March 1 whether to extend the central bank's policy limit until next June. In light of the recent Fed actions in recent months, the US Federal Reserve should look at more ways it can mitigate long-term volatility. The US could also consider moving into additional "buy back" mechanisms if it sees it is unable to meet its fiscal targets, like those agreed to by the Japanese government. "In view of the uncertainty and uncertainty surrounding the future of the Fed's policy, it is important that we try to maintain long-term bond yields over a longer period of time to ensure a sustainable growth scenario," said Robert Vickers, chief market strategist at Credit Suisse.

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      [-] qudcjf7928 28 points 4 days ago

      I can see how GPT-2 could maliciously be used to generate a believable fake news

      permalink embed save parent report give award reply

The Partial Release

ML is becoming more powerful and impactful

  Amazing applications

  Potential for malicious use

No existing norms for responsible disclosure

  Thus: can always release later; can never un-release

All these issues will become far more severe in the future

Thank You!