



Healthcare Analytics

Big Data in Healthcare

Health care industry generated

- About **153** exabytes of data in 2013
- Estimate **2,314** exabytes 2020 (**11,000%** spike)

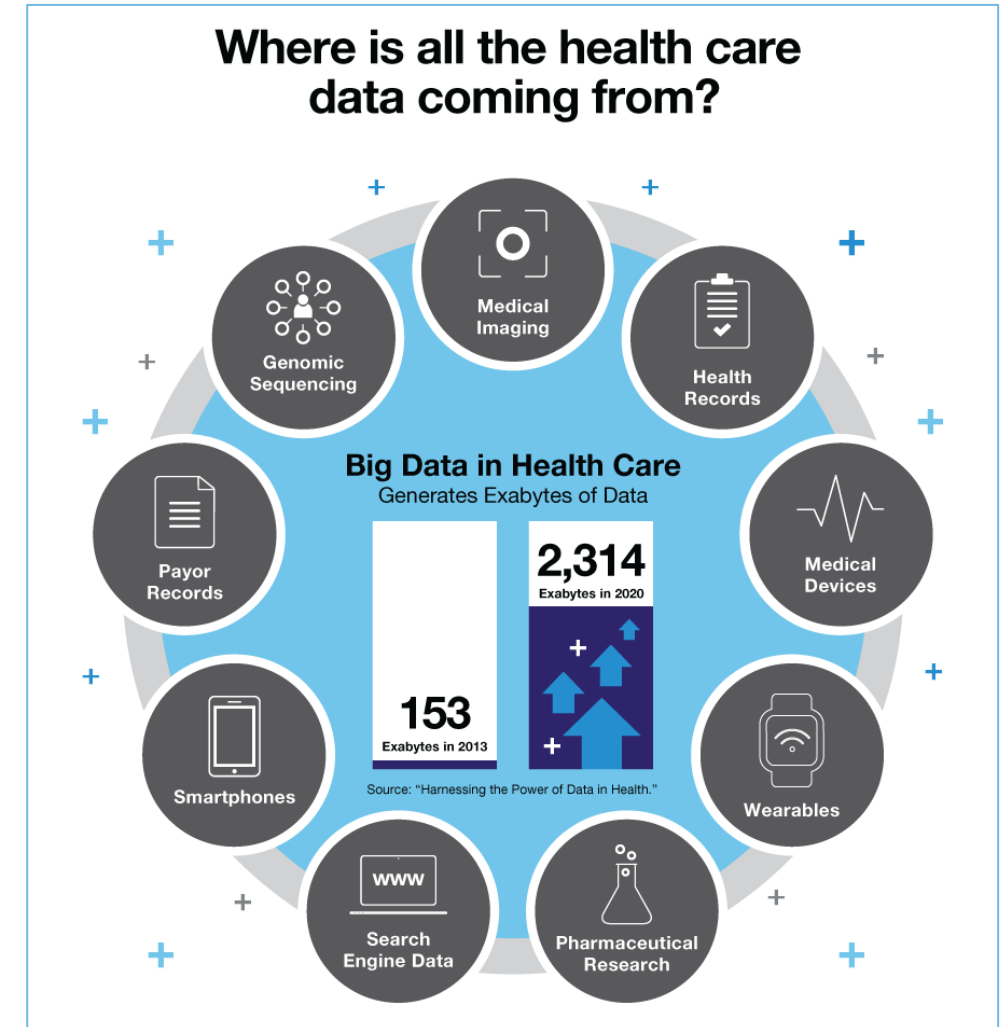


Image Credit: International Data Corporation

Big Data in Healthcare

How much data is generated
by every human body per day?

➡ 2 Terabytes

➡ 1,000,000,000 bytes

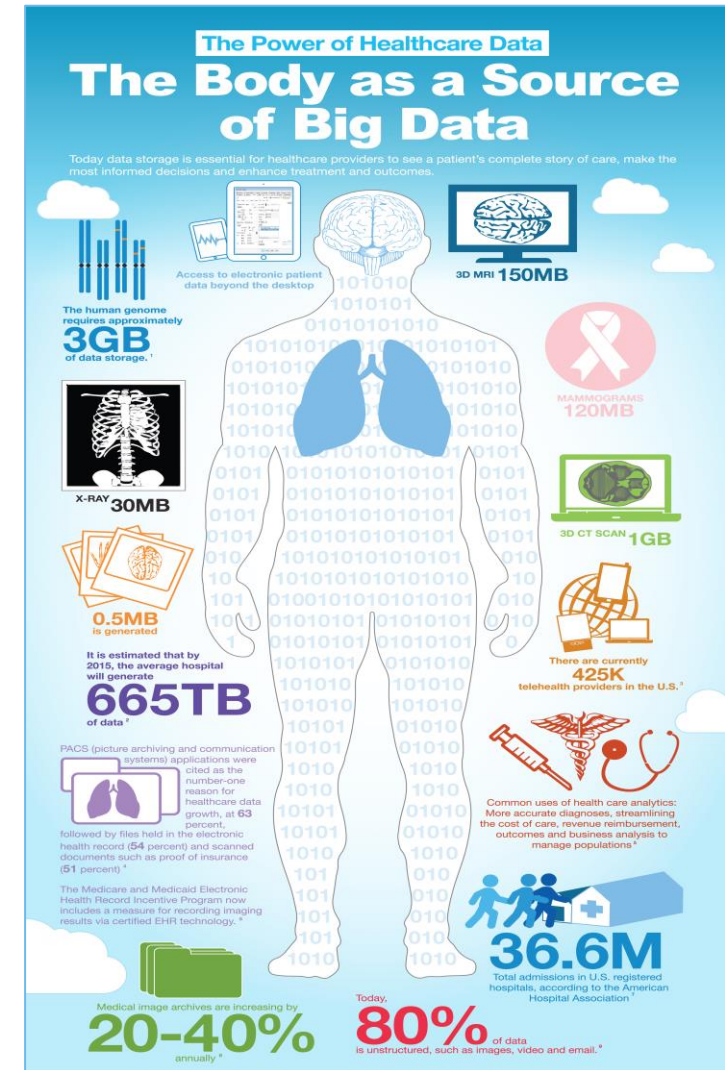


Image Credit: datafloq.com

Applications of Data Science

Drug Research



Monitor Patient Health



Medical Imaging



Virtual Assistance



Genomics



Medical Imaging Analysis

Without Data Science

- Manual inspection
- Difficult to find microscopic deformities
- No proper diagnosis

Benefits of Data Science

- Search for defects in scanned images
- Effective treatment
- Predict diseases such as cancer and tumour

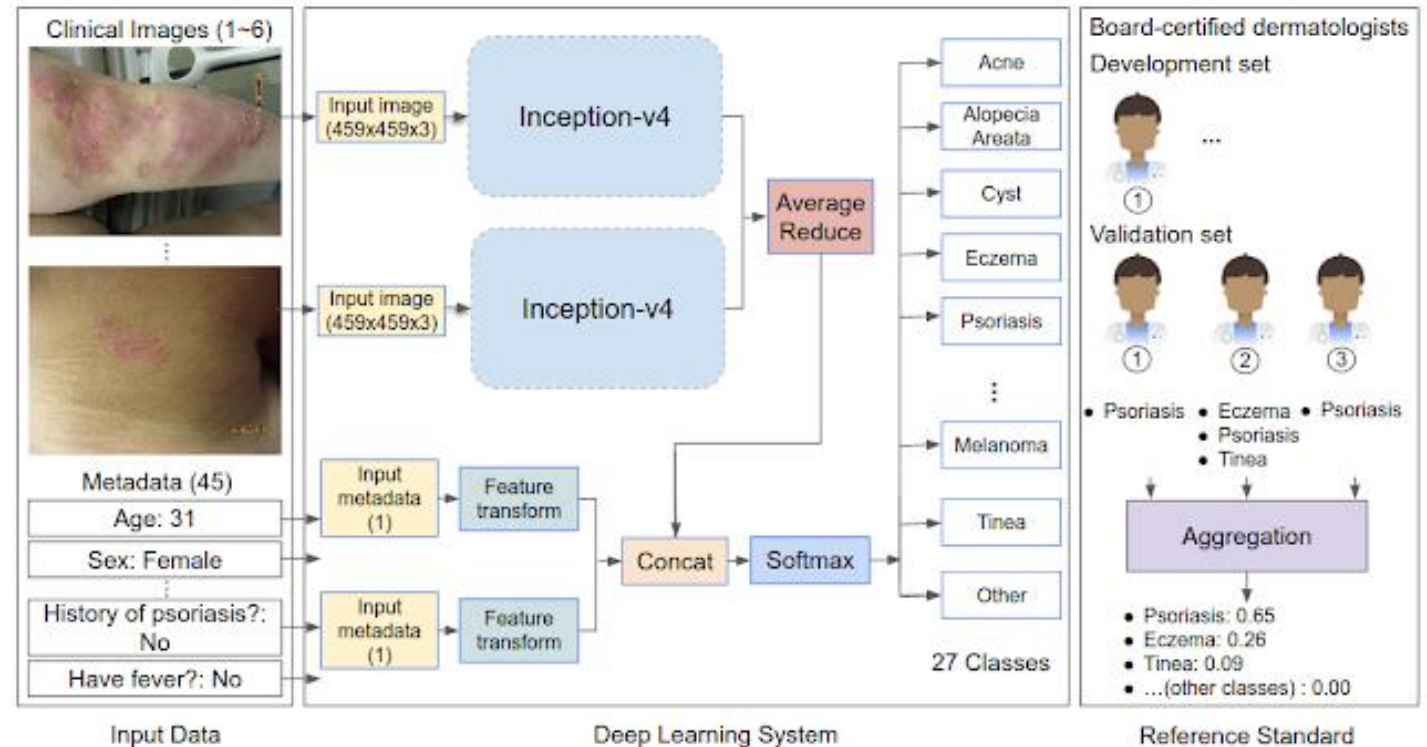


Image Credit: https://www.123rf.com/photo_31910452_collection-x-ray-and-multiple-injury.html

Medical Imaging Analysis

Application

- Google AI detects 26 skin conditions using Deep Learning
- Achieve accuracy of **97%**
- On par with U.S. board-certified dermatologists
- Address global shortage of dermatologists



Monitoring Patient Health

Without Data Science

- Manual recording of diagnosis
- Diagnostic delay

Benefits of Data Science

- Internet of Bodies (IoB)
- Effective monitoring and treatment
- Reduce errors
- Decrease costs



Monitoring Patient Health

Applications

- Smartwatch
- Fitbit
- Pacemaker
- Digital pills
- Smart contact lenses



Virtual Health Assistance

Without Data Science

- Multiple clinic visits
- Overburden healthcare system

Benefits of Data Science

- Analyse symptoms
- Identify/predict disease and condition
- Suggest medication and treatment
- Remote communication



Virtual Health Assistance

Application

- Mental Health Chatbot – Woebot
- Powered by AI and Natural Language Processing (NLP)
- **4.7M** messages exchanged every week
- **75%** of users report feeling better after first time use
- **98.9%** accuracy rate in detecting crisis language

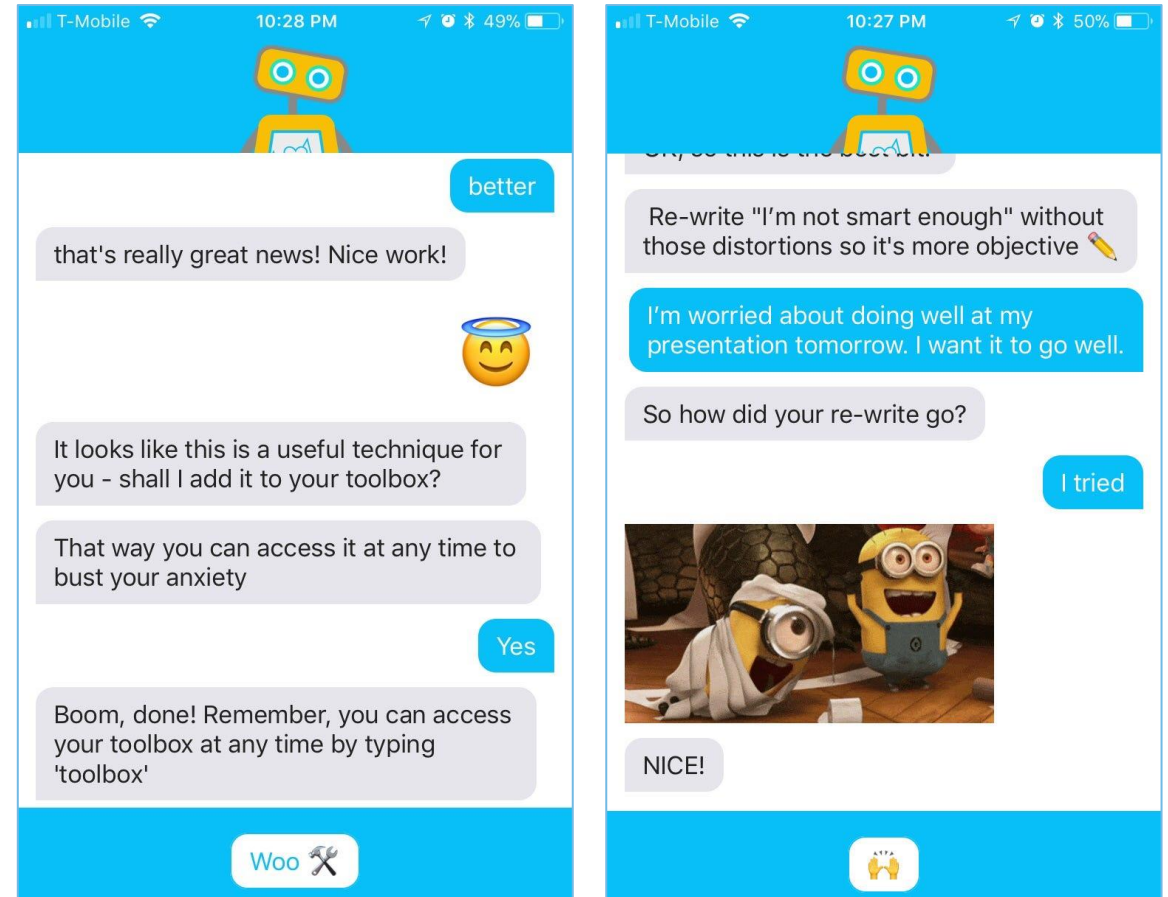


Image Credit: <https://www.businessinsider.com/therapy-chatbot-depression-app-what-its-like-woebot-2018-1>

Drug Research

Bring new drug to market

- Estimated cost **US\$4 billion**
- Take **10 – 15 years**
- Less than **10%** make it to market

Machine learning offers a solution

- Accelerate drug discovery
- Optimise efficacy of clinical trials
- Target specific patient population

“

“Big data and machine learning in pharmaceuticals and medicine could generate a value of up to \$100B annually.”

Source: McKinsey



Image credit: Shutterstock

Drug Research

Application

- The Machine Learning for Pharmaceutical Discovery and Synthesis Consortium (MLPDS)
- Invented a smart home WIFI box to monitor physiological signals
- Monitor disease progression, drug efficacy and safety
- Reduce length of clinical trials
- Reduce costs

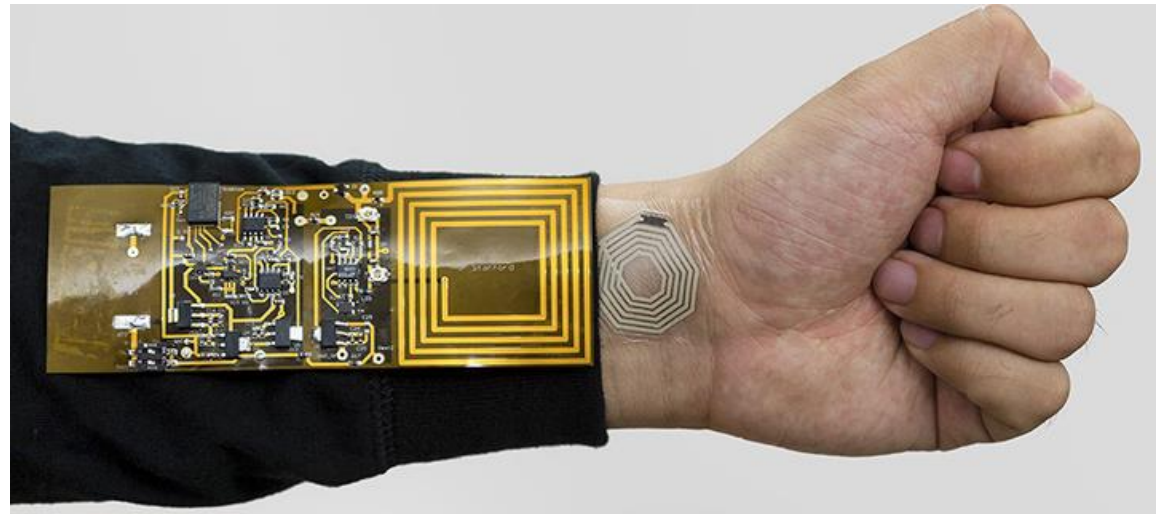


Image Credit: <https://www.medgadget.com/2019/08/fully-flexible-and-wireless-body-monitoring-sensors.html>

Challenges

- Capture – clean, complete, accurate data
- Cleaning – accurate, correct, consistent, not corrupted datasets
- Storage – cost, security and performance
- Security – data breach
- Stewardship – data governance

**SINGHEALTH
PATIENTS'
DATA STOLEN**

WHO'S AFFECTED:
**1.5 MILLION PATIENTS WHO
VISITED THESE SPECIALIST
OUTPATIENT CLINICS AND
POLYCLINICS BETWEEN
MAY 1, 2015 AND JUL 4, 2018,
INCLUDING PM LEE HSIEN LOONG**

POLYCLINICS:	SINGAPORE GENERAL HOSPITAL
BEDOK	CHANGI GENERAL HOSPITAL
BUKIT MERAH	SENGKANG GENERAL HOSPITAL
GEYLANG	KK WOMEN'S AND CHILDREN'S HOSPITAL
MARINE PARADE	NATIONAL CANCER CENTRE
OUTRAM	NATIONAL HEART CENTRE
PASIR RIS	SINGAPORE NATIONAL EYE CENTRE
PUNGGOL	BRIGHT VISION HOSPITAL
SENGKANG	
TAMPINES	
QUEENSTOWN	

**GEYLANG AND QUEENSTOWN POLYCLINICS
ARE NO LONGER UNDER SINGHEALTH**


CHANNEL NEWSASIA

Challenges

- Querying – data siloes
- Reporting – clear, concise and accessible to target audience
- Visualisation – clean and engaging data visualisation
- Updating – maintain current and relevant data, duplicates
- Sharing – sharing data with external partners

Conclusion

Benefits outweigh the challenges

- Provide high-risk patient care
- Track and identify diseases
- Reduce healthcare costs
- Prevents human errors in services
- Innovates healthcare solutions



Q & A

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