Artificial Intelligence and Modern Medical Practice: Do's and Don'ts in Medicine in 2024

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What is Artificial Intelligence?

Artificial intelligence (AI) is a branch of computer science that uses computational power, data, and algorithms to develop machines that can perform tasks that usually require human intelligence.

AI can perform tasks such as:

- Making decisions

- Learning from experience

- Recognizing patterns

- Solving problems

- Understanding natural language

- Reasoning

- Perception

What A.I. is NOT…

Human Intelligence is general (enabling it to tackle new and unfamiliar tasks). Present A.I capabilities are more specialized (designed to perform a narrow task, e.g., facial recognition, internet searches, or driving a car).

Most current AI systems, including those that can play complex games like chess and Go, fall under this category. They operate under a limited pre-defined range or set of contexts

A.I. Current limitations

Current implementations have many shortcomings, some very particular derived from their specific design methodology and some general such as:

- Reflects the biases of its training data
- Lack of ability to switch from one task to another
- Inability to "improvise"
- Security concerns, including hacking, privacy issues and lack of expert technical support during critical use out of routine office hours.
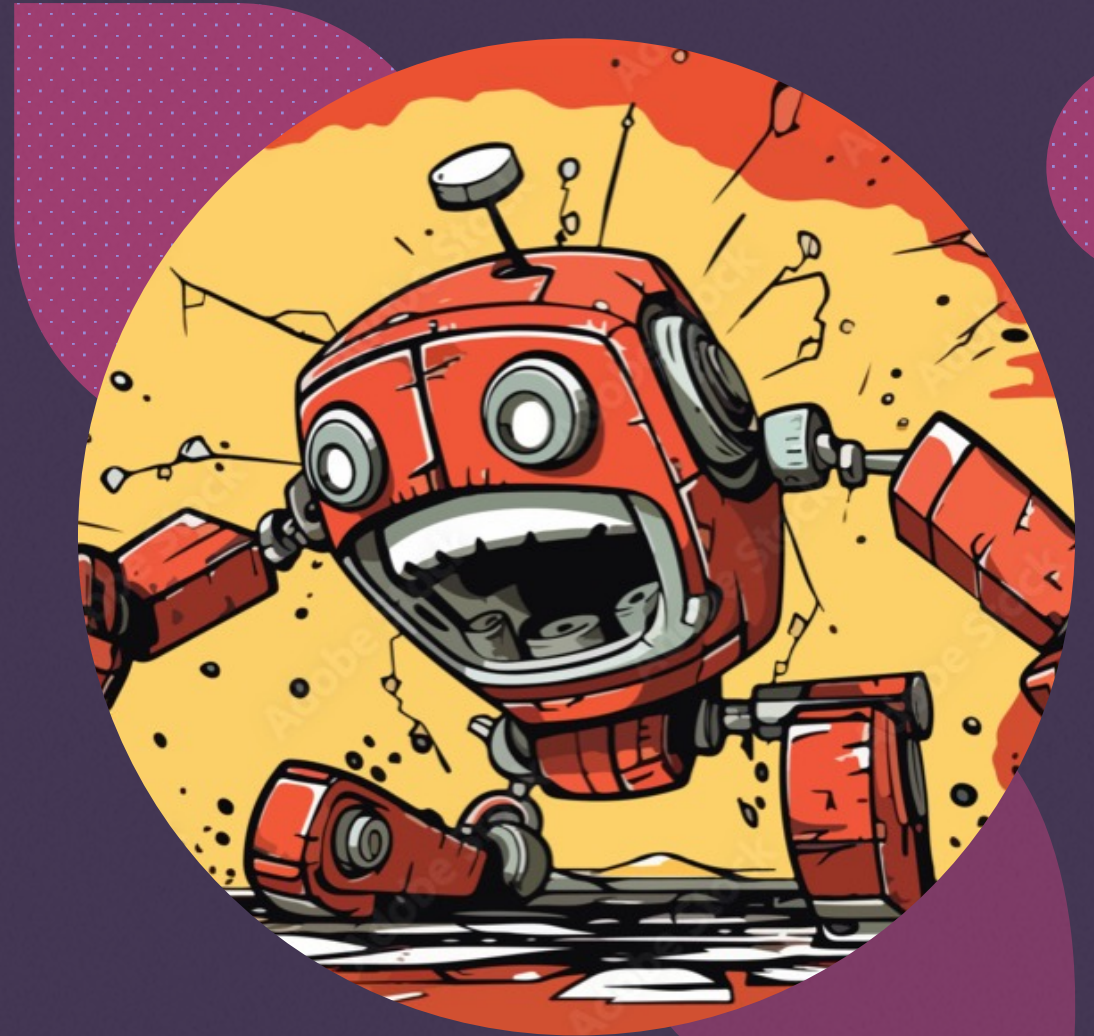
Most common forms of A.I.

Machine Learning (ML)

- AI systems capable of self-improvement through experience, without direct programming. They concentrate on creating software that can independently learn by accessing and utilizing data.

Deep Learning

- A subset of ML involving many layers of neural networks. It is used for learning from large amounts of data and is the technology behind voice control in consumer devices, image recognition, and many other applications.

Natural Language Processing (NLP)

- This AI technology enables machines to understand and interpret human language. It's used in chatbots, translation services, and sentiment analysis applications.

# Most common forms of A.I.

Robotics

- This field involves designing, constructing, operating, and using robots and computer systems for controlling them, sensory feedback, and information processing.

Computer Vision

- This technology allows machines to interpret the world visually, and it's used in various applications such as medical image analysis, surveillance, and manufacturing.

Expert Systems

- These AI systems answer questions and solve problems in a specific domain of expertise using rule-based systems.
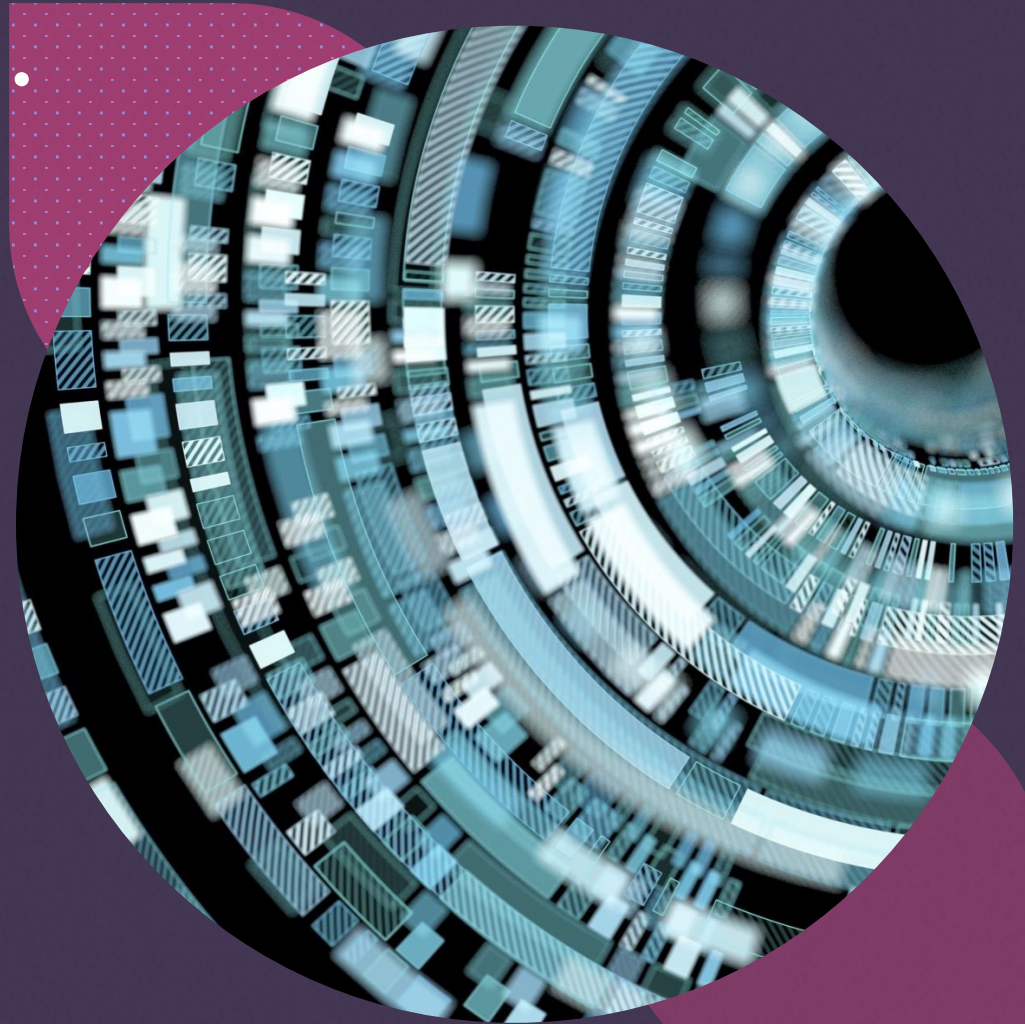
A.I. Applications in general Healthcare

MACHINE LEARNING IS
NOW BEEN USED IN

AUTOMATED CLINICAL
BILLING

CLINICAL DECISION
SUPPORT

THE DEVELOPMENT OF
CLINICAL PRACTICE
GUIDELINES

A.I. Applications in general Healthcare

Deep Learning has achieved the current milestones:

At MD Anderson, data scientists have developed the first deep learning in healthcare algorithm using machine learning to predict acute toxicities in patients receiving radiation therapy for head and neck cancers.

A.I. Applications in general Healthcare

Natural Language processing is being used:

For speech transcription (Dragon dictation systems being the most ubiquituous)

NLP can be applied to medical records to accurately diagnose illnesses by extracting useful information from health data. Additionally, it can be used to identify relevant treatments and medications for each patient or even predict potential health risks based on past health data.

NLP also provides clinicians with powerful tools for managing large amounts of complex data – something which would normally take much longer to do manually. Some EHR software vendors are beginning to build limited healthcare analytics functions with AI into their product offerings

A.I. Applications in general Healthcare

Robotics:

- **Telepresence:** Physicians use robots to help them examine and treat patients in rural or remote locations, giving them a telepresence in the room.

- **Surgical Assistants:** The ability to manipulate a highly sophisticated robotic arm by operating controls, seated at a workstation out of the operating room, is the hallmark of surgical robotic assistants.

- **Rehabilitation Robots:** play a crucial role in the recovery of people with disabilities in areas such as improved mobility, strength, coordination, and quality of life.

- **Transportation Robots:** deliver supplies, medications, and meals to patients and staff thereby optimizing communication between doctors, hospital staff members, and patients.
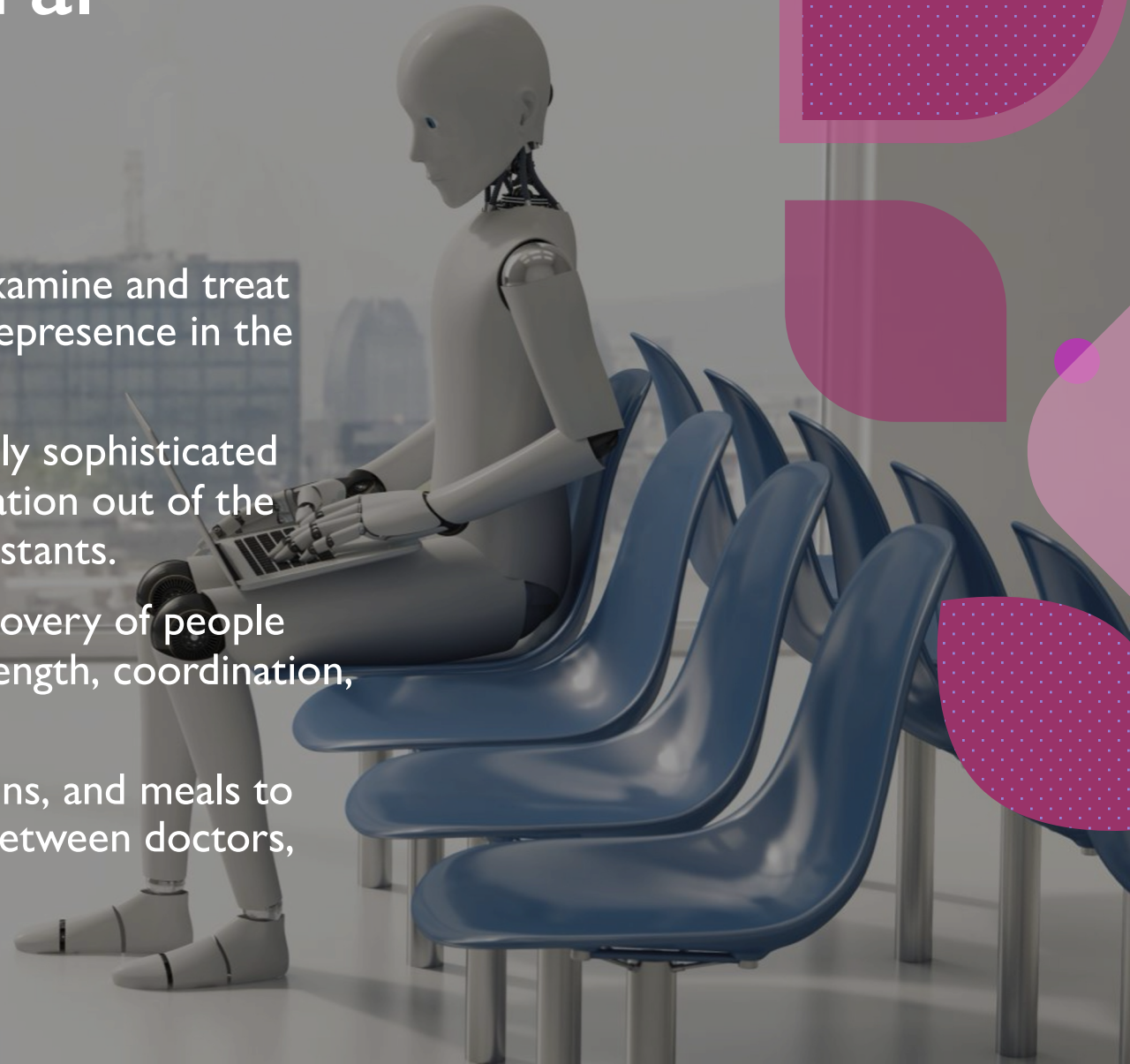
A.I. Applications in general Healthcare

Robotics:

- **Prescription Dispensing Systems:** The biggest advantages of robots are speed and accuracy—two features that are very important to pharmacies.

- **Sanitation and Disinfection Robots:** With the increase in antibiotic-resistant bacteria and outbreaks of deadly infections like the recent (and future) pandemics, more healthcare facilities are using robots to clean and disinfect surfaces. Currently, the primary methods used for disinfection are UV light and hydrogen peroxide vapors.

- Enhanced interfaces include the extensive use of virtual reality and enhanced reality to commandeer robots under closer human supervision.

A.I. Applications in general Healthcare

- Computer Vision is currently being applied…

- In ophthalmology, since the A.I. can analyze retinal images to detect diabetic retinopathy

- In Radiology & oncology to assist in the early detection of cancerous tumors through imaging automated interpretation and post-processing

Administrative Applications for A.I.

data entry

claims processing

appointment scheduling

claims processing

test results alerts

Leveraging A.I. to implement Value-Based Care

Managing the explosion of clinical data sets and ICD codes

Equipping providers with valuable information at the point of care

increases the accuracy of risk adjustment factor scores

"Leveraging EHR-agnostic interoperability standards with AI can bring siloed data together in a longitudinal record, including structured and unstructured data from health information exchanges, all hospital and specialist EHRs, medications, and labs. Patient information can be packaged as a pre-encounter summary and shared directly with the provider before a patient visit to proactively close care gaps. Providers can add encounter data to the longitudinal record for concurrent and retrospective analysis"

Jay Ackerman, CEO and president of Reveleer

Leveraging A.I. to implement Value-Based Care

AI-enabled technology can serve as a virtual team member:

codifying documents

automating data abstraction

deriving meaning from medical records

Do's and Don't s of A.I. for Healthcare applications

Use A.I. to enhance your Medical Knowledge, not to replace it.

Use A.I. to facilitate your work, not to do your work for you.

Use A.I. ethically: first do no harm!

Any questions ?