AI in Healthcare



AI in Gastroenterology



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1-آیا ماشین های هوشمند ترسناکند ؟

2- تا کنون چقدر از هوش مصنوعی در زندگی روزمره مان استفاده کرده ایم ؟

3-کاربرد هوش مصنوعی درپزشکی و رشته گوارش و کبد .

4- کدام کشورها کاربرد هوش مصنوعی در ابزار پزشکی را رسما تایید کرده اند ؟

5- آیا ماشینهای هوشمند جایگزین متخصین گوارش می شوند ؟



Objectives

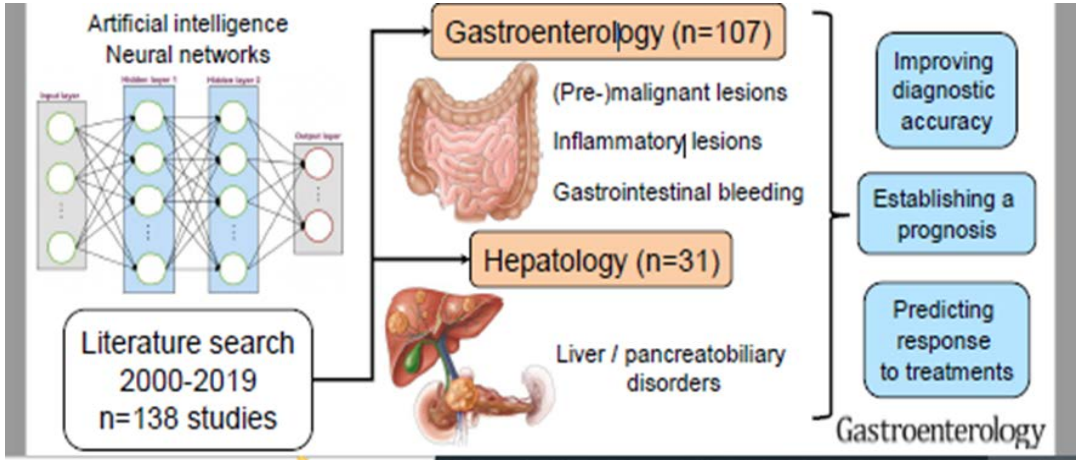
Source of the presentation ;

- The Applications of Artificial Intelligence in Digestive System Neoplasms: A Review . *https://doi.org/10.34133(2023) .*

- Artificial Intelligence in Inflammatory Bowel Disease Endoscopy: Advanced Development and New Horizons. *doi.org/10.1155/2023/3228832 (2023).*

- Application of artificial intelligence in gastrointestinal disease: a narrative review. *doi: 10.21037/atm-21-3001 (2021).*

- Applications of Artificial Intelligence for the Diagnosis of Gastrointestinal Diseases. *https://doi.org/10.3390/diagnostics11091575 (2021).*



Declare



History of AI initiation and progress.

- ✓ In the 1950s, the concept of artificial intelligence (AI) was first proposed at the Dartmouth Conference, with the aim to create complex machines that simulate cognitive traits of the working human brain.

- ✓ The Dartmouth Summer Research Project on Artificial Intelligence was a 1956 summer workshop widely considered to be the founding event of AI as a field.

- ✓ The Dartmouth AI Conference | September 29, 2023.
- ✓ Generative AI Week - Atlanta, GA | October 17-18, 2023. https://www.aidataanalytics.network

AI: Past, Present, Future [edit]

- John McCarthy, What Was Expected, What We Did, and AI Today
- Marvin Minsky, The Emotion Machine

The Future Model of Thinking [edit]

- Ron Brachman and Hector Levesque, A Large Part of Human Thought
- David Mumford, What is the Right Model for 'Thought'?
- Stuart Russell, The Approach of Modern AI[5]

The Future of Network Models [edit]

- Geoffrey Hinton & Simon Osindero, From Pandemonium to Graphical Models and Back Again
- Rick Granger, From Brain Circuits to Mind Manufacture

The Future of Learning & Search [edit]

- Oliver Selfridge, Learning and Education for Software: New Approaches in Machine Learning
- Ray Solomonoff, Machine Learning — Past and Future [6]
- Leslie Pack Kaelbling, Learning to be Intelligent

Future Interactions with Intelligent Machines [edit]

- Daniela Rus, Making Bodies Smart
- Sherry Turkle, From Building Intelligences to Nurturing Sensibilities

Selected Submitted Papers: Future Strategies for AI [edit]

- J. Storrs Hall, Self-improving AI: An Analysis[9]
- Selmer Bringsjord, The Logicist Manifesto[10]
- Vincent C. Müller, Is There a Future for AI Without Representation?[11]
- Kristinn R. Thórisson, Integrated A.I. Systems[12]

Selected Submitted Papers: Future Possibilities for AI [edit]

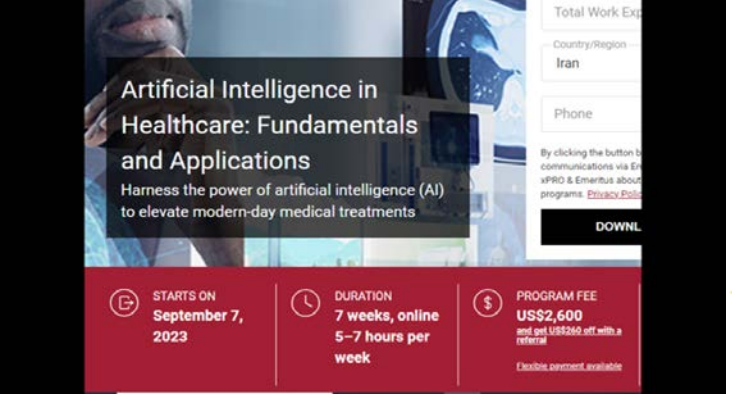
- Eric Steinhart, Survival as a Digital Ghost[13]
- Colin T. A. Schmidt, Did You Leave That 'Contraption' Alone With Your Little Sister?[14]
- Michael Anderson & Susan Leigh Anderson, The Status of Machine Ethics[15]
- Marcello Guarini, Computation, Coherence, and Ethical Reasoning[16]

-AI in health care as a master since 2023 !

-How many university give the master ??

-Which medical fields are impacted by AI ?





COURSE CURRICULUM

the duration of this online program, you'll work your way through the following modules:

Module 1: AI and Machine Learning — Applications and Foundations
Become familiar with supervised machine learning and the types of problems it may be applied to.

Module 2: Using AI for Disease Diagnosis and Patient Monitoring
Examine real-world applications of AI for diagnosis and patient monitoring.

Module 3: Natural Language Processing and Data Analytics in Health Care
Use AI to extract value-adding outcomes from medical literature and pathology reports.

Module 4: Interpretability in Machine Learning — Benefits and Challenges
Appreciate the importance and benefits of interpretable algorithms.

Module 5: Patient Risk Stratification and Augmenting Clinical Workflows
Discover how AI can be applied to health care interventions and patient care.

Module 6: Taking An Integrated Approach to Hospital Management and Optimization
Investigate a holistic approach to optimizing health care processes.



Table 2 Selected Areas in Medicine Where Machine Learning Has High Potential and Implications

Field	Application
Clinical	Disease prediction and diagnosis
	Treatment effectiveness and outcome prediction
Translation	Drug discovery and repurposing
	(*In Silico*) Clinical trial
Public health	Epidemic outbreak prediction
	Precision health



Current applications of artificial intelligence in health care

Technology	Application scheme	Application area
Robotics	Provide high-quality treatment by improving the precision and accuracy of the surgical procedures.	Medical device, Health IT
Digital secretary	Find the golden hour of appropriate intervention by continuously monitoring the patient condition indicators and alerting the nurse when necessary.	Medical device, Health IT
Machine learning	Predict and analyze patterns based on the data affecting treatment results. Reduce the uncertainty in the medical treatment decision-making by processing large volumes of diagnostic medical images through self-learning.	Diagnostic medical image, Health IT
Image processing	Quickly process large amounts of medical images and apply the findings in judging the disease type and negative and positive test results.	Diagnostic medical image, Health IT
Natural language processing	Convert long unstructured text data, such as medical charts, to be easily read and interpreted.	Medical device, Health IT
Voice recognition	Capture patient voice and language and store important information in electronic medical records.	Medical device, Health IT
Statistical analysis	Predict patient treatment results through rapidly analyzing large amounts of patient health record data.	Medicine, Health IT
Big data analysis	Provide personalized recommendations to the patients and therapeutics by processing large amounts of data maintained by healthcare institutions.	Medicine, Health IT
Predictive modeling	Predict treatment outcomes, such as predicting risky diseases, by applying mathematical models.	Medicine, Health IT

AI in GI Diseases

Field	Disease	Topic Investigated
ESOPHAGUS	*BE*	• Detection of dysplasia
	EAC	• Detection of lesions • Depth of invasion
	ESCC	• Detection of lesions • Depth of invasion • Prediction of lymph nodal invasion • Guide for radiotherapy treatment • Prediction of treatment response • Prediction of risk of recurrence
STOMACH	*HP*	• Prediction of infection
	CAG	• Detection
	GIM	• Detection
	GC	• Detection • Dept of invasion • Prediction of recurrence
LOWER GI TRACT	*UC*	• Diagnosis • Disease activity evaluation
	CD	• Ulcer detection • Ulcer severity grading
	PCL	• Detection • Characterization

Legend: BE, Barrett's esophagus; EAC, esophageal adenocarcinoma; ESCC, esophageal squamous cell carcinoma; HP, Helicobacter pylori; CAG, chronic atrophic gastritis; GIM, gastric intestinal metaplasia; GC, gastric cancer; UC, ulcerative colitis; CD, Crohn's disease; PCL, precancerous colonic lesions; GI, gastro-intestinal.



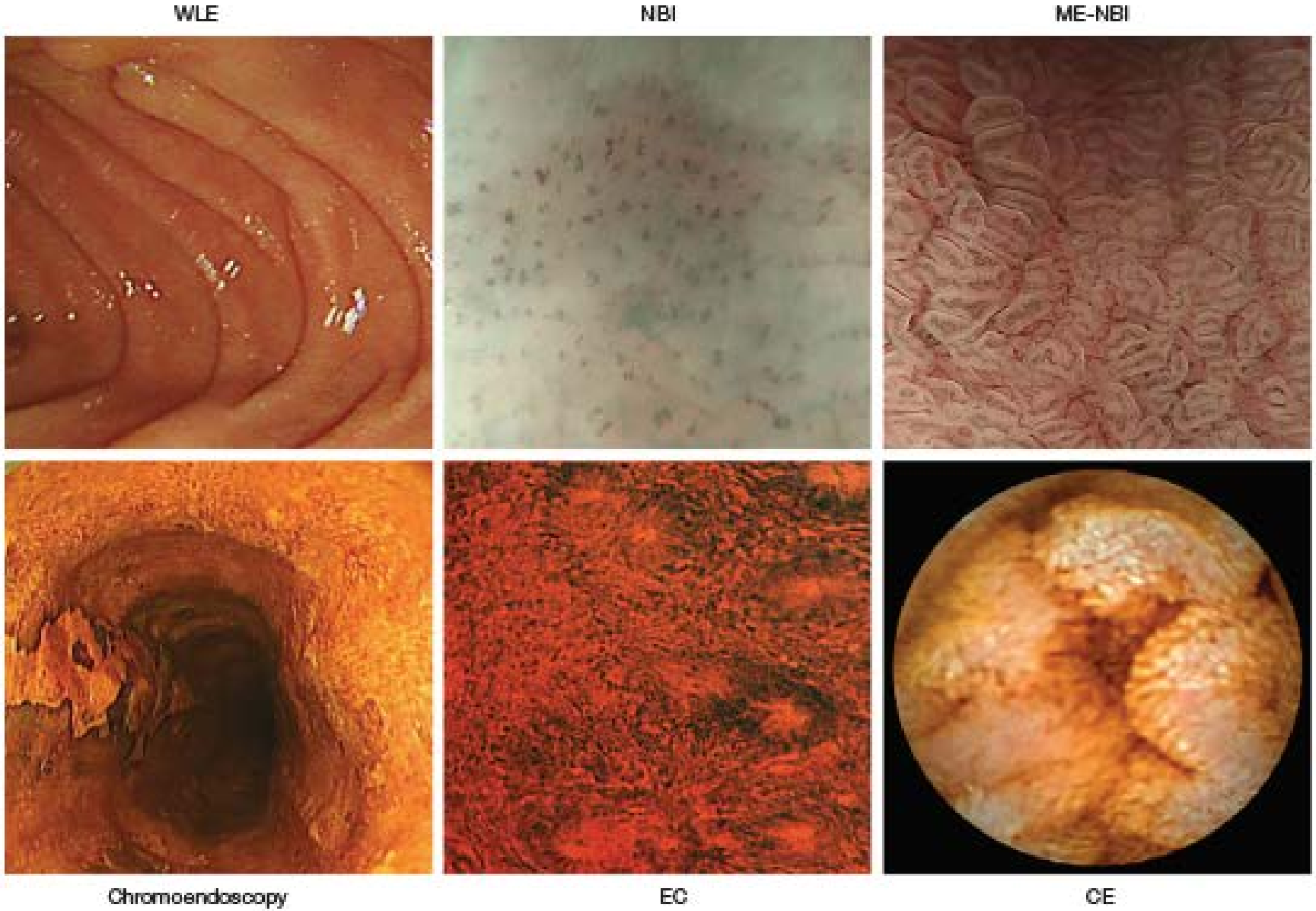


Figure 1 Endoscopy images often used to develop artificial intelligence models. WLE, white light endoscopy; NBI, narrow band imaging; ME-NBI, magnifying endoscopy with narrow band imaging; EC, endocytoscopy; CE, capsule endoscopy. Reprinted, with permission, from (7).

Application of AI in medical images of GI and liver cancers (2023)

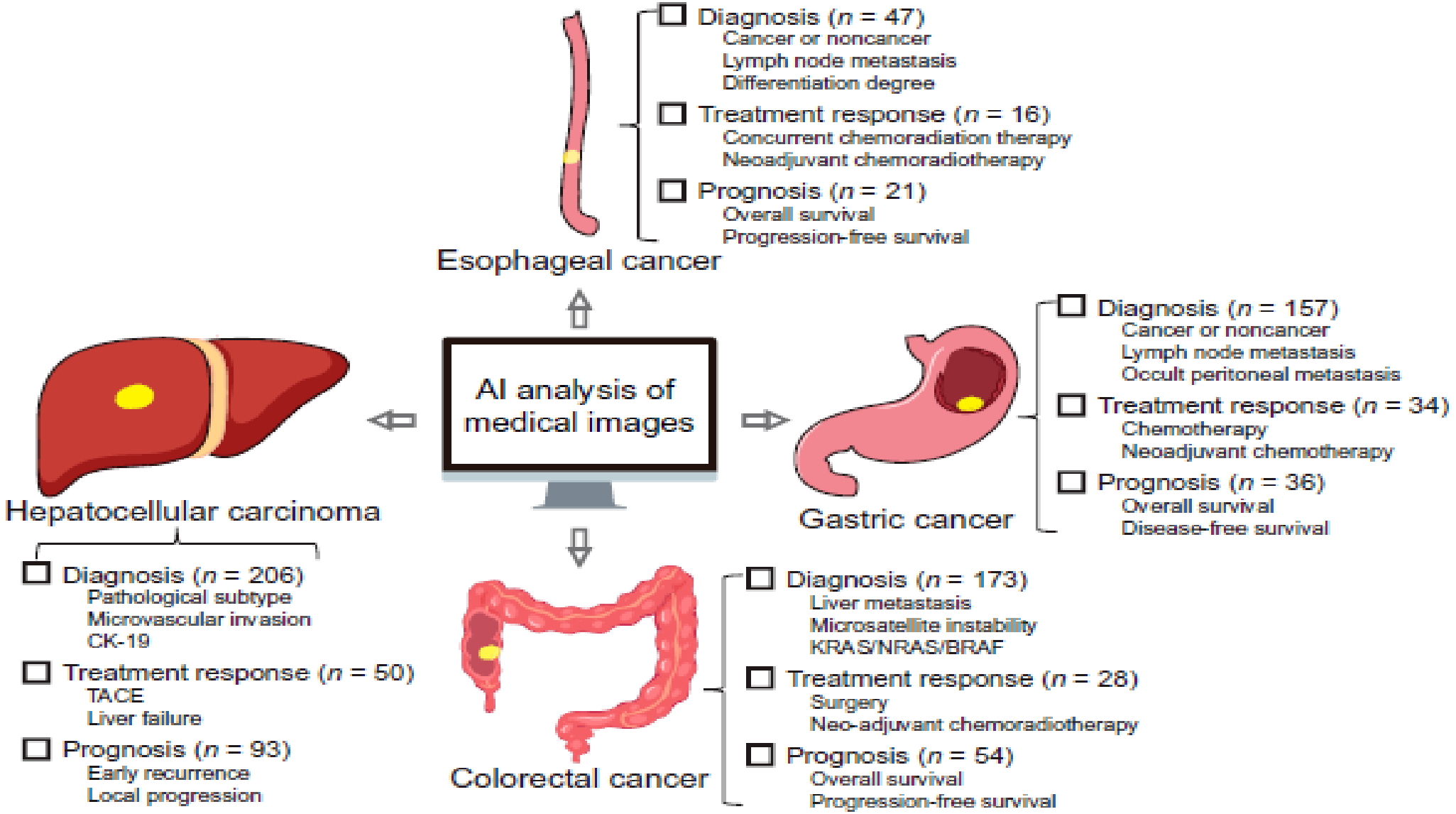


Fig. 3. The representative applications of AI in digestive system neoplasms. AI, artificial intelligence ; TACE, transarterial chemoembolization; KRAS, Kirsten rat sarcoma viral oncogene homolog; NRAS, neuroblastoma rat sarcoma viral oncogene homolog; BRAF, v-Raf murine sarcoma viral oncogene homolog B.

Table 1: Endoscopic AI applications in diagnosing UC.

Author	Year	Data source	Purpose	Results
Sutton et al.	2022	851 images of UC patients	To differentiate UC from other intestinal diseases and to evaluate the severity of UC endoscopic ulcers	The accuracy (87.50%) and area under the curve (AUC, 0.90)
Takenaka et al.	2020	40,758 images of endoscopies and 6,885 biopsy outcomes of 2012 UC patients	To create a deep neural network system for analyzing endoscopic images of UC patients	The remission in endoscopy with 90.1% accuracy (95% and 89.2–90.9%)
Najarian et al.	2021	Video of the clinical trial set with 51 high resolution and 264 tests	To trial a fully automated video system for analyzing and grading endoscopic disease in UC	Automated Mayo endoscopic subscores (MES) scoring of clinical trial videos correctly differentiated between remission and active disease in 83.7% of cases
Gottlieb et al.	2021	795 full-length endoscopy videos of 249 patients	To verify a deep learning, algorithm can be trained to predict levels of UC severity from full-length endoscopy videos	(0.787–0.901) for endoscopic Mayo Score (eMS) and 0.855 (95% confidence interval, 0.80–0.91) for UCEIS
Bossuyt et al.	2020	29 consecutive patients with UC and 6 healthy controls	To develop an operator- independent computer-based tool to determine UC activity based on endoscopic images	RD correlated with Robarts histological index (RHI) ($r = 0.74$, $p < 0.0001$), MES ($r = 0.76$, $p < 0.0001$), and UC endoscopic index of severity scores ($r = 0.74$, $p < 0.0001$)

Table 2: Endoscopic AI applications in diagnosing CD.

Author	Year	Data source	Purpose	Results
Ding et al.	2019	4,206 abnormalities in 3,280 patients	To analyze SB-CE images with greater accuracy and sensitivity than conventional methods	99.88% sensitivity in the per-patient analysis (95% confidence interval [CI], 99.67–99.96)
Aoki et al.	2019	113,426,569 images from 6,970 patients	To develop a CNN-based algorithm that could automatically detect erosions and ulcers from capsule endoscopic images	With 99.88% sensitivity in the per-patient analysis (95% CI, 99.67–99.96) and 99.90% sensitivity in the per-lesion analysis (95% CI, 99.74–99.97)
Klang et al.	2019	17,640 CE images from 49 patients	To evaluate a deep learning algorithm for the automated detection of small-bowel ulcers in Crohn's disease (CD) on capsule endoscopy (CE) images	AUCs (area under the curve of 0.99 and accuracies ranging from 95.4–96.7%
Klang et al.	2021	27,892 CE images	To prove the ability of deep neural networks to identify intestinal strictures on CE images of Crohn's disease (CD) patients	A differentiation between strictures and normal mucosa (area under the curve [AUC], 0.989)
Barash et al.	2021	17,640 CE images from 49 patients	To develop a deep learning algorithm for automated grading of CD ulcers on CE	The accuracy of the algorithm was 0.91 (95% CI) for distinction of 3 different grades

Conclusion

- ✓ AI technologies are expected to bring innovations to the existing medical technologies . The currently available AI-based health care technologies have shown outstanding results in accurately diagnosing and classifying patient conditions and predicting the course of diseases by using the accumulated medical data.

- ✓ Increasing the taring number size , decreasing hidden learning layers , establishment of standardized guidelines, and systematic improvements , and general public awareness of AI, will be required in the future in addition to the technological advancements.

- ✓ Safety and security , Ethical , Legal and Societal concerns included .


THANK YOU FOR YOUR ATTENTION