

How is Artificial Intelligence, a Central Tenet For the Disruptive Changes, is Shifting the Health Care Paradigm

INTRODUCTION

Artificial intelligence (AI) is a field of study to make machines intelligent that they can mimic human behavior. Artificial intelligence is reforming numerous industries like cybersecurity, construction, manufacturing, education, retail and healthcare. In the current era of immense data and the gigantic computational powers, artificial intelligence is getting smart.

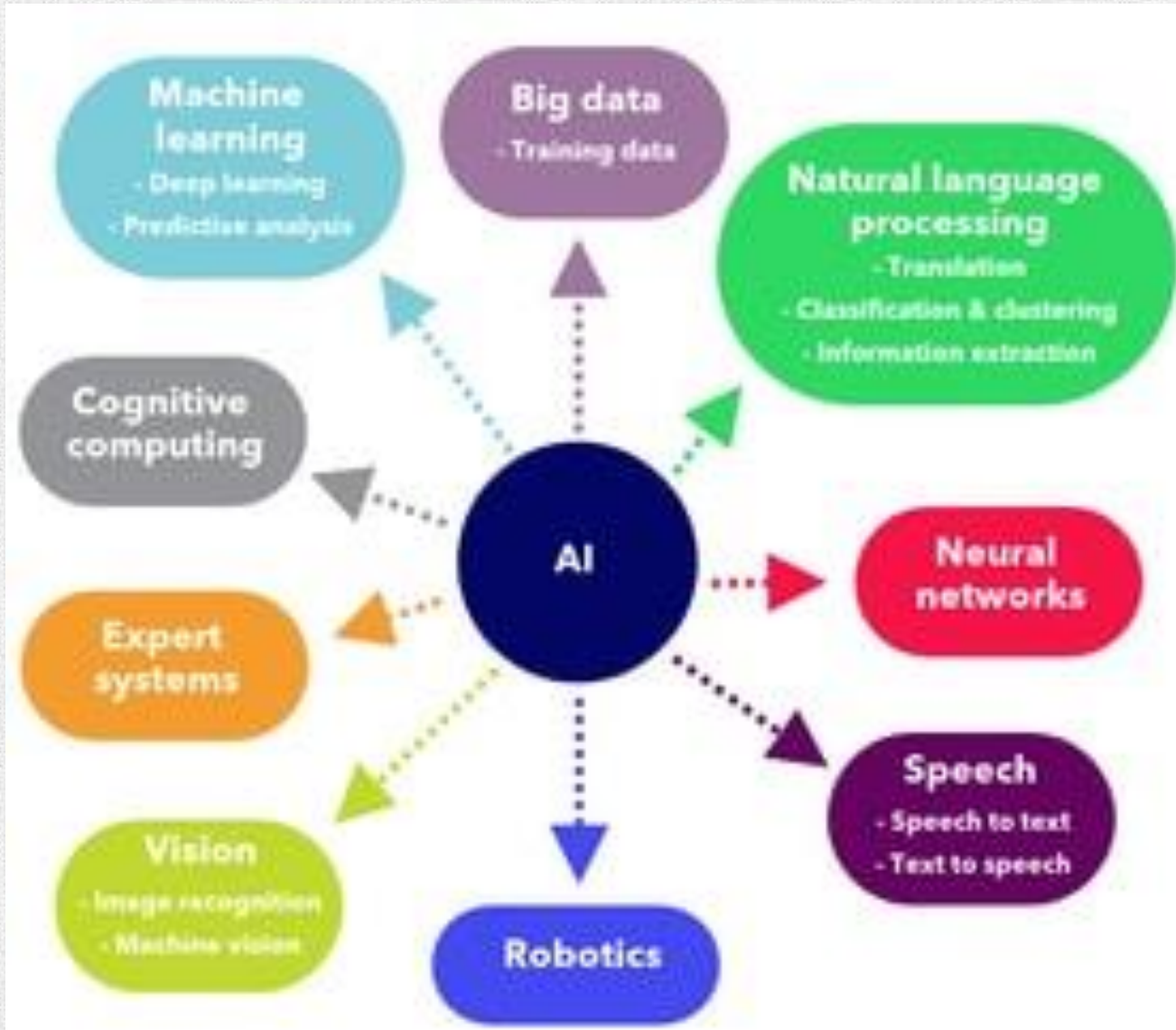


Fig. 1: Branches of Artificial Intelligence. Created by Syam, Nilay and Nguyen, Linh. "Everything You Need to Know about Artificial Intelligence", <https://news.cgtn.com/news/2019-06-12/Everything-you-need-to-know-about-artificial-intelligence-HswDK6aQdW/index.html>. [6]

WHY AI IS IMPORTANT IN HEALTH SYSTEMS

Artificial intelligence can assist physicians in:

- Timely diagnosis and treatment of diseases^[4]
- Providing up-to-date medical data from books, journals and clinical practices^[1]
- Robot-assisted surgeries by combining medical records of the patient with real-time data
- Recommending medications after considering the past medical record and the latest information.

HOW AI WORKS IN HEALTH SYSTEMS^[1]

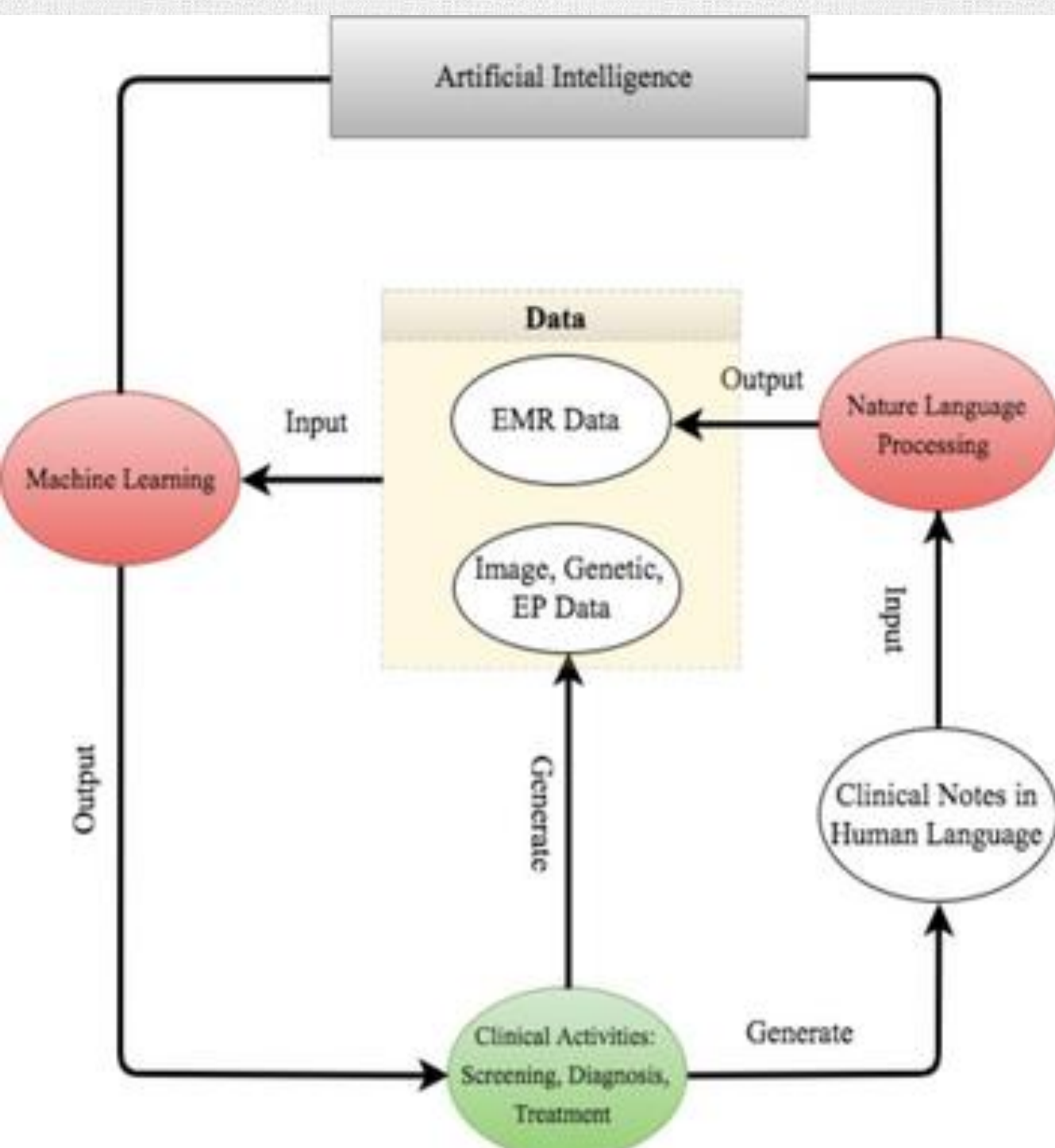


Fig. 2: Road map of data generation to decision making

THE AI DEVICES^[1]

- Machine Learning: Takes an image, speech, or patient's trait as input, extract features and make a decision to detect a disease.

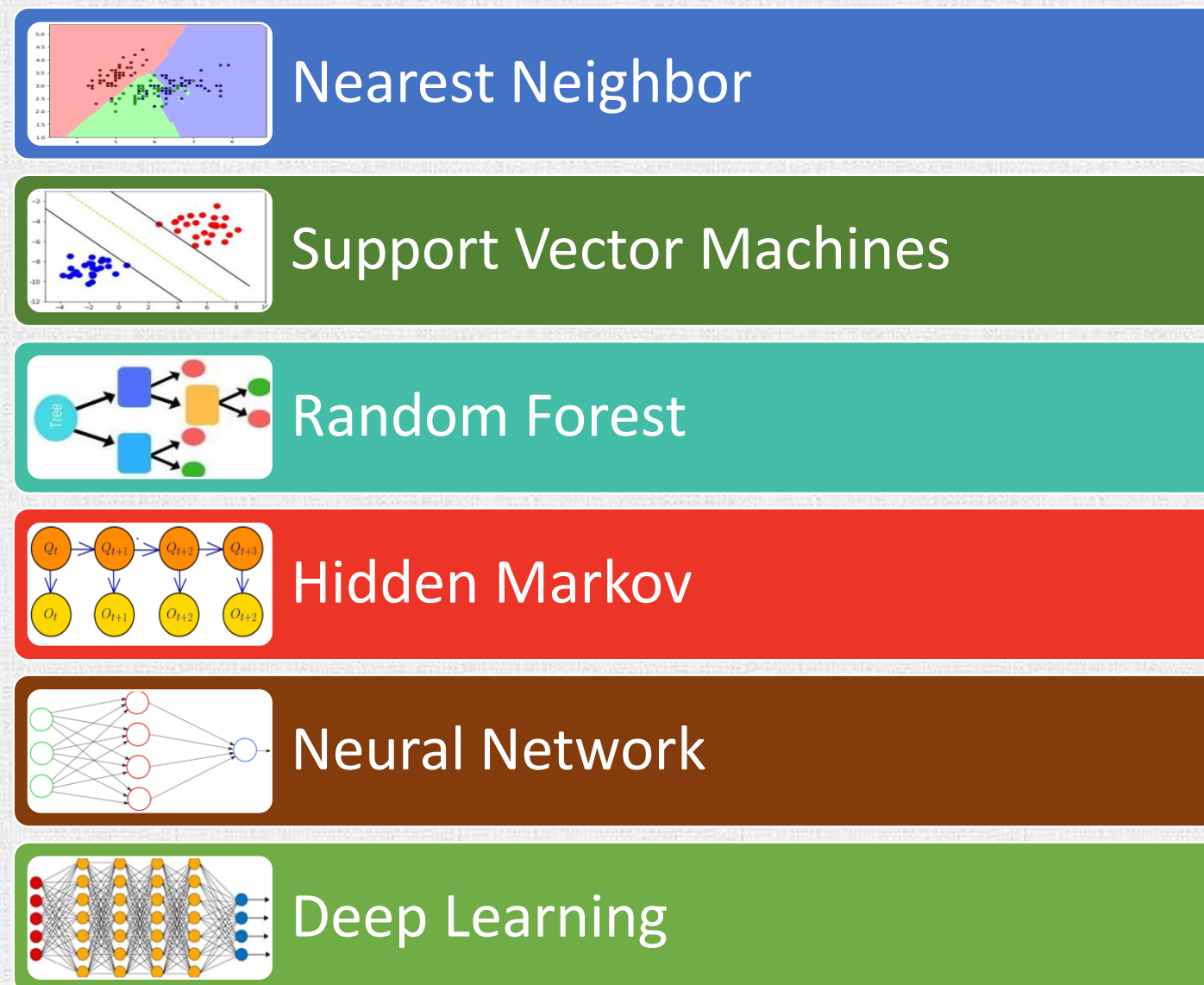


Fig. 3: Machine Learning Techniques applied in Health Care [9]

- Natural Language Processing (NLP): Process the textual clinical data, extracts the useful keywords and make decisions to identify normal and abnormal cases.

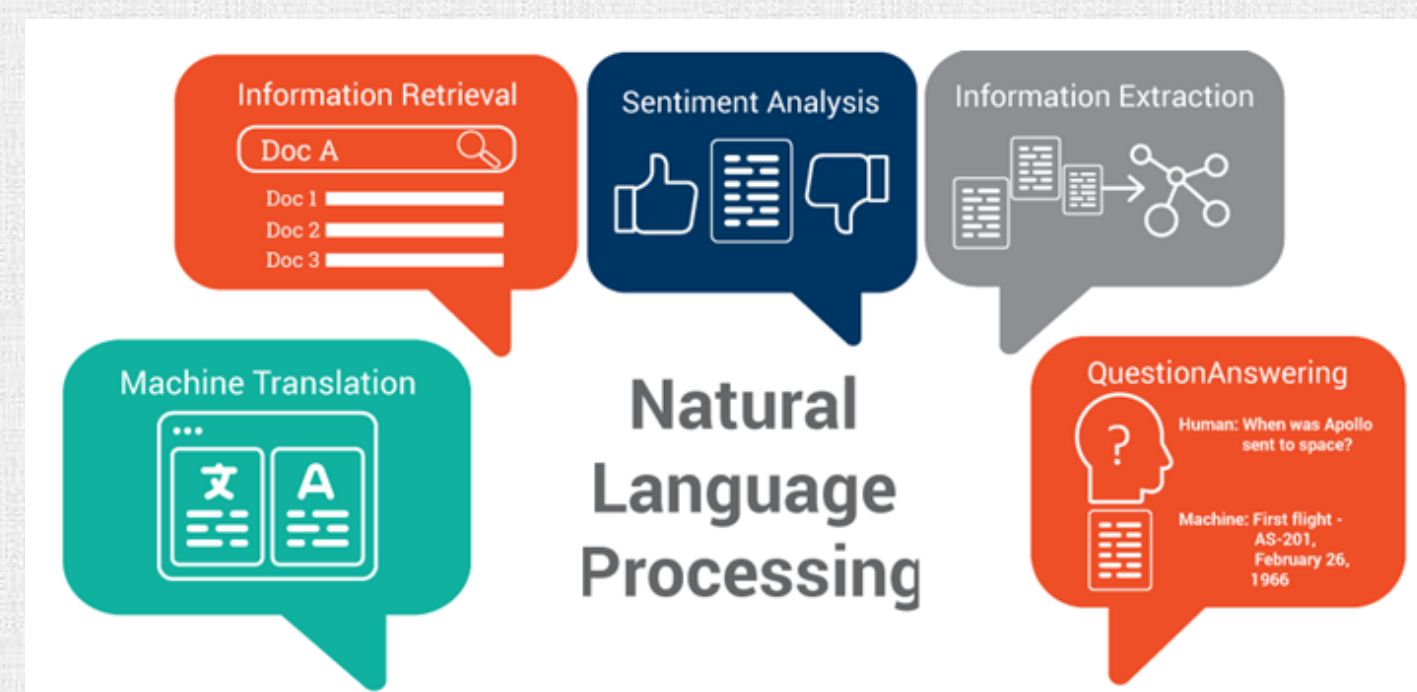


Fig. 4: Natural Language Processing. Created by Milena Yankova. From Top 5 Semantic Technology Trends to Look for in 2017, <https://www.ontotext.com/top-5-semantic-technology-trends-2017/>. [7]

AI FOR DIAGNOSING DISEASES^[2]

Radiology

- Pneumonia
- Tuberculosis
- Head trauma and pancreatic cancer

Pathology

- Brain tumor
- Breast cancer
- Lung Cancer

Dermatology

- Skin cancers
- Melanoma
- Skin lesions

Ophthalmology

- Diabetic retinopathy
- Retinal diseases (OCT)
- Macular degeneration

Cardiology

- Echocardiography

LIMITATIONS AND CHALLENGES^[1,2,3]

Assessing safety and efficacy of AI systems

Human bias

Exchange of clinical data

Distributional Shift

Privacy and security of data

Displacing human work force

Unsafe Exploration

FEW EXAMPLES OF AI BASED HEALTH SYSTEMS IN REAL LIFE^[5]

IBM Watson for oncology patients

IBM Genomics for personalized cancer care

CONCLUSION

Artificial intelligence is shifting the health paradigm by assisting physicians in early diagnosis and treatment of disease. AI has been applied for the detection of tuberculosis, cancer, bone fractures, and retinal diseases and the results are coherent with the physician's decisions. Although the recent advancements in AI, has produced some successful applications for diagnosis and treatment of diseases, the real-life implementation of AI-based health systems is still under the question. The consequences of a wrong prediction of the disease are significantly huge as compared to a physician. Such systems need to be exhaustively tested and validated before unleashing their power in clinical practices.

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