

AI Development in Healthcare Industry

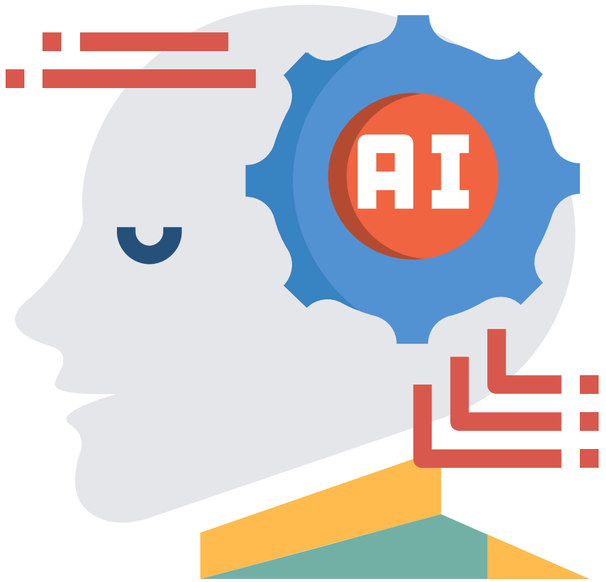
dr. Arief Purnama Muharram



Presentation Outline

1. What is Artificial Intelligence?
2. Artificial Intelligence in Healthcare
3. Benefits of AI in Healthcare
4. Ethics and Privacy Concern in AI

What is Artificial Intelligence?



Several definitions,

“The art of creating machines that perform functions that **require intelligence** when performed by people“ (Kurzweil, 1990)

The study of how to **make computers do things** at which, at the moment, **people are better** (Rich and Knight, 1991)

What is Artificial Intelligence?

In short, artificial intelligence (AI) is an **INTELLIGENCE** demonstrated by **MACHINE**s, as opposed to the natural intelligence displayed by animals including humans.

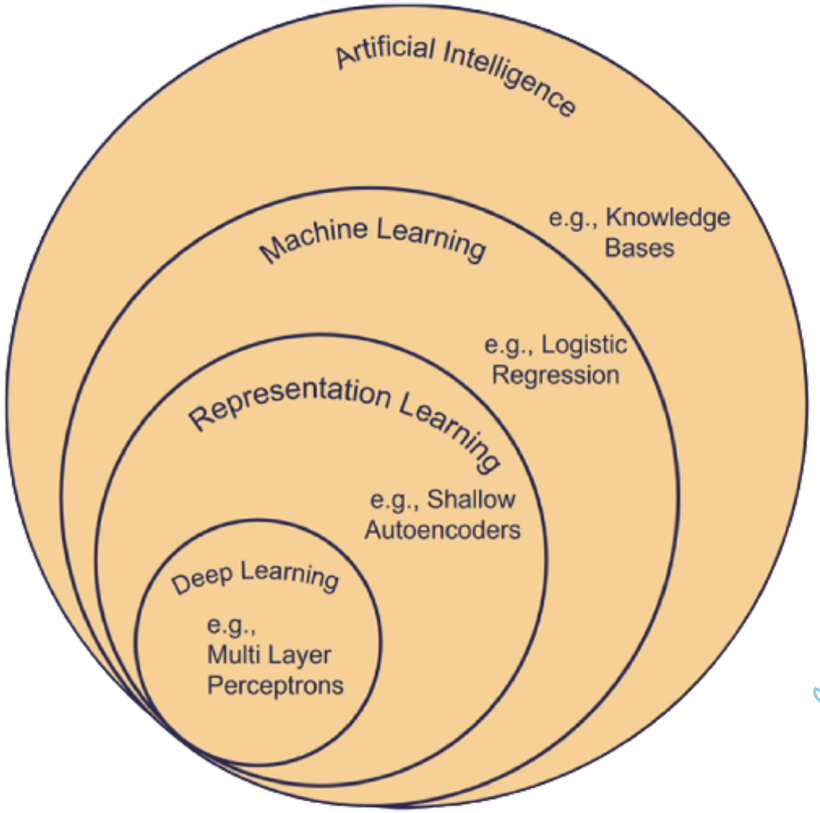


Figure: Susanto AP, Winarto Hm Fahira A, Abdurrohman H, Muharram AP, Widitha UR, Efirianti GEW, George YAE, Tjoa K. Building an artificial intelligence-powered medical image recognition smartphone application: what medical practitioners need to know. Inform. Med. Unlocked. 2022:32;1-10.. DOI: https://doi.org/10.1016/j.imu.2022.101017



How an AI Works?

Intuition Behind Artificial Intelligence

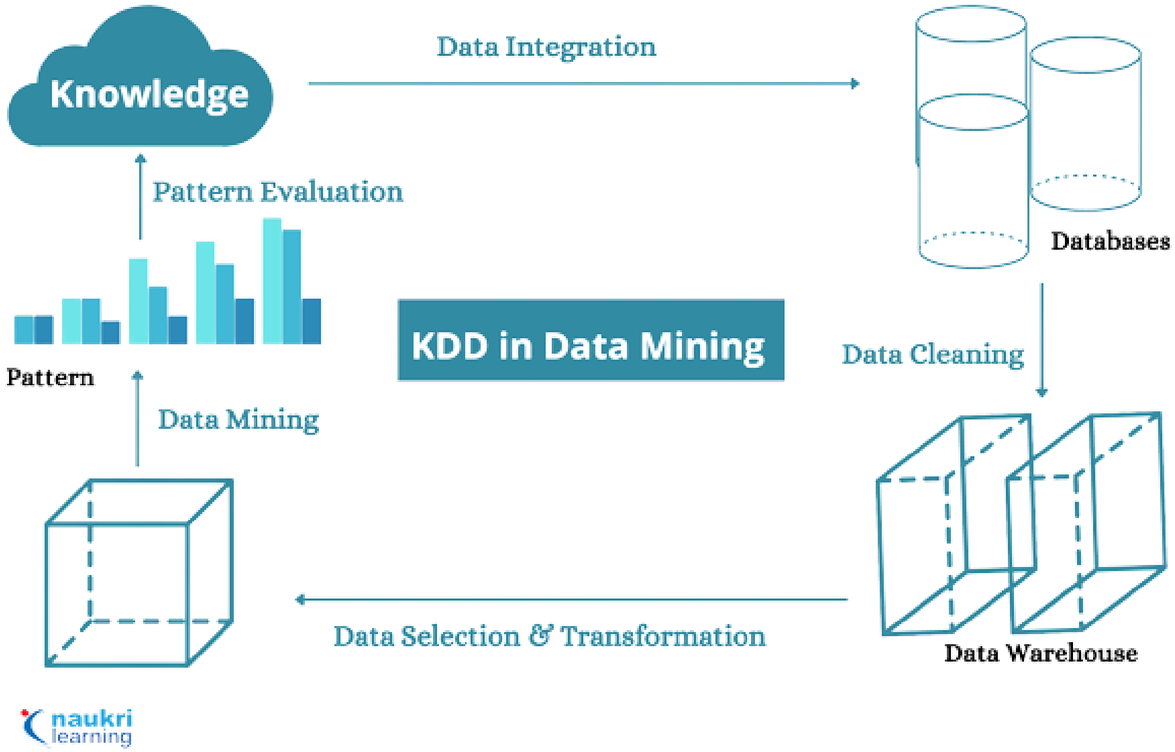


- Remember the old days school when our teacher teach us the name of an object (example: **car**).
- We know that this is a car because our teacher told us that this object is a "**car**".
- Does the machine learn like the way how we learn something? The answer is **YES**, similar to it!
- The machine learn and become smart because we introduce them with **DATA**!

Knowledge Discovery Process

The concept to explain how machine learn and become "smart" from **DATA**.

Remember, the key is **DATA**!



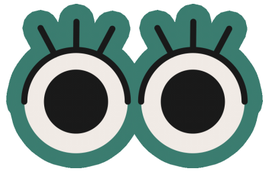
Knowledge Discovery in Databases (KDD) in Data. Available from: https://www.naukri.com/learning/articles/kdd-in-data-mining/

Data in
Human vs Machine Perspective

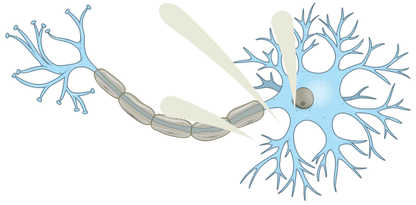
HUMAN



OBJECT



SENSORY DEVICE



INFORMATION ENCODING



PROCESSING

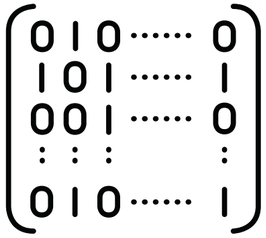
MACHINE



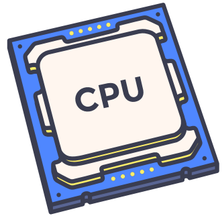
OBJECT



SENSORY DEVICE

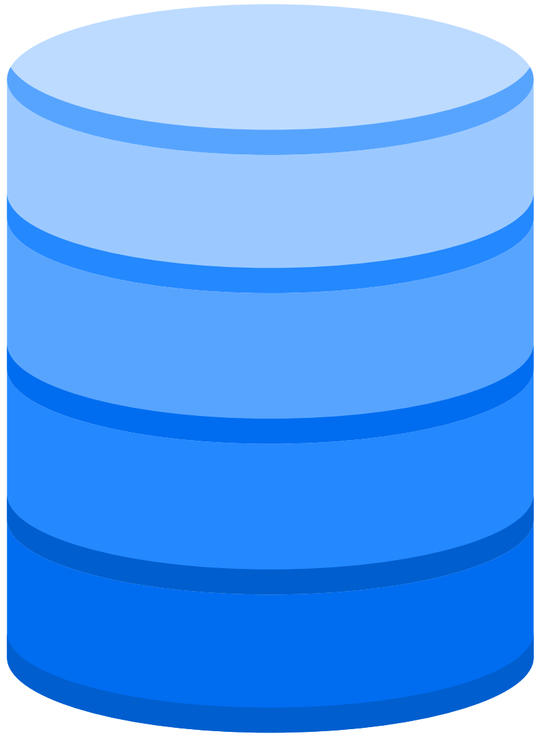


INFORMATION ENCODING



PROCESSING

So Then, What I Want to Say is...

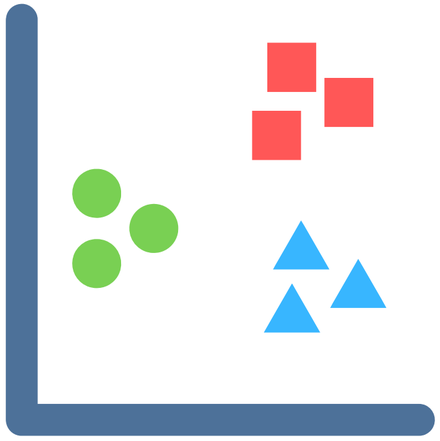


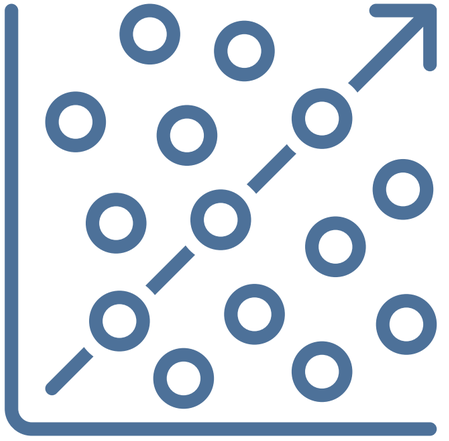
- The more **DATA** we feed into the machine, the **SMARTER** the machine will be.
- Almost all solutions can be make through artificial intelligence, as long as we have the **RELEVANT DATA.**
- So, the key is **DATA**! **DATA** is the next oil!
- Why? Because machine learning use the ability of machine to recognize pattern from the data **(PATTERN RECOGNITION)**

(Machine) Learning Types

Supervised Learning

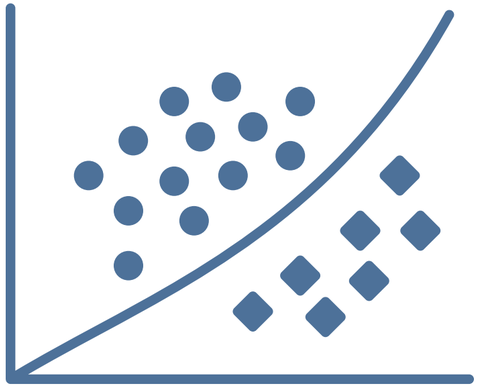
Classification, Regression





Unsupervised Learning

Clustering



Reinforcement Learning

How AI Play Role in Healthcare



Early Diagnosis of Disease

Improve Decision Making Process

Personalized Medicine

Expanded Access to Medical Services

Better Patient Experience

Integration with Wearable Device

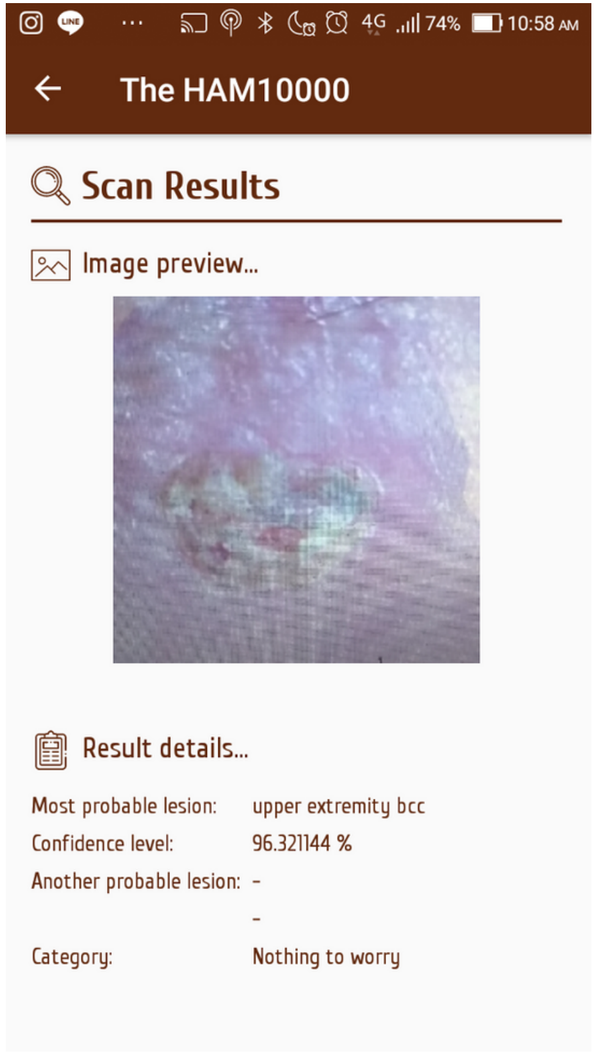
Benefits of AI in Healthcare



- Better quality of life in patients
- Better accuracy of disease treatment
- Reducing costs needed
- Better healthcare workers efficiency
- Reducing workload in healthcare workers

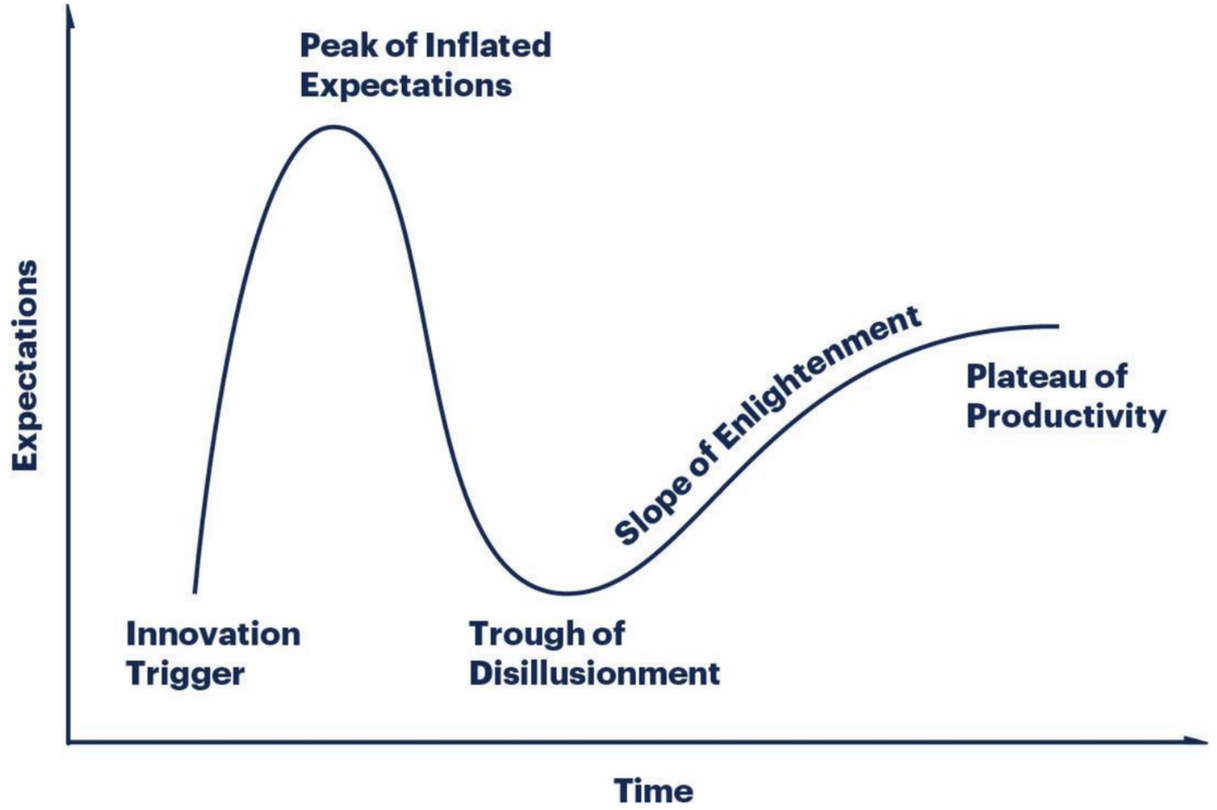
AI in Skin Lesion Classification: A Personal Experience

- Skin cancer case often underdiagnosed
- Sometimes hard to identify the lesion features
- Create an AI model to identify primary pre-cancerous skin lesion
- Deployed on smartphone
- Model thinks that this is BCC. **What do you think?**



Muharram AP, Abdurrohman H, Dini R. Pengembangan aplikasi klasifikasi lesi kulit berbasis dataset citra dermatoskopi dengan deep learning menggunakan Tensorflow dan Tensorflow Lite pada perangkat Android. Dipresentasikan di Seminar Nasional Instrumentasi, Kontrol, dan Otomasi tahun 2018 (SNIKO 2018).

Intermezzo:
The Gartner Hype Cycle



www.gartner.com

Does Every Problems Need an AI Solution?

Let's discuss...



Does Every Problems Need an AI Solution?

Math formula?

Algorithm?



Simple knowledge?

Expert knowledge?



Data is available?

So, we can use artificial intelligence when

- There is no general solution available
- The problem is too complex to be solved
- The dataset is available and large enough

Examples...

Problems That DOESN'T NEED an AI as the Solution

- Classifying someone's nutritional status based on its body mass index
- Deciding patient triage
- Classifying patient's basal metabolic rate

Problems That NEED an AI as the Solution

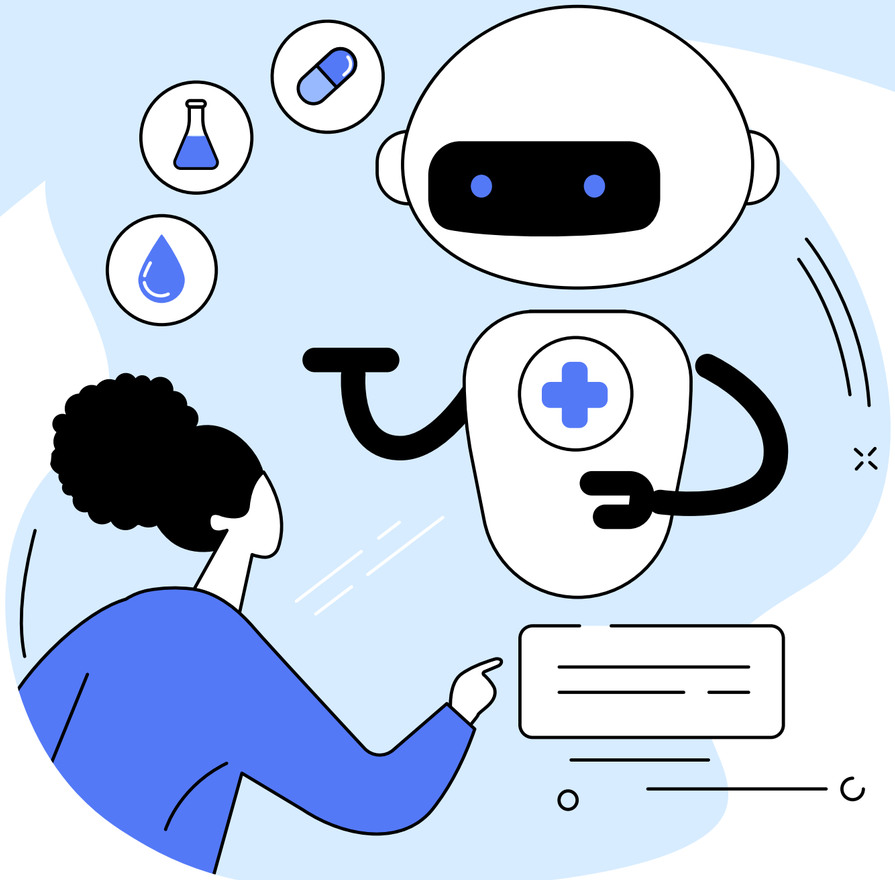
- MYCIN: an expert system used to identify bacteria causing a disease and its recommended antibiotics
- Predicting COVID-19 by using chest X-Ray
- Individualized drug choice using genetic profiling approach (precision medicine)
- Genomic analysis



Deciding Which Patient Should Be More Prioritized To Be Admitted In ICU

Does this problem need an AI solution?

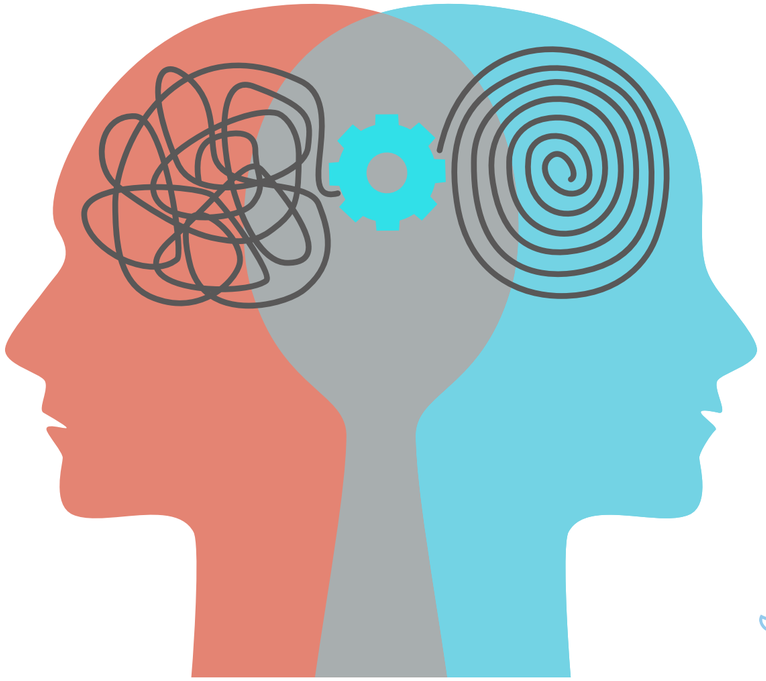
The Man and The Machine: A Concept



- AI is designed to **augment human capabilities.**
- AI **automates redundant process** so doctor can focus on the matter tasks.
- Human oversight will continue to be needed: **Verifying AI output** and **clinical decision making**

Stat. Artificial intelligence in health care: the hope, the hype, and the-real world impact [Presentation]. Available from:https://www.statnews.com/wp-content/uploads/2018/09/AI-Webinar-Final.pdf

Challenge of Implementing AI in Healthcare



- Data bias
- Personal
- The principle of ethical double effects
- Problem of ethic related to research and biomedical medicine

Sunarti S, Rahman FF, Naufal M, Risky M, Febriyanto K, Masnina R. Artificial intelligence in healthcare: opportunities and risk for future. Gaceta Sanitaria. 2021:35 suppl 1. S67-S70. DOI: 10.1016/j.gaceta.2020.12.019

Ethics and Privacy Concern in AI



- System robustness regarding data handling
- Human vs machine empathy
- Beware of algorithmic bias regarding final decision of diagnosis/treatment

Davenport T, Kalakota R. The potential for artificial intelligence in healthcare. Future Healthc J. 2019 Jun; 6(2): 94-98.

Weighing Costs and Benefits

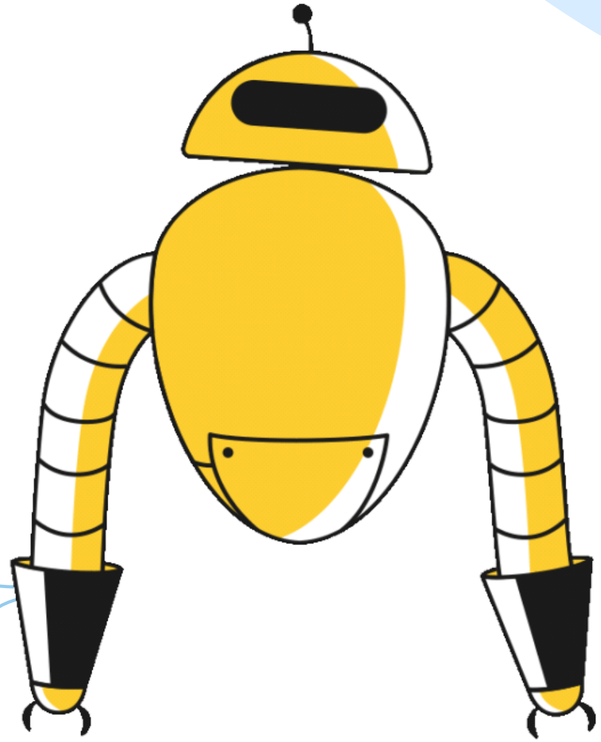
Before implementation...

- Financial Costs
- Privacy and Ethical Costs
- Reputational Costs



Stat. Artificial intelligence in health care: the hope, the hype, and the-real world impact [Presentation]. Available from:https://www.statnews.com/wp-content/uploads/2018/09/AI-Webinar-Final.pdf

Conclusion



- **Artificial intelligence (AI)** is the ability of machine to perform functionality the same as animals and humans do.
- AI learns from **data** by **recognizing its pattern**.
- No every problems need AI as their solutions.
- Health workers get benefits from AI, but will **never** replace their role.
- Always **weighing costs and benefits** before implementing any AI solution.



Thank You