

Artificial Intelligence For NLP

Lesson-Final-16

人工智能与自然语言处理课程组

2019.10. 26



人工智能与 自然语言处 理(理解)的极 限与未来



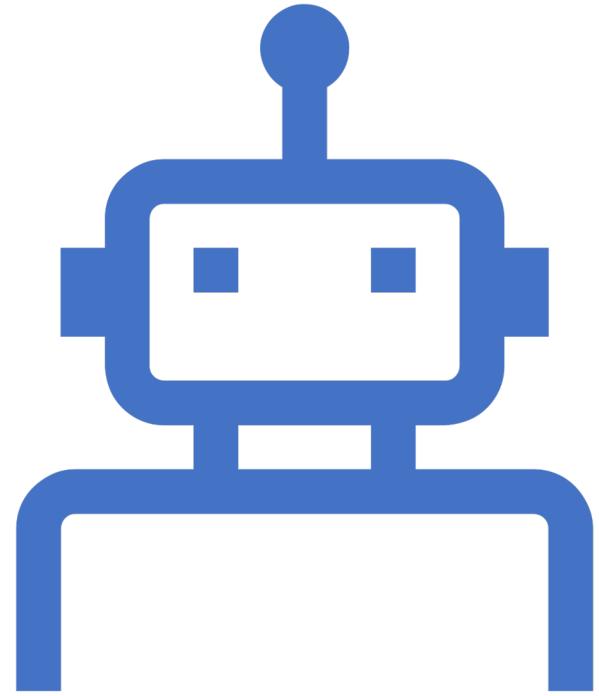
1. Single-Task to Multitask



2. Bias in the CV and Language
of Artificial Intelligence



3. The future of Deep Learning
and NLP



Part-1

Single-Task to Multitask



1. Analytics Algorithm and Parsing Algorithms



2. Search Policy



3. Probability Based Model (e.g Language Model)



4. Machine Learning with feature engineering



5. Deep learning for feature learning



6. Deep architecture engineering for single tasks



7. ?

The Limits of Single-task Learning

Great performance improvements in recent years given {dataset, task, model, metric}

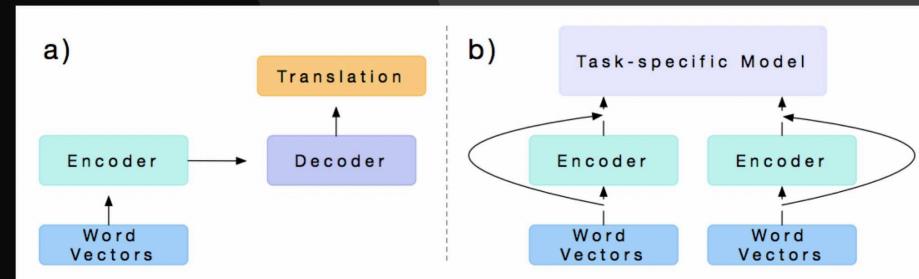
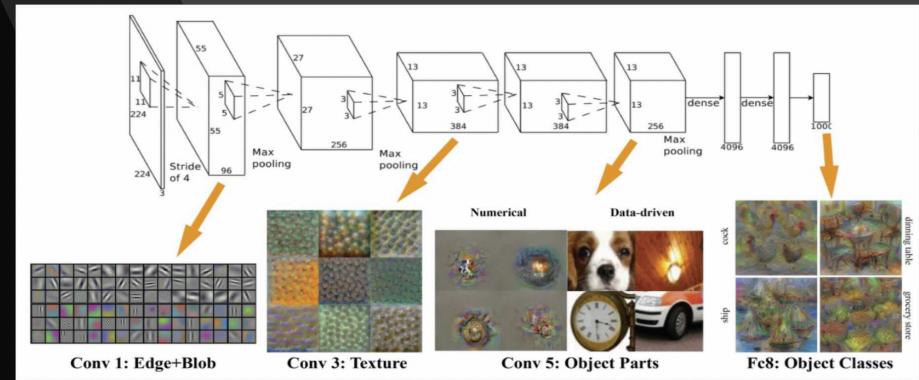
We can hill-climb to local optima as long as $|dataset| > 1000 \times C$

For more general AI, we need continuous learning in a single model instead

Models typically start from random or are only partly pre-trained → L

Pre-train in Computer Vision and NLP

- Transfer Learning in Computer Vision
- Word2Vec, Glove, CoVe, ELMO, BERT
 - Beginning success!

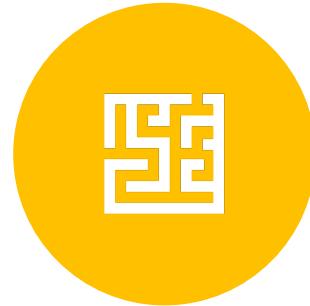


Why has weight & model sharing not happened as much in NLP?



NLP REQUIRES MANY TYPES
OF REASONING: LOGICS,
LINGUISTIC, EMOTIONAL

REQUIRES SHORT AND
LONG TERM MEMORY



NLP HAD BEEN DIVIDED
INTO INTERMEDIATE AND
SEPARATE TASKS

Examples

Question	Context	Answer	Question	Context	Answer
What is a major importance of Southern California in relation to California and the US?	...Southern California is a major economic center for the state of California and the US....	major economic center	What has something experienced?	Areas of the Baltic that have experienced eutrophication .	eutrophication
What is the translation from English to German?	Most of the planet is ocean water.	Der Großteil der Erde ist Meerwasser	Who is the illustrator of Cycle of the Werewolf?	Cycle of the Werewolf is a short novel by Stephen King, featuring illustrations by comic book artist Bernie Wrightson .	Bernie Wrightso
What is the summary?	Harry Potter star Daniel Radcliffe gains access to a reported £320 million fortune ...	Harry Potter star Daniel Radcliffe gets £320M fortune...	What is the change in dialogue state?	Are there any Eritrean restaurants in town?	food: Eritrean
Hypothesis: Product and geography are what make cream skimming work. Entailment , neutral, or contradiction?	Premise: Conceptually cream skimming has two basic dimensions – product and geography.	Entailment	What is the translation from English to SQL?	The table has column names... Tell me what the notes are for South Australia	SELECT notes from table WHERE 'Current Slogan' = 'South Australia'
Is this sentence positive or negative?	A stirring, funny and finally transporting re-imagining of Beauty and the Beast and	positive	Who had given help? Susan or Joan ?	Joan made sure to thank Susan for all the help she had given.	Susan

3 equivalent Supertasks of NLP

- Language Modeling
- Question Answering
- Dialogue

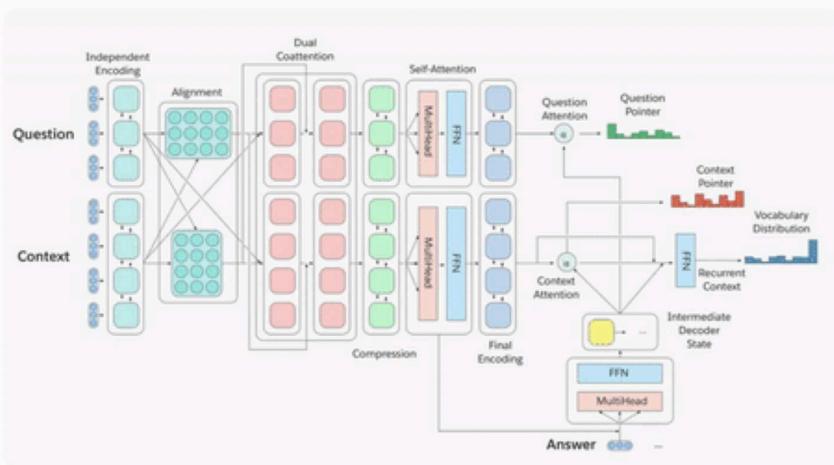
- Question Answering
- Machine Translation
- Summarization
- Natural Language Inference
- Sentiment Classification
- Semantic Role Labeling
- Relation Extraction
- Dialogue
- Semantic Parsing
- Commonsense Reasoning



Why do we call them “Supertask”?

Context

Southern California, often abbreviated SoCal, is a geographic and cultural region that generally comprises California's southernmost 10 counties. The region is traditionally described as "eight counties", based on demographics and economic ties: Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, and Ventura. The more extensive 10-county definition, including Kern and San Luis Obispo counties, is also used based on historical political divisions. Southern California is a major economic center for the state of California and the United States.



A Multitask Question Answering Network for decaNLP

- Start with a context
- Ask a question
- Generate the answer one word at a time by:
 - Pointing to context
 - Pointing to question
 - Or choosing a word from an external vocabulary
- For code and leaderboard see www.decaNLP.com

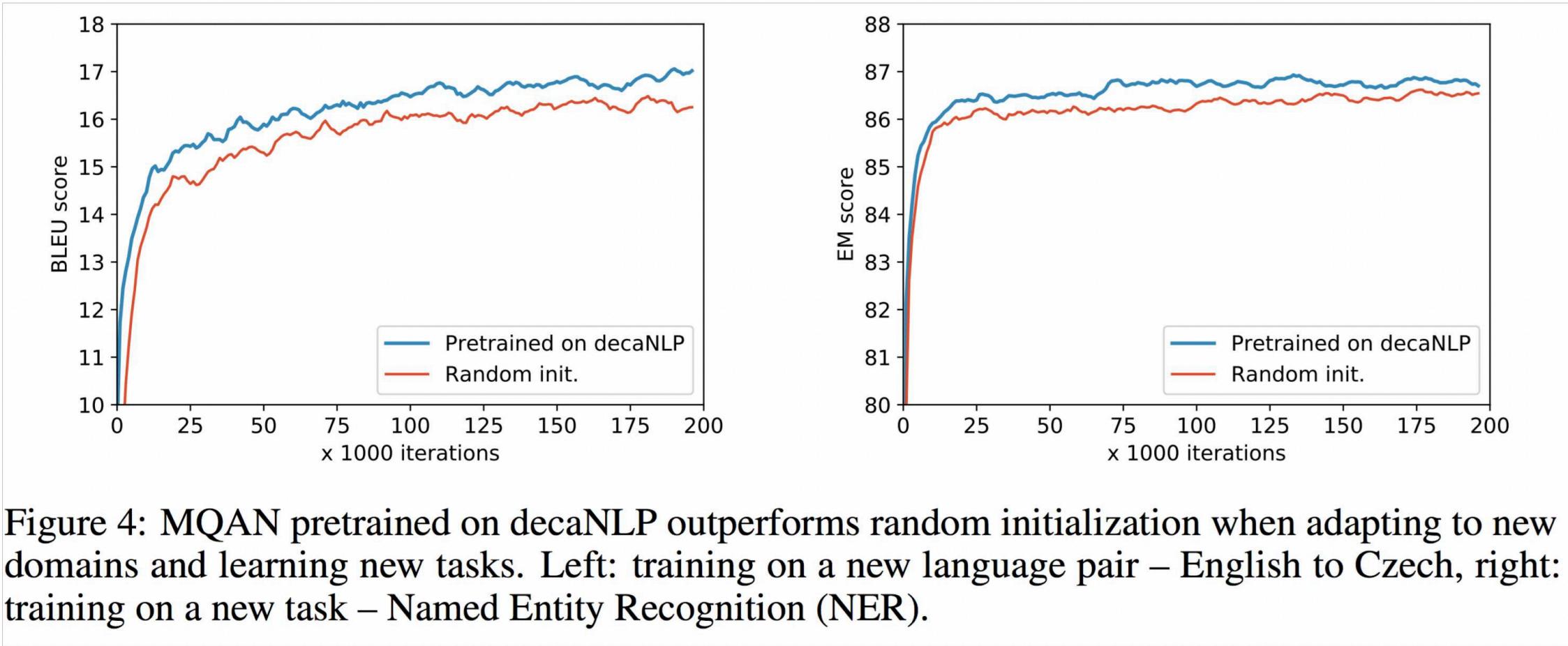
- **Bleu measures precision:** how much the words (and/or n-grams) in the *machine generated summaries* appeared in the human reference summaries.
 - **Rouge measures recall:** how much the words (and/or n-grams) in the *human reference summaries* appeared in the machine generated summaries.
-
- ROUGE = # overlapping words / # human references words
 - BLEU = # overlapping words / # system generated words



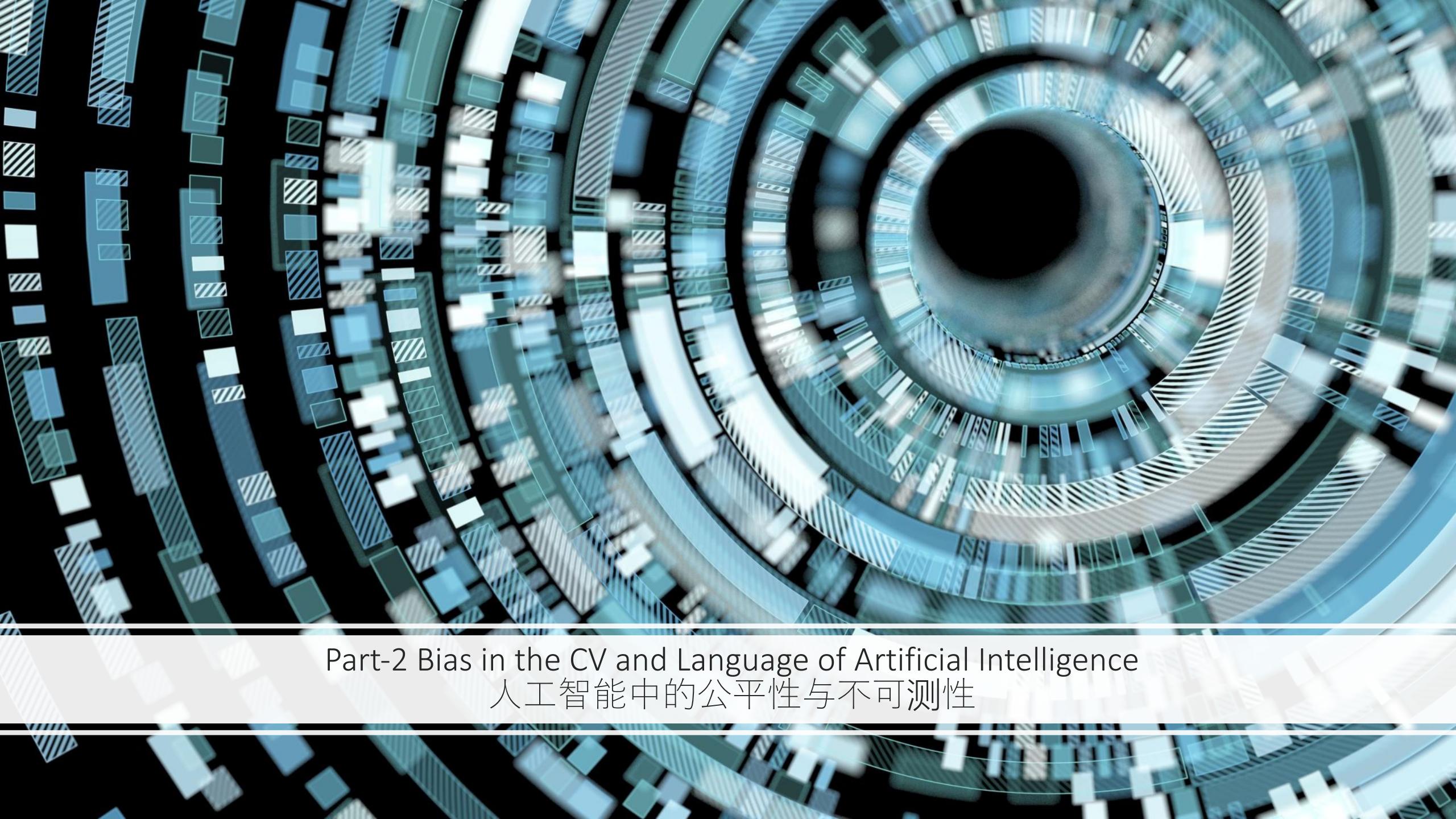
Evaluation for Machine Understanding and Machine Translation

Task	Dataset	Metric	
Question Answering	SQuAD	nF1	normalized word-level F1, (case insensitive , no punctuation or articles)
Machine Translation	IWSLT En — De	BLEU	
Summarization	CNN/DailyMail	ROUGE	
Natural Language Inference	MultiNLI	EM	exact match
Sentiment Analysis	SST2	EM	
Semantic Role Labeling	QA-SRL	nF1	
Relation Extraction	QA-ZRE	cF1	corpus-level F1
Goal-Oriented Dialogue	WOZ	dsEM	dialogue state EM
Semantic Parsing	WikiSQL	lfEM	logical form EM
Pronoun Resolution	Winograd Schemas	EM	

Pretraining on decaNLP improves final performance



 1. Analytics Algorithm and Parsing Algorithms 2. Search Policy 3. Probability Based Model (e.g Language Model) 4. Machine Learning with feature engineering 5. Deep learning for feature learning 6. Deep architecture engineering for single tasks 7. Single Multitask Model (Need your strength 😎)



Part-2 Bias in the CV and Language of Artificial Intelligence

人工智能中的公平性与不可测性



你看到了什么？

- 香蕉
 - 标签
 - 商店里的香蕉
 - 货架上的香蕉
 - 贴着贴纸的香蕉
-
- 但是没有人会说：黄色的香蕉

- 绿香蕉
- 没熟的香蕉



- 成熟的香蕉
- 坏香蕉



- One purpose of categorization is to **reduce the infinite differences among stimuli to behaviourally and cognitively usable proportions**

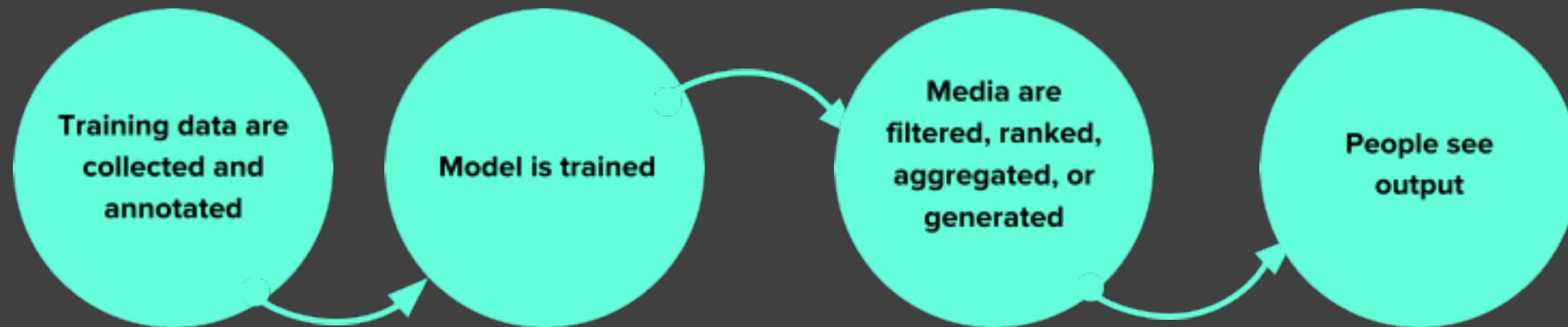


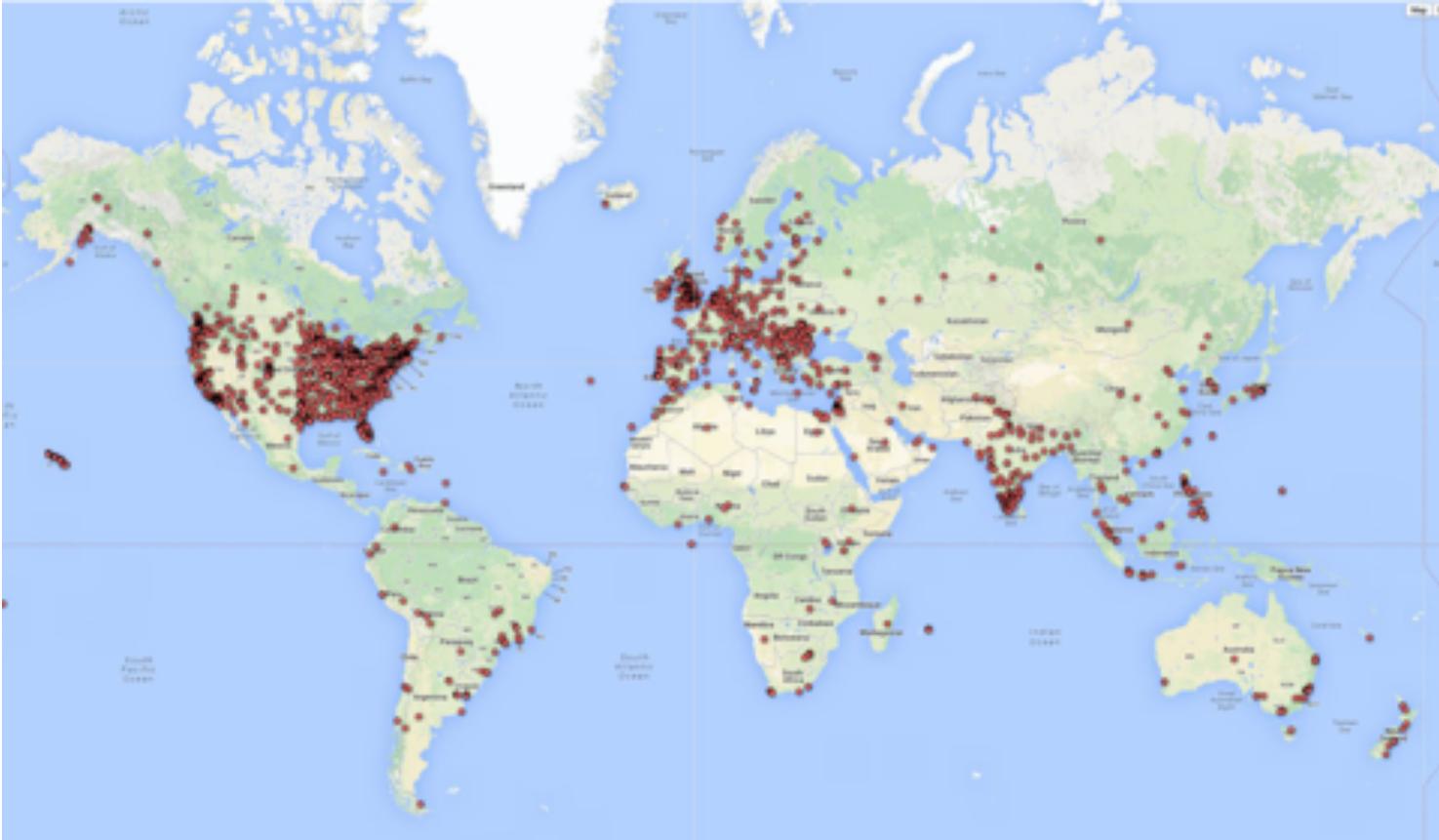
-
- 一个爸爸带着他的儿子冲进医院要求做手术，
手术医生说：“我做不了这个手术，他是我儿子！”
 - 为什么？



-
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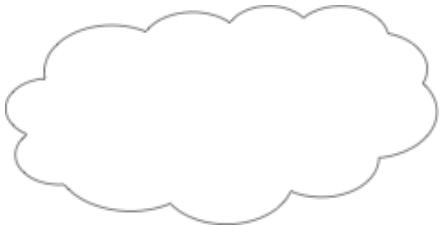






Bias in Data
Selection does not reflect a
random sample

- 土耳其机械工人的分布图



Biases in Data



- It's possible that you have an appropriate amount of data for every group you can think of but that some groups are represented less positively than others.

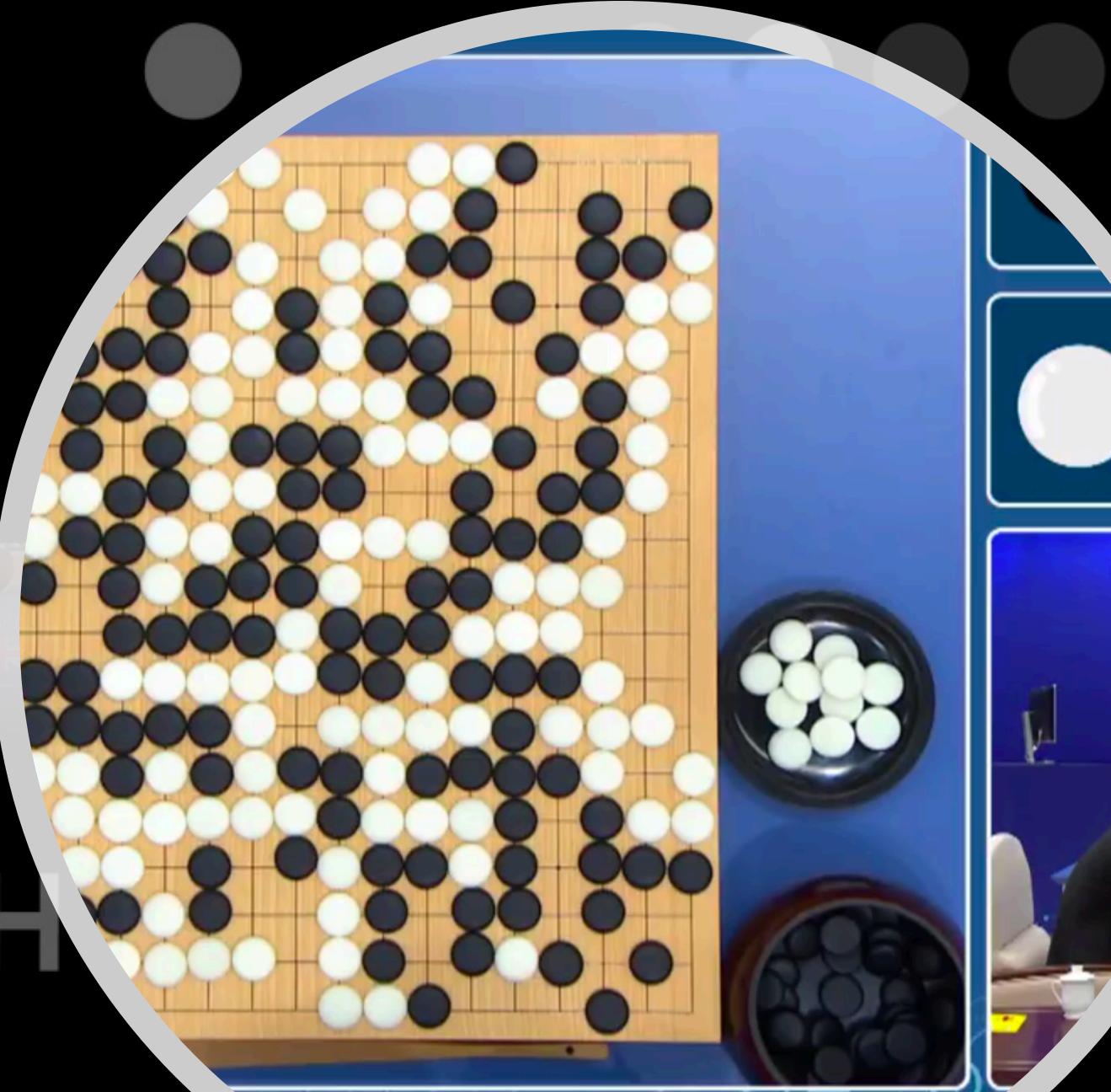


婚礼、新娘，西服、婚纱

黑人

Biases in
Interpretation 对AI
结果解析的问题

A L P H

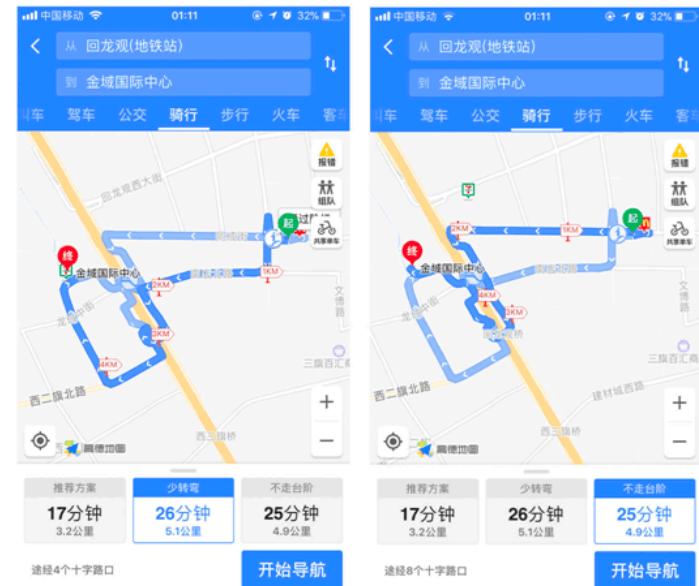


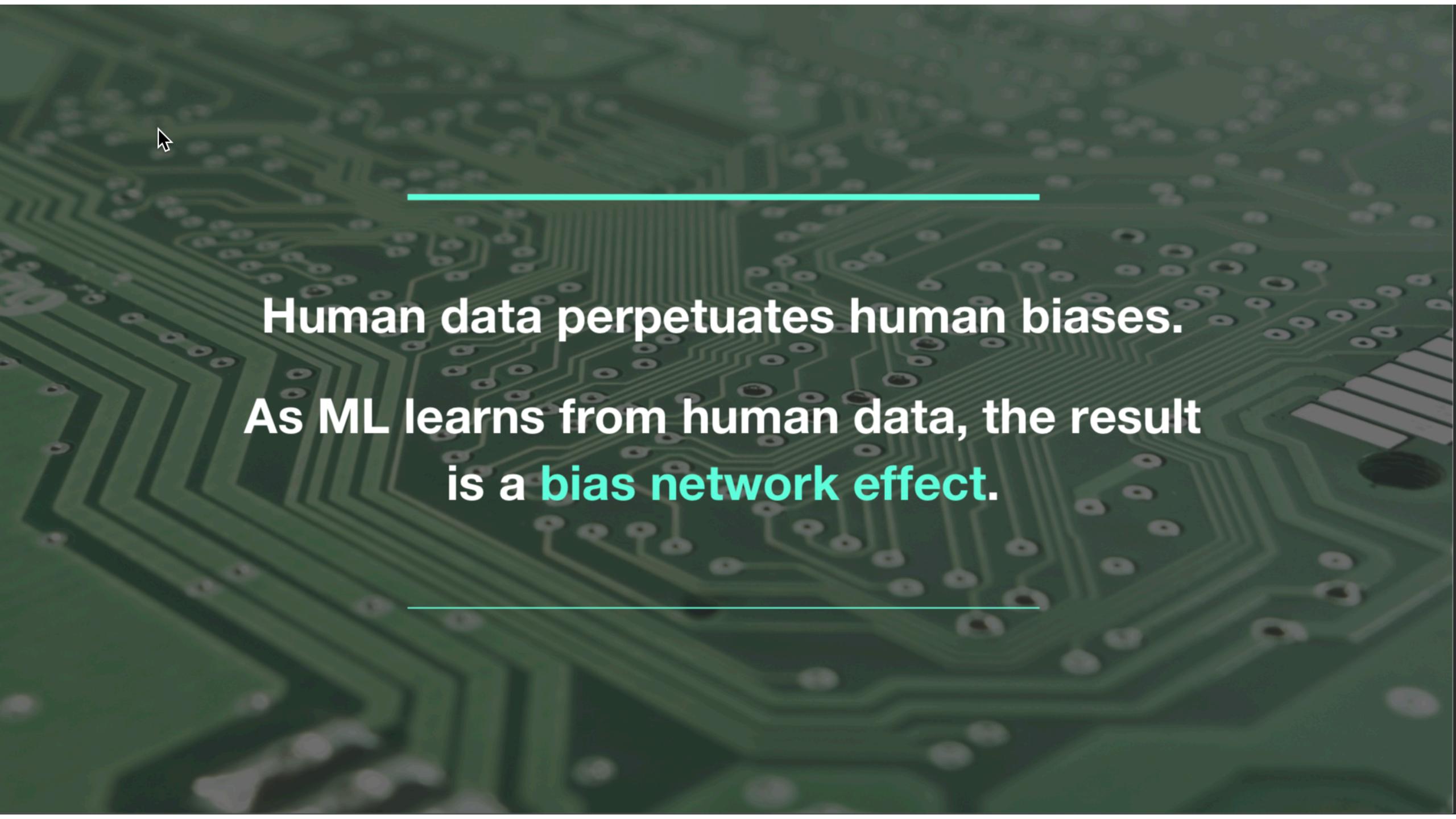


AlphaGo

Hard to Explanation, Religion

辅助决策的误区



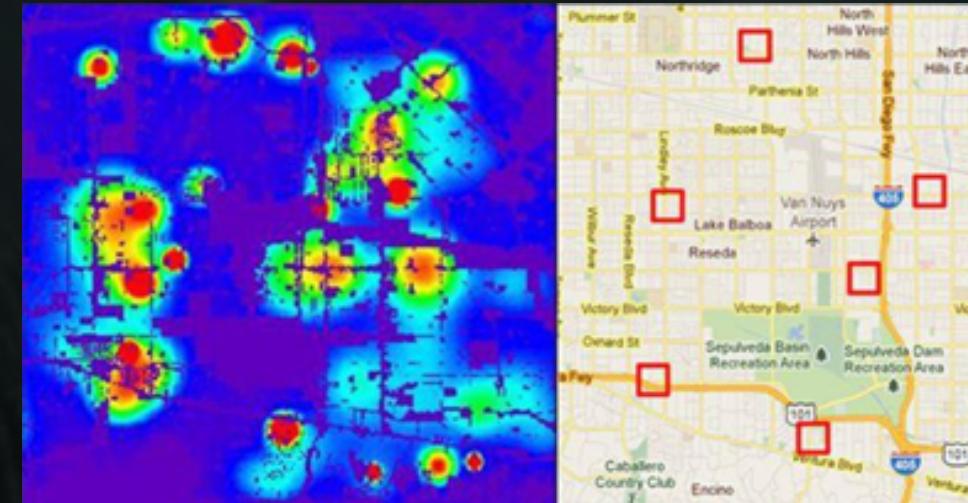


Human data perpetuates human biases.

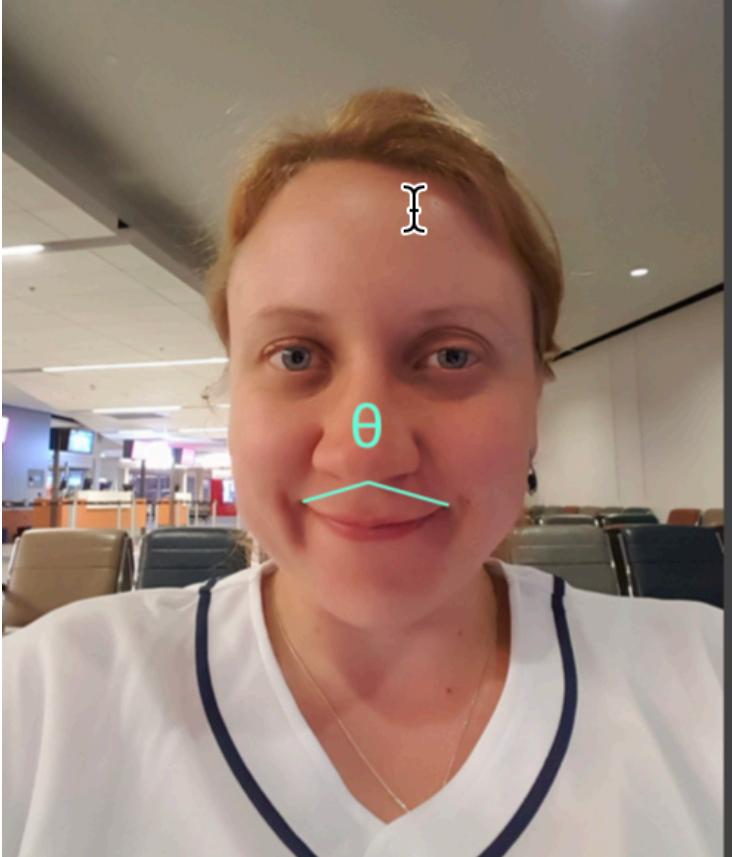
As ML learns from human data, the result
is a **bias network effect**.

Predicting Policy

MINORITY
REPORT
EVERYBODY RUNS
JUNE 21



- Algorithms identify potential crime hot-spots
- Minority Report (少数派報告)



- “Automated Inference on Criminality using Face Images” Wu and Zhang, 2016. arXiv

Predicating Criminality

Predicting Criminality

arXiv Paper Spotlight: Automated Inference on Criminality Using Face ...

[www.kdnuggets.com/.../arxiv-spotlight-automated-inference-criminality-face-images... ▾](http://www.kdnuggets.com/.../arxiv-spotlight-automated-inference-criminality-face-images...)

A recent paper by Xiaolin Wu (McMaster University, Shanghai Jiao Tong University) and Xi Zhang (Shanghai Jiao Tong University), titled "Automated Inference ...

Automated Inference on Criminality Using Face Images | Hacker News

[https://news.ycombinator.com/item?id=12983827 ▾](https://news.ycombinator.com/item?id=12983827)

Nov 18, 2016 - The automated inference on criminality eliminates the variable of meta-accuracy (the competence of the human judge/examiner) all together.

A New Program Judges If You're a Criminal From Your Facial Features ...

[https://motherboard.vice.com/.../new-program-decides-criminality-from-facial-feature... ▾](https://motherboard.vice.com/.../new-program-decides-criminality-from-facial-feature...)

Nov 18, 2016 - In their paper 'Automated Inference on Criminality using Face Images', published on the arXiv pre-print server, Xiaolin Wu and Xi Zhang from ...

Can face classifiers make a reliable inference on criminality?

[https://techxplore.com/.../Computer Sciences ▾](https://techxplore.com/.../Computer%20Sciences)

Nov 23, 2016 - Their paper is titled "Automated Inference on Criminality using Face Images ... face classifiers are able to make reliable inference on criminality.

Troubling Study Says Artificial Intelligence Can Predict Who Will Be ...

[https://theintercept.com/.../troubling-study-says-artificial-intelligence-can-predict-who... ▾](https://theintercept.com/.../troubling-study-says-artificial-intelligence-can-predict-who...)

Nov 18, 2016 - Not so in the modern age of Artificial Intelligence, apparently. In a paper titled "Automated Inference on Criminality using Face Images," two ...

Automated Inference on Criminality using Face Images (via arXiv ...)

[https://computationallegalstudies.com/.../automated-inference-on-criminality-using-fa... ▾](https://computationallegalstudies.com/.../automated-inference-on-criminality-using-fa...)

Dec 6, 2016 - Next Next post: A General Approach for Predicting the Behavior of the Supreme Court of the United States (Paper Version 2.01) (Katz, ...

Predicting Homosexuality 同性恋预测



- Wang and Kosinski, Deep neural networks are more accurate than humans at detecting sexual orientation from facial images, 2017.



Why do we need to concern it?

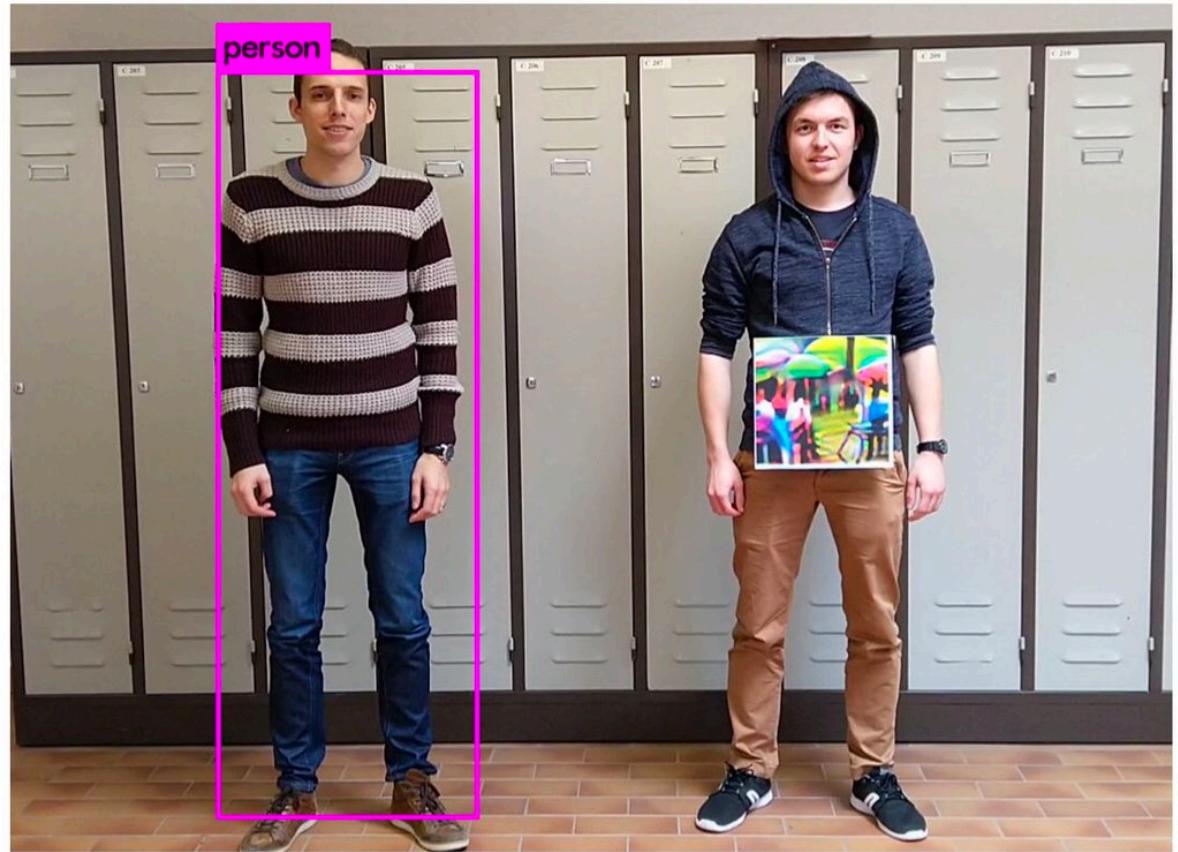
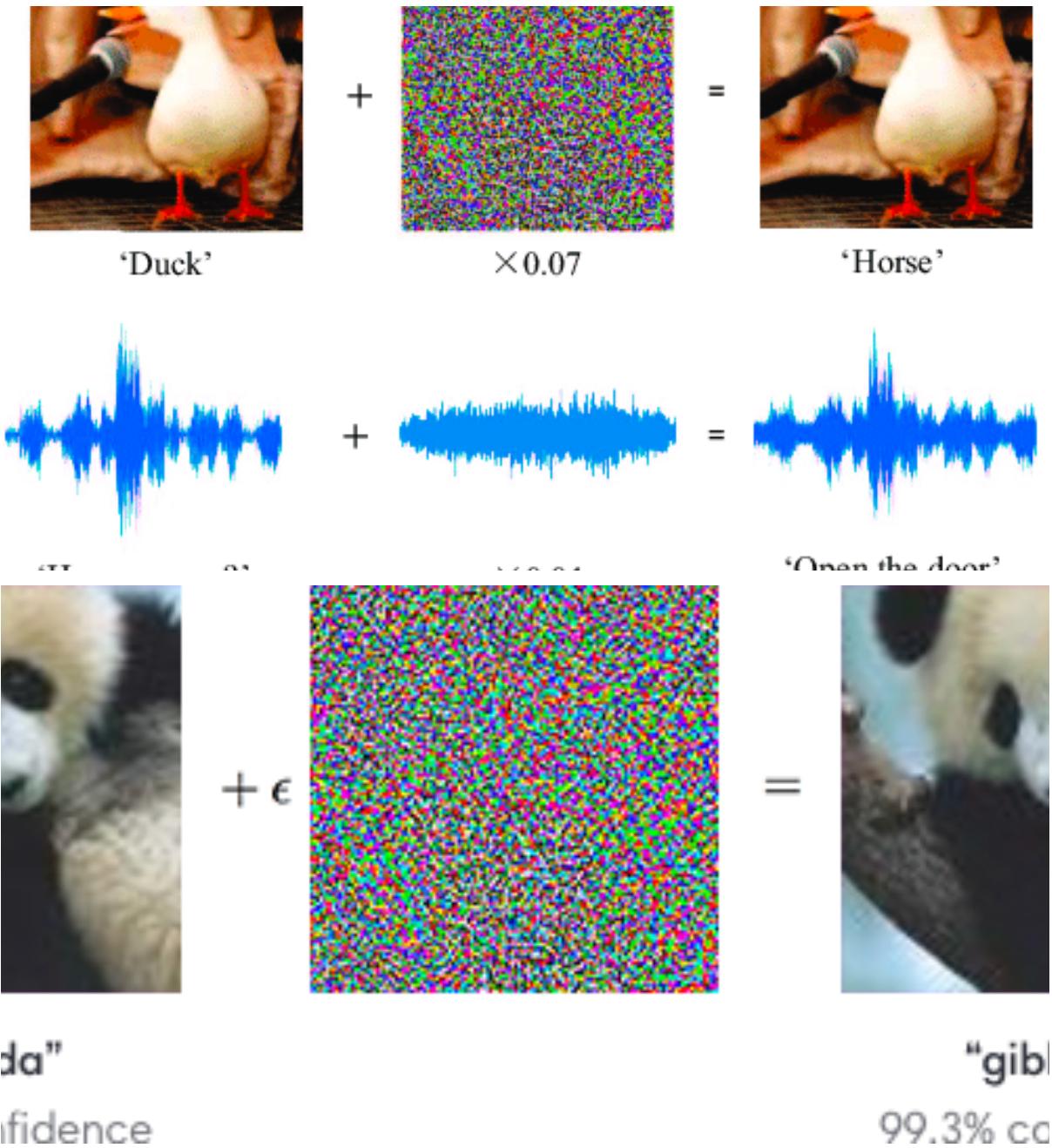


Figure 1: We create an adversarial patch that is successfully able to hide persons from a person detector. Left: The person without a patch is successfully detected. Right: The person holding the patch is ignored.

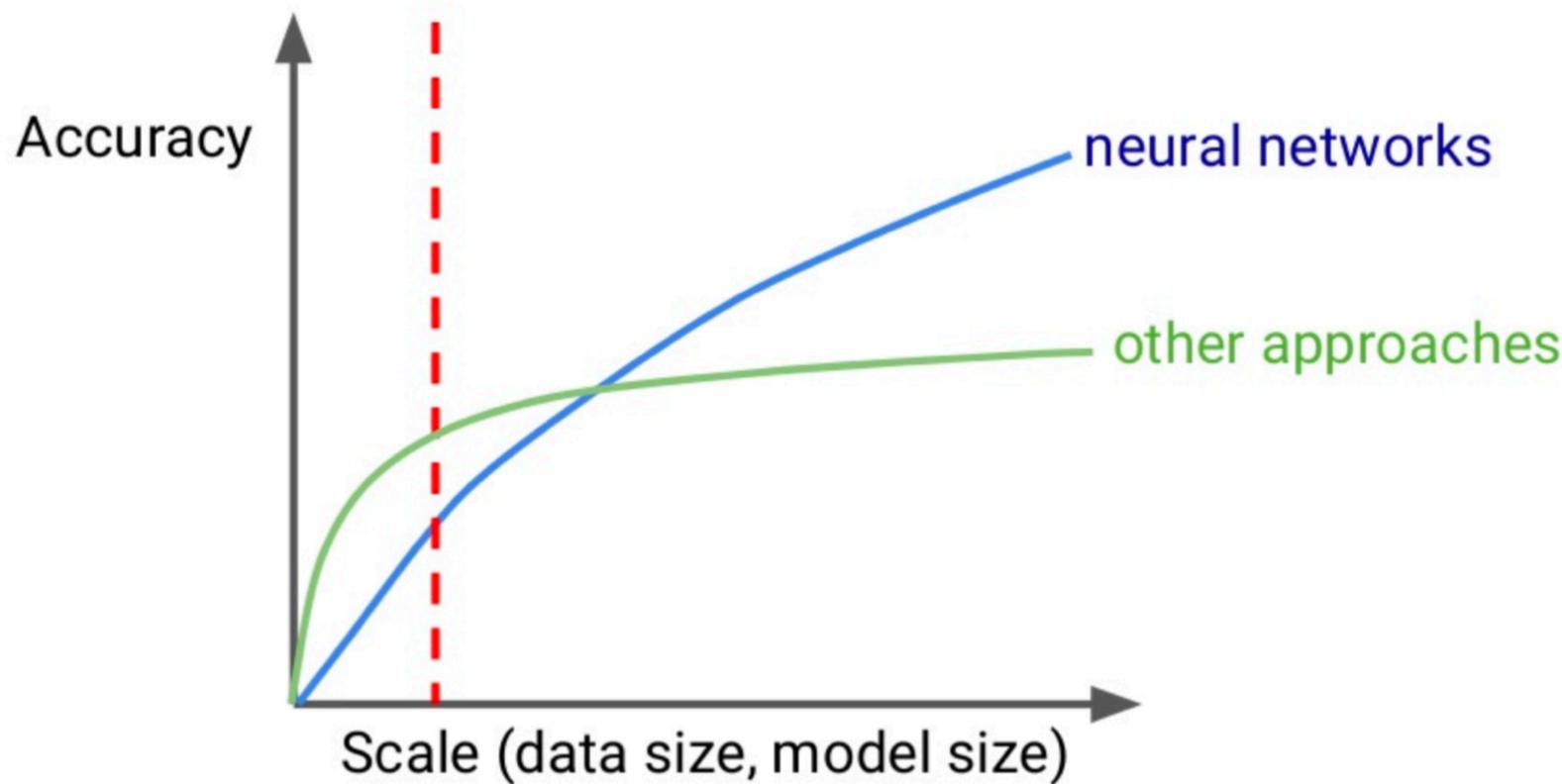
The future about AI

深度学习为
何如此成功？





1980s and 1990s



Using Unlabeled Text

- Label data: Limits the size and domain of data

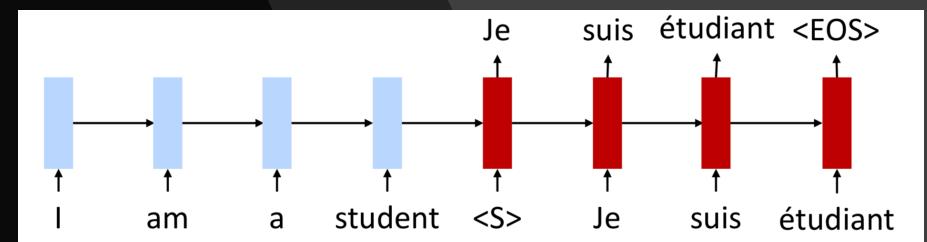
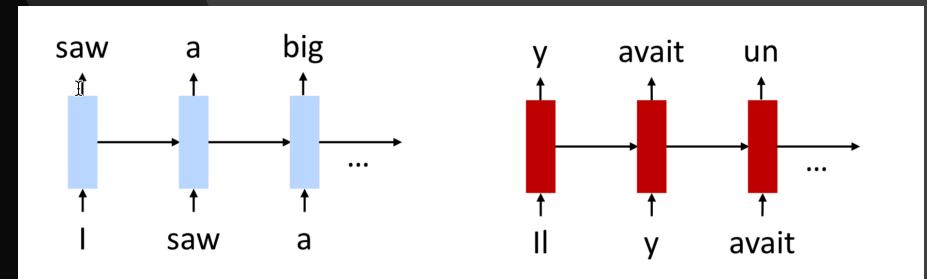


TED

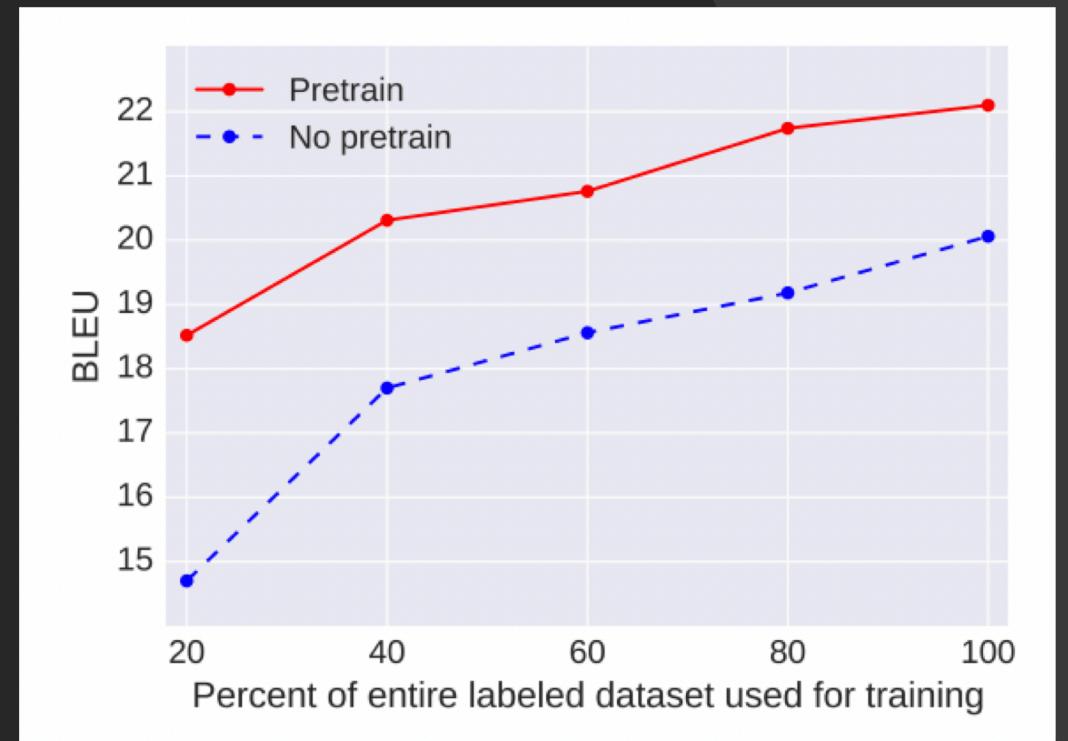
Using Unlabeled Text



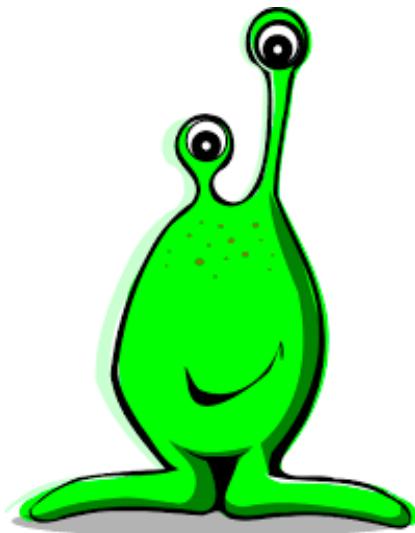
- Separately Train Encoder and Decoder as Language Models
- Then Train Jointly on Bilingual Data



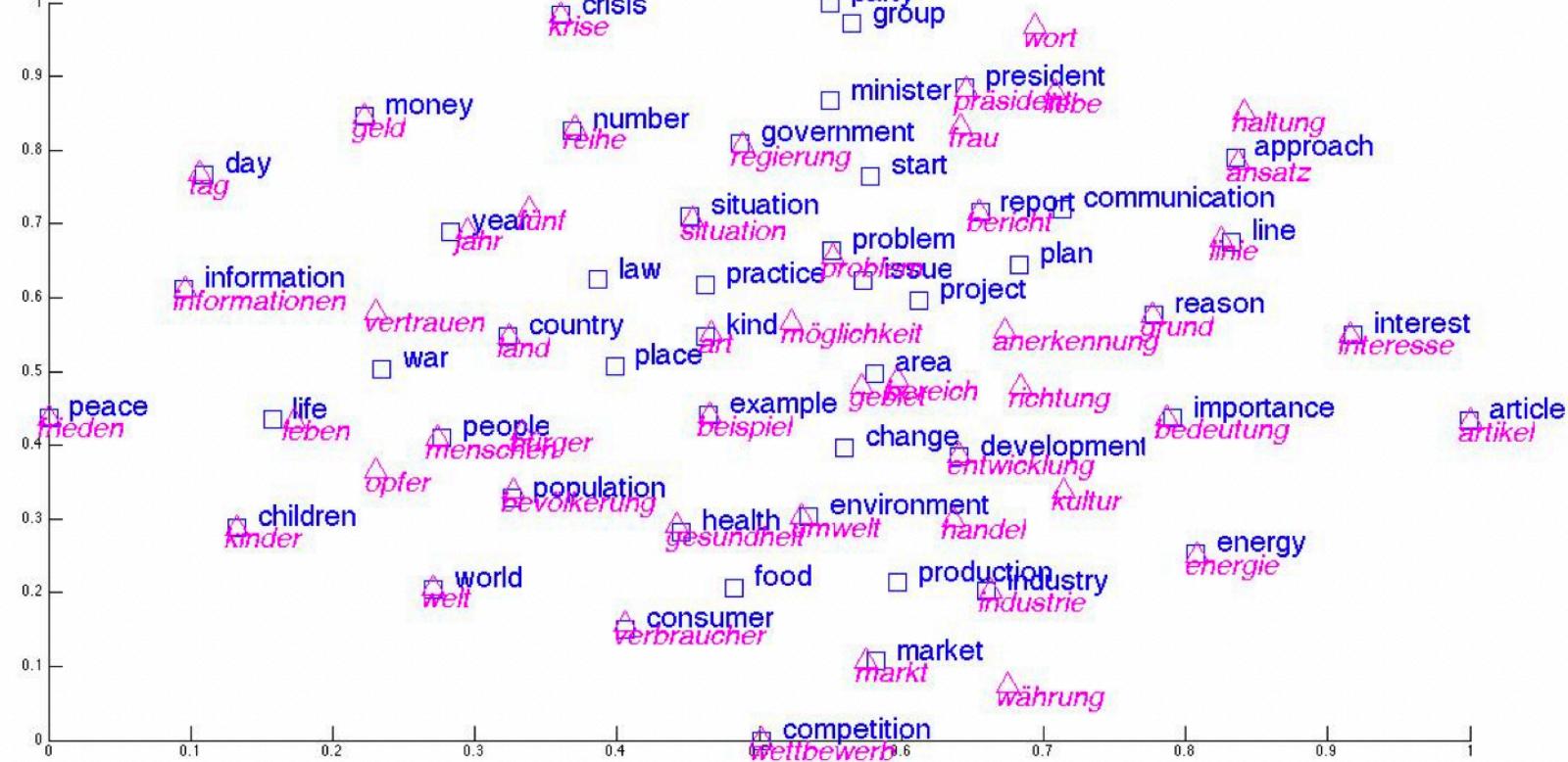
- English -> German Results: 2+ BLEU point improvement

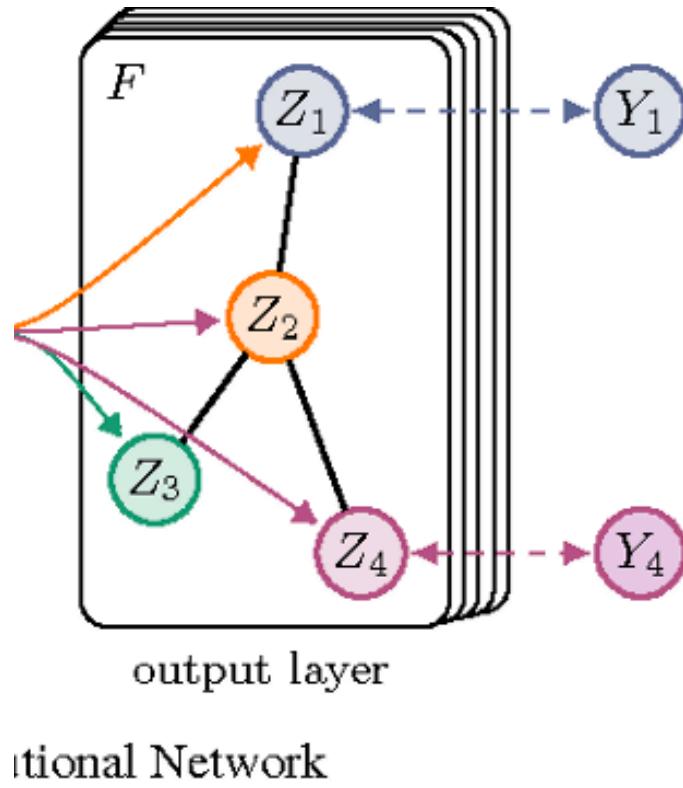
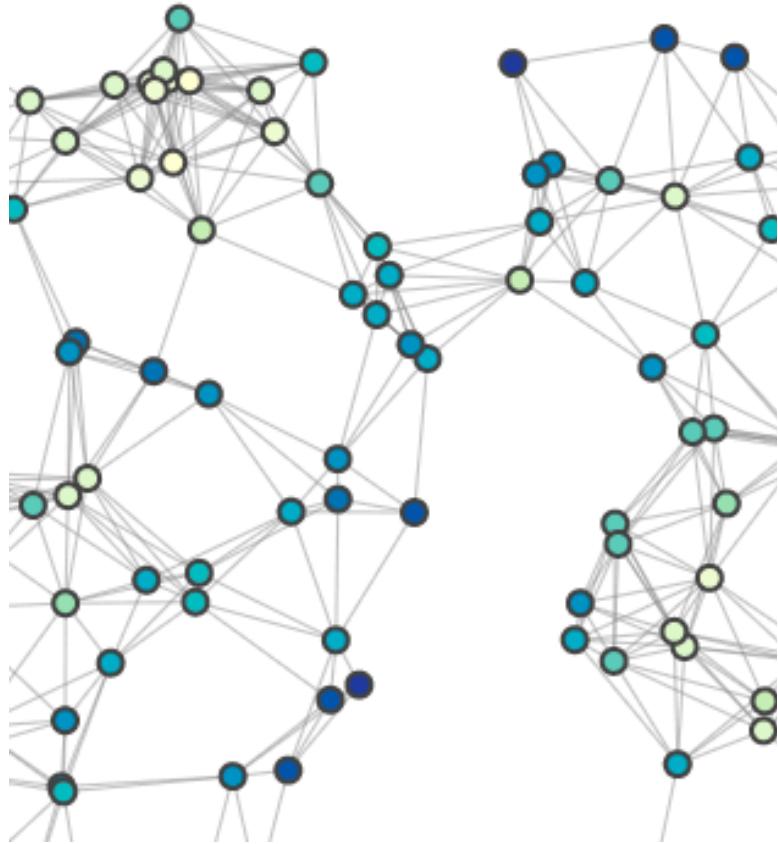


What if there is no Bilingual Data?



Unsupervised Word Representation

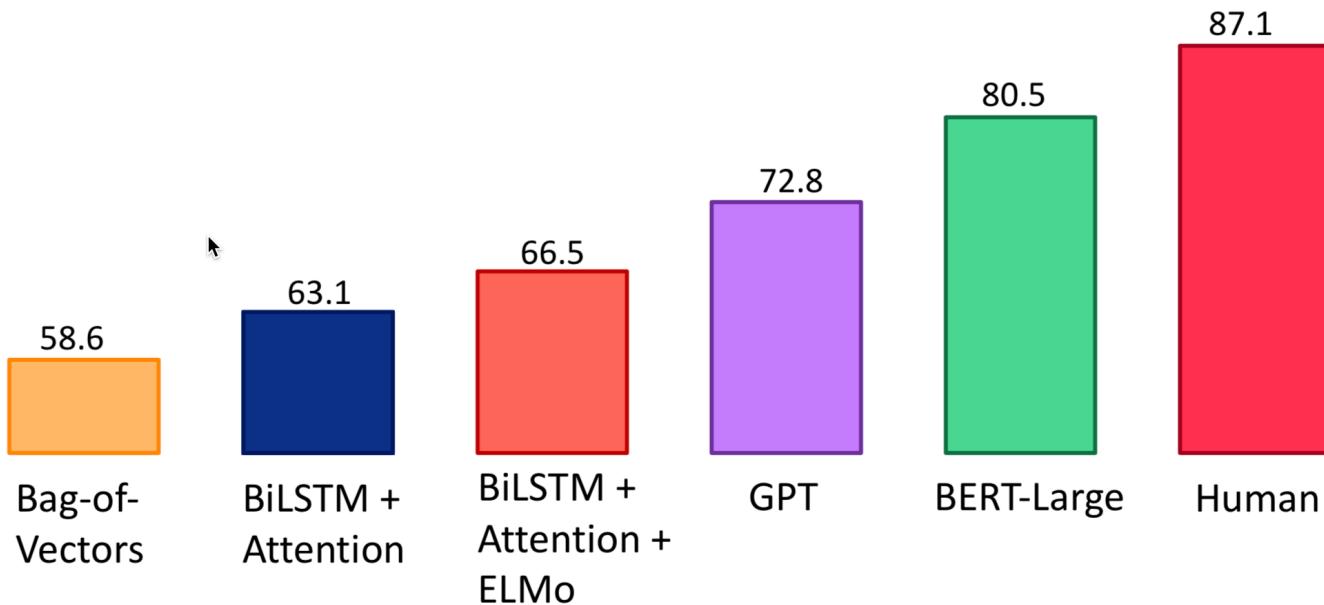




(b) Hidden layer activations

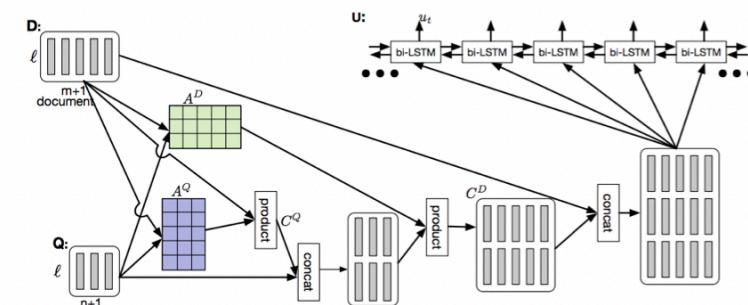
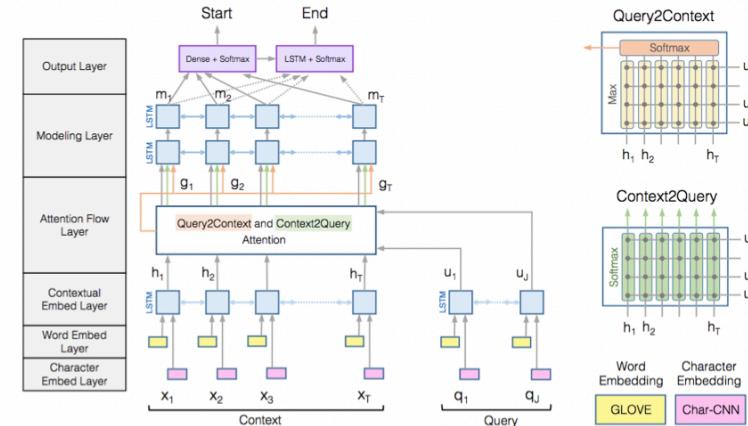
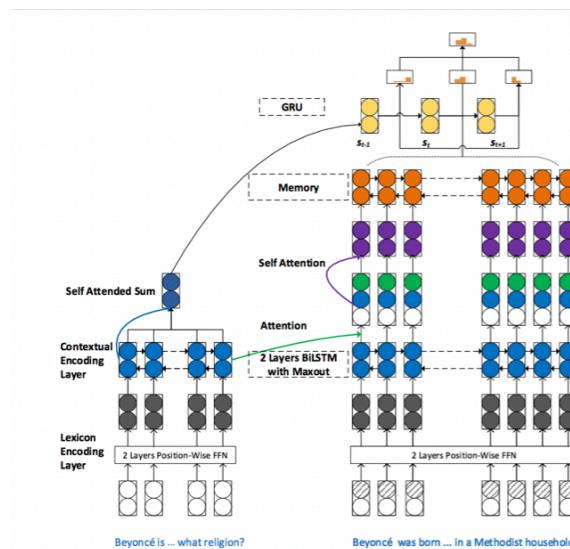
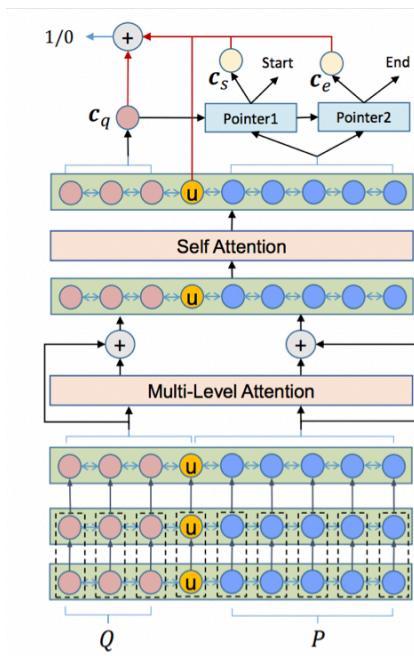
Graph Neural Networks

What did BERT “solve” and what do we work on next?



The Death of Architecture Engineering?

- Some SQuAD Architecture



Commonsense Reasoning

- I. The book would not fit in the brown suitcase because it was too **big** (*small*).

What was too **big** (*small*)?

Answer 0: the book

Answer 1: the suitcase

- II. The town councilors refused to give the demonstrators a permit because they **fear** (*advocated*) violence.

Who **fear** (*advocated*) violence?

Answer 0: the town councilors

Answer 1: the demonstrators





What do you need next?

AI算法能力 10%

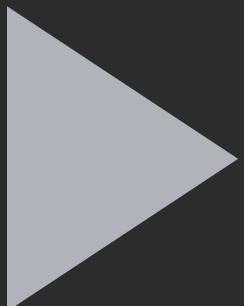
数学建模能力 30%

经典算法编程能力 60%

读书 110%，心理学，社会学，管理学，技术是能力，认知决定如何使用技术

-
- 靡革匪因 靡故匪新
 - 在这个充满虚幻与谎言的世界中，实际的项目作品展示大于一切

AI只是历史长河
中很有限的一个
技术，可能明年，
可能未来某个时
代就不会受到
人们的重视



追求不变的东西，
不要被变化的东
西困扰

- 开始项目4吧，祝大家学习顺利！
-

