

Applications of Artificial Intelligence in Medicine

Sara Ranjbar, PhD.

Post-doctoral Research Fellow

Precision Neurotherapeutics Innovation Program

Mayo Clinic, Phoenix, AZ

No Disclosure

*techniques that enable
machines to mimic
intelligent behavior*

*Statistical models
that learn from
input data*

*A type of ML that
consists of many
connected
processing nodes*

*Deep neural
networks*

Artificial Intelligence

Machine
Learning

Neural
Networks

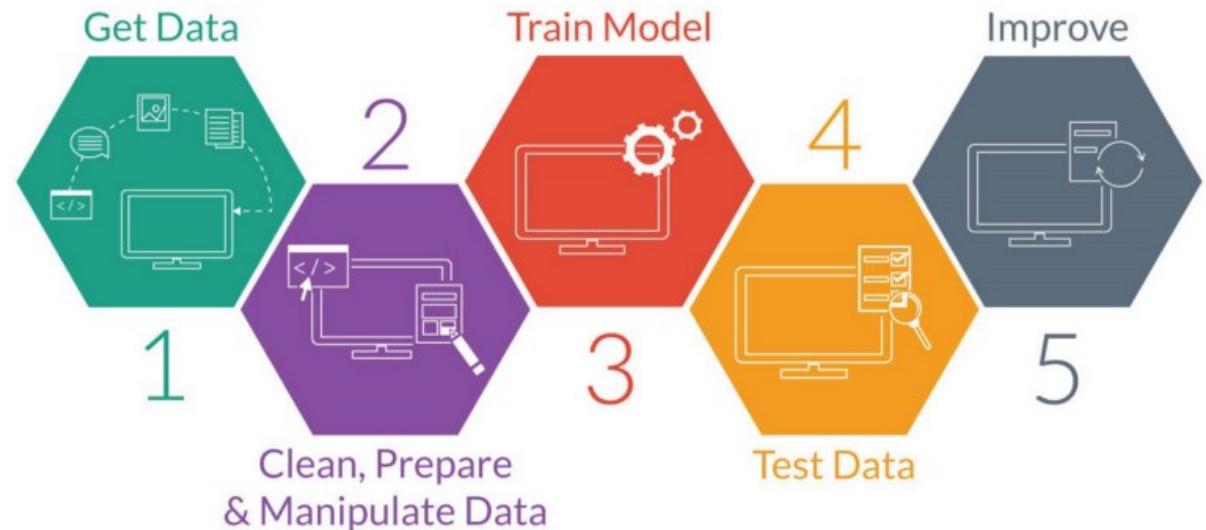
Deep
Learning

Data
Science

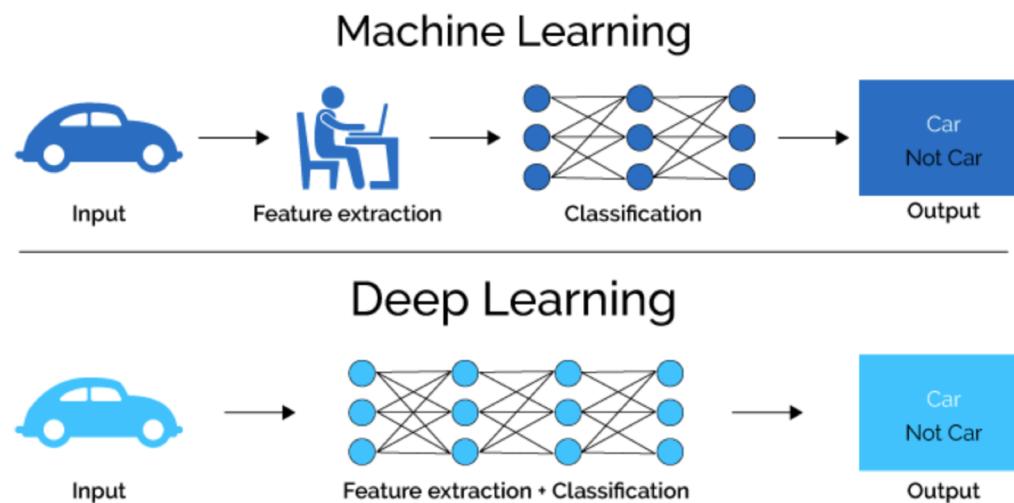
*Understand
data to derive
insight*

How does it work?

- Needs large amounts of data
- Learn automatically from patterns in the data
- Learn from examples or experiences
- Narrow AI: performing specific task



source: <https://www.houseofbots.com>



<https://www.quora.com/What-is-the-difference-between-deep-learning-and-usual-machine-learning>

Some of Key Issues in Medicine

- Medical Errors: false negatives and positives, medication error
- Poor/Inconsistent quality of care: whether or not patient receives the intended care
- One-Size-fit-all approach: practice hinges on the “average” patient.

AI Applications in healthcare

Diagnosis

Drug
Development

Health
Monitoring

Estimating
Treatment
Effects

Predicting
Outcome and
Survival

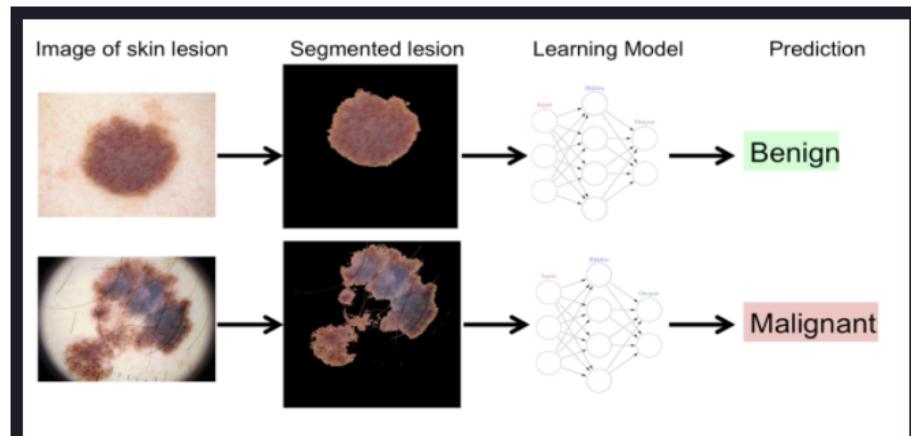
Managing
Medical Data

Personalized
Treatments

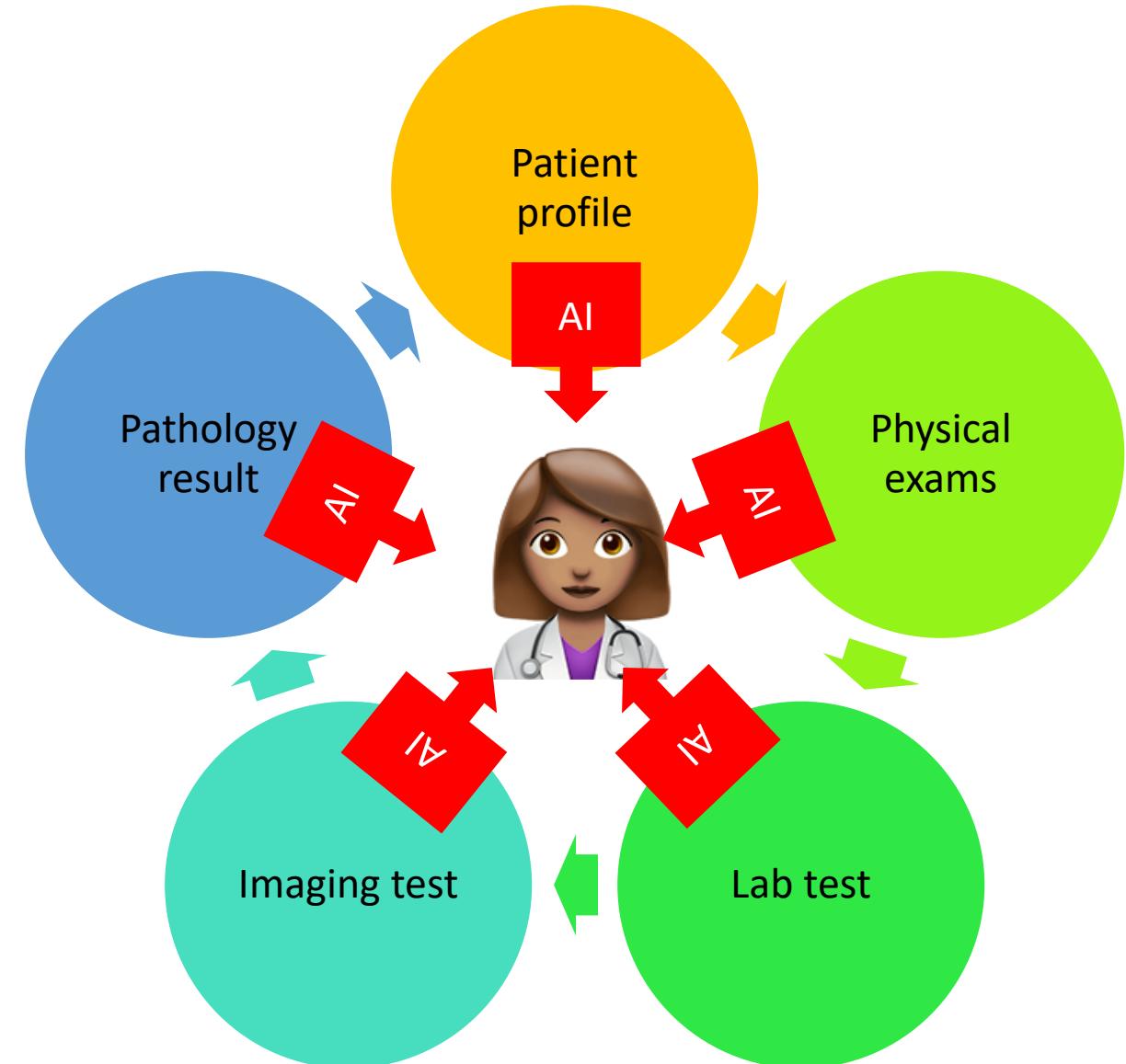
Robotic
Surgery

Diagnosis

- 10-15% misdiagnosis rate account for all US deaths¹
- Faster, earlier, more accurate diagnosis with AI
- Streamline symptom checking
- AI to provide actionable insight

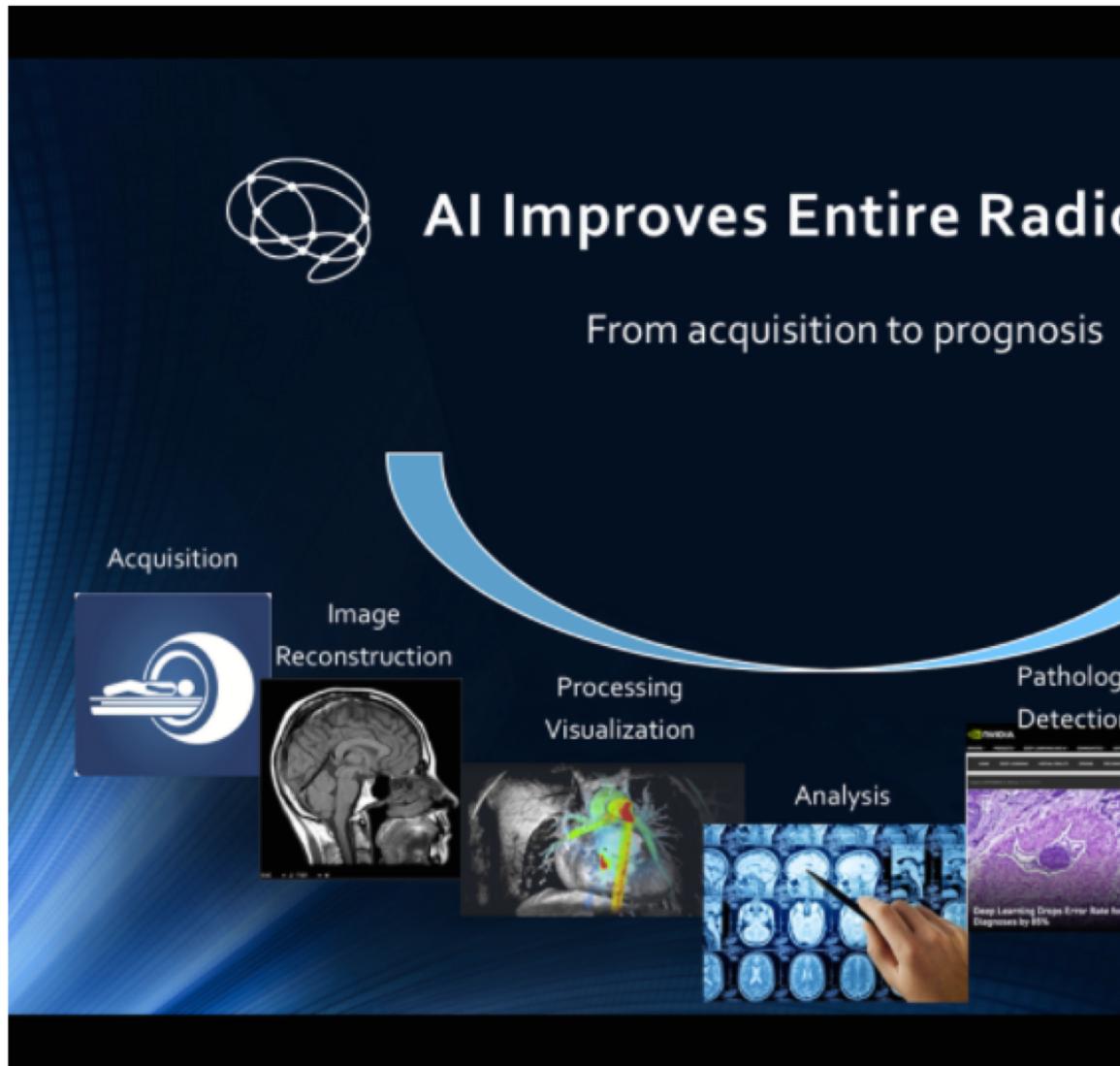


Source <https://web.stanford.edu>



¹ https://qualitysafety.bmj.com/content/22/Suppl_2/ii21

AI in radiology



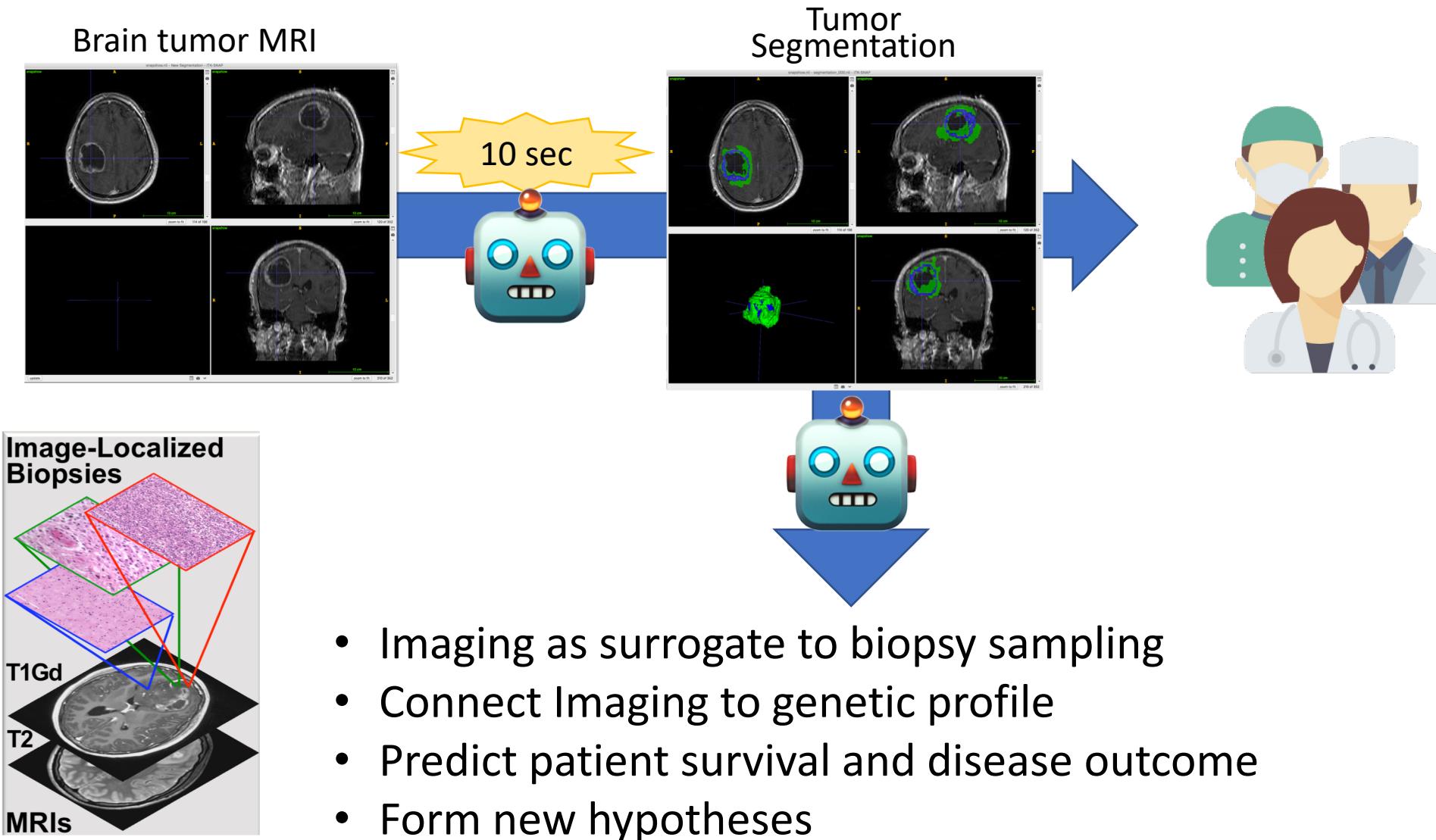
Hello AI, Goodbye Radiology as We Know It

Robert Schier, MD | February 18, 2020 | Artificial Intelligence



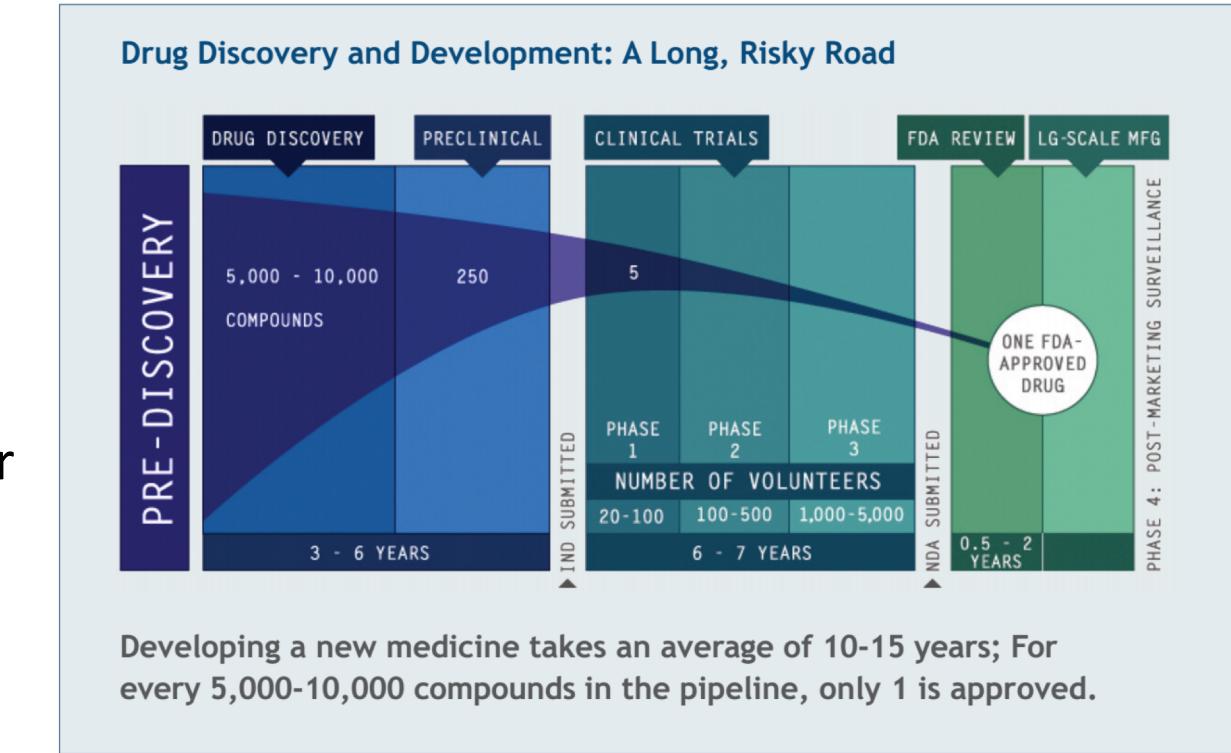
<https://subtlemedical.com>

Our group's AI efforts



AI in Drug Discovery

- Cost of developing new drug: \$500M – \$2,000M¹
- 9/10 drugs fail
- AI to streamline characterization of candidates for new drugs
- AI to match patients with clinical trials
- AI to match the right treatments to the right patients at the right time



Source: http://cmidd.northwestern.edu/files/2015/10/Drug_RD_Brochure-12e7vs6.pdf

HEALTH

Meet Adam and Eve: AI Lab-Bots That Can Take On Reams of Data

Scientists build autonomous labs that use computers, robotics and lab equipment to experiment and analyze results

NEWS / IBM and Pfizer to Accelerate Immuno-oncology Research with Watson for Drug Discovery

IBM AND PFIZER TO ACCELERATE IMMUNO-ONCOLOGY RESEARCH WITH WATSON FOR DRUG DISCOVERY

Collaboration combines IBM Watson's cognitive computing capabilities with Pfizer's scientific knowledge to help scientists generate meaningful insights

Seamless Patient Experience with AI

- Automating repetitive processes such as eligibility checks, data management
- Track hospital waiting times
- prioritize conditions in the ER
- chart the fastest ambulance routes
- AI-powered chatbot to recommend virtual check-in or face-to-face with a provider

Capacity Command Center: Machine Learning & Hospital Management at Johns Hopkins

By Alexa Elinor Walls
Student
MODIFIED NOV 13, 2018

Next:
[Visual Deep Learning – The Power of Images at Pinterest](#)



A top US hospital is taking substantial steps in the use of machine learning to transform healthcare delivery

*60% improvement in accepting complex patients
63min sooner ambulatory pick up
30% faster patient admission to ER
70% reduced patient transfer delay after operation*

Source: <https://digital.hbs.edu/platform-rctom/submission/capacity-command-center-machine-learning-hospital-management-at-johns-hopkins/>

ROBOT-ASSISTED SURGERY WITH AI

- Improve precision, flexibility, and control beyond human capabilities
- Virtual reality-enabled robotics for minimally invasive operations
- Robotic surgery assistant
- Tools to visualize surgical plans

The FDA-approved
da Vinci platform



Source: <https://www.roboticoncology.com/history-of-robotic-surgery/>

Perspective | Open Access | Published: 07 April 2020

The need for a system view to regulate artificial intelligence/machine learning-based software as medical device

Sara Gerke, Boris Babic, Theodoros Evgeniou & I. Glenn Cohen [✉](#)

njp Digital Medicine **3**, Article number: 53 (2020) | Cite this article

3615 Accesses | 41 Altmetric | Metrics

Conclusion

- AI and Medicine can go hand in hand.
Why? DATA
- AI will change how medicine is practiced.
- Still many challenges ahead
 - Adequate accuracy?
 - Model transparency or black box?
 - Do we really trust it?
 - Biases?

