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**Conference & Exhibition | March 5–9, 2018**

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# How Machine Learning and AI Are Disrupting the Current Healthcare System

**Session #30, March 6, 2018**

**Cris Ross, CIO Mayo Clinic, Jim Golden, PwC**

# COMMITMENT

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DISCLAIMER: The views and opinions expressed in this presentation are those of the author and do not necessarily represent official policy or position of HIMSS.

## Conflicts of Interest:

***Christopher Ross, MBA***

*Has no real or apparent conflicts of interest to report.*

***James Golden, Ph.D.***

*Has no real or apparent conflicts of interest to report.*

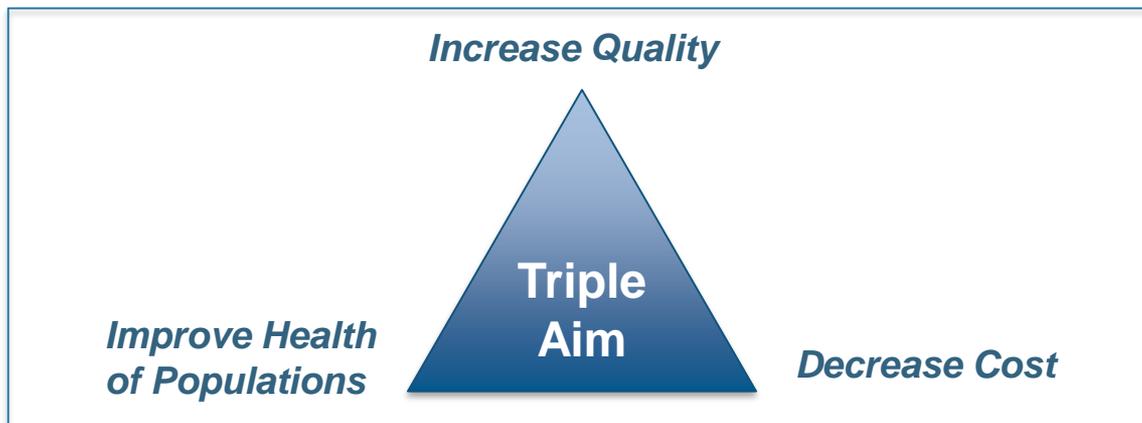
## Agenda

- What do we mean by Artificial Intelligence (AI) and Machine Learning (ML)?
- Is it over-hyped? Why is it important?
- Examples of Machine Learning applications in Healthcare
- Opportunities for AI in clinical settings
- Discussion and Questions

## Learning Objectives

- Define the terms *artificial intelligence* and *machine learning* and the potential applicability for healthcare
- Identify the reasons that AI is considered a disruptive technology for healthcare and be able to list areas where it can make an impact
- Summarize the ways that Mayo Clinic is using AI / ML and identify the impact it can have on other healthcare organizations

## Is AI the New Healthcare Reform?



- Artificial Intelligence and the Triple Aim – When, Where and How?
- Can Artificial Intelligence make healthcare more human?
- Is Artificial Intelligence the cure for what ails healthcare?
- Is Artificial Intelligence the next real healthcare reform?

## Do we have enough data to build credible AI solutions?



Healthcare is one of the most **data rich** industries, driven by **digital health** adoption, **images**, and **medical records**



Between electronic medical records, digitized diagnostics, and wearable medical devices, **the average person will leave a trail of more than 1 million gigabytes of health-related data in their lifetime**

## Velocity, Variability, Volume: Data + Computing Power → AI

THE WALL STREET JOURNAL.

TECH

### IBM to Buy Truven Health Analytics for \$2.6 Billion

Trove of medical data will be used to improve Watson artificial-intelligence system

IBM's other health-care acquisitions include Phytel Inc. and Explorys Inc., companies that maintained clinical data on more than 50 million patients, and Merge Healthcare Inc., which specialized in medical-image technology.



The New York Times

RECOMMENDATIONS

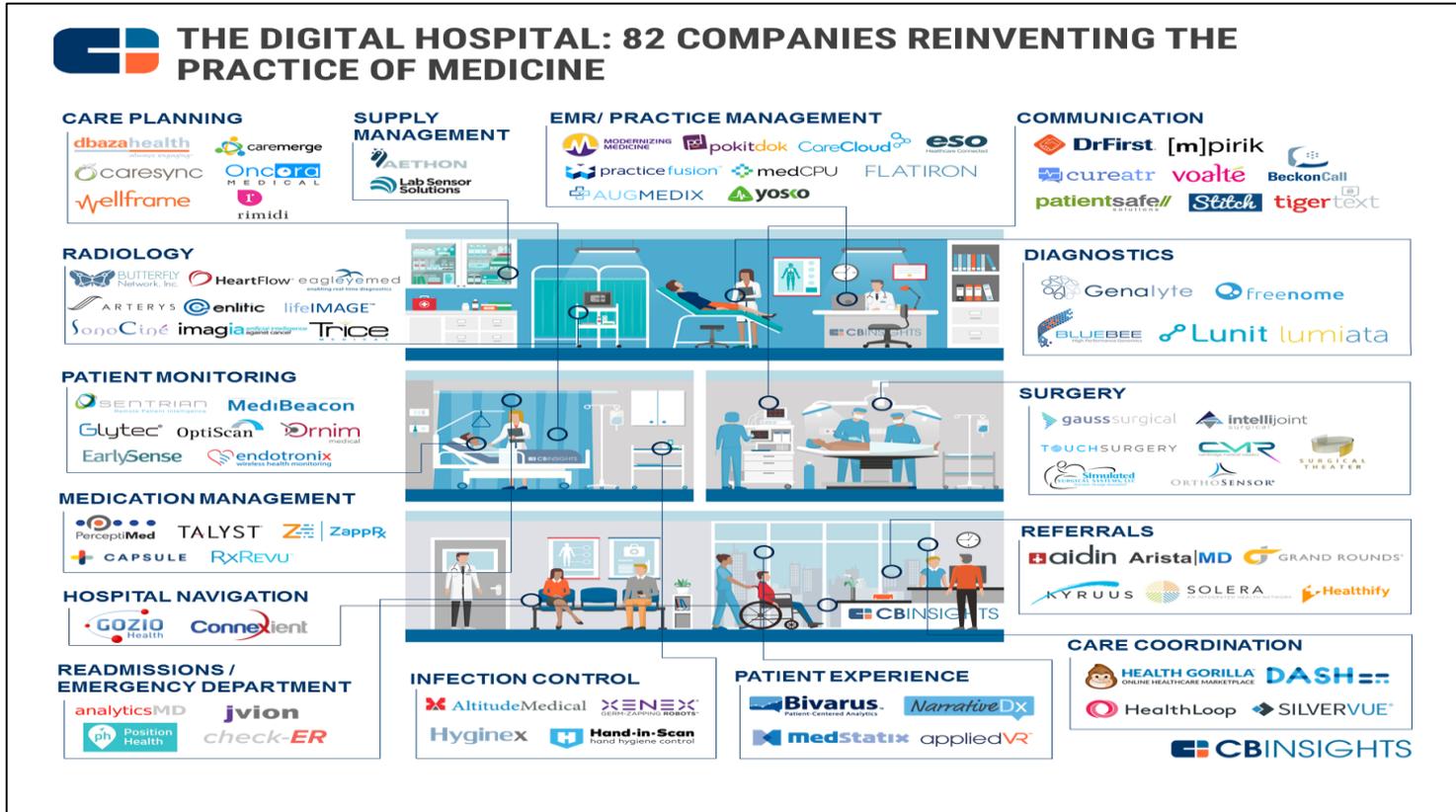
BUSINESS DAY

### *Roche to Buy Flatiron Health for \$1.9 Billion to Expand Cancer Care Portfolio*

By REUTERS FEB. 15, 2018, 5:36 P.M. E.S.T.



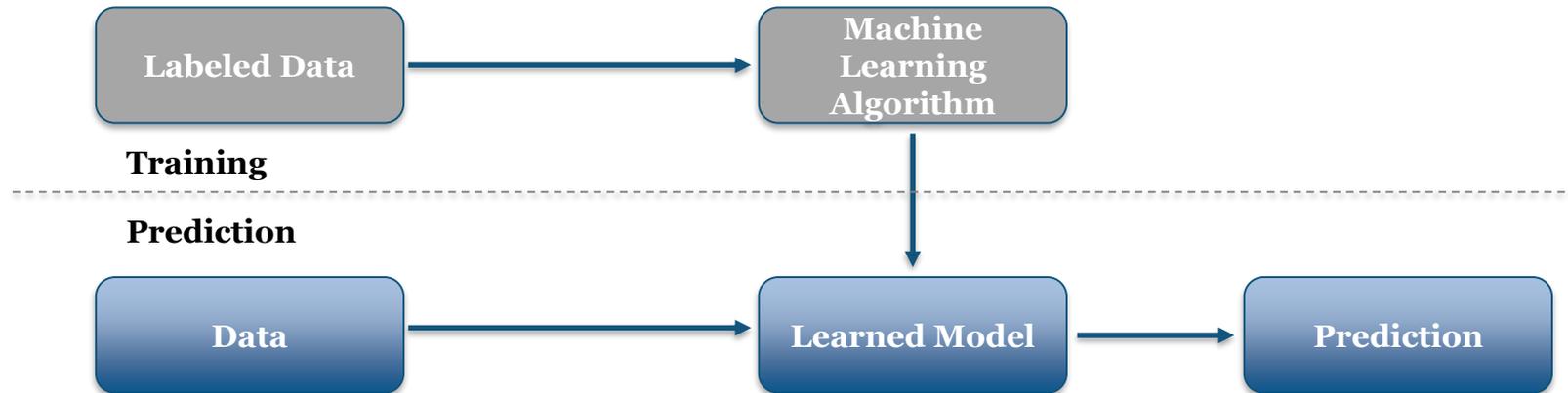
## Many organizations are trying this approach, especially venture-backed startups



**Artificial Intelligence (AI) is a branch of computer science which attempts to emulate human problem-solving skills. AI is a branch of computer science that loosely attempts to mimic the intelligence and behavior of human beings.**

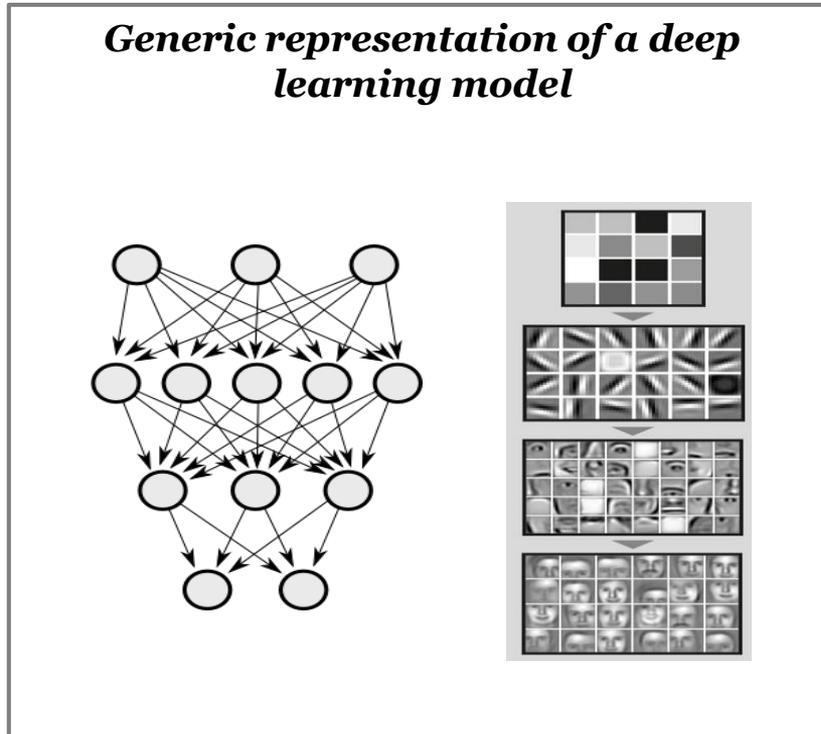
<b>AI Technique</b>
Machine Learning (ML)
Deep Learning (DL)
Natural Language Processing (NLP)
Robotic Process Automation (RPA)
Speech Recognition
Image Recognition
Search

**Machine Learning (ML) is a type of AI that provides computers the ability to learn without being explicitly programmed**

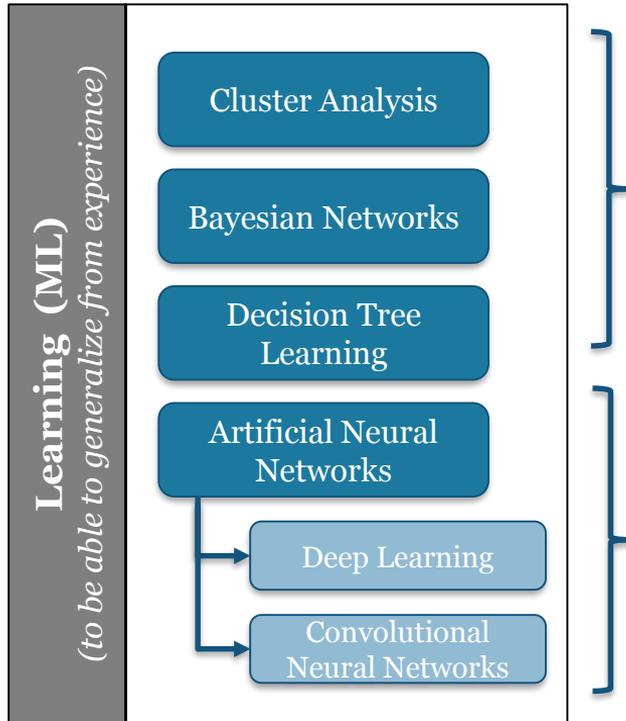


*There are a number of various ML techniques that can learn from, and make predictions on, data*

**Deep Learning (DL) is a Machine Learning technique that can learn effective representations of data, especially patterns**



## A very incomplete but instructive map of ML terminology

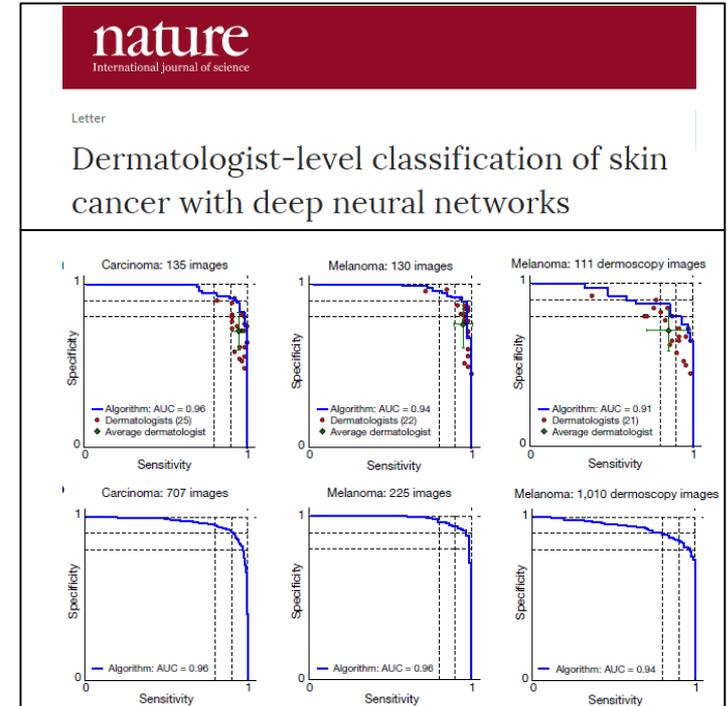
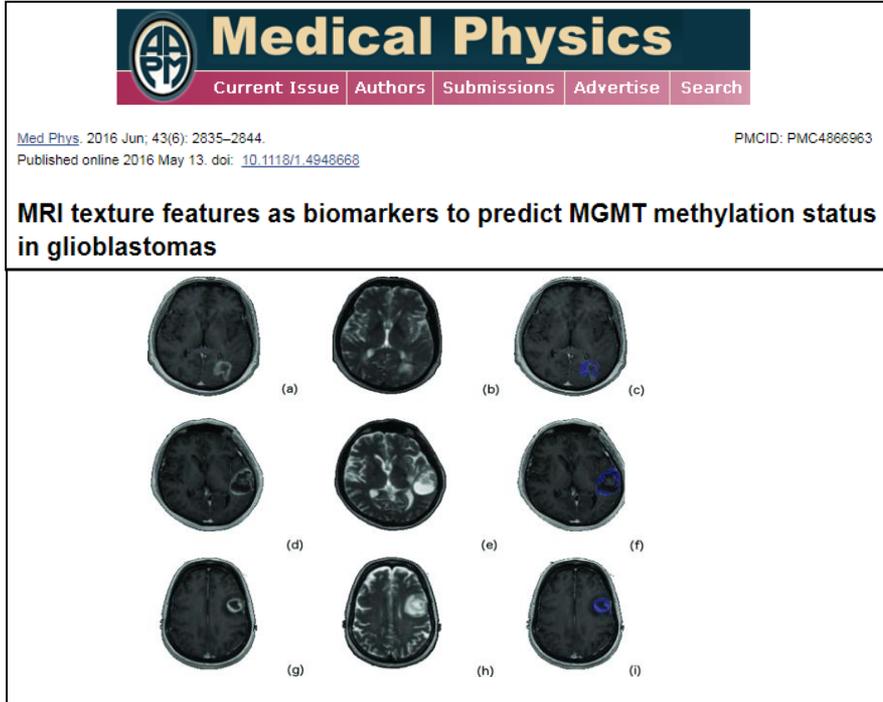


***From standard statistical methods***

***Huge data sets and powerful computing applied to generate algorithms***

- ***Deep Learning***: Many learning processes, including natural language processing, speech recognition
- ***Convolutional Neural Networks***: Analyzing visual imagery, inspired by biological processes

## Two examples of convolutional neural networks for radiology



## Clinical Decision Support: AI is getting better



Volume 29, Issue 2  
February 2018

EDITOR'S CHOICE

### **Watson for Oncology and breast cancer treatment recommendations: agreement with an expert multidisciplinary tumor board**

S P Somashekhar ✉, M -J Sepúlveda, S Puglielli, A D Norden, E H Shortliffe, C Rohit Kumar, A Rauthan, N Arun Kumar, P Patil, K Rhee ... [Show more](#)

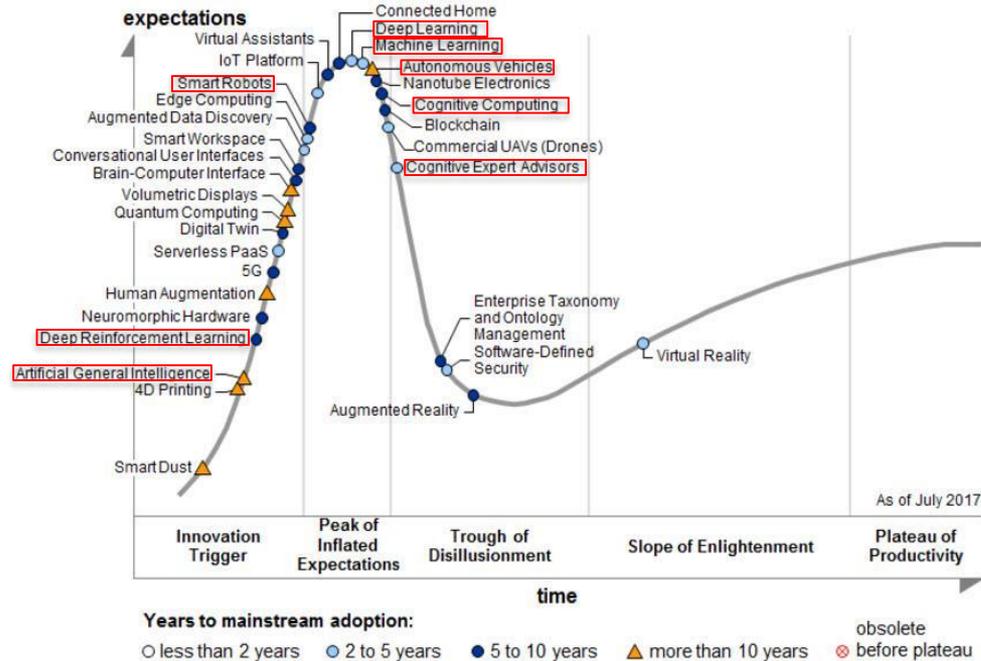
*Annals of Oncology*, Volume 29, Issue 2, 1 February 2018, Pages 418–423,  
<https://doi.org/10.1093/annonc/mdx781>

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# Is Artificial Intelligence over-hyped?

Hype Cycle for Emerging Technologies, 2017

# Gartner Hype Cycle



Note: PaaS = platform as a service; UAVs = unmanned aerial vehicles

Source: Gartner (July 2017)

## AI ~ "Technoecstasy"



**“Machines will be capable, within twenty years, of doing any work a man can do.”**  
– *Herbert Simon, 1956.*



**“In from three to eight years we will have a machine with the general intelligence of an average human being.”**  
- *Marvin Minsky, 1966*

## AI is being used to address problems across the healthcare value chain.

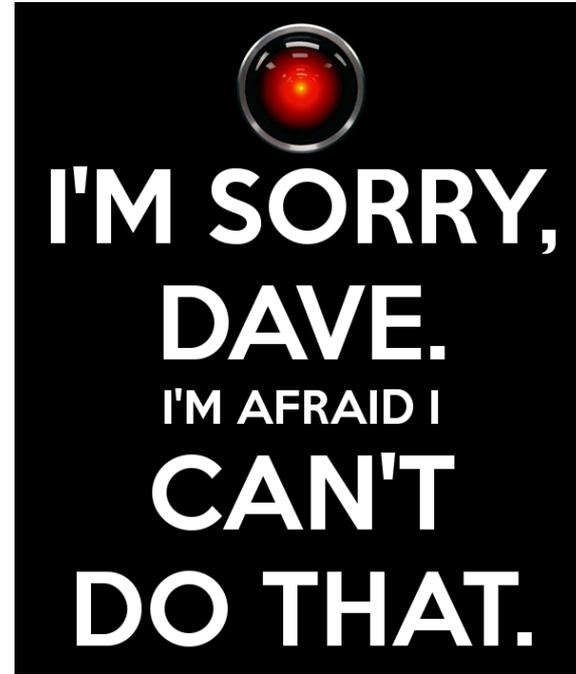
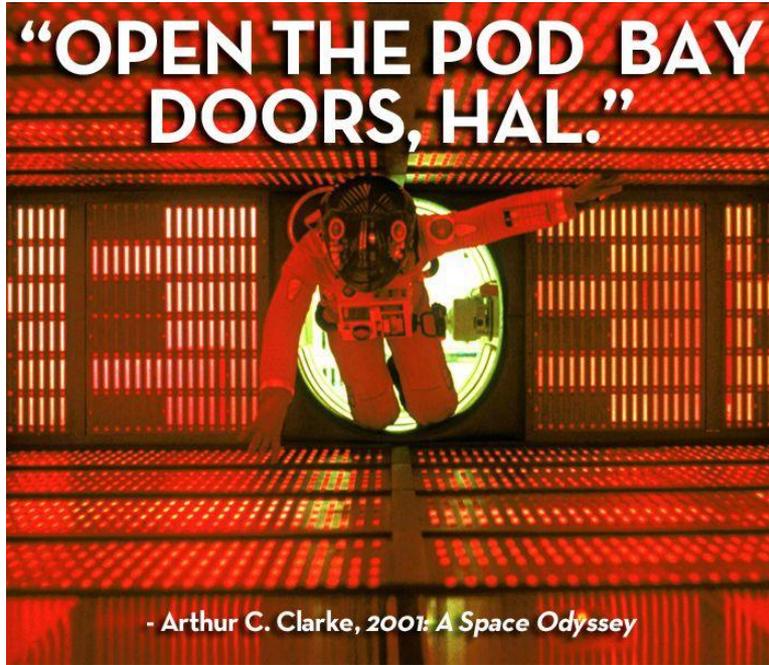
- **Clinical Decision Support**
  - Medical Imaging – Pathology and Radiology
  - Medical Signal Processing – Cardiology and Neurology
  - Genomics
  - Population Health + Value-Based Care
  - Real-World Evidence / Comparative Effectiveness
  - Reducing Medical Error and Improving Patient Outcomes
- **Clinical Trials**
  - Patient Recruitment
  - Patient Monitoring + Safety
- **Hospital Operations**
  - Reducing Physician Clerical Burden
  - Improving Patient Experience

## So – Is AI the new Healthcare Reform?



On the family trip to Nirvana

## Discussion



## Discussion

- What are some examples of AI and ML applied to clinical settings?
- What are some near-term opportunities to apply AI to important medical challenges?
- How do we avoid the hype and improve physician adoption?
- How can AI be used to help ease physician burden and improve hospital operations?
- **Please remember to complete online session evaluation!**