CS 4873-A: Computing and Society

Munmun De Choudhury | Associate Professor | School of Interactive Computing

Week 13: Algorithmic Manipulation
April 11, 2021

A Lack of Control

Impacting Real World Outcomes: The Positive Side

Defining "fake news"

Professor in Political Science and Computer and Information Science

DAVID LAZER

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BIOGRAPHICAL NOTES

Welcome! I am Professor at the Department of Political Science and College of Computer and Information Science at Northeastern University. Click here for **biographical information** and an **overview of my publications**, of **teaching and academic activities**, and some **media appearances**.

Yours,

David Lazer

RESEARCH FOLLOWUP

The objective of this website is to provide entrée into **my body of research**. Most of my work is based on the idea that how people and organizations are connected together is critical to understanding the **functioning, success and failure of actors and systems**. My teaching, research, and institution building have all centered on that theme. I've taken that essential idea and, with a variety of collaborators, examined a **wide array of domains**.

LABORATORY

My research covers everything **from very micro** (social influence processes within groups), **to the very macro** (the development of global-wide regulatory regimes).

Sources of misinformation/disinformation

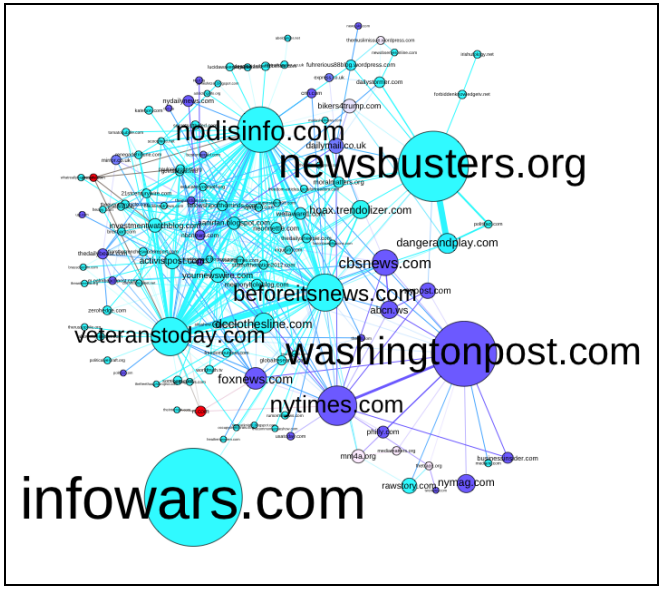
- Rumors and fiction
- Governments and politicians
- Vested interests
- The media

Lewandowsky et al 2012

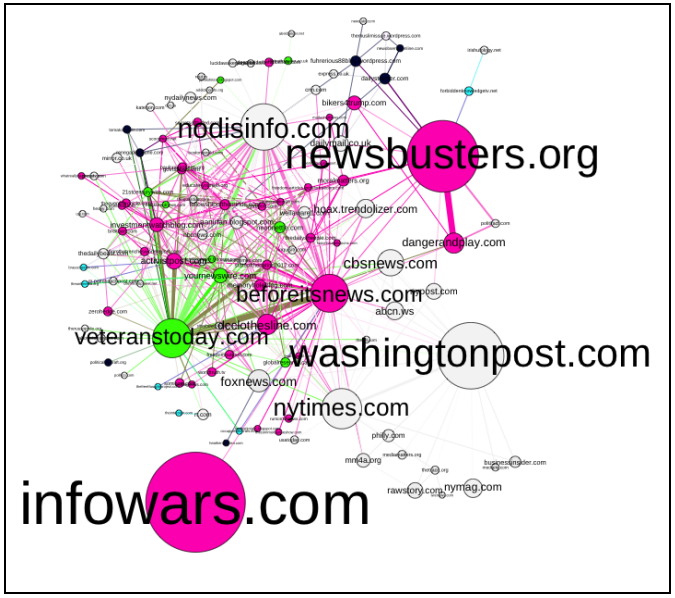
The societal costs of misinformation

Examining the Alternative Media Ecosystem Through the Production of Alternative Narratives of Mass Shooting Events on Twitter

Summary (2)



Purple = mainstream media; Aqua = alternative media; Red = government controlled media



ink = U.S. Alt-Right; Aqua = U.S. Alt-Left; Green = Intl. Anti-Globalist; Black = White Nationalist/Anti-Semitic; White = other

Leaning	Description
U.S. Alt Right	U.S. focused, anti-mainstream media, pro-Christian, anti-LGBT, anti-feminist, anti-globalist, climate change denying
U.S. Alt Left	U.S. focused, anti-mainstream media, anti-corporatist, critical of police, pro-prison reform, pro-BlackLivesMatter
International Anti-Globalist	Internationally focused, anti-globalist or anti-New World Order/Cabal, anti-corporatist, conspiracy-focused
White Nationalist and/or Anti-Semitic	primarily white-nationalist or anti-Semitic positions
Muslim Defense	primarily challenges mainstream narratives of terrorist attacks by Muslims
Russian Propaganda	primarily supports Russian interests, anti-globalist

Renewed interest

POLITICAL SCIENCE

Fake news on Twitter during the 2016 U.S. presidential election

Nir Grinberg[1,2]*, Kenneth Joseph[3]*, Lisa Friedland[1]*, Briony Swire-Thompson[1,2], David Lazer[1,2]†

The spread of fake news on social media became a public concern in the United States after the 2016 presidential election. We examined exposure to and sharing of fake news by registered voters on Twitter and found that engagement with fake news sources was extremely concentrated. Only 1% of individuals accounted for 80% of fake news source exposures, and 0.1% accounted for nearly 80% of fake news sources shared. Individuals most likely to engage with fake news sources were conservative leaning, older, and highly engaged with political news. A cluster of fake news sources shared overlapping audiences on the extreme right, but for people across the political spectrum, most political news exposure still came from mainstream media outlets.

In 1925, *Harper's Magazine* published an article titled "Fake news and the public," decrying the ways in which emerging technologies had made it increasingly difficult to separate rumor from fact (*1*). Nearly a century later, fake news has again found its way social media have described its spread within platforms (*5*, *6*) and highlighted the disproportionate role played by automated accounts (*7*), but they have been unable to make inferences about the experiences of ordinary citizens.

Outside of social media, fake news has been

We distinguished among three classes of fake news sources to allow comparisons of different operational definitions of fake news. The three classes correspond to differences in methods of generating lists of sources as well as perceived differences in the sites' likelihoods of publishing misinformation. We labeled as "black" a set of websites taken from preexisting lists of fake news sources constructed by fact-checkers, journalists, and academics (*8*, *9*) who identified sites that published almost exclusively fabricated stories [see supplementary materials (SM) section S.5 for details]. To measure fake news more comprehensively, we labeled additional websites as "red" or "orange" via a manual annotation process of sites identified by Snopes.com as sources of questionable claims. Sites with a red label (e.g., Infowars.com) spread falsehoods that clearly reflected a flawed editorial process, and sites with an orange label represented cases where annotators were less certain that the falsehoods stemmed from a systematically flawed process. There were 171 black, 64 red, and 65 orange fake news sources appearing at least once in our data.

Voters on Twitter

To focus on the experiences of real people on Twitter, we linked a sample of U.S. voter reg-

The spread of true and false news online

Media's Next Challenge: Overcoming the Threat of Fake News

Jim Rutenberg
MEDIATOR NOV. 6, 2016

Spielberg
Turbulent

A Failure

In AT&T
With Trur

Terrorism

Russia In

See More

The impact of social media “fake news”…

Ecosystem of social media bots

The challenges of bots

f i ® s t m ¤ ñ d @ ¥
PEER-REVIEWED JOURNAL ON THE INTERNET

Social bots distort the 2016 U.S. Presidential election online discussion

by Alessandro Bessi and Emilio Ferrara

Abstract

Social media have been extensively praised for increasing democratic discussion on social issues related to policy and politics. However, what happens when this powerful communication tools are exploited to manipulate online discussion, to change the public perception of political entities, or even to try affecting the outcome of political elections? In this study we investigated how the presence of social media bots, algorithmically driven entities that on the surface appear as legitimate users, affect political discussion around the 2016 U.S. Presidential election. By leveraging state-of-the-art social bot detection algorithms, we uncovered a large fraction of user population that may not be human, accounting for a significant portion of generated content (about one-fifth of the entire conversation). We inferred political partisanships from hashtag adoption, for both humans and bots, and studied spatio-temporal communication, political support dynamics, and influence mechanisms by discovering the level of network embeddedness of the bots. Our findings suggest that the presence of social media bots can indeed negatively affect democratic political discussion rather than improving it, which in turn can potentially alter public opinion and endanger the integrity of the Presidential election.

Contents

Introduction

Various computational social science studies demonstrated that social media have been extensively used to foster democratic conversation about social and political issues: From the Arab Spring (González-Bailón, *et al.*, 2011; Howard, *et al.*, 2011), to Occupy Wall Street (Conover, *et al.*, 2013a; Conover, *et al.*, 2013b) and many other civil protests (Varol, *et al.*, 2014; González-Bailón, *et al.*, 2013) (Bastos, *et al.*, 2014), Twitter and other social media seemed to play an instrumental role to involve the public in policy and political conversations, by collectively framing the narratives related to particular social issues, and coordinating online and off-line activities. The use of digital media to discuss politics during election times has also been the subject of various studies, covering the last four U.S. Presidential elections (Adamic and Glance, 2005; Diakopoulos and Shamma, 2010; Bekafigo and McBride, 2013; Carlisle and Patton, 2013; DiGrazia, *et al.*, 2013; Wang, *et al.*, 2016), and other countries like Australia (Gibson and McAllister, 2006; Bruns and Burgess, 2011; Burgess and Bruns, 2012), and Norway (Enli and Skogerbø, 2013). Findings that focused on the positive effects of social media such as incrementing voting turnout (Bond, *et al.*, 2012) or exposure to diverse political views (Bakshy, *et al.*, 2015) contributed to the general praise of these platforms as a tool to foster democracy and civil political engagement (Shirky, 2011; Loader and Mercea, 2011; Effing, *et al.*, 2011; Tufekci and Wilson, 2012; Tufekci, 2014; Yang, *et al.*, 2016).

However, as early as 2006, Philip Howard raised concerns regarding the possibility of manipulating public opinion and spreading political misinformation through social media (Howard, 2006). These issues have been later proved true by several studies (Ratkiewicz, *et al.*, 2011a; Ratkiewicz, *et al.*, 2011b) (Metaxas and Mustafaraj, 2012) (El-Khalili, 2013; Ferrara, 2015; Woolley and Howard, 2016; Shorey and Howard, 2016). Of particular concern is the fact social media have been demonstrated effective in influencing individuals (Aral and Walker, 2010). One way to perform such type of manipulation is by using social bots, algorithmically controlled accounts that emulate the activity of human users but operate at much higher pace (*e.g.*, automatically producing content or engaging in social interactions), while successfully keeping their artificial identity undisclosed (Hwang, *et al.*, 2012; Messias, *et al.*, 2013; Ferrara, *et al.*, 2016).

Evidence of the adoption of social media bots to attempt manipulating political communication dates back half a decade: during the 2010 U.S. midterm elections, social bots were employed to support some candidates and smear others, by injecting thousands of tweets pointing to Web sites with fake news (Ratkiewicz, *et al.*, 2011a). The research community reported another similar case around the time of the 2010 Massachusetts special election (Metaxas and Mustafaraj, 2012). Campaigns of this type are sometimes referred to as *astroturf* or *Twitter bombs*. Unfortunately, most of the times, it has proven impossible to determine who's behind these types of operations (Kollanyi, *et al.*, 2016; Ferrara, *et al.*, 2016). Governments, organizations, and other entities with sufficient resources, can obtain the technological capabilities to deploy thousands of social bots and use them to their advantage, either to support or to attack particular political figures or candidates. Indeed, it has become increasingly simpler to deploy social bots, so that, in some cases, no coding skills are required to setup accounts that perform simple automated activities: tech blogs often post tutorials and ready-to-go tools for this purposes [1], [2], [3]. Various source codes for sophisticated social media bots can be found online as well, ready to be customized and optimized by the more technical savvy users (Kollanyi, 2016). We inspected several of these readily available bots and this is a (non-comprehensive) list of the capabilities that they provide: Search Twitter for phrases/hashtags/keywords and automatically retweet them; Automatically reply to tweets that meet a certain criteria; automatically follow any users that tweet something with a specific phrase/hashtag/keyword; Automatically follow back any users that have followed the bot; Automatically follow any users that follow a specified user; Automatically add users tweeting about something to public lists; Search Google (and other engines) for articles/news according to specific criteria and post them, or link them in automatic replies to other users; Automatically aggregating public sentiment on certain topics of discussion; Buffer and post tweets automatically. Most of these bots can run in cloud services or infrastructures like Amazon Web Services (AWS) or Heroku, making it more difficult to block them. Finally, a very recent trend is that of providing Bot-As-A-Service (BaaS): companies like RoboLike (https://robolike.com/) provide "Easy-to-use Instagram/Twitter auto bots" performing certain automatic activities for a monthly price. Advanced conversational bots powered by more sophisticated Artificial Intelligences are provided by companies like ChatBots.io that allow anyone to "Add a bot to services like Twitter, Hubot, Facebook, Skype, Twilio, and more" (https://developer.pandorabots.com/).

Connectivity

First Evidence That Social Bots Play a Major Role in Spreading Fake News

Automated accounts are being programmed to spread fake news, according to the first systematic study of the way online misinformation spreads

by Emerging Technology from the arXiv August 7, 2017

Fake news and the way it spreads on social media is emerging as one of the great threats to modern society. In recent times, fake news has been used to manipulate stock markets, make people choose dangerous health-care options, and manipulate elections, including last year's presidential election in the U.S.

Clearly, there is an urgent need for a way to limit the diffusion of fake news. And that raises an important question: how does fake news

Similar results

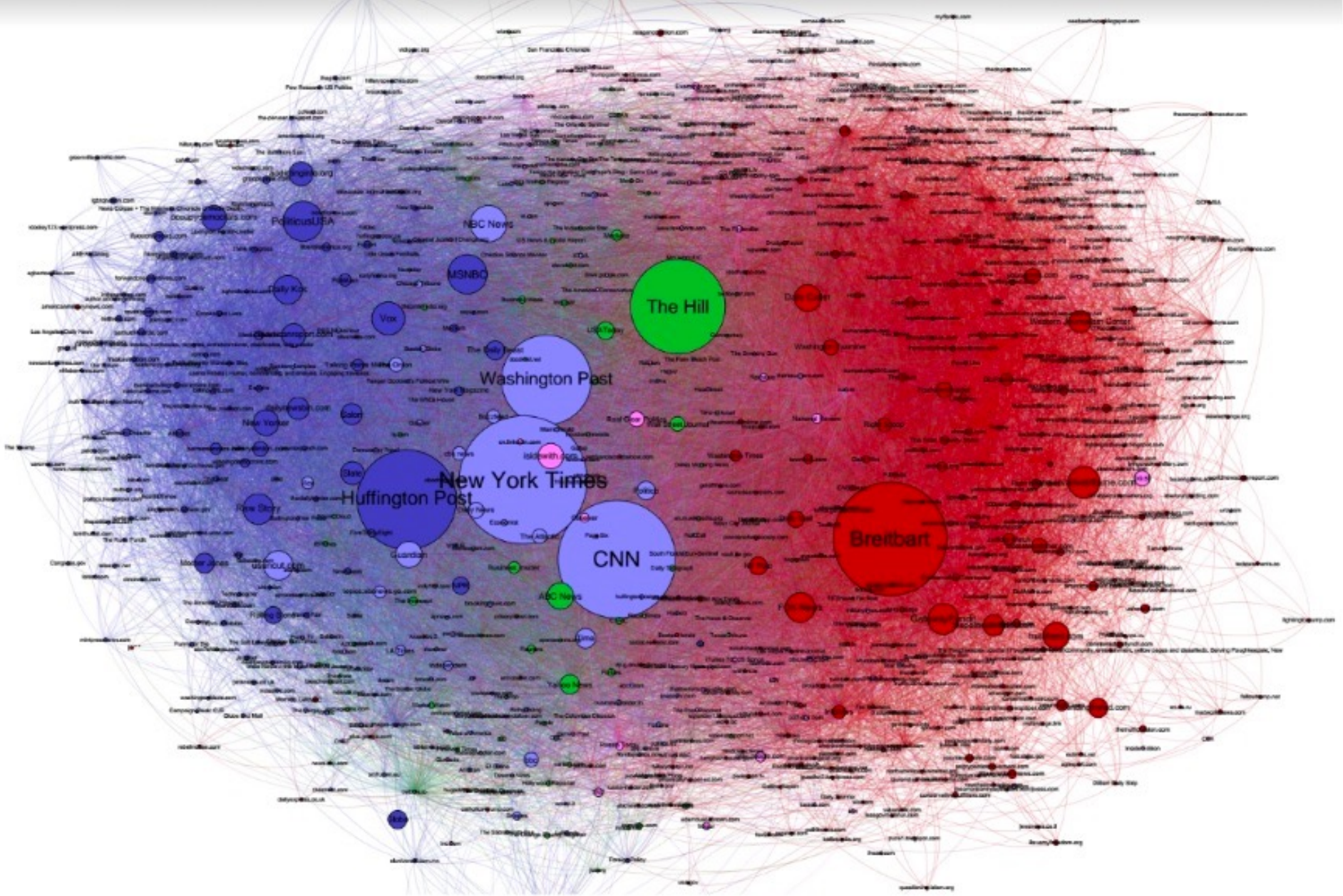
Bots Generate False News

TECH

Zuckerberg tells Congress Facebook is not a media company: 'I consider us to be a technology company'

PUBLISHED WED, APR 11 2018•10:27 AM EDT | UPDATED WED, APR 11 2018•10:51 AM EDT

Michelle Castillo
@MISHCASTILLO



Sites by partisan attention (Yochai Benkler, Robert Faris, Hal Roberts, and Ethan Zuckerman)

https://www.huffingtonpost.com/entry/mark-zuckerberg-regrets-fake-news-facebook_us_59cc2039e4b05063fe0eed9d

MEDIA 09/27/2017 08:53 pm ET

830

Mark Zuckerberg: 'I Regret' Rejecting Idea That Facebook Fake News Altered Election

He admitted this after Donald Trump claimed that Facebook was "always anti-Trump."

By Carla Herreria

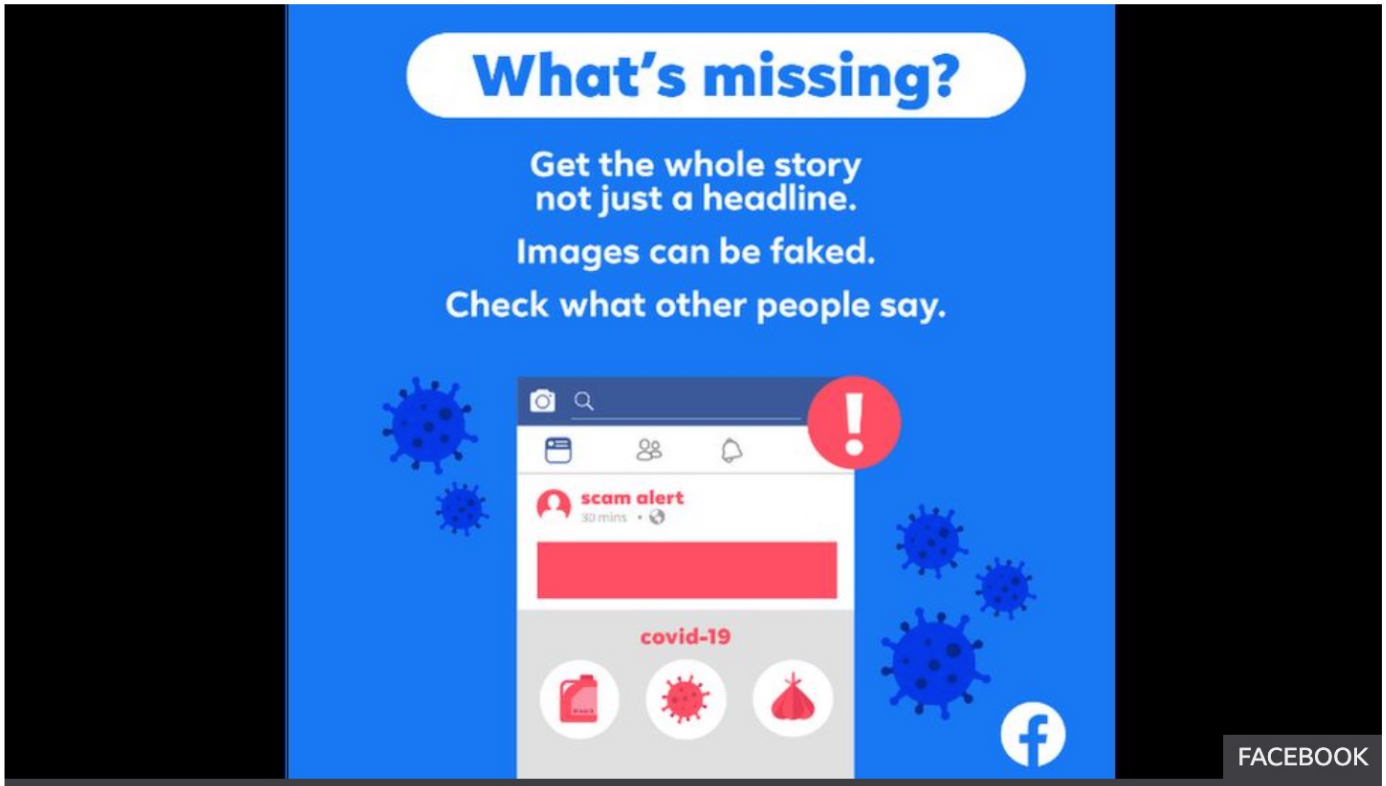
Facebook CEO Mark Zuckerberg admitted on Wednesday that he was wrong to dismiss the idea that fake news shared on the giant social network affected last year's presidential election.

Zuckerberg's statement came in response to a tweeted attack from President Donald Trump hours earlier. Trump claimed that Facebook was "always anti-Trump" and accused it of colluding with news outlets that the president has deemed to be "fake news."

Facebook targets 'false news' amid growing pressure from advertisers

By Marianna Spring
Specialist disinformation and social media reporter

30 June 2020



Facebook's new media literacy campaign will ask users questions about what they see online

Mother Jones

MEDIA JANUARY 17, 2021

Deplatforming Trump Is Already Having a Huge Impact

A new report finds election misinformation online has fallen 73 percent since the president's ban from Twitter.

MADISON PAULY
Reporter
Bio | Follow

Working to Stop Misinformation and False News

We know people want to see accurate information on Facebook – and so do we.

False news is harmful to our community, it makes the world less informed, and it erodes trust. It's not a new phenomenon, and all of us — tech companies, media companies, newsrooms, teachers — have a responsibility to do our part in addressing it. At Facebook, we're working to fight the spread of false news in three key areas:

- **disrupting economic incentives** because most false news is financially motivated;
- **building new products** to curb the spread of false news; and
- **helping people make more informed decisions** when they encounter false news.

Asia

Oct 24th 2020 edition ›

Anti-social network

In Myanmar, Facebook struggles with a deluge of disinformation

Weeks before an election, Burmese social media are awash with fake news and vitriol

So social media sites are starting to label fake news or take down posts. Is this enough? What else can be done to stop the spread of fake news?

CS 4873-A: Computing and Society

Munmun De Choudhury | Associate Professor | School of Interactive Computing

Week 13: Future of Work and Automation

April 11, 2021

2001 A Space Odyssey

HAL 9000

Notable Achievements in AI since 1995

- Computer-controlled minivan “drove” on freeways across USA in 1995
- IBM supercomputer Deep Blue defeated chess champion Gary Kasparov in 1997
- Honda’s ASIMO android can climb and descend stairs and respond to human gestures and postures
- Electrolux introduced robotic vacuum cleaner in 2001
- Five autonomous vehicles successfully completed 128-mile course in Nevada desert in 2005
- Watson trounced two most successful human *Jeopardy!* champions in 2011

Stanley, the Autonomous Vehicle

Watson Wins *Jeopardy!* Challenge

HEALTH AND SCIENCE

Google's DeepMind A.I. beats doctors in breast cancer screening trial

PUBLISHED THU, JAN 2 2020•8:13 AM EST

David Reid
@DAVYREID73

KEY POINTS

- Anonymous scans of 29,000 women were used in the trial.
- The biggest improvements over human scanning was found in the U.S. portion of the study.
- Google-owned DeepMind has already used AI to read eye scans and spot neck cancer.

AI

How people are using AI to detect and fight the coronavirus

KHARI JOHNSON @KHARIJOHNSON MARCH 3, 2020 12:49 PM

UVD disinfectant robot spreads ultraviolet rays in hospitals to kill bacteria and viruses

TOM SIMONITE BUSINESS 02.26.2020 07:00 AM

Chinese Hospitals Deploy AI to Help Diagnose Covid-19

Software that reads CT lung scans had been used primarily to detect cancer. Now it's retooled to look for signs of pneumonia caused by coronavirus.

Class Discussion 1

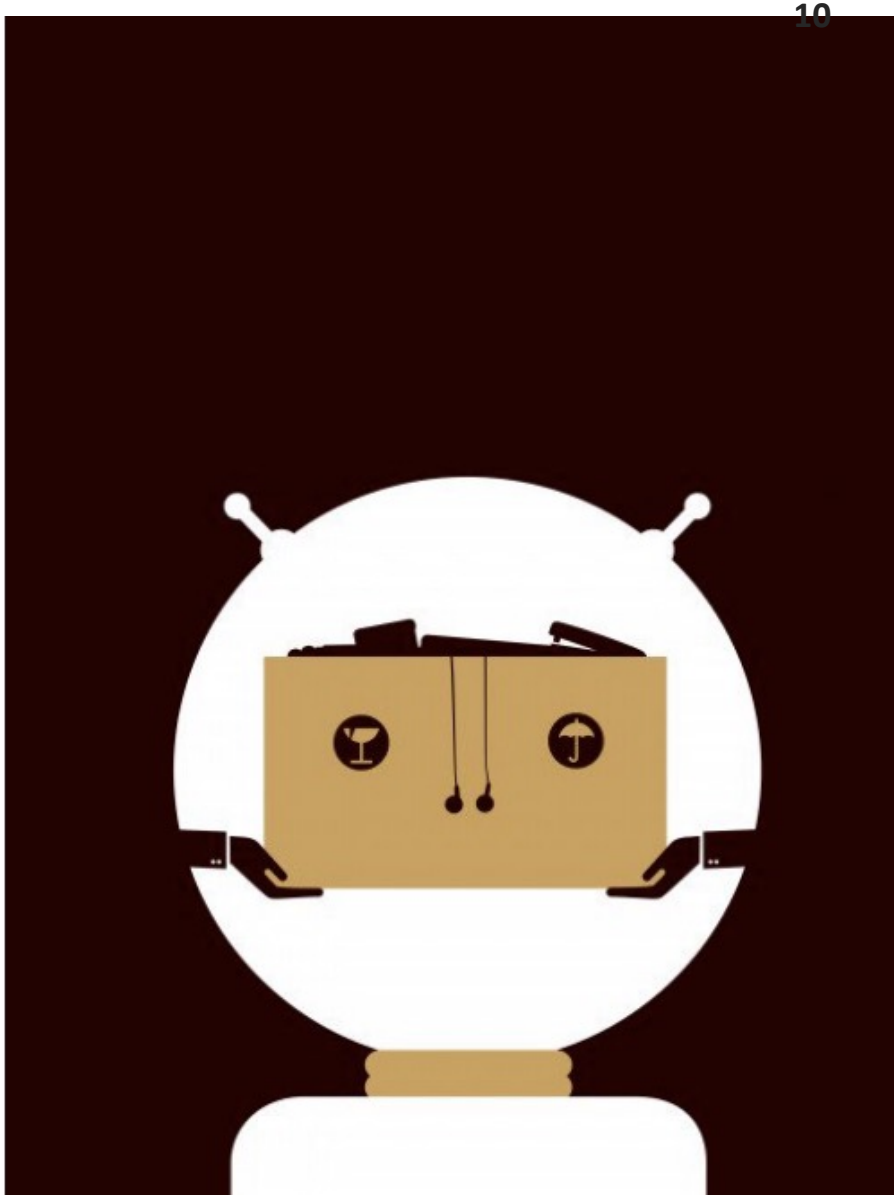
- How do we evaluate which AI based automations are worthwhile?
  - IBM Watson winning the Jeopardy Challenge
  - Google AI beating radiologists in cancer diagnosis
  - AI use in China to detect symptoms relating to COVID-19
- Discuss what societal benefits such technology can have. Does it pose any risks?

Business Impact

How Technology Is Destroying Jobs

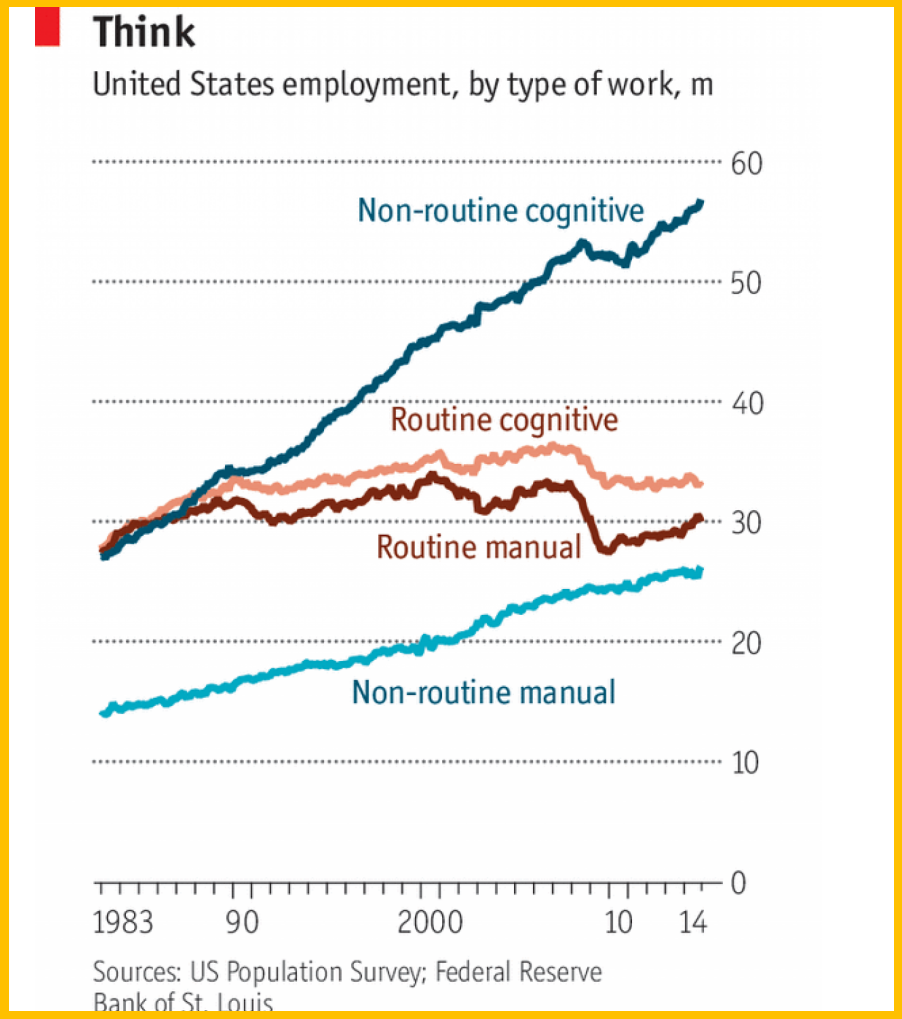
Automation is reducing the need for people in many jobs. Are we facing a future of stagnant income and worsening inequality?

by David Rotman June 12, 2013



AUTOMATION HAS BEEN CHANGING THE JOB LANDSCAPE FOR MANY YEARS

- Over many decades:
  - Routine jobs (manual or cognitive) have declined.
  - Only non-routine jobs have continued to grow. (Source: Economist)
- Now: The most famous study on Job Loss and AI, by Carl Frey and Michael Osbourne, predicts that 47% of the workforce is in danger.



Economist

WHAT JOBS ARE IN DANGER

- **Previous trends**: high skill and low skill were safe, mid skill has been cut by automation.
- **New Danger is regardless of level:** All logistics, transport, taxi, office support, security people, telemarketing, accounting, auditors, tech writers.
- **Industry Areas Most Effected:** Accommodation/Hospitality, Food Service, Manufacturing, Agriculture, Transportation, Warehousing, Retail, Mining, and Construction

Sources: Frey, Osbourne, and US Dept. of Labor

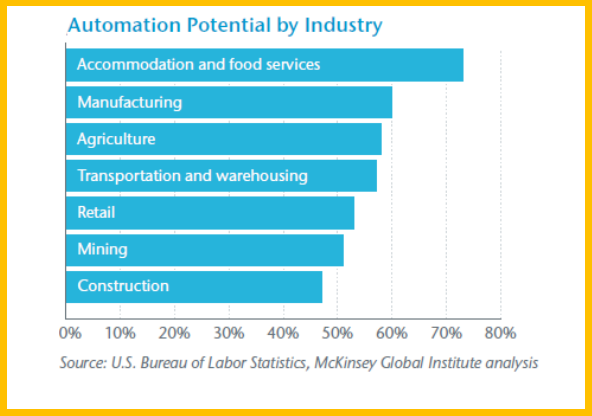
Catalogue of fears

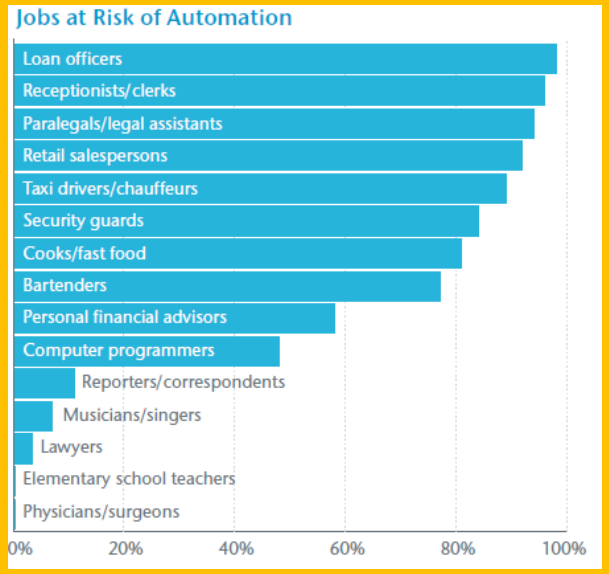
Probability of computerisation of different occupations, 2013
(1 = certain)

Job	Probability
Recreational therapists	0.003
Dentists	0.004
Athletic trainers	0.007
Clergy	0.008
Chemical engineers	0.02
Editors	0.06
Firefighters	0.17
Actors	0.37
Health technologists	0.40
Economists	0.43
Commercial pilots	0.55
Machinists	0.65
Word processors and typists	0.81
Real-estate sales agents	0.86
Technical writers	0.89
Retail salespeople	0.92
Accountants and auditors	0.94
Telemarketers	0.99

Source: "The Future of Employment: How Susceptible are Jobs to Computerisation?", by C. Frey and M. Osborne (2013)

Economist.com





World Economic Forum is among the most negative: Five Million Jobs by 2020. The Real Challenge of the Fourth Industrial Revolution

- Skills and job displacement will affect every industry and geographical region, but losses can be offset by job growth in key areas.

- "Over the next five years is such that as many as 7.1 million jobs could be lost through redundancy, automation or disintermediation, with the greatest losses in white-collar office and administrative roles. This loss is predicted to be partially offset by the creation of 2.1 million new jobs, mainly in more specialized 'job families', such as Computer and Mathematical or Architecture and Engineering."

Cann, O. (2016, January 18). Five Million Jobs by 2020: the Real Challenge of the Fourth Industrial Revolution [Web log post]. Retrieved September 23, 2017, from https://www.weforum.org/press/2016/01/five-million-jobs-by-2020-the-real-challenge-of-the-fourth-industrial-revolution/

47 % of U.S. jobs are at risk of being replaced by AI technologies and computerization

Some recent comments

WaPo: Elon Musk, the billionaire inventor and Tesla chief executive — who believes artificial intelligence could help trigger the next world war — has issued another severe warning about how super-intelligent machines could come to dominate the world. Those super computers could become "an immortal dictator from which we would never escape," Musk passionately warns in the new documentary "Do You Trust This Computer?"

The New York Times

Opinion

Andrew Yang: Yes, Robots Are Stealing Your Job

Self-driving trucks will be great for the G.D.P. They'll be terrible for millions of truck drivers.

By Andrew Yang

Mr. Yang is a Democratic candidate for president.

Nov. 14, 2019

962

Head To Head

Could artificial intelligence make doctors obsolete?

BMJ 2018 ; 363 doi: https://doi.org/10.1136/bmj.k4563 (Published 07 November 2018)
Cite this as: *BMJ* 2018;363:k4563

BMJ talk medicine
HAL will see you now

SOUNDCLOUD
Share

0:48 33:23

▶ 11.5K

Linked patient commentary

Stop hyping artificial intelligence—patients will always need human doctors

COMMENT · 06 APRIL 2018

People must retain control of autonomous vehicles

Legislation on the testing of self-driving cars does not address liability and safety concerns, warn Ashley Nunes, Bryan Reimer and Joseph F. Coughlin.

Ashley Nunes ✉, Bryan Reimer & Joseph F. Coughlin

Driverless vehicles are being tested on public roads in a number of countries. Credit: Prostock/Getty

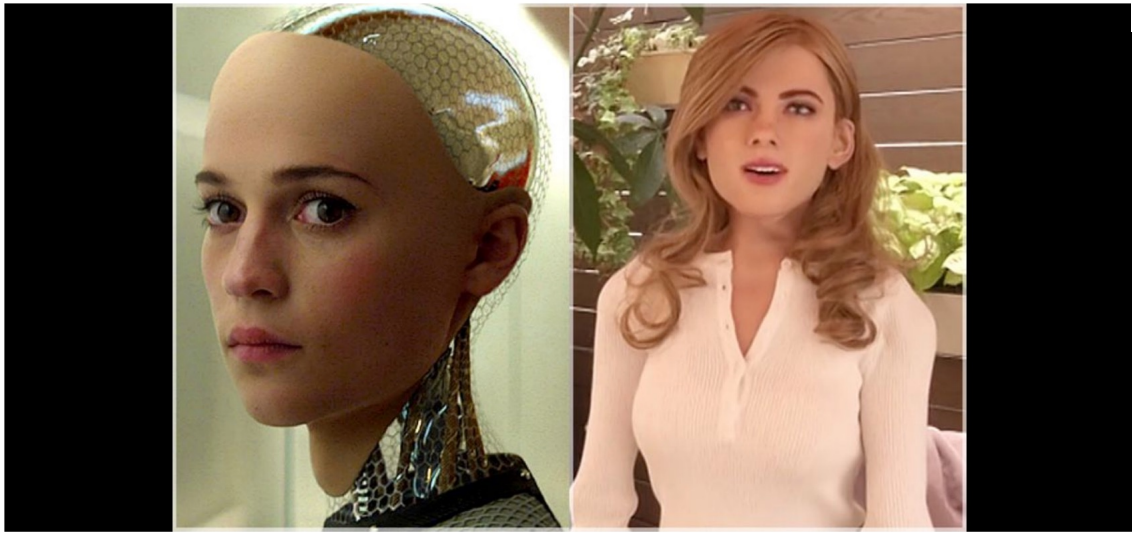
PDF version

RELATED ARTICLES

Reboot for the AI revolution

Technology: Use or lose our navigation skills

Autonomous vehicles: No drivers required



Alicia Vikander in "Ex Machina," Scarlett Johansson Robot (Credit: Universal Pictures)

From Siri to sexbots: Female AI reinforces a toxic desire for passive, agreeable and easily dominated women

From telephone operators to the ScarJo robot, tech's female voice has little to do with empowerment [UPDATED]

JENNIFER SEAMAN COOK
04.08.2016 • 7:00 PM

This story has been corrected since it was originally published.

A recent article titled "Why is AI Female?" made the connection that gendered labor, in service professions in particular, is fueling our expectations for gendered AI assistants and service robots. Furthermore, the author argues, this "feminizing — and sexualizing — of machines" signals a future with a disproportionate use of feminized VR and robots for a male-dominated sex industry. Monica Nickelsburg writes:

> "Sex with robots is a big leap from asking Siri to set an alarm, but the fact that we've largely equated artificial intelligence with female personalities is worth examining. There are, after all, few sexualized male robots or avatars."

Discussion Point 2: Is it wrong to create machines capable of making human labor obsolete? Contrast Kantian and act utilitarian perspectives.

THE ERRORS IN JOB REPLACEMENT LOGIC

- Every machine that replaces a job also creates new work.
- In many cases, we need AI to scale productivity to efficiently meet needs, like healthcare.
- Displaced jobs cause economic growth which creates new demands that are hard to predict.
- Historically, those places that automated increased their efficiency, and actually had very low unemployment rates

A MODIFIED ARGUMENT

- The First Industrial Revolution already replaced repetitive "manual" functions
- Now AI can replace all repetitive "cognitive" functions
- Compare with historic job destruction:
  - Average worker was replaced.
  - New job functions were to "design" the machine, and operate the "machine"
- Most places that automated had higher employment than before.
- Safest jobs*: (simplest argument)
  - Creating the AI machines
  - Operating and developing/designing the process for them to run.
  - Any managing function of people becomes managing of AI tools.

*Jobs least likely to be replaced by AI.

Economists and historians claim that job disruption actually helped the economies that participated.

One Caveat: The McKinsey Global Institute estimates that, compared with the Industrial Revolution of the late 18th and early 19th centuries, AI's disruption of society is happening ten times faster and at 300 times the scale.

Reference: Do we understand the impact of artificial intelligence on employment? | Bruegel

Textile vs Hand weaving: During the 19th century, amount of cloth a single weaver in America could produce = 50X gain. Labor required fell by 98%. Result: cloth became cheaper, demand greater, 4X more jobs were created in the same sector.

Auto vs Horse-based transportation: This led to a decline in horse-related jobs. However, the automobile industry itself grew fast. Jobs were also created in different sectors, e.g. motel and fast-food industries that arose to serve motorists and truck drivers.

ATM Machines at Banks: Automated teller machines (ATMs) reduce the number of bank clerks (20/bank in 1988 to 13/bank in 2004) by taking over some of their routine tasks. However, bank branches grew in numbers by 43% and total employees grew.

Only 9% of jobs are at risk of being fully replaced. Majority of jobs to be amplified by AI.

But is job amplification with AI going to be easy? What problems might it raise?

Rise of Robot Radiologists

Deep-learning algorithms are peering into MRIs and x-rays with unmatched vision, but who is to blame when they make a mistake?

By Sara Reardon

tificial intelligence—for natural-language processing. But she had been looking for a new line of research and decided to team up with radiologists to develop machine-learning algorithms that use computers' superior visual analysis to spot subtle patterns in mammograms that the human eye might miss.

Over the next four years the team taught a computer program to analyze mammograms from about 32,000 women of different ages and races and told it which women had been diagnosed with cancer within five years of the scan. They then tested the computer's matching abilities in 3,800 more patients. Their resulting algorithm, published last May in *Radiology*, was significantly more accurate at predicting cancer—or the absence of cancer—than practices generally used in clinics. When Barzilay's team ran the program on her own mammograms from 2012—ones her doctor had cleared—the algorithm correctly predicted she was at a higher risk of developing breast cancer within five years than 98 percent of patients.

AI algorithms not only spot details too subtle for the human eye to see. They can also develop entirely new ways

"AI won't replace radiologists, but radiologists who use AI will replace radiologists who don't," Curtis Langlotz, radiologist at Stanford