



Ethics of Smart Pills and the Dawn of Surveillance Medicine

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DEPARTMENT OF HEALTH SCIENCES

DEPAUL UNIVERSITY

Medical Assistance

3,128 views | Aug 13, 2018, 07:11pm

Google DeepMind's AI Can Detect 50 Eye Disease Conditions And Save Sight



Sam Shead Contributor

AI & Big Data

I cover artificial intelligence and Google DeepMind.

FDA News Release

FDA permits marketing of artificial intelligence-based device to detect certain diabetes-related eye problems

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For Immediate Release

April 11, 2018

Release

How Twitter can predict flu outbreaks 6 weeks in advance

by Kaya Yurieff @kyurieff
May 11, 2017, 4:54 PM ET

Scientists use AI to predict embryo quality

Scientists working to more accurately predict which embryos have the greatest potential for success are turning to a new tool: artificial intelligence. Fertility researchers in the U.S. and Australia are presenting their AI approaches at the American Society for Reproductive Medicine's [scientific meeting](#) today. In the researchers used 18,000 images of embryos to train an algorithm to predict the quality, which it was 97 percent accurate at doing. And the researchers used time-lapse videos to analyze specific features of the embryos they used that intel to train a system that can predict pregnancy with a fetal heartbeat.

FDA News Release

FDA permits marketing of clinical decision support software for alerting providers of a potential stroke in patients

February 13, 2018

Business Standard

This AI system spots often-missed lung cancer tumours

IANIS | New York August 27, 2018 Last Updated at 11:46 IST

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How can doctors find better ways to talk – and listen – to patients close to death?

By Michael Erard
27 AUG 2019

Health

Healthcare

Two brothers are combining palliative care expertise, linguistics and AI to encourage more effective conversations between doctors and people receiving end-of-life care.

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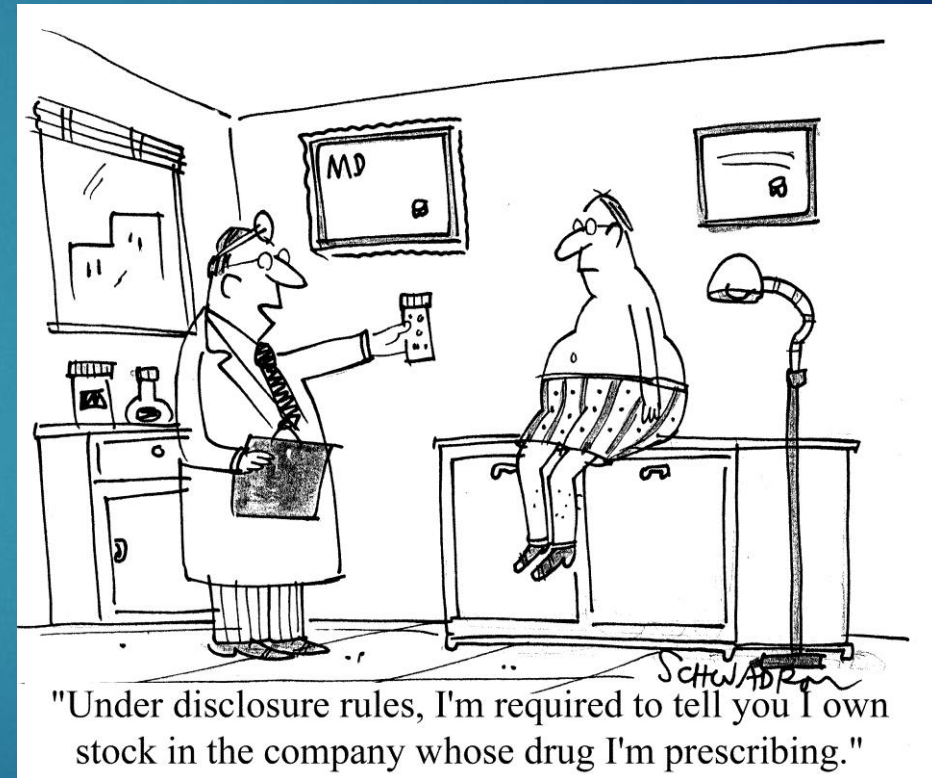
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Disclosures

Dr. Klugman was a bioethics consultant with Otsuka Pharmaceuticals (through July 2019)



Agenda

- ▶ Definitions
- ▶ Case Studies
- ▶ The Tech
- ▶ Ethical Issues
- ▶ Future Directions

Digital Medicine

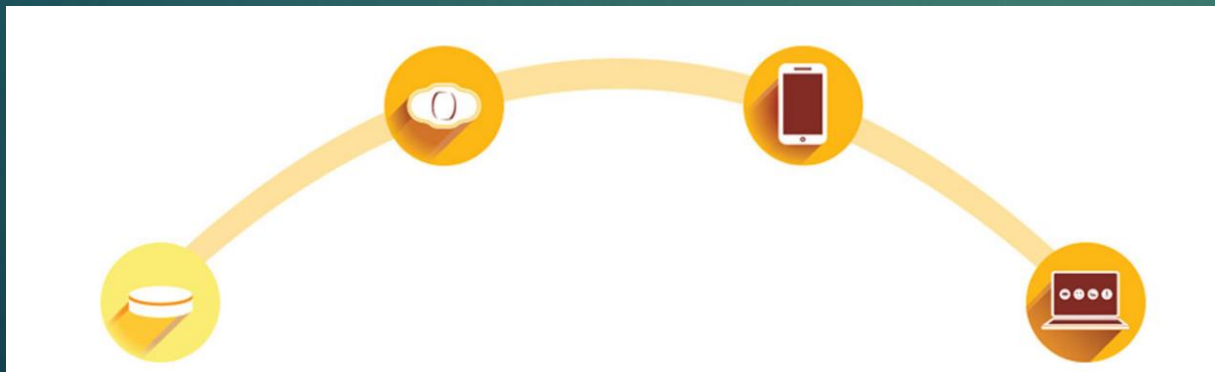
- ▶ Combining technological advances in information technology, artificial intelligence, and big data with those of pharmaceutical, biotechnology, and medical device companies



Digital Pill



- ▶ MyCite
 - ▶ Proteus sensor encapsulated with Abilify
 - ▶ Patch
 - ▶ iPhone with App
 - ▶ Portal



FDA News Release

FDA approves pill with sensor that digitally tracks if patients have ingested their medication

New tool for patients taking Abilify

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For Immediate Release

November 13, 2017

Summary

FDA approves Abilify MyCite, a pill with a sensor that digitally tracks if patients have ingested their medication

Release

The U.S. Food and Drug Administration today approved the first drug in the U.S. with a digital ingestion tracking system. Abilify MyCite (aripiprazole tablets with sensor) has an ingestible sensor embedded in the pill that records that the medication was taken. The product is approved for the treatment of schizophrenia, acute treatment of manic and mixed episodes associated with bipolar I disorder and for use as an add-on treatment for depression in adults.

The system works by sending a message from the pill's sensor to a wearable patch. The patch transmits the information to a mobile application so that patients can track the ingestion of the medication on their smart phone. Patients can also permit their caregivers and physician to access the information through a web-based portal.

"Being able to track ingestion of medications prescribed for mental illness may be useful for some patients," said Mitchell Mathis, M.D., director of the Division of Psychiatry Products in the FDA's Center for Drug Evaluation and Research. "The FDA supports the development and use of new technology in prescription drugs and is committed to working with companies to understand how technology might benefit patients and providers."

Big Data Studies

05/17/2018

BIG DATA STUDIES AND ABUSE OF FIDUCIARY DUTIES

by Craig Klugman, Ph.D.

A study published in the May 17th, 2018 issue of *Cell*, "[Disease Heritability Inferred from Familial Relationships Reported in Medical Records](#)," shows a connection between families and certain diseases at three large urban university medical centers. The researchers took private health information from electronic medical records, identified family trees by matching emergency contacts, examined diagnoses and other health information, and matched that with any tissue samples from biobanks to build a picture of disease heritability. The people whose private health information was used have no idea that the study occurred.

This study is similar to the recent revelation of [Facebook data being used and shared without permission if a friend consented](#) to a quiz. I did not consent, but my data was swept up because a friend clicked a button. This study feels very similar to that. Private data and records were used in this study without informing people, without asking if they would like to be part of the study, and without giving them a chance to opt out. On Facebook, there is no expectation of privacy: It is clear that we pay for this free service by giving away our information which is repackaged and sold. In medicine, there is a strong expectation of privacy going all the way to the Hippocratic Oath. The risks are real: Matching records like this could bring to light some family secrets that people would rather not be known. What if dad has a second family that the first knows nothing about? What if the mother has a child from her past that her current family does not know about?



The New York Times

'Will You Be My Emergency Contact?' Takes On a Whole New Meaning



Did you know that your emergency contact's data could be mined for medical research?

Brendan Smialowski/Agence France-Presse — Getty Images

By Heather Murphy

Digital Phenotyping

- ▶ “Smartphone sensors and phone usage patterns...are able to capture various social and behavioral manifestations of illnesses, in naturalistic settings, as lived and experienced by patients.”



News & Events

News

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Your Computer May Know You Have Parkinson's. Shall It Tell You?

[JMIR Ment Health](#). 2016 Apr-Jun; 3(2): e16.

Published online 2016 May 5. doi: [10.2196/mental.5165](#)

PMCID: PMC4873624

PMID: [27150677](#)

New Tools for New Research in Psychiatry: A Scalable and Customizable Platform to Empower Data Driven Smartphone Research

Monitoring Editor: Gunther Eysenbach

Reviewed by Mark Lars

[John Torous, MD](#),^{1,2} [M](#)

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Huntington Avenue, Boston

[Author information](#) ▶ [Article](#)

This article has been [cited](#)

Abstract

Background

A longstanding barrier to research on persistent difficulty combined with data science disease phenotypes, and biomedical research

Objective

Our aim is not the creation of research-quality smartphone mathematical, and co

[Kaveh Waddell](#) Sep 11

AXIOS

AI may detect depression just from your voice

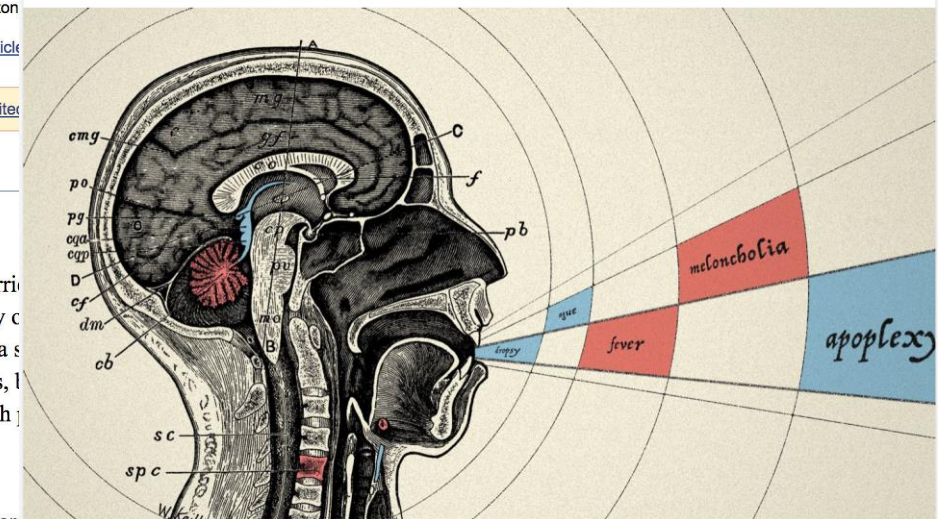


Illustration: Sarah Grillo/Axios

“And if can find evidence of disorders like schizophrenia, PTSD, and Alzheimer’s in speech patterns

Medical Assistance

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Business Standard

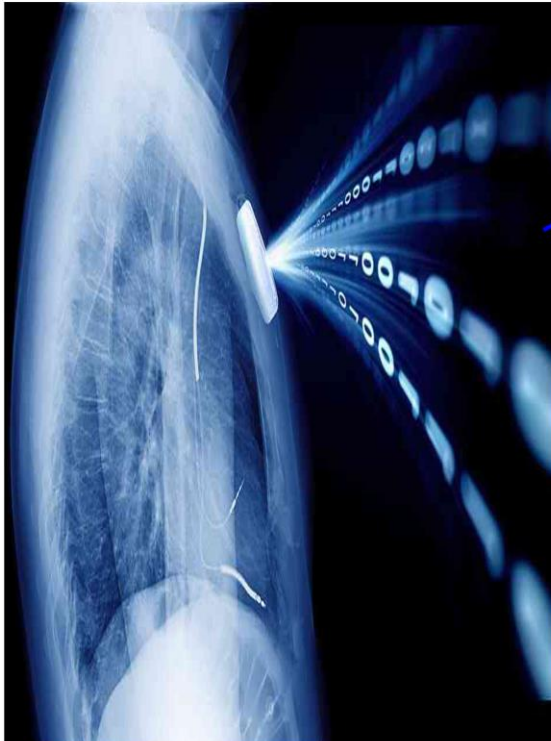
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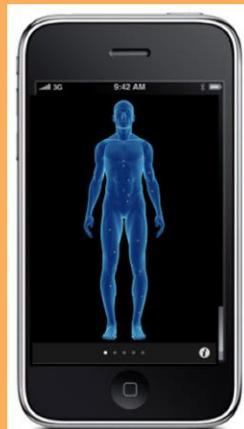
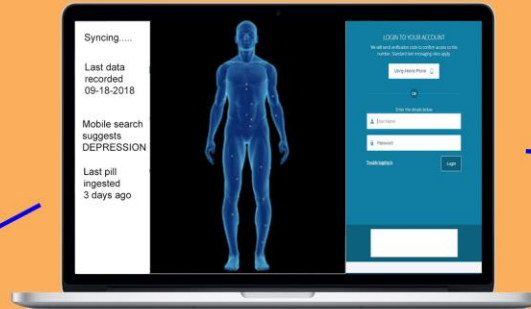
The Tech

Digital Medicine Systems

Medical Device



Mobile/Laptop



Data Structures



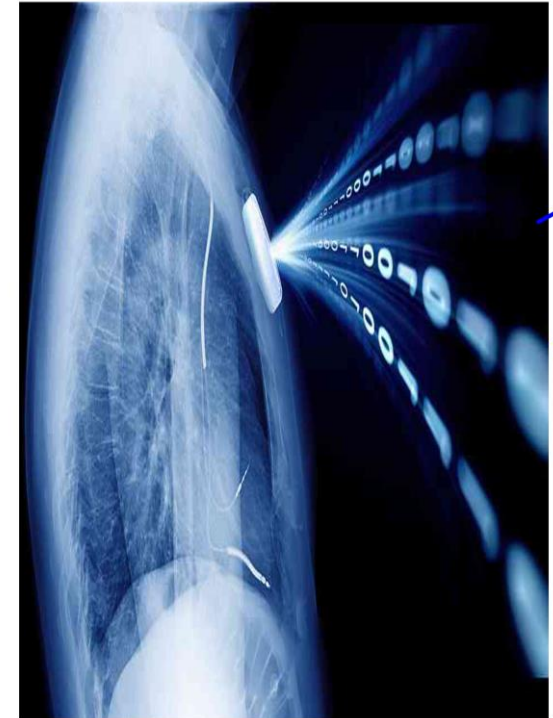
Algorithm



Medical Device Categories

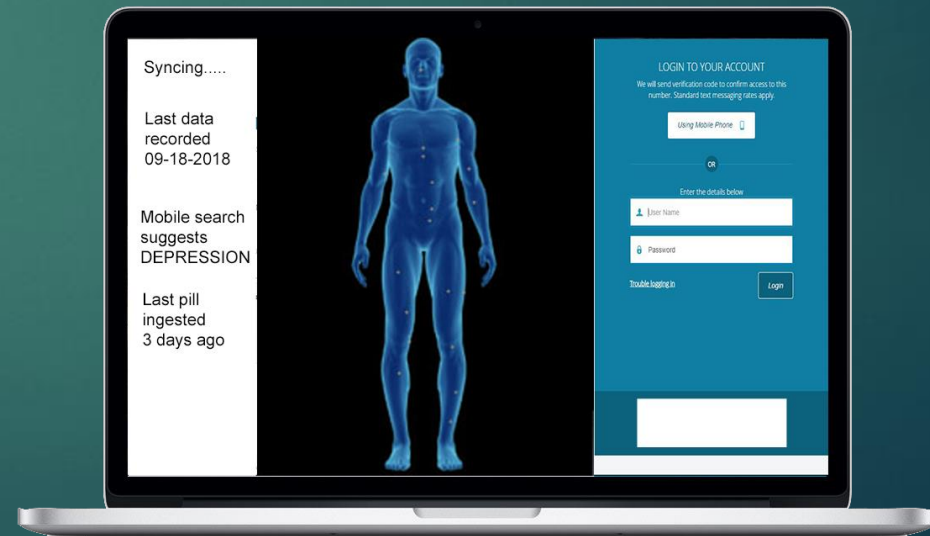
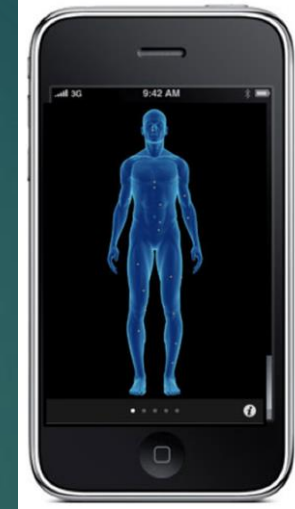
- ▶ Type I: Mobile apps
- ▶ Type II: Limited body contact
 - ▶ Sensors
 - ▶ Remote monitoring
- ▶ Type III: Contact with the body
 - ▶ Pacemakers
 - ▶ Insulin Pumps

Medical Device



Portals

- ▶ Receive signals from medical devices
- ▶ Sends data to the servers
- ▶ Portal to provide access to information from servers



Data Structures

- ▶ Servers
 - ▶ Where information is kept – “The Cloud”
- ▶ Algorithms
 - ▶ A set of guidelines that describe how to perform a task (often mathematical)
- ▶ AI Systems

Data Structures



Algorithm



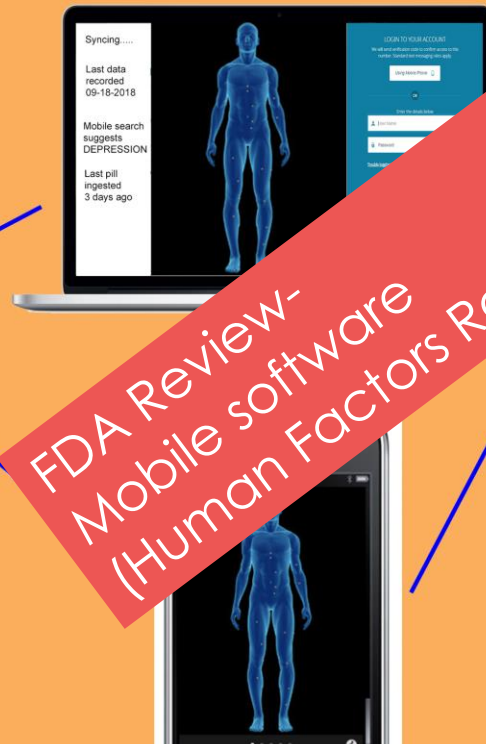
Digital Medicine Landscape

Medical Device



FDA Pre-Market Review

Mobile/Laptop



FDA Review-
Mobile software
(Human Factors Review)

Data Structures



No FDA Review

Algorithm



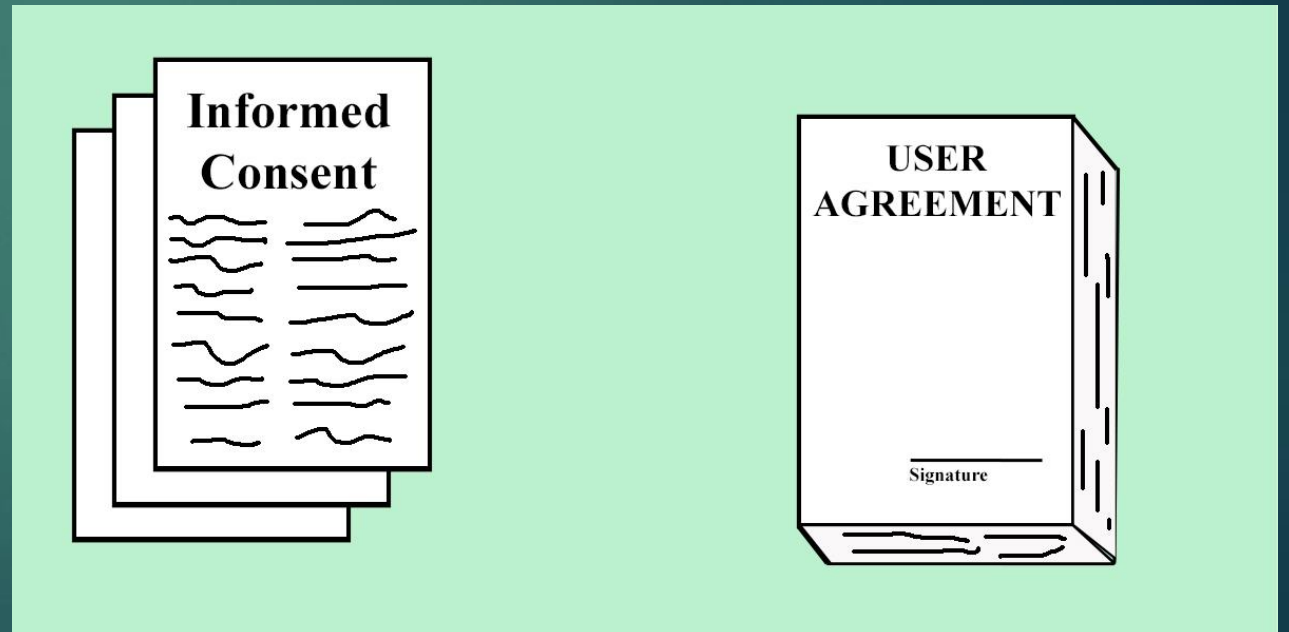
FDA Review-
Clinical Decision-Support Program

European Medicines Agency Reviews the whole system

Ethical Issues

Autonomy & Informed Consent

- ▶ IP means patient can not know the full process of the digital solution
- ▶ Informed Consent v. User Agreement
- ▶ Therapeutic Misconception
- ▶ Data Management
 - ▶ Who owns the data?
 - ▶ Right to withdraw?



Bias


- ▶ Algorithms are biased
 - ▶ Only as good as the information they are fed
 - ▶ Carry through their programmer's biases
- ▶ No checks and balances on an algorithms decisions, no way to ask “why”

SCIENTIFIC REPORTS

Article | [OPEN](#) | Published: 05 September 2018

Indirect Reciprocity and the Evolution of Prejudicial Groups

Roger M. Whitaker , Gualtiero B. Colombo & David G. Rand

Scientific Reports 8, Article number: 13247 (2018) | [Download Citation](#) 

Abstract

“This new work demonstrates the possibility of AI evolving prejudicial groups on their own.”

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FEATURE 12 April 2018, updated 27 April 2018

Discriminating algorithms: 5 times AI showed prejudice

Artificial intelligence is supposed to make life easier for us all – but it is also prone to amplify sexist and ra

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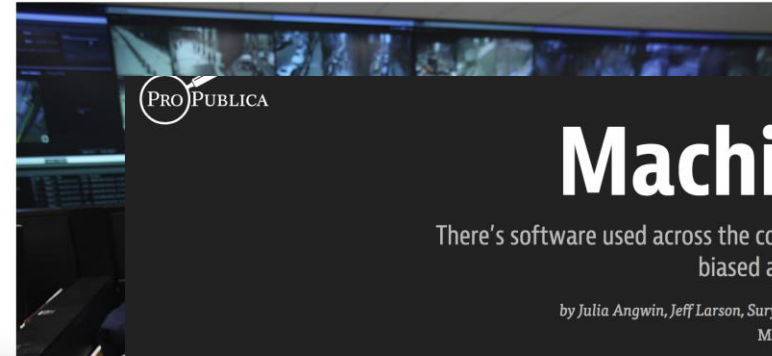
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ANALYSIS 20 October 2016

Police mass face recognition in the US will net innocent people



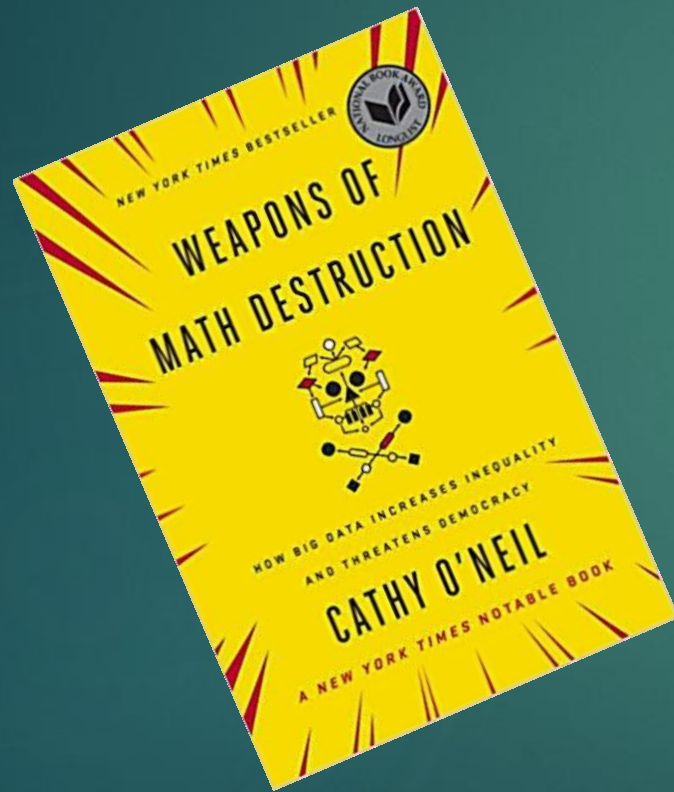
Machine Bias

There's software used across the country to predict future criminals. And it's biased against blacks.

by Julia Angwin, Jeff Larson, Surya Mattu and Lauren Kirchner, ProPublica
May 23, 2016

ON A SPRING AFTERNOON IN 2014, Brisha Borden was running late to pick up her god-sister from school when she spotted an unlocked kid's blue Huffy bicycle and a silver Razor scooter. Borden and a friend grabbed the bike and scooter and tried to ride them down the street in the Fort Lauderdale suburb of Coral Springs.

Lack of Feedback



IBM's Watson recommended 'unsafe and incorrect' cancer treatments - STAT

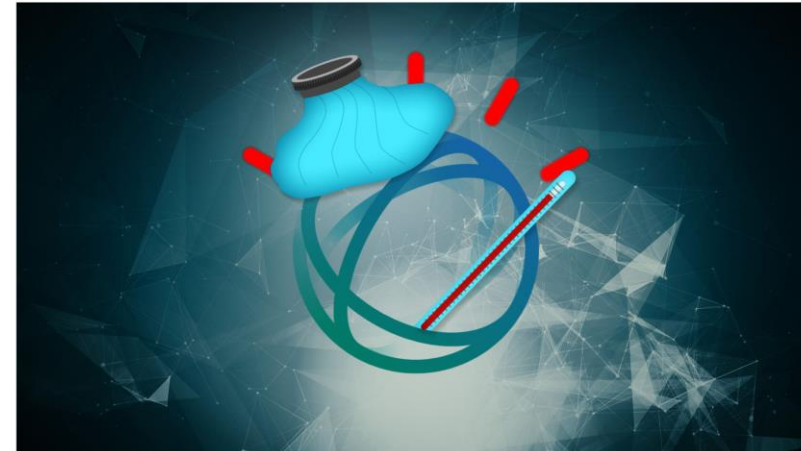
7/25/18, 11:57 AM

STAT+

IBM's Watson supercomputer recommended 'unsafe and incorrect' cancer treatments, internal documents show

By Casey Ross @caseymross and Ike Swetlitz @ikeswetlitz

July 25, 2018



Alex Hogan/STAT

Internal IBM documents show that its Watson supercomputer often spit out erroneous cancer treatment advice and that company medical specialists and customers identified “multiple examples of unsafe and incorrect treatment recommendations” as IBM was promoting the product to hospitals and physicians around the world.

The documents — slide decks presented last summer by IBM Watson Health’s deputy chief health officer — largely blame the problems on the training of Watson by IBM engineers and doctors at the renowned Memorial Sloan Kettering Cancer Center. The software was drilled with a small number of “synthetic” cancer cases, or hypothetical patients, rather than real patient data. Recommendations were based on the expertise of a few specialists for each cancer type, the documents say, instead of “guidelines or evidence.”

Privacy & Confidentiality-I

- ▶ **Privacy** – The right to keep your own secrets
- ▶ **Confidentiality** – Expectation that a person with whom you share information will keep it secret.



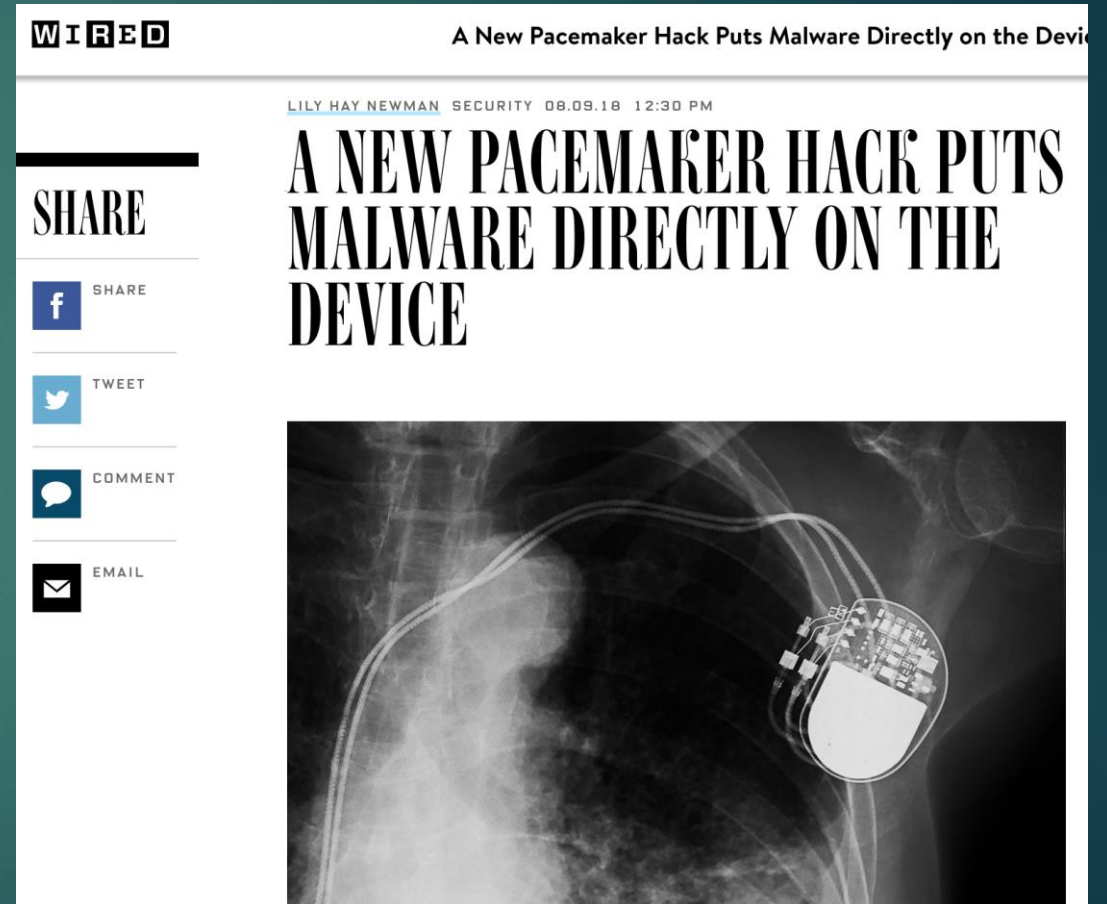
Privacy & Confidentiality-II

- ▶ Information sharing
 - ▶ Physician
 - ▶ Family/Friends (optional)
 - ▶ Pharmaceutical Company
 - ▶ Device Manufacturer
 - ▶ Software Developer
 - ▶ Insurance Company



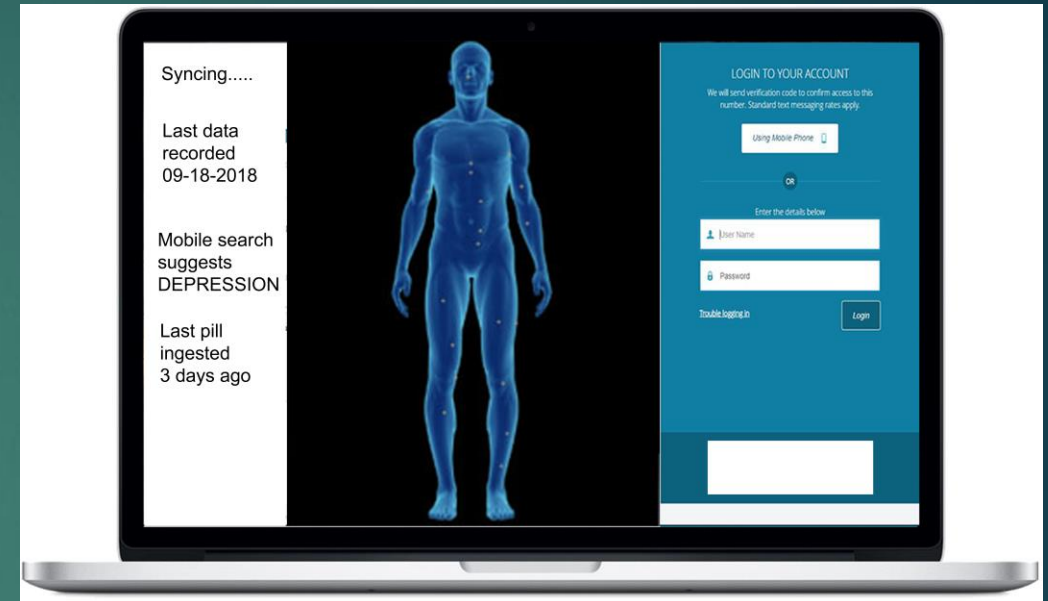
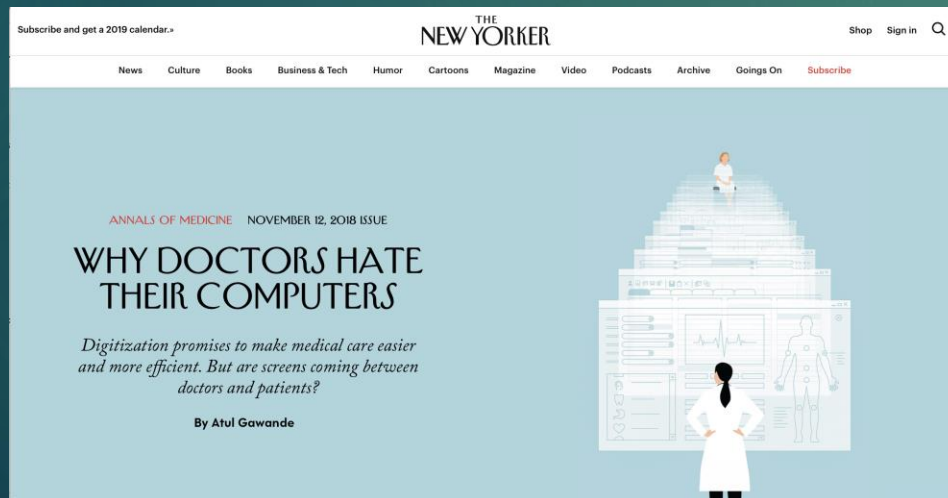
Cybersecurity

- ▶ No legal or FDA requirement for data encryption
- ▶ Hacking



Changing Physician-Patient Relationships

- ▶ Trust
- ▶ Clinician Monitoring
- ▶ Managing Expectations



- ▶ Liability Risks
- ▶ Blame for adverse events
- ▶ More physician computer responsibilities
 - ▶ 2016, 2 for 1

Unexamined Issues

- ▶ Involuntariness
 - ▶ Direct Observed Therapy
 - ▶ Court-Ordered
- ▶ Can Becomes Must



Future of AI and Health

Uses in Health Care

- ▶ New frontiers
 - ▶ Better control of chronic conditions
- ▶ Expanding expertise
 - ▶ Greater availability of expert views
 - ▶ Greater availability of expertise in resource poor settings
- ▶ Automate tedious tasks
- ▶ Allocate resources
 - ▶ E.g. How to best schedule Ors
- ▶ Decision-assistant

Ethics & Policy Tasks

- ▶ Need to create regulatory and oversight structure
- ▶ Updating privacy rules
- ▶ What happens when docs and AIs disagree?
- ▶ Integrate computers further into practice

New AI Outperforms In Stanford Medical Study

PRESS RELEASE PR Newswire

Sep. 10, 2018, 06:03 AM

SAN FRANCISCO, Sept. 10, 2018 /PRNewswire/ -- **Stanford University School of Medicine (<https://med.stanford.edu/>) and Unanimous AI (<https://unanimous.ai/>)** presented a new study today showing that a small group of doctors, connected by intelligence algorithms that enable them to work together as a "hive mind," could achieve higher diagnostic accuracy than the individual doctors or machine learning algorithms alone. The technology used is called Swarm AI and it empowers networked human groups to combine their individual insights in real-time, using AI algorithms to converge on optimal solutions.



Thanks

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bioethics.net/author/craig-klugman/



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