Big Data & Health

Implication in Practice of Evidence based Medicine & elearning

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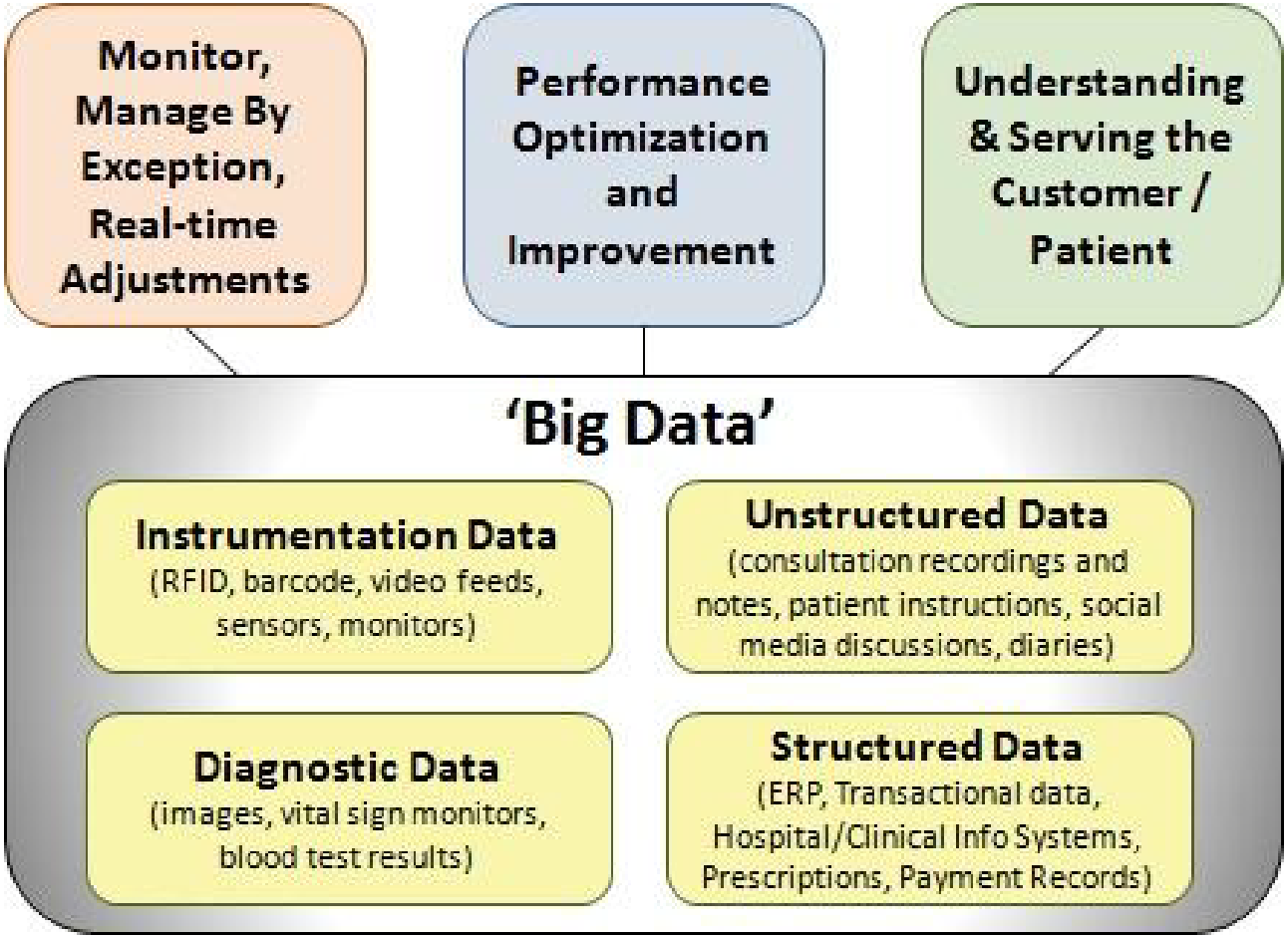
Big Data

- “Big data in healthcare refers to electronic health data sets so large and complex that they are difficult (or impossible) to manage with traditional software and/or hardware; nor can they be easily managed with traditional or common data management tools and methods”

https://www.emc.com/collateral/analyst-reports/frost-sullivan-reducing-information-technology-complexities-ar.pdf

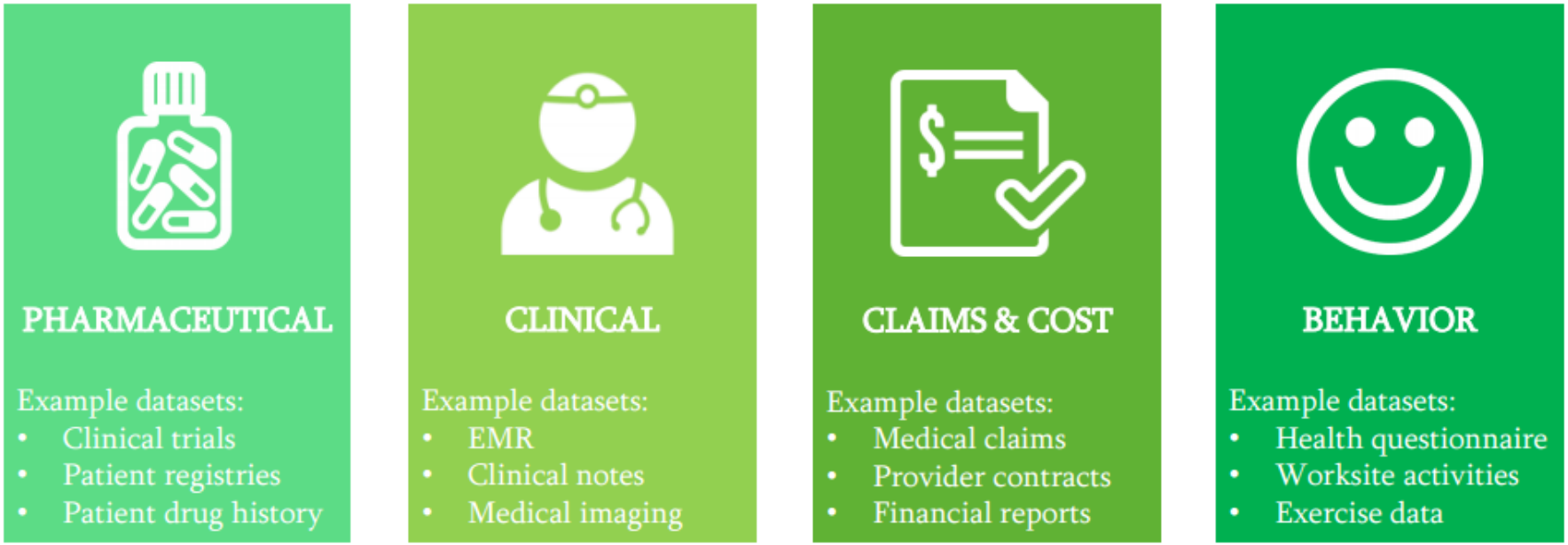
Components of Big Data in Health



Health Analytics

- HEALTH ANALYTICS is the systematic use of patient data and related insights to drive evidence-based decision making for care management, operations improvement, and outcomes measurement

Healthcare Data from variety of Source



80 % of healthcare data is unstructured, including text images and sounds

Predictive Analytics

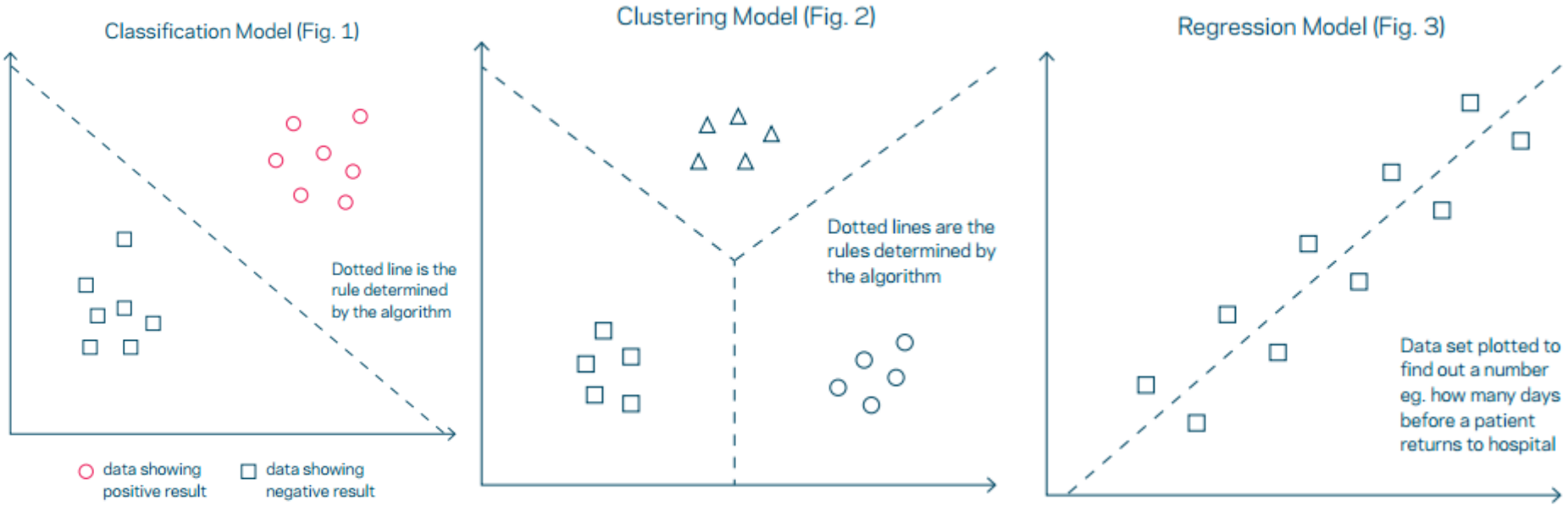
- An area of data mining that deals with extracting information from data and using the information to predict trends and behaviour patterns. It is used to make predictions about unknown future events.

Pathway Genomics

- An IBM-backed group called Pathway Genomics is developing a simple blood test to determine if early detection or prediction of certain cancers is possible.

Machine Learning

- Machine learning is when a computer has been taught to recognise patterns by providing it with data and an algorithm to help understand that data.
- *Machine Learning modes are Classification, Clustering and Regression*



Deep Learning

- Deep learning (term coined by Geoffrey Hinton in 2006) combines advances in computing power and special types of neural networks to learn complicated patterns in large amounts of data.
- It is a branch of machine learning.

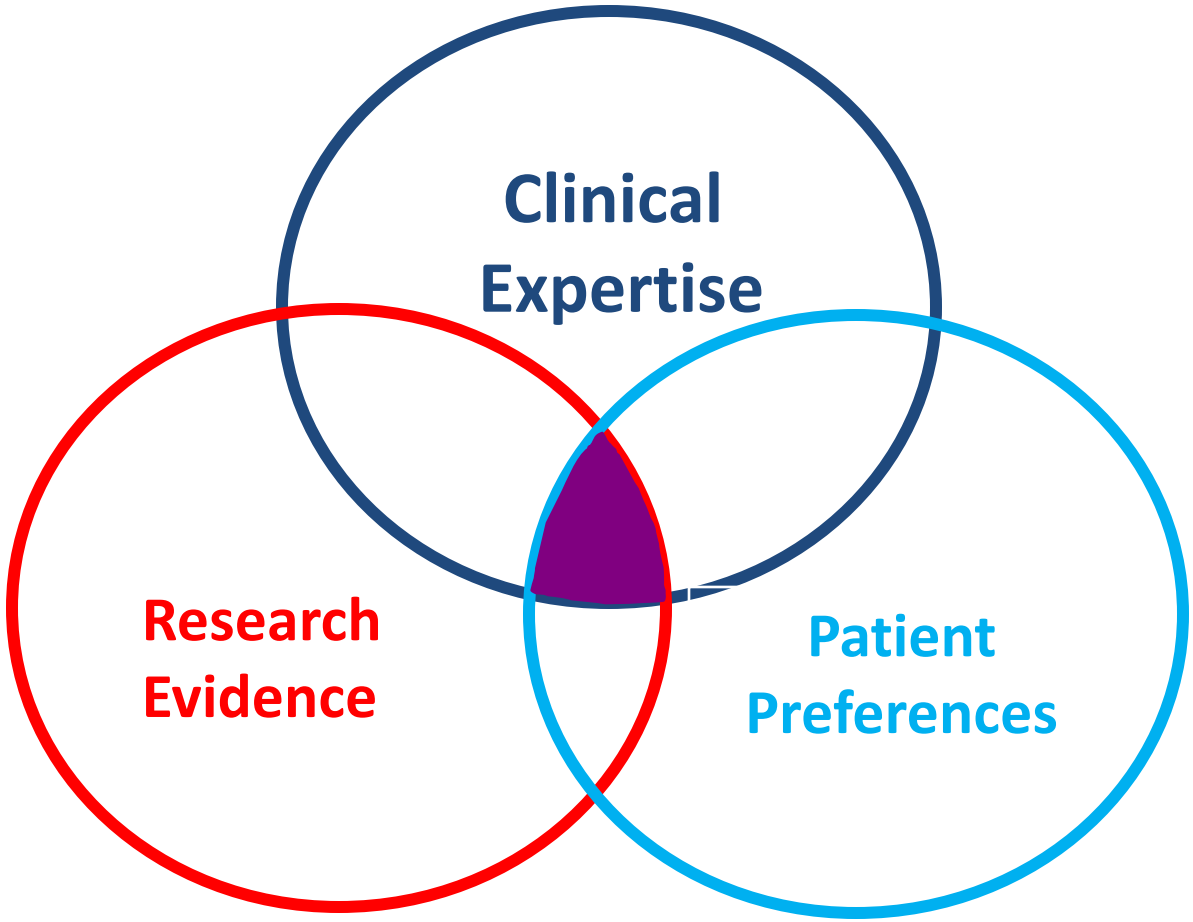
What is evidence-based medicine?

"Evidence-based medicine is the integration of best research evidence with clinical expertise and patient values"

- ***David Sackett***

- "Explicit, judicious, and conscientious use of current best evidence from medical care research to make decisions about the medical care of individuals"

EBM - What is it?



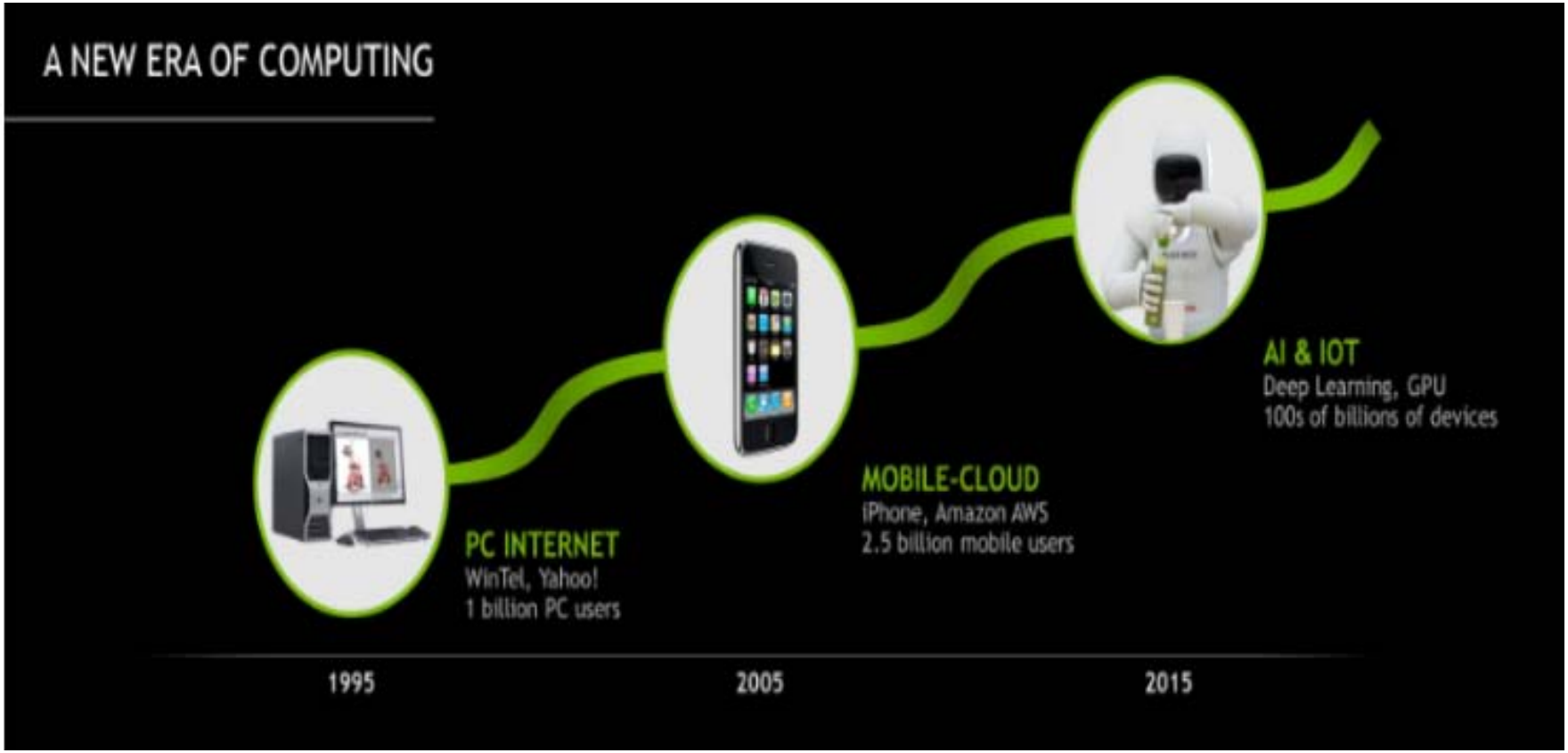
Evidence Based Medicine ?

Integrating individual clinical expertise and the best external evidence

‘Doctors in a box’ to diagnose diseases.

BMJ 1996;312:71-72 (13 January)
Editorial

The Intelligence Revolution



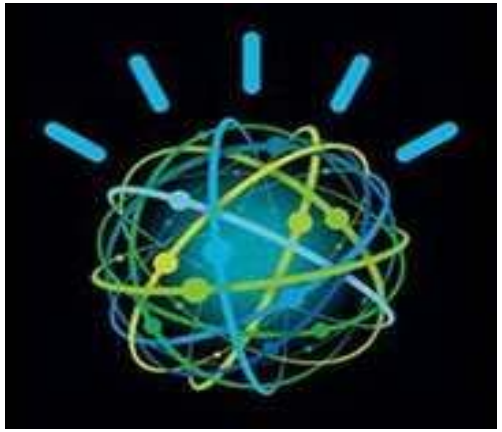
Artificial Intelligence

- Medical artificial intelligence is primarily concerned with the construction of AI programs that perform diagnosis and make therapy recommendations.

  Medical AI programs are based on symbolic models of disease entities and their relationship to patient factors and clinical manifestations'
- AI specialized to medical applications Employ human- like reasoning methods in the programs

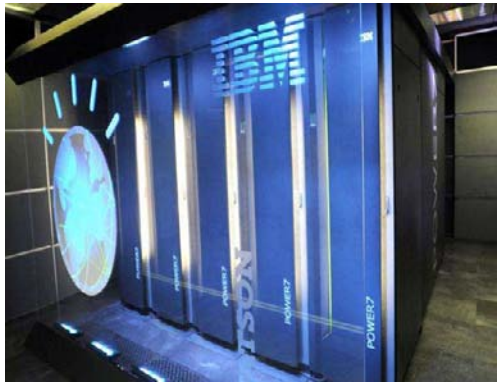
IBM Watson‘s project started 2007

- Project started in 2007, lead David Ferrucci
- Initial goal: create a system able to process natural language & extract knowledge faster than any other computer or human
- Jeopardy! was chosen because it’s a huge challenge for a computer to find the questions to such “human” answers under time pressure



- Watson was NOT online!

- Watson weighs the probability of his answer being right – doesn’t ring the buzzer if he’s not confident enough



- Which questions Watson got wrong almost as interesting as which he got right!

Watson – a Workload Optimized System

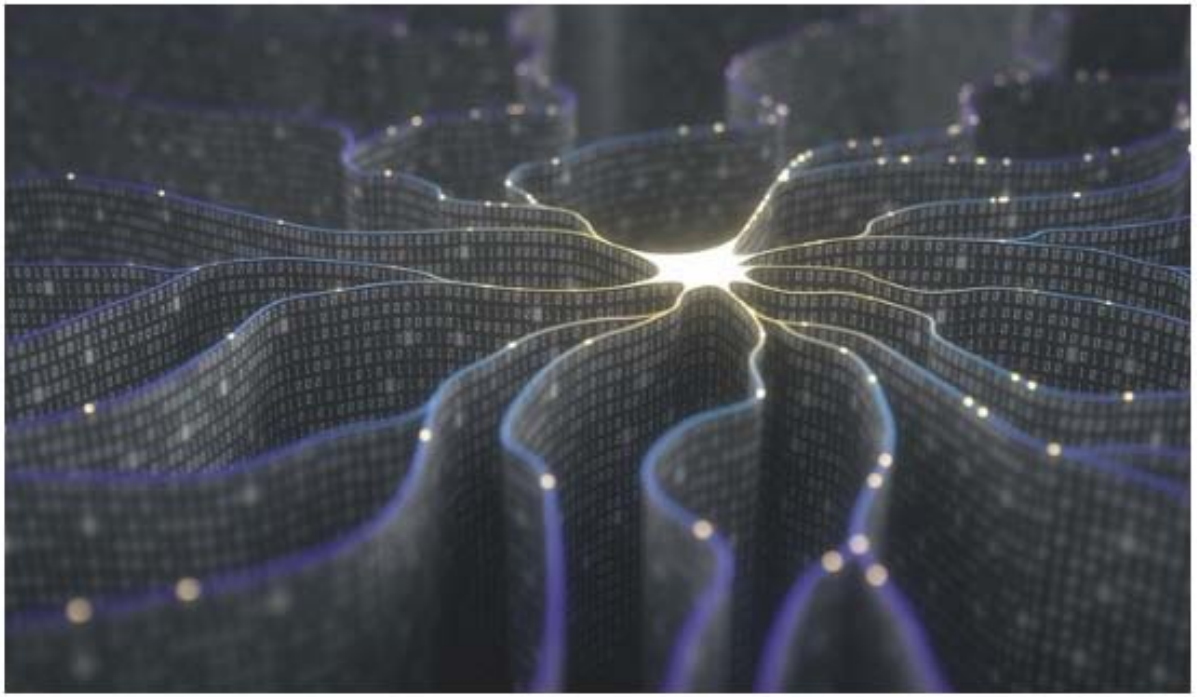
- 90 x IBM Power 750 servers
- 2880 POWER7 cores
- POWER7 3.55 GHz chip
- 500 GB per sec on-chip bandwidth
- 10 Gb Ethernet network
- 15 Terabytes of memory
- 20 Terabytes of disk, clustered
- Can operate at 80 Teraflops
- Runs IBM DeepQA software
- Scales out with and searches vast amounts of unstructured information with UIMA & Hadoop open source components
- Linux provides a scalable, open platform, optimized to exploit POWER7 performance
- 10 racks include servers, networking, shared disk system, cluster controllers

AI in Healthcare

- Detection
- Diagnosis
- Prediction
- Drug Discovery
- Personalized Medicine
- Medical Imaging
- Genomics
- Cancer Research
- Brain Tumours
- Dermatology
- Mental Health
- Speech Patterns
- Diabetics
- Radiology

Google Using FHIR, Deep Learning for Healthcare Predictive Analytics

Google is eager to apply its deep learning prowess and familiarity with FHIR to the problems of predictive analytics in healthcare.



Genome Sequencing and Big Data

- The use of genomic data is on the rise in patient treatment. The cost of sequencing an individual's full genome has plunged in recent years.
- Sequencing will become commonplace and eventually become a commodity lab test.
- Genomic sequences are huge files and the analysis of genomes generates even more data.

Thank You

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