S&DS 265 / 565

Introductory Machine Learning

Societal Issues for Machine Learning

Tuesday, December 7

Yale

Housekeeping

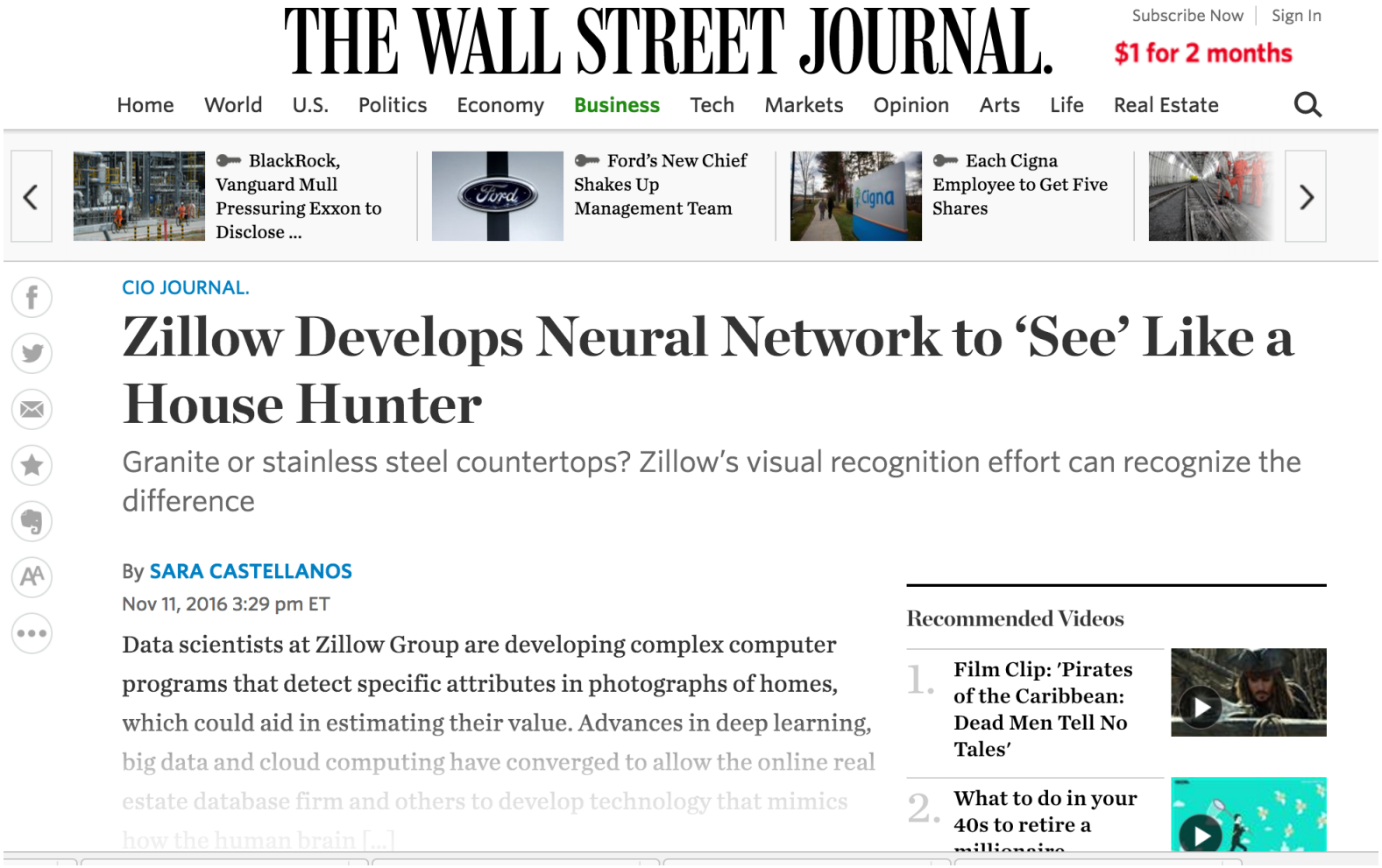
- Assignment 7 out (neural nets and RL)
- New due date: Tuesday December 14
- Assignment 6 will be graded by Thursday, Dec. 9
- Quiz 4: Today (neural nets and RL); usual protocol
- Final exam, Dec 21 at 7pm (cumulative, 3 hours, cheat sheet, practice exam end of this week)
- Thursday (last class): Details and review for final exam

Outline

- Recall: ML vs. AI
- Examples of bias
- Examples from recent news
- Panel discussion

Today: 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
- Generative vs. discriminative models
- Representation learning

Example of representation learning: Word embeddings

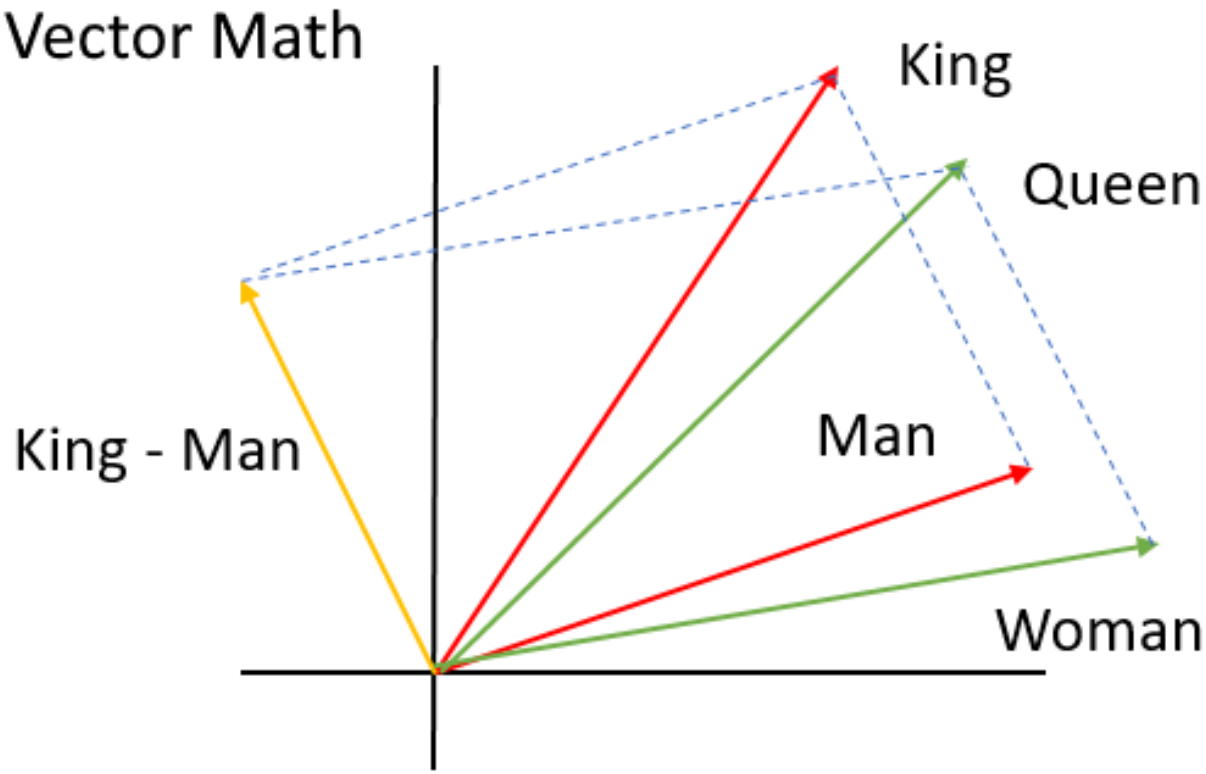
- Each word in vocab is mapped to 100 or 500 dimensional vector
- Based solely on co-occurrence statistics in corpus of text

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

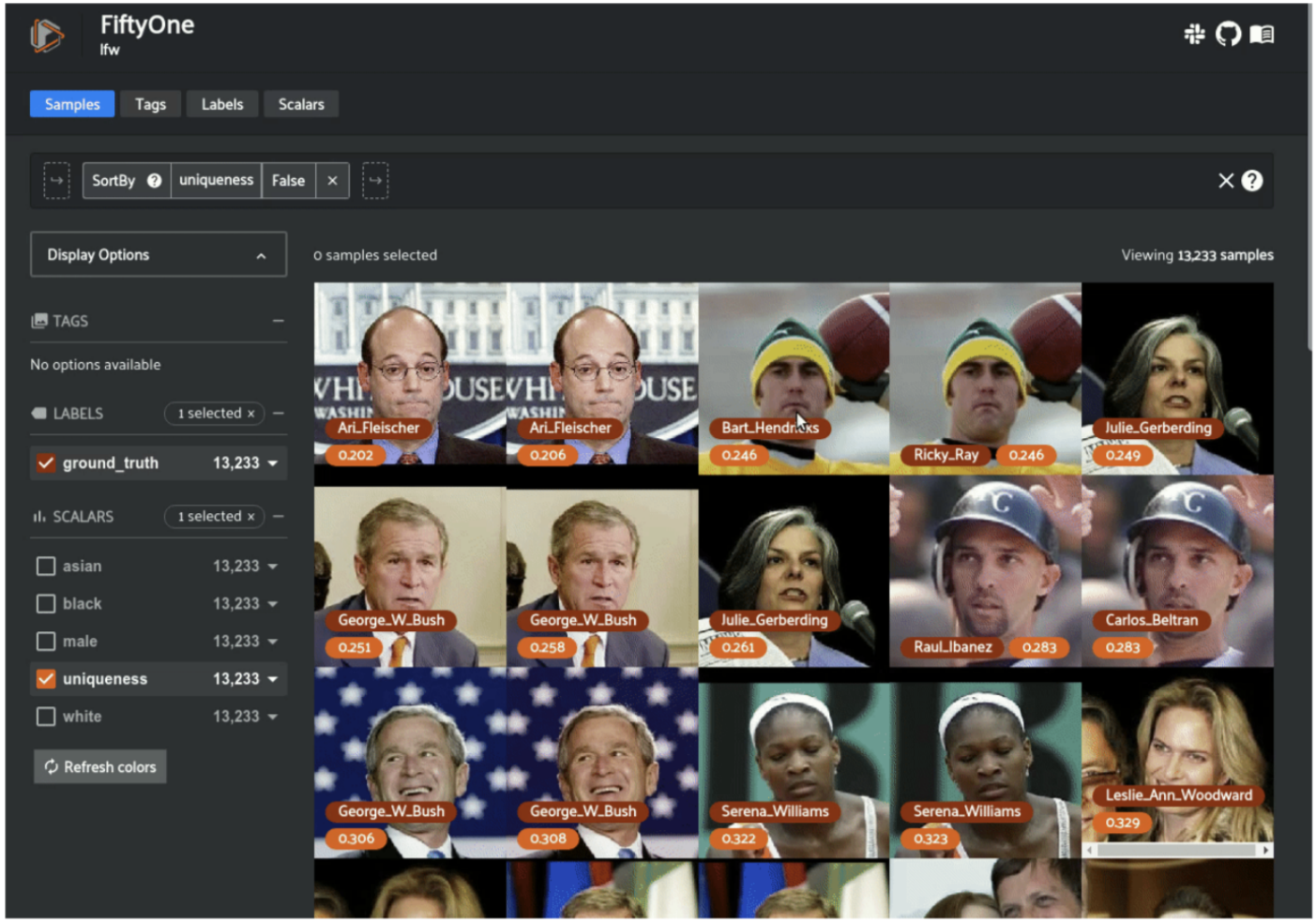
$\phi(\texttt{smart}) - \phi(\texttt{girl}) + \phi(\texttt{boy})$:

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

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

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

Bias in LFW dataset



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

Hacking AI systems

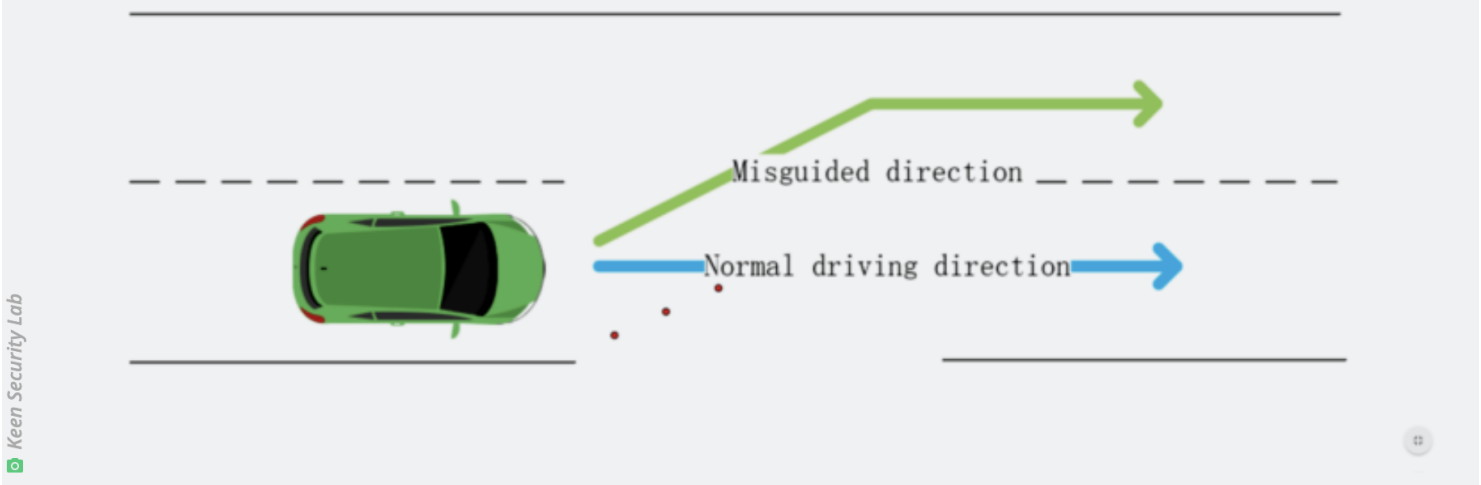
ars TECHNICA SUBSCRIBE SIGN IN

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

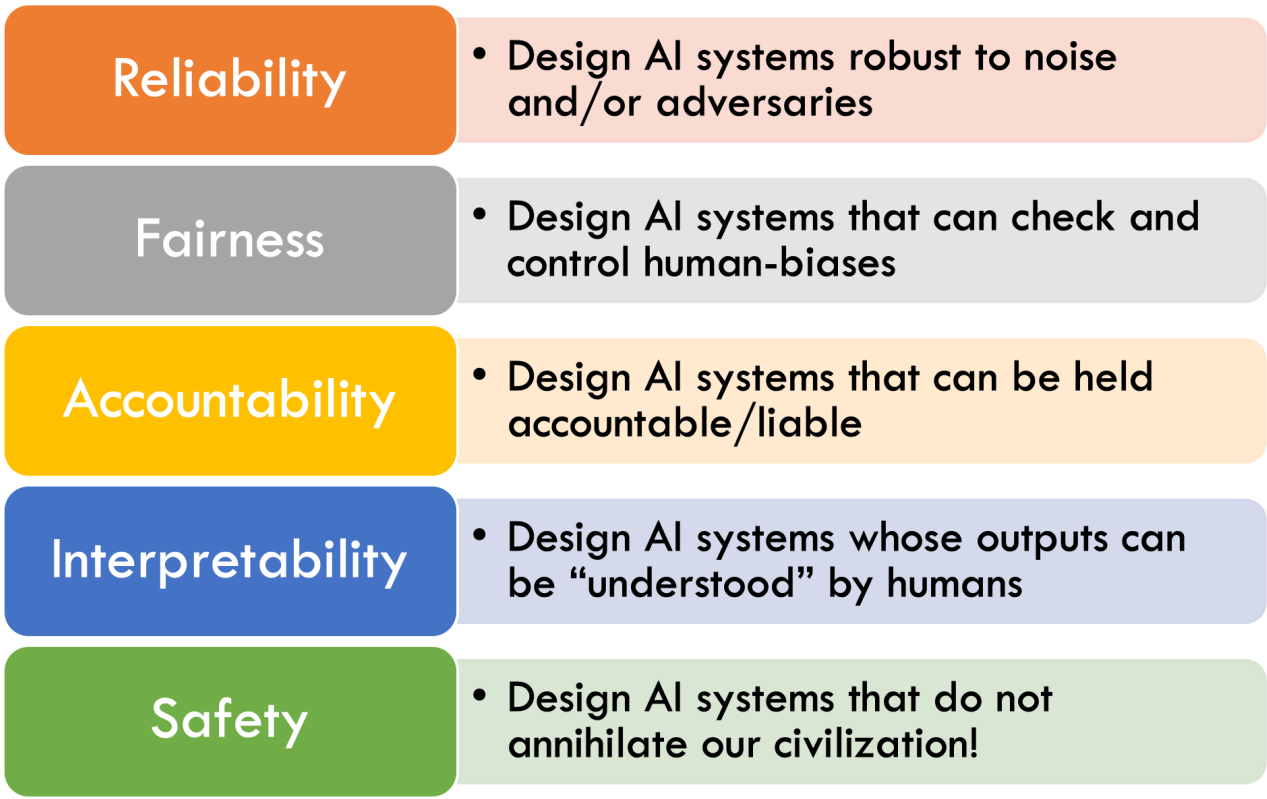
- Typical project lifetime: 6 months to 1 year
- Ads projects involve thousands of software engineers
- Often adding new “feature” to existing black box model
- No single person understands entire model
- Not interpretable
- Security issues with data

Important directions

Reliability	• Design AI systems robust to noise and/or adversaries
Fairness	• Design AI systems that can check and control human-biases
Accountability	• Design AI systems that can be held accountable/liable
Interpretability	• Design AI systems whose outputs can be “understood” by humans
Safety	• Design AI systems that do not annihilate our civilization!

Ack: Nisheeth Vishnoi and Elisa Celis

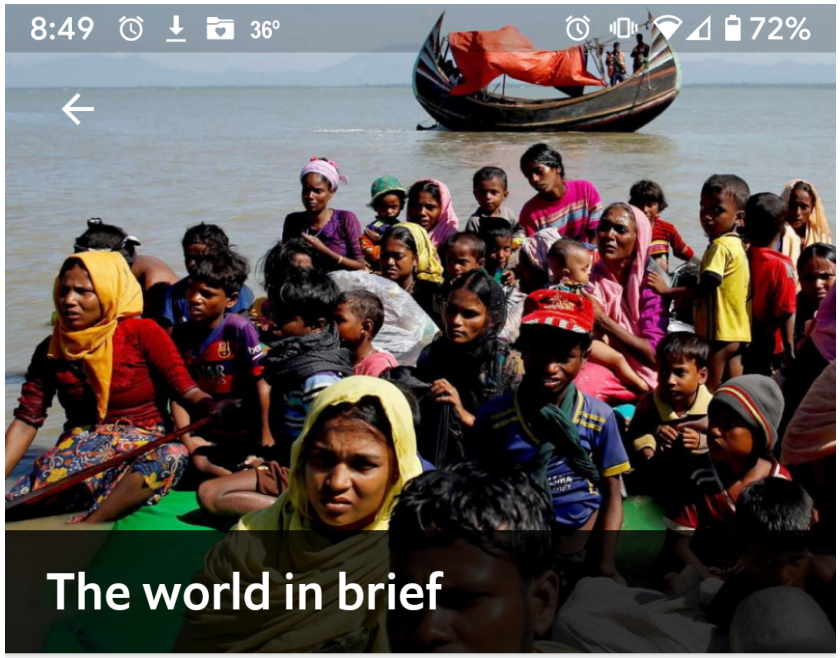
Important directions



- Requires a principled, interdisciplinary approach

Ack: Nisheeth Vishnoi and Elisa Celis

From this morning's news feed



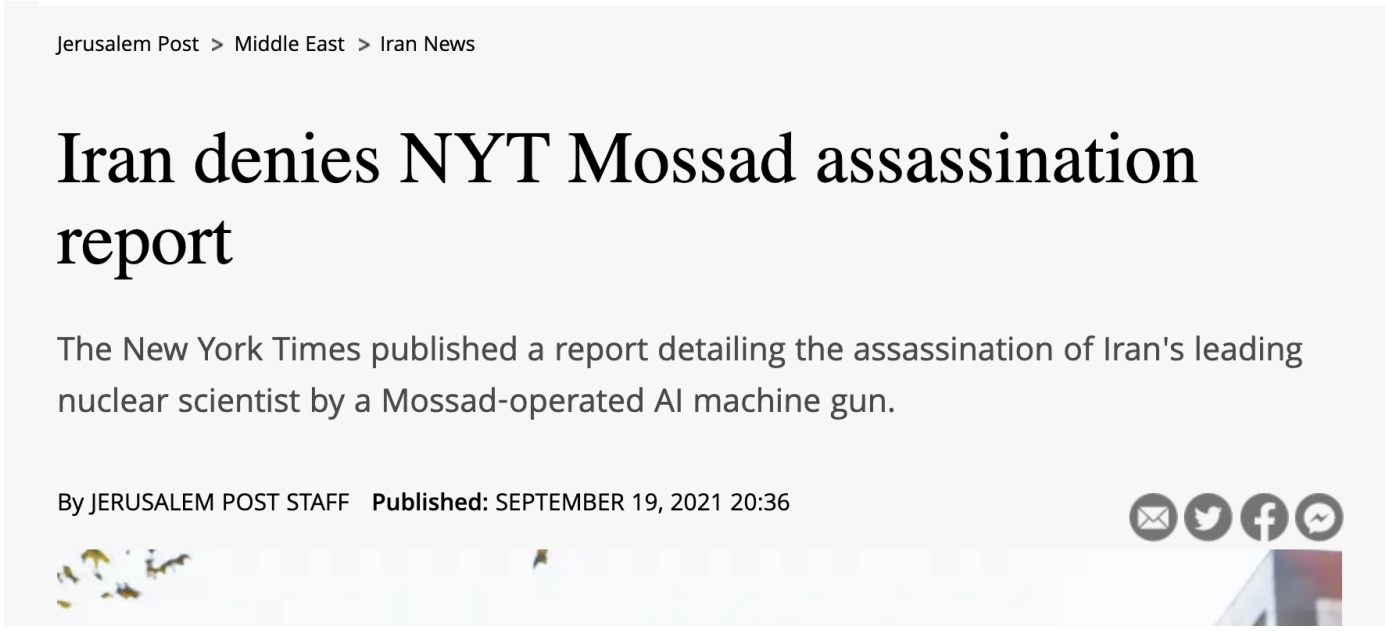
Rohingya refugees, members of an ethnic minority forcibly driven from **Myanmar**, filed a class-action lawsuit against **Facebook** (through its parent, Meta) claiming damages worth $150bn. Their lawyers say the social-media giant neglected to prevent incitements of violence against them. Facebook has 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

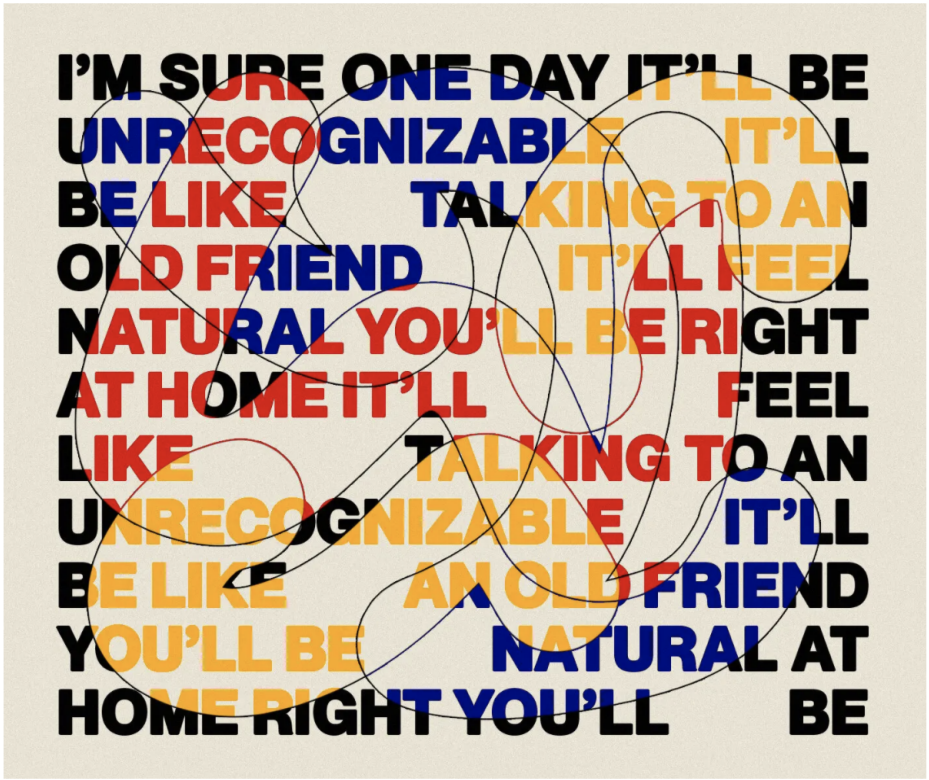
The New York Times published a report detailing the assassination of Iran's leading nuclear scientist by a Mossad-operated AI machine gun.

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

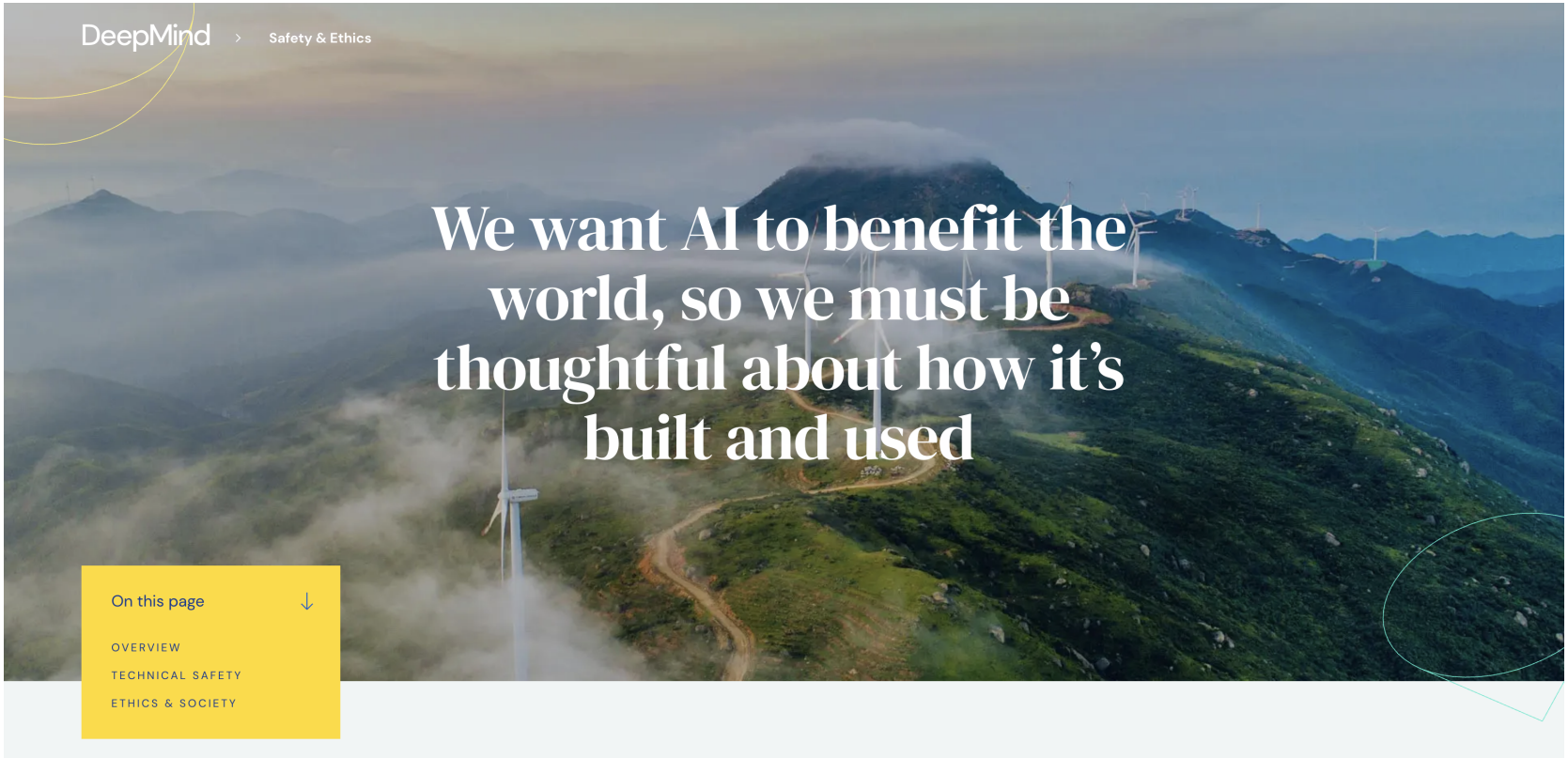
By Henry A. Kissinger, Eric Schmidt and Daniel Huttenlocher

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 initiatives



Corporate 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

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.

Panel Discussion

Team A

Boris Cyusa

Eliza Oak

Lucas Zheng

Panel Discussion

Team A

Dystopian view: AI and ML are going to result in major societal inequities. The harm may outweigh the benefits unless “we” are very careful, including corporations and government entities.

Panel Discussion

Team B

Aishwarya Iyer

Jorge Herrera

Medha Majety

Panel Discussion

Team B

Utopian view: AI and ML are going to result in major societal benefits. The technology is unprecedented, and people will adapt to harness it in ways that will improve the human condition.