S&DS 265 / 565

Introductory Machine Learning

Societal Issues in ML

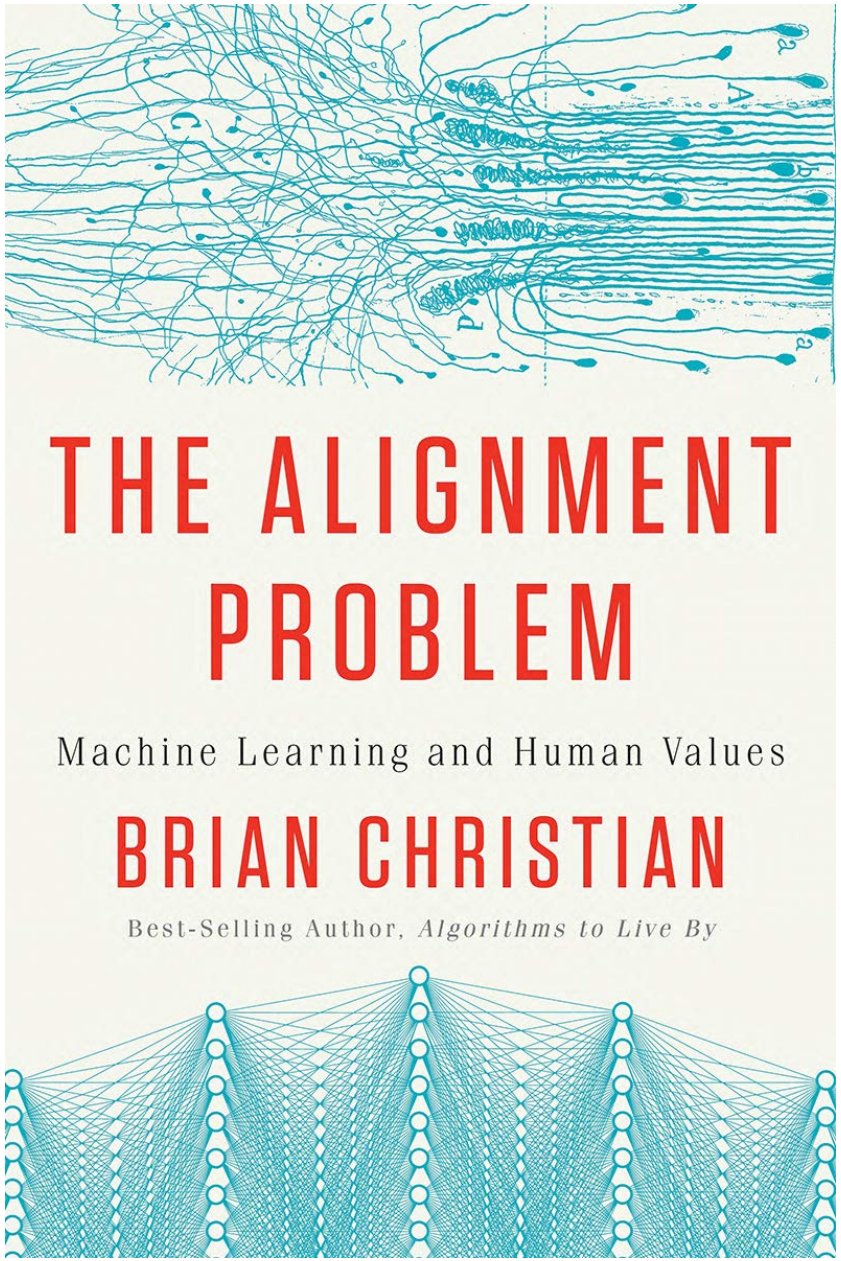
December 6

Yale

Reminders

- Quiz 6 posted today at 10:30–available until December 10
- Assn 6 out; due next week
- Final exam: Monday Dec 19, 7pm in Davies
- Practice exams are posted
- Review sessions TBA

Today: Alignment

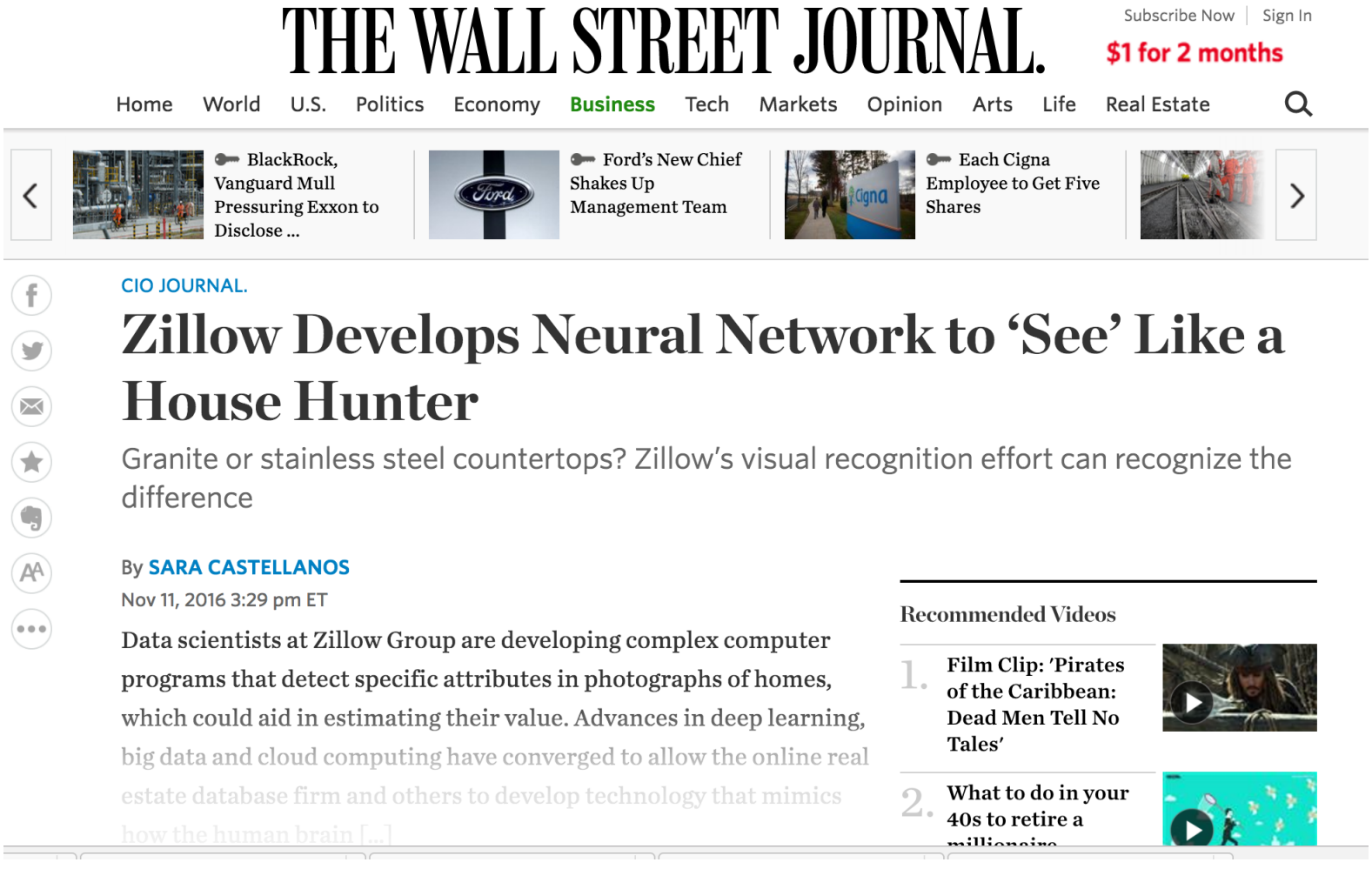


Our intrepid panelists:

Anjali Gupta, Shankara Abbineni, Clark Fisher, Iman Jaroudi, Aparajita Kaphle, Corin Katzke, Luke Reynolds, Matthew Shu, Kelly Wang

It’s everywhere: Home assistants

Pricing and recommending homes



https://blogs.wsj.com/cio/2016/11/11/zillow-develops-neural-network-to-see-like-a-home-buyer/

AI vs. ML

Machine learning focuses on making predictions and inferences from data.

AI combines machine learning components into a larger system that includes a decision making component.

An AI system exhibits a behavior, resulting from the collective decisions that are made.

Machine learning frameworks

- Supervised, unsupervised, semi-supervised
- Reinforcement learning
- Representation learning

Example of representation learning: Word embeddings

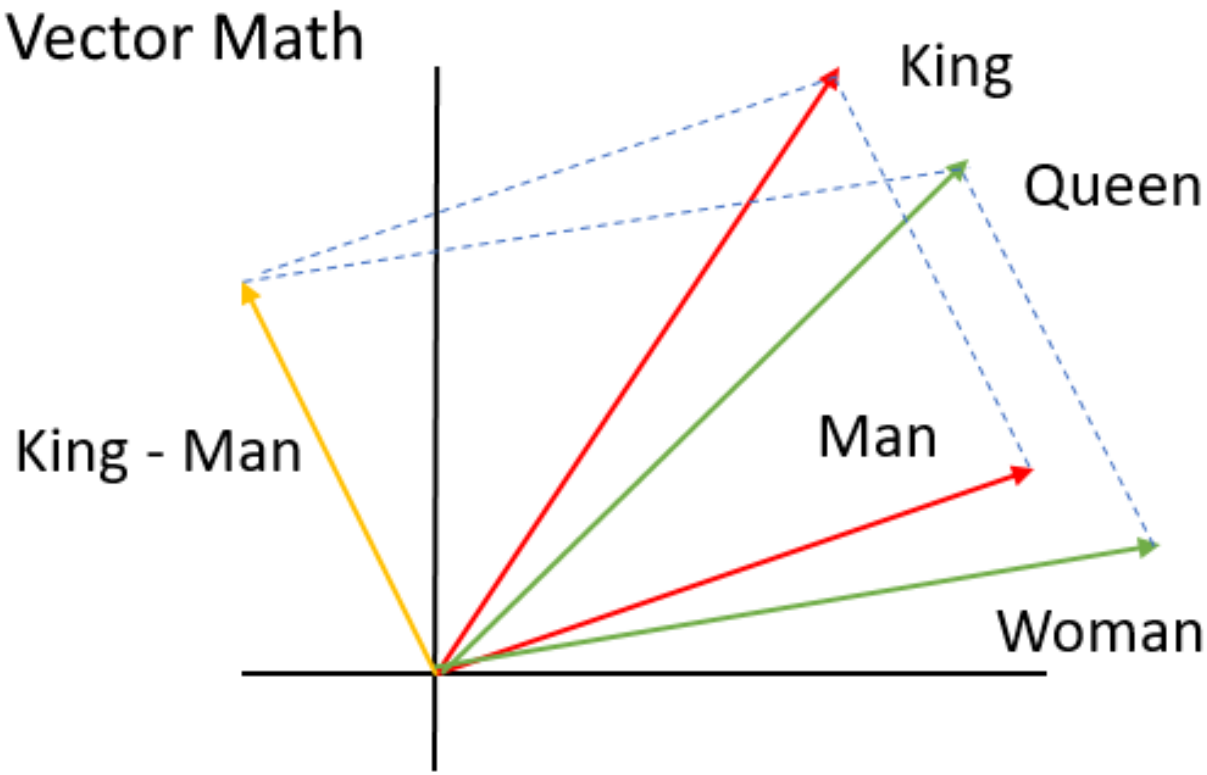
- Each word in vocab is mapped to 100 or 500 dimensional vector
- Based solely on co-occurrence statistics in corpus of text

Example of representation learning: Word embeddings

Yale:

[0.78310001, 0.51717001, -0.38207 , -0.23722 , -0.31615999, 0.30805001, 0.76389998, 0.064106 , -0.74913001, 0.60585999, -0.23871 , -0.16876 , -0.25634 , 1.07270002, -0.29967999, 0.020095 , 0.54500997, -0.17847 , -0.26675999, -0.11798 , -0.48692 , 0.22712 , 0.017473 , -0.4747 , 0.44861001, -0.084281 , -0.30412999, -1.13510001, -0.14869 , -0.11182 , -0.32530001, 1.0029 , -0.35742 , 0.35148999, -1.10679996, -0.064142 , -0.72284001, 0.14114 , -0.41247001, -0.16184001, -0.54576999, -0.12958001, -0.88356 , -0.089722 , 0.10555 , -0.12288 , 0.92851001, 0.50032002, 0.1349 , 0.21457 , 0.35073999, -0.73132998, 0.39633 , -0.43239999, -0.38815999, -1.34669995, 0.37463999, -0.79386002, 0.11185 , 0.18007 , -0.75142998, 0.24975 , -0.094948 , -0.36341 , 0.24869999, -0.22667 , 0.32289001, 1.29489994, 0.42658001, 1.29120004, -0.13954 , 0.68976003, 0.21586999, 0.13715 , -1.00919998, 0.028827 , 0.11011 , -0.1912 , -0.073198 , -0.52449 , 0.49199 , 0.14463 , -0.18844 , -0.75536001, -0.28704 , 0.019113 , 0.30349001, -0.74425 , -0.072221 , -0.40647 , 0.26899001, -0.28318 , 0.72409999, 0.50796002, -0.37845999, -0.13008 , -0.13808 , 0.098928 , 0.16215999, 0.16293]

Word geometry



Embeddings encode societal bias

$\phi(\texttt{scientist}) - \phi(\texttt{woman}) + \phi(\texttt{man})$:	`geologist`
	`engineer`
	`astronomer`
	`mathematician`
	`science`

$\phi(\texttt{scientist}) - \phi(\texttt{man}) + \phi(\texttt{woman})$:	`anthropologist`
	`sociologist`
	`psychologist`
	`geneticist`
	`biochemist`

Trained on 6 billion words of Wikipedia

Embeddings encode societal bias

$\phi(\texttt{smart}) - \phi(\texttt{girl}) + \phi(\texttt{boy})$:

```
wise
better
guy
kind
good
kid
```

$\phi(\texttt{smart}) - \phi(\texttt{boy}) + \phi(\texttt{girl})$:

```
sexy
pretty
incredibly
cute
exciting
funny
```

Man is to Computer Programmer as Woman is to Homemaker? Debiasing Word Embeddings

Tolga Bolukbasi[1], **Kai-Wei Chang**[2], **James Zou**[2], **Venkatesh Saligrama**[1,2], **Adam Kalai**[2]
[1]Boston University, 8 Saint Mary's Street, Boston, MA
[2]Microsoft Research New England, 1 Memorial Drive, Cambridge, MA
tolgab@bu.edu, kw@kwchang.net, jamesyzou@gmail.com, srv@bu.edu, adam.kalai@microsoft.com

Abstract

The blind application of machine learning runs the risk of amplifying biases present in data. Such a danger is facing us with *word embedding*, a popular framework to represent text data as vectors which has been used in many machine learning and natural language processing tasks. We show that even word embeddings trained on Google News articles exhibit female/male gender stereotypes to a disturbing extent.

1 hr 16 min PLAY

Is A.I. the Problem? Or Are We?

The Ezra Klein Show

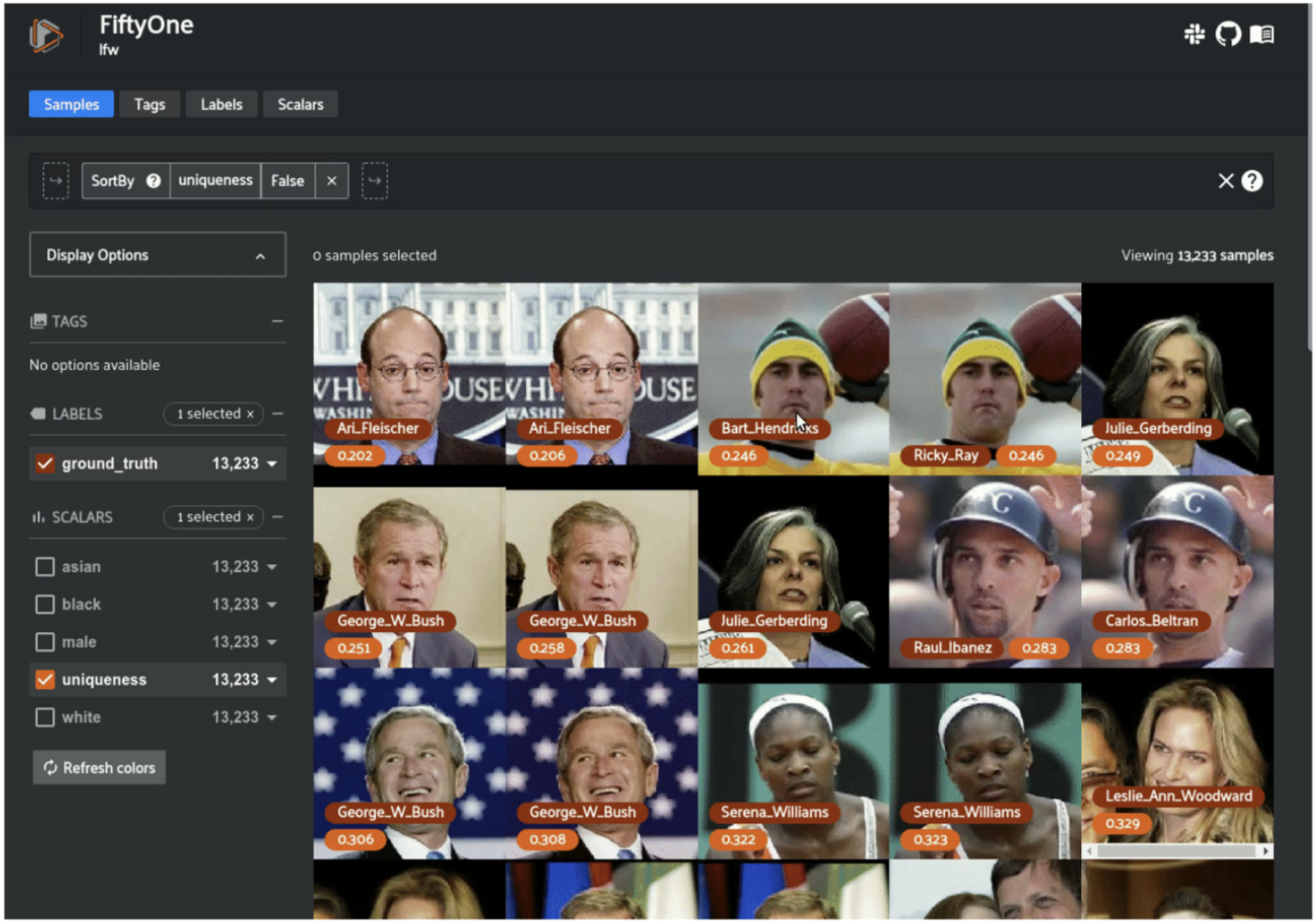
Society & Culture

Listen on Apple Podcasts ↗

If you talk to many of the people working on the cutting edge of artificial intelligence research, you'll hear that we are on the cusp of a technology that will be far more transformative than simply computers and the internet, one that could bring about a new industrial revolution and usher in a utopia — or perhaps pose the greatest threat in our species's history.

Others, of course, will tell you those folks are nuts.

Bias in LFW dataset



Sorting by the least unique images to find duplicates and incorrect labels

Hacking AI systems

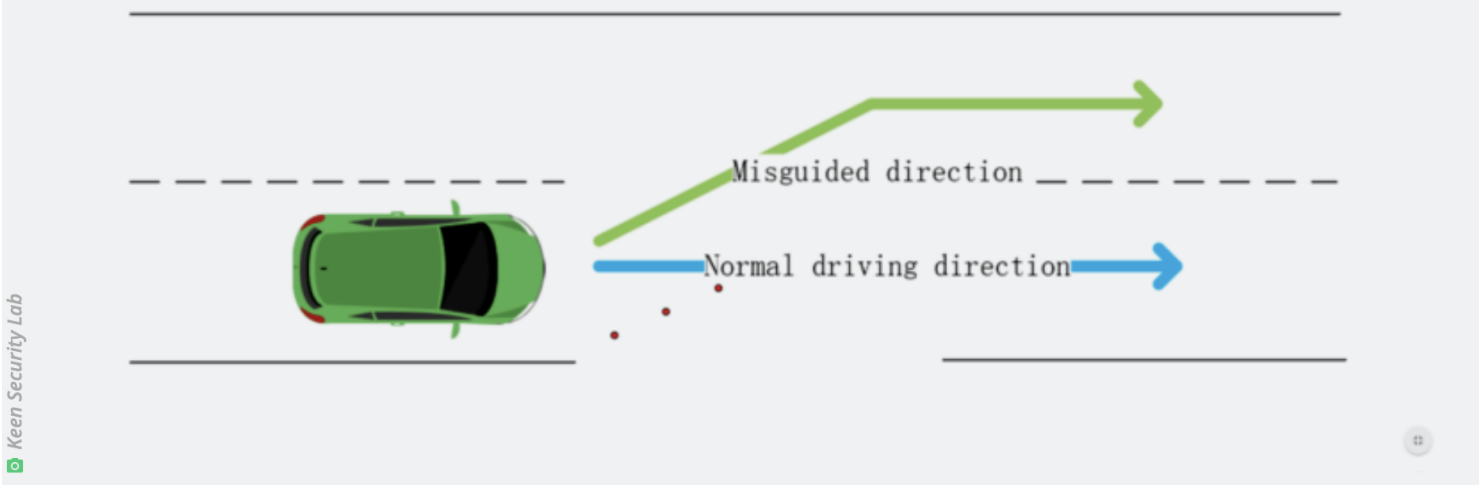
ars TECHNICA SUBSCRIBE SIGN IN

TESLA AUTOPILOT —

Researchers trick Tesla Autopilot into steering into oncoming traffic

Stickers that are invisible to drivers and fool autopilot.

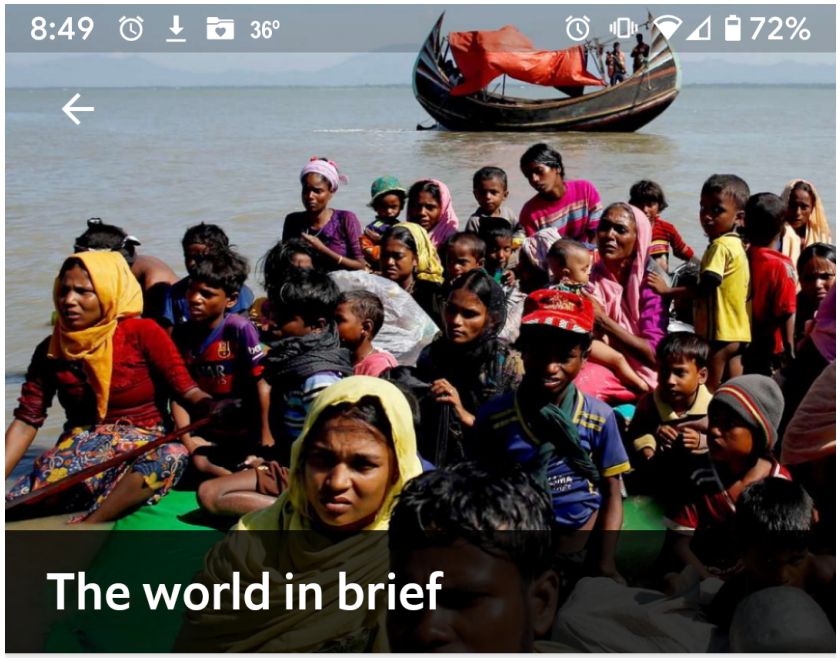
DAN GOODIN - 4/1/2019, 8:50 PM



Machine learning at a large Internet company

- Typical project lifetime: 6 months to 1 year
- Ads projects involve thousands of software engineers
- Often adding new “feature” to existing black box model
- No single person understands entire model
- Not interpretable
- Security issues with data

From recent news feed



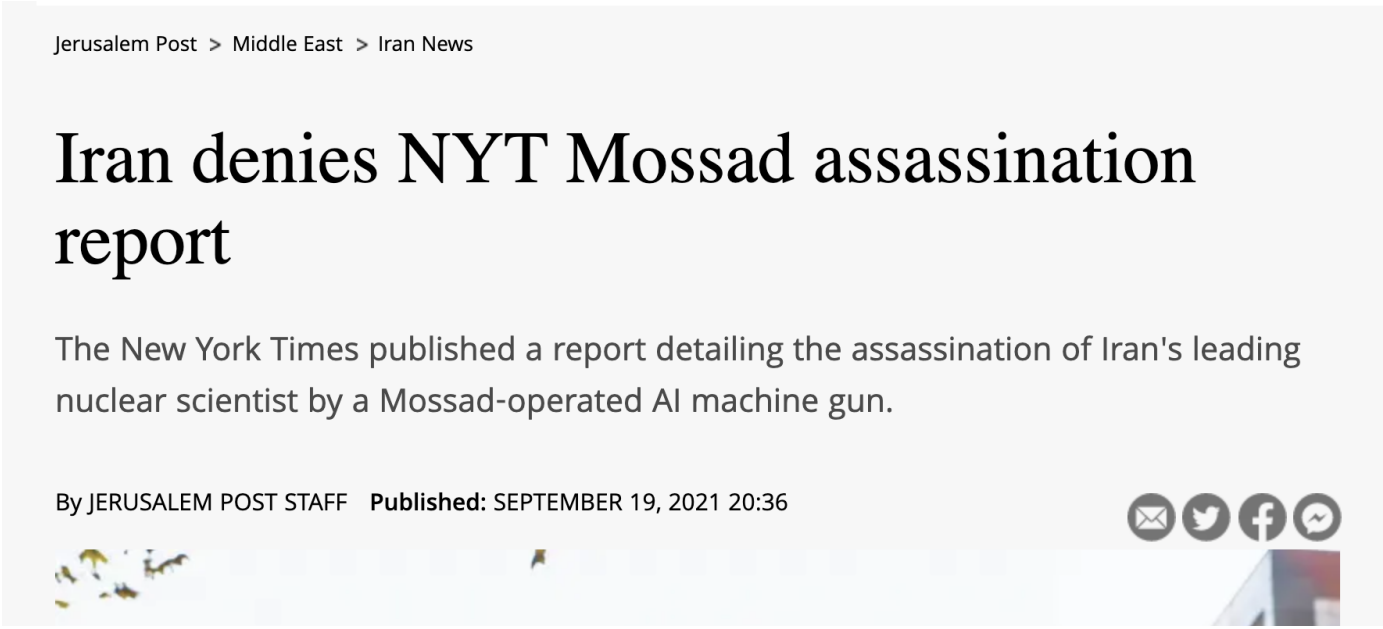
Rohingya refugees, members of an ethnic minority forcibly driven from **Myanmar**, filed a class-action lawsuit against **Facebook** (through its parent, Meta) claiming damages worth $150bn. Their lawyers say the social-media giant neglected to prevent incitements of violence against them. Facebook has said it was "too slow to prevent misinformation" in Myanmar, but also argued it is not liable for the effects.

Descriptions in press

The Scientist and the A.I.-Assisted, Remote-Control Killing Machine

Israeli agents had wanted to kill Iran's top nuclear scientist for years. Then they came up with a way to do it with no operatives present.

Descriptions in press



Jerusalem Post > Middle East > Iran News

Iran denies NYT Mossad assassination report

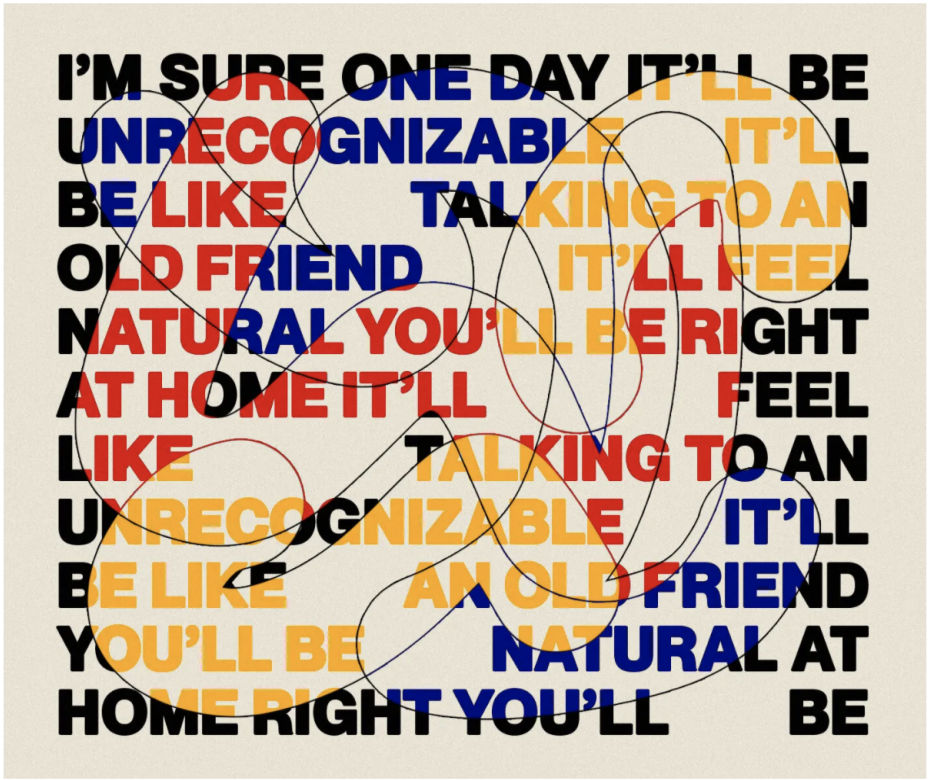
The New York Times published a report detailing the assassination of Iran's leading nuclear scientist by a Mossad-operated AI machine gun.

By JERUSALEM POST STAFF **Published:** SEPTEMBER 19, 2021 20:36

Descriptions in press

NONFICTION

A Robot Wrote This Book Review



Elliot Ulm

Descriptions in press

By Kevin Roose

Nov. 21, 2021

THE AGE OF AI

And Our Human Future

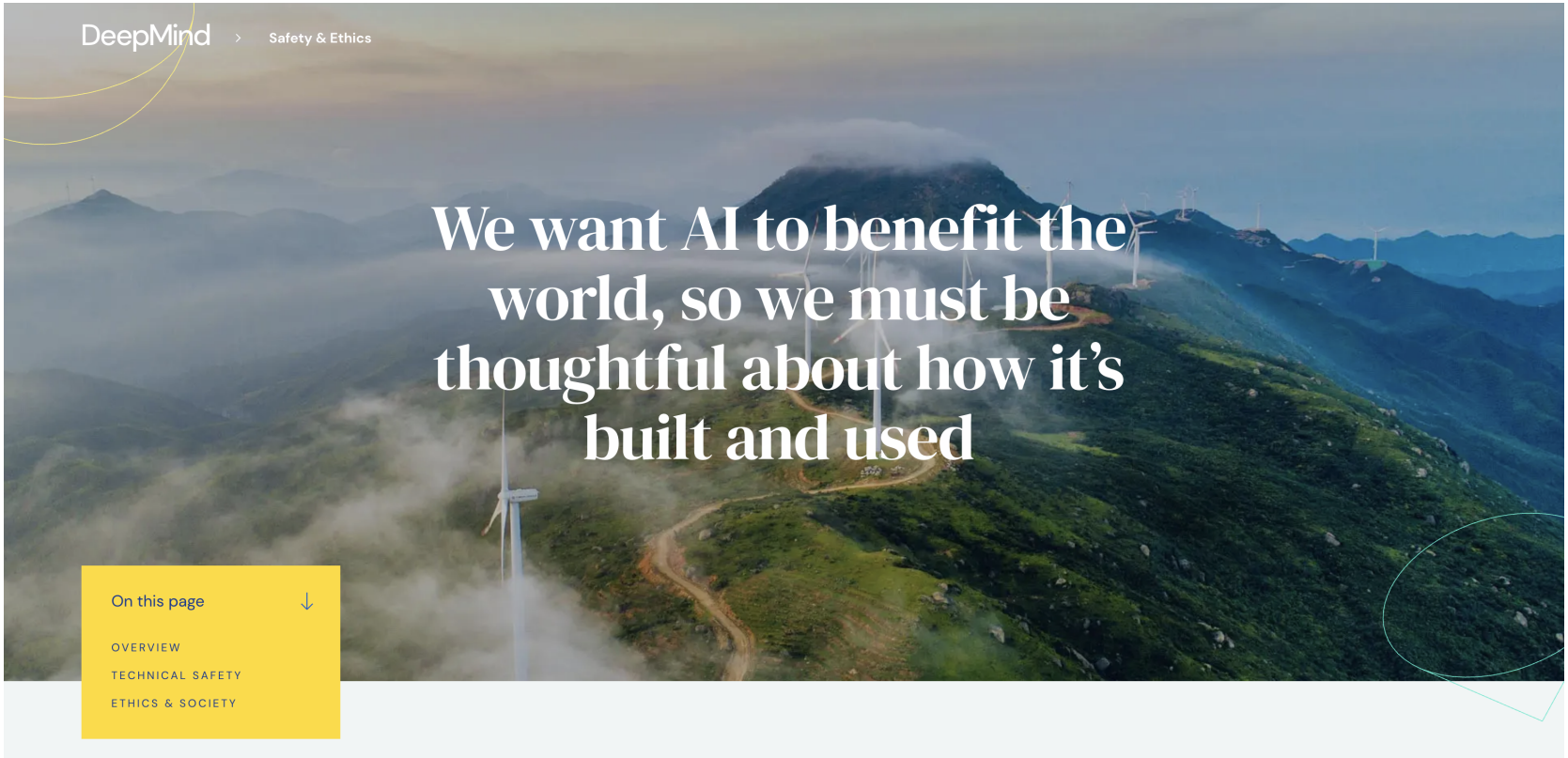
By Henry A. Kissinger, Eric Schmidt and Daniel Huttenlocher

One of the great promises of technology is that it can do the work that humans find too boring or arduous.

In the 19th and 20th centuries, factory machines relieved us of repetitive manual labor and backbreaking farm work. In this century, artificial intelligence has taken care of a few more tasks — curating Spotify playlists, selecting the next YouTube video, vacuuming the floor and so on — but many more mind-numbing activities remain ripe for the picking. The experts promise us that someday, all of our least favorite chores — including complex cognitive ones, like interviewing job candidates or managing global supply chains — will be outsourced to machines.

But that day has not yet arrived. Or has it?

Corporate (de)initiatives



Corporate (de)initiatives

Elon Musk Has Fired Twitter's 'Ethical AI' Team

As part of a wave of layoffs, the new CEO disbanded a group working to make Twitter's algorithms more transparent and fair.

Corporate (de)initiatives

TOM SIMONITE BUSINESS 12.02.2021 08:00 AM

Ex-Googler Timnit Gebru Starts Her Own AI Research Center

The researcher, who says Google fired her a year ago, wants to ask questions about responsible use of artificial intelligence.

ILLUSTRATION: WIRED STAFF; GETTY IMAGES

Corrigibility

Corrigibility

"If we use, to achieve our purposes, a mechanical agency with whose operation we cannot efficiently interfere once we have started it...then we had better be quite sure that the purpose put into the machine is the purpose which we really desire and not merely a coloful immitation of it."

Norbert Wiener
Moral and Technical Consequences of Automation, 1960

Further listening

1 hr 16 min PLAY

Is A.I. the Problem? Or Are We?

The Ezra Klein Show

Society & Culture

Listen on Apple Podcasts ↗

If you talk to many of the people working on the cutting edge of artificial intelligence research, you'll hear that we are on the cusp of a technology that will be far more transformative than simply computers and the internet, one that could bring about a new industrial revolution and usher in a utopia — or perhaps pose the greatest threat in our species's history.

Others, of course, will tell you those folks are nuts.

Our intrepid panelists:

Anjali Gupta, Shankara Abbineni, Clark Fisher, Iman Jaroudi, Aparajita Kaphle, Corin Katzke, Luke Reynolds, Matthew Shu, Kelly Wang

Team A’s stories

1. Algorithms label people as unvaccinated

In response to rising COVID-19 rates, Pfizer developed and implemented machine learning methods to predict and track whether individuals have gotten their most recent COVID-19 boosters. Using publicly available data from the U.S. Census, in conjunction with their own data on vaccination rates, Pfizer has built complex decision models which classify people as either “vaccinated + boosted,” ”vaccinated,” or ”unvaccinated.” As of now, it is unclear whether they will be attempting to profit off of this model, by selling it to a government or another pharmaceutical company.

Team A's stories

2. AI sends home asthma patients

AI has the potential to improve health outcomes in healthcare settings by picking up on patterns in data that humans miss. At one hospital, a team of doctors and ML researchers created a model to recommend whether patients with pneumonia be treated as inpatients (treated monitored in the hospital) or outpatients (treated and sent home), based on the patient's health information. It seemed like the model was successful, until the doctors realized that it was recommending that patients with asthma—a group with a high risk of developing complications from pneumonia—be sent home as outpatients.

Team A's stories

3. YouTuber befriends a bot

A small YouTuber befriended someone whom they believed to be their age and also a member of the gaming community. The two communicated entirely online, through chat room messaging, for about 6 months before the YouTuber learned that their friend's side of the conversations were artificially generated using language modeling.

Team B's stories

1. Metabots invent their own language

At the Facebook Artificial Intelligence Research lab, researchers trained bots to negotiate with one another in natural language using English words with the goal that the bots could talk to human users. Following this reinforcement learning process, however, the researchers discovered that the robots seemed to communicate in their own nonsensical language (i can i everything else, balls have zero to me to me to me to me to me to me to me to me to). Strangely, some of the negotiations reached successful conclusions, suggesting the robots may have developed their own language.

Team B's stories

2. Discriminatory job ad placements

Researchers found that Facebook job ads discriminate against people according to race, by not showing ads for a certain job to people of underrepresented groups (for example tech jobs for Hispanic people). Although it's not lawful to discriminate by demographic info, Facebook/Meta algorithms still show statistically significant differences in the frequency at which they show ads to people of different races.

Team B's stories

3. Trademark stamp used by hackers

Malware detection software created by Microsoft was trained on a large number of labeled examples and was shown to perform very well (over 95% accuracy) on a test set. However, the training set included a large amount of Microsoft's own code, each file of which contained a trademark stamp at the top of the file. As a result, the neural net learned to label all examples with the watermark as safe. When Microsoft released the malware detection software, hackers quickly realized they could get by the filter just by including Microsoft's trademark stamp. The new software was quickly recalled.

Questions for discussion/debate

Should machines be held to a higher standard than humans?

- A self-driving car kills a pedestrian
- A drunk driver kills a pedestrian

Questions for discussion/debate

Will a superintelligent AGI be developed within the next 50 years?

- It will be difficult to aligned with human values
- Humanity will learn how to make it a productive partner

Questions for discussion/debate

How important is communication of machine learning technology?

- Public misconceptions are endemic
- People eventually gain a basic understanding

Questions for discussion/debate

Will AI create jobs or destroy jobs?

- A robot replaces a factory worker
- A robot supervisor is needed

Questions for discussion/debate

How will AI affect the global balance of power and wealth?

- A rich country adopts an AI research program
- A poor country adopts open technology

Questions for discussion/debate

How should history guide development of AI?

- Technology is neither inherently good or bad (nuclear fission)
- This is completely new in history