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ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN PATIENT'S HEALTH MONITORING

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Abstract

Artificial intelligence is a branch of computer science capable of analysing complex medical data. Their potential to exploit meaningful relationship with in a data set can be used in the diagnosis, treatment and predicting outcomes in many clinical scenarios. There is a fundamental lack of understanding of clinicians do even amongst data scientists and it is easy to think that computer vision and interpretation of medical images alone is sufficient to replace image-intensive subspecialties like radiologist, pathologists, ophthalmologists, dermatologists, and cardiologists. The doctor's tasks can be divided into perception (visual image interpretation and integrative data analytics), cognition (creative problem solving and complex decision making),and operation (procedures).

AI can be applied to every aspect of healthcare to bring value. While AI can improve workflow and increase accuracy of diagnoses, there are certain technologies that will not necessarily benefit from AI application.

Keywords: artificial intelligence, machine learning, digital medicine, medical monitoring, neutral networks.

Introduction

AI in medicine can be dichotomized into two subtypes: Virtual and physical. The virtual part ranges from applications such as electronic health record systems to neural network-based guidance in treatment decisions. The physical part deals with robots assisting in performing surgeries, intelligent prostheses for handicapped people, and elderly care.

Computers learn the art of diagnosing a patient via two broad techniques - flowcharts and database approach. The flowchart-based approach involves translating the process of history-taking, i. e. a physician asking a series of questions and then arriving at a probable diagnosis by combining the symptom complex presented. This requires feeding a large amount of data into machine-based cloud networks considering the wide range of symptoms and disease processes encountered in routine medical practice. The outcomes of this approach are limited because the machines are not able to observe and gather cues which can only be observed by a doctor during the patient encounter.

The database approach utilizes the principle of deep learning or pattern recognition that involves teaching a computer via repetitive algorithms in recognizing what certain groups of symptoms or certain clinical/radiological images look like. An example of this approach is the Google's artificial brain project launched in 2012.

AI is already being utilized in the medical field, ranging from online scheduling of appointments, online check-ins in medical centers, digitization of medical records, reminder calls for follow-up appointments and immunization dates for children and pregnant females to drug dosage algorithms and adverse effect warnings while prescribing multidrug combinations.

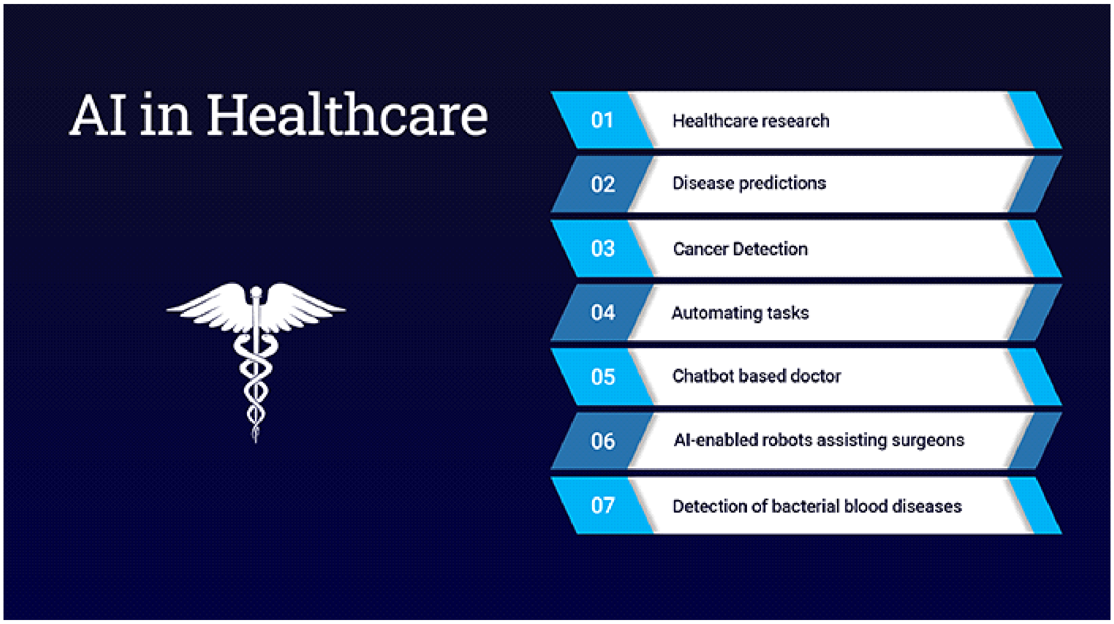

Figure 1. Applications of AI in Healthcare

Result and Discussion

Recent advances in AI technology and its current applications in the field of medicine have been discussed in detail**.** This descriptive article gives a broad overview of AI in medicine, dealing with the terms and concepts as well as the current and future applications of AI. It aims to develop knowledge and familiarity of AI among primary care physicians.AI is growing into the public health sector and is going to have a major impact on every aspect of primary care. AI-enabled computer applications will help primary care physicians to better identify patients who require extra attention and provide personalized protocols for each individual.

Robotics

The DaVinci robotic surgical system developed by Intuitive surgicals has revolutionized the field of surgery especially urological and gynecological surgeries. The robotic arm of the system mimics a surgeon's hand movements with better precision and has a 3D view and magnification options which allow the surgeon to perform minute incisions.

Fit bit , Apple, and other health trackers can monitor heart rate, activity levels, sleep levels, and some have even launched ECG tracings as a new feature. All these new advances can alert the user regarding any variation and let the doctor have a better idea of the patient's condition. AI for their healthcare system analysis - detecting mistakes in treatment, workflow inefficiencies to avoid unnecessary hospitalizations. Apart from the inventions which already exist, there are certain advances in various phases of development, which will help physicians be better doctors. This will be equipped to efficiently identify symptoms of heart disease and cancer. Stanford University is making a program AI-assisted care (PAC). PAC has intelligent senior wellbeing support system and smart ICUs, which will sense any behavioral changes in elderly people living alone and ICU patients.

Figure 2. Wearables (smart watches)

Wearables such as smart-watches, clothes, and shoes are already trending. Researchers and manufacturers are looking to benefit from this trend by making it available for both everyday use and clinical-grade applications. AI engines are being integrated into the products' health solutions to capture the health insights of an individual.

Radiology

Artificial intelligence has become the buzz word in radiology. Simply put artificial intelligence in radiology means what computers understand, interpret, and label medical diagnostic images after learning from examples. The roots of this belief lie in the fact that radiology is more a science of perception where in due course these perceptive algorithms would get better than humans and we would be better off training these algorithms than the human radiologist.

The statement would literally mean a medical imaging world where the "artificial intelligence powered radiology robots" would be working round the clock all 365 days a year to report the most complex radiological investigations accurately at a breathtaking pace in cranky basements without getting fatigued, distracted, or bored by the monotonous nature of the work and also without demanding leaves or pay hikes. One of the most important way to clear the backlog would be the concept of "triaging" where the artificial intelligence software would decide which scans should be on top of the radiologist's list for reporting and also raising alarms on the scans with critical findings which would warrant immediate confirmation with the attending radiologist. Artificial intelligence can help radiologists by rapidly analyze images and data registries, achieve better understanding of patient's condition, increase their clinical role, and become a part of the core management team. In fact, the question is not about replacing the radiologists, but artificial intelligence has the potential to improve the capabilities, efficiency, and accuracy of radiologists and improve patient outcome by intelligent protocol of imaging equipments to reduce unnecessary imaging studies.

Figure 3. AI in Robotics

Next important issue is trust. When a machine sends out a report, will the patients just trust and get their medical and surgical interventions done based on the results. Patients invariably come and ask the doctor what does the report mean, what can be alternate diagnoses, and what treatments can be planned based on it.

Dermatology

Skin cancer, the most common human malignancy, is primarily diagnosed visually, beginning with an initial clinical screening and followed potentially by dermoscopic analysis, a biopsy and histopathological examination. Deep convolutional neural networks (CNNs) show potential for general and highly variable tasks across many fine-grained object categories. We test its performance against 21 board-certified dermatologists on biopsy-proven clinical images with two critical binary classification use cases: keratinocyte carcinomas versus benign seborrheic keratoses; and malignant melanomas versus benign nevi. The first case represents the identification of the most common cancers, the second represents the identification of the deadliest skin cancer.

Early detection is critical, as the estimated 5-year survival rate for melanoma drops from over 99% if detected in its earliest stages to about 14% if detected in its latest stages. Previous work in dermatological computer-aided classification has lacked the generalization capability of medical practitioners owing to insufficient data and a focus on standardized tasks such as dermoscopy and histological image classification, Dermoscopy images are acquired via a specialized instrument and histological images are acquired via invasive biopsy and microscopy; whereby both modalities yield highly standardized images. Photographic images (for example, smartphone images) exhibit variability in factors such as zoom, angle and lighting, making classification substantially more challenging. They have developed a computational method which may allow medical practitioners and patients to proactively track skin lesions and detect cancer earlier. By creating a novel disease taxonomy, and a disease-partitioning algorithm that maps individual diseases into training classes, we are able to build a deep learning system for automated dermatology. Many previous techniques require extensive preprocessing, lesion segmentation and extraction of domain-specific visual features before classification. By contrast, our system requires no hand-crafted features; it is trained end-to-end directly from image labels and raw pixels, with a single network for both photographic and dermoscopic images.

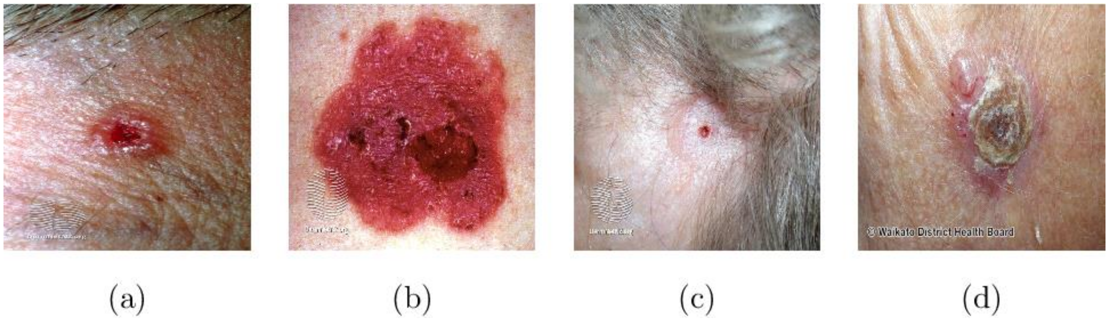

Figure 4. Illustration of intra-class dissimilarities in BCC (a) Nodular BCC (b) Superficial BCC (c) Morphoeic BCC (d) Basosquamous BCC

Skin cancers

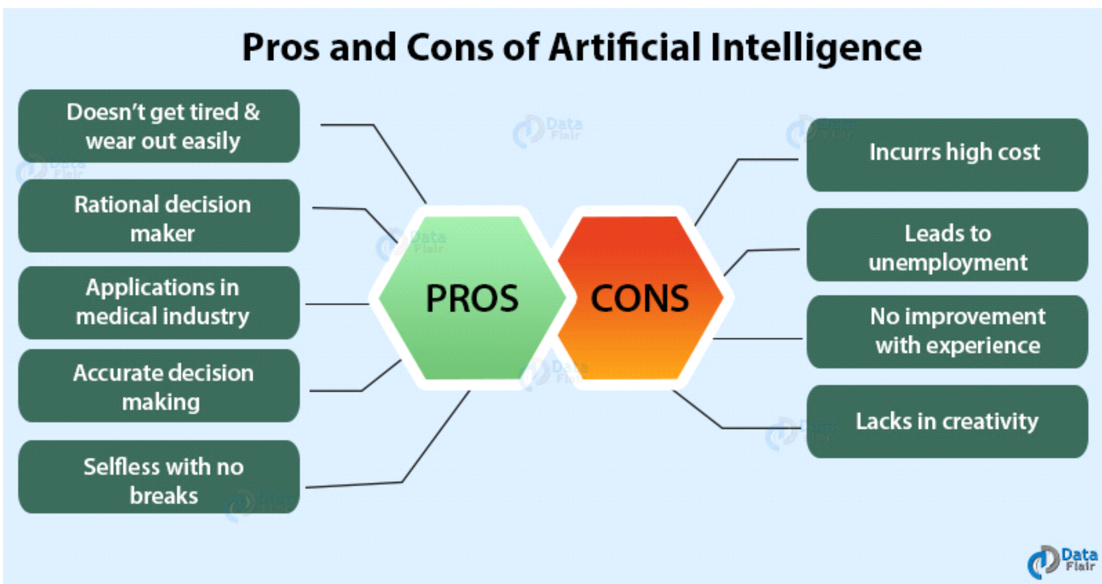

Figure 5. Advantages and disadvantages of AI

Conclusion

Artificial intelligence is definitely improving the healthcare industry. From Predictive medical care and more accurate diagnosis to motivating the patients o take care of health AI will certainly continue enhancing the patient experience and healthcare expertise in general.
AI promises to changes the practice of medicine in hitherto unknown ways, but many of its practical applications are still in their infancy and needed to be explored and developed better.
Medical professional also need to understand and acclimatize healthcare delivery to the masses.
AI is the centre of a new enterprise to build computational models of intelligence can be represented in terms of symbols structure and symbolic operations which can be programmed in a digital computer.

Summary

Key challenges are abbreviated as the RISE criteria: Regulatory aspects, Interpretability, interoperability, and the need for sstructured data and Evidence. As reoccurring barriers of AI adoption, these concepts are delineated and complemented by points to consider and possible solutions for effective and safe use of AI applications. Artificial intelligence research on dialysis is still in an early stage, and the main challenge relies on interpretability and/or comprehensibility of data models when applied to decision making. Artificial neural networks and medical decision support systems have been used to make predictions about anemia, total body water, or intradialysis hypotension and are promising approaches for the prescription and monitoring of hemodialysis therapy. Current dialysis machines are continuously improving due to innovative technological developments, but patient safety is still a key challenge. Real-time monitoring systems, coupled with automatic instantaneous biofeedback, will allow changing dialysis prescriptions continuously. The integration of vital sign monitoring with dialysis parameters will produce large data sets that will require the use of data analysis techniques, possibly from the area of machine learning, in order to make better decisions and increase the safety of patients.

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