

Opportunities Arise in the Middle of the Crisis



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World is Changing

COVID-19 has spread globally and quite rapidly since it was reported as a global health emergency and identified as a pandemic

Urgent need to assess its impact on diseases and the treatment of colorectal disorders

When treating a patient, this individual might have no infection, have an infection not yet diagnosed or a detected infection

In addition to care to avoid contamination of the team and the patient, we must take into account the need to change some criteria for surgical indications or even operative procedures







Pressure on Healthcare systems









What do we need?

- Save time for doctors as they are involved in other healthcare tasks
- Decrease contact between doctor and patients
- Easier way to predict complications
- More accurate diagnosis to avoid extra-cost from mis diagnosis







New generations of medical technology



Converging technologies







What is Artificial Intelligence

- Definition--"Use of a computer to model intelligent behaviour with minimal human intervention"
- Machines & computer programs are capable of problem solving and learning, like a human brain
- Natural Language Processing ("NLP") and translation,
 - Pattern recognition
 - Visual perception
 - Decision making







The application of **AI in medicine** has two main branches: A) Virtual branch B) Physical branch.

- Highly repetitive work
- Empower doctors
 - help them deliver faster and more accurate
- Augment the professionals, offering them expertise and assistance.
- Replace personnel and staffing in medical facilities, particularly in administrative functions,
- Managing wait times & automating scheduling
- "Deep-learning devices will not replace clinicians









Musk, Zuckerberg clash over AI future

San Francisco: In the ongoing spat between two tech honchos, founder and CEO of SpaceX Elon Musk has hit back at Facebook CEO Mark Zuckerberg, saying the internet entrepreneur's understanding of artificial intelligence (Al) is 'limited'.

"Tve talked to Mark about this (AI). His understanding of the subject is limited," Musk tweeted on Monday.

The tweet came after Zuckerberg, during a Facebook livestream last week, castigated Tesla founder Musk for arguing that care and regulation was needed to safe-mond the future if A Lba



I think people who are naysayers and try to drum up these doomsday scenarios — I just, I don't understand it. It's really negative... irresponsible. In the next five to 10 years, AI is going to deliver so many improvements in the quality of our lives

I have exposure to the very cutting-edge AI and I think people should be concerned about it. I've talked to Mark about this (AI). His understanding of the subject is limited

ELÓN MUSK | FOUNDER AND CED OF SPACEK

said during the livestream: "I think people who are naysayers and try to drum up these documentary comparior led its progress the "biggest risk we face as a civilisation". "AI is a rare case where managed to be projective in re-

AI. Inspired by 'iron Man's' AI "Jarvis" and his capabilities, he has coded and developed his own "Jarvis" to run his home.

During the recent livestream session with his fans, he observed that AI would be "responsible for such lifesaving services as diagnosing diseases and driving cars". "One of the top causes of death for people is car accidents still and if you can eliminate that with AI, that is going to be just a dramatic improvement," he said.

The war of words between the two top CEOs is not new. I act work when a SpaceX sbook



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Editorial

The rise of artificial intelligence and the uncertain future for physicians

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Artificial intelligence in medicine : The virtual branch

The virtual component is represented by Machine Learning, which is using mathematical algorithms that improve learning through experience.

Three types of machine learning algorithms:

- 1. Unsupervised (ability to find patterns)
- 2. Supervised (classification and prediction algorithms based on previous examples)
- **3.** Reinforcement learning (use of sequences of rewards and punishments to form a strategy for operation in a specific problem space)

















ARTIFICIAL INTELLIGENCE

Any technique that enables machines to mimic human intelligence or behavioral patterns

MACHINE LEARNING

A subset of AI algorithms that enables systems to learn automatically and improve at tasks from experience by using statistical methods







Machine Learning

- Advantage of Machine
 - Can retain information
 - **Becomes smarter over time**
 - Machine is not susceptible to Sleep deprivation, distractions, information overload and short-term memory loss







Artificial intelligence in medicine: The physical branch

It includes:

- Physical objects,
- Medical devices
- Sophisticated
 robots for
 delivery of care









Use of robots to deliver treatment -Robotic surgery



Use of robots to monitor effectiveness of treatment

















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Growth drivers of AI in healthcare

- Increasing individual healthcare expenses
- Larger Geriatric population
- Imbalance between health workforce and patients
- Increasing Global Health care expenditure
- COVID 19









Growth drivers of AI in healthcare

- Continuous shortage of nursing and technician staff.
 The number of vacancies for nurses was 1.2 million in 2020
- AI is and will help medical practitioners efficiently achieve their tasks with minimal human intervention, a critical factor in meeting increasing patient demand







Benefits of AI

- AI can definitely assist physicians
 - Clinical decision making
 - Replace human judgement in certain functional areas (eg, radiology).
 - Up-to-date medical information from journals, textbooks and clinical practices
 - Experienced vs fresh Clinician
 - 24x7 availability of expert









Benefits of AI

- Early diagnosis , Prediction of outcome of the disease as well as treatment & Feedback
- Reduce diagnostic and therapeutic errors
- Increased patient safety and Huge cost savings
- AI system extracts useful information from a large patient population
- Assist making real-time inferences for health risk alert and health outcome prediction
- Learning and self-correcting abilities







Potential challenges

- Development costs
- Integration issues
 - Ethical issues
 - Reluctance among medical practitioners to adopt AI
 - Fear of replacing humans
- Data Privacy and security
 - Mobile health applications and devices that use AI
 - Lack of interoperability between AI solutions







Potential challenges

- Data exchange
 - Need for continuous training by data from clinical studies
 - Incentives for sharing data on the system for further development and improvement of the system
 - Medicolegal regulations
- Rapid and iterative process of software updates commonly used to improve existing products and services















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Review Article Application of artificial intelligence to the diagnosis and therapy of colorectal cancer

Yutong Wang^{1*}, Xiaoyun He^{1,2*}, Hui Nie¹, Jianhua Zhou¹, Pengfei Cao³, Chunlin Ou¹

- AI application during colonoscopy
- AI application in pathological biopsy
- AI application in blood tests and other tests
- AI application in clinicopathological feature analysis
- AI application combined with non-coding RNAs (ncRNAs) in CRC diagnosis
- AI application in CRC surgery
- AI application in CRC chemotherapy
- AI application in the personalization and precision of CRC
- Artificial intelligence and predicted colorectal cancer prognosis







U.S. FDA Grants De Novo Clearance for First and Only Artificial Intelligence System for Colonoscopy; Medtronic Launches GI Genius[™] Intelligent Endoscopy Module **Medtronic**







GI Genius module

- Uses advanced AI to highlight the presence of precancerous lesions with a visual marker in real-time
- It processes images using advanced algorithms that can identify and mark abnormalities consistent with polyps, including small flat polyps that might otherwise go undetected by the human eye
- 14% absolute increase in ADR compared to colonoscopy alone for both flat) and polyploid lesions, thus increasing accuracy and reducing the rise of interval cancers between colonoscopies







Computer-aided detection (CADe) system using artificial intelligence (AI) to identify colorectal polyps. The module, compatible with any colonoscope video, provides physicians with a powerful new solution in the fight against colorectal cancer









NEC technology determines if colorectal lesions are neoplastic



Med Tech Innovation







AI application in pathological biopsy

- Pathological biopsy is necessary for the diagnosis of CRC
- Results are typically subjective assessments based on the past experience and knowledge of pathologists.
- The application of AI technology can automatically classify and diagnose biopsy samples, significantly improving the accuracy of diagnosis while reducing time and costs









Artificial Intelligence in Colorectal Cancer Screening, Diagnosis and Treatment. A New Era

Athanasia Mitsala ^{1,*}, Christos Tsalikidis ¹, Michail Pitiakoudis ¹, Constantinos Simopoulos ¹ and Alexandra K. Tsaroucha ²



Figure 2. A convolutional neural network (CNN) design for colorectal polyp classification. CNN is a multilayer artificial neural network typically composed of three types of layers; convolution, pooling, and fully connected layers. Feature extraction from an input image is performed from the first two layers. The fully connected layers are used to map these features into a final output, CNN, convolutional neural network.





Applicable in?

- Colonoscopy
- Virtual colonoscopy
- Capsule endoscopy
- Laser-Induced Fluorescence Spectroscopy (LIFS)
- Autofluorescence Endoscopy (AFE)
- Magnifying Chromoendoscopy
- Confocal Laser Endomicroscopy
- Magnification Endoscopy with Narrow-Band Imaging (NBI)







Neural networks

- Gregor et al. designed and trained a convolutional neural network (CNN) system to improve the adenoma detection rate (ADR) for colonoscopy
- Collected 8,641 representative marked images from more than 2,000 colonoscopy results for machine learning and tested their system's predictive capabilities on 20 sets of colonoscopy results
- Their assistant system achieved a cross-validation accuracy of 96.4%









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Pathological biopsy:

Biopsy pre-screening Nuclei detection Tissue annotation...

Colonoscopy:

Navigation Polyps classification Measurement and segmentation...



Surgery:

Artificial

Chemotherapy: NamiRobot drug G navigation Treatment Multi-targeted drugs TCM diagnoses... Personalization and precision: \$ Watson for Oncology (WFO) **Clinical management** Personalized drug targets... Prognosis OS\DFS\recurrence survival rate tumor-stroma ratio (TSR) New prognostic markers

Metastasis diagnosis...









Conclusions

- The integration of AI applications in screening, diagnosis, and treatment of CRC may improve clinical outcomes and prognosis for the patients
- In recent years, deep learning techniques are further applied in clinical cancer research
- AI is considered a valuable tool in transforming the future of healthcare and precision oncology







Conclusions

- Computer-aided systems can provide physicians with assistance in detecting and diagnosing precancerous lesions or early-stage CRC
- Several novel algorithms have shown promising results for defining management pathway of CRC
- However, additional prospective, large-scale, multicenter clinical trials are required to evaluate the diagnostic and management accuracy of AI systems







The best way to predict the future is to create it.

Peter Ducker

fancu

















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Thank you

