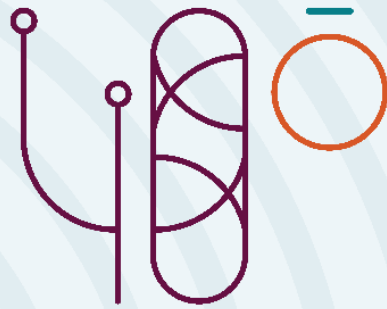




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COMISSÃO DE TRABALHO DE
TÉCNICAS ENDOSCÓPICAS

**NOVAS FERRAMENTAS NA
PNEUMOLOGIA DE INTERVENÇÃO**

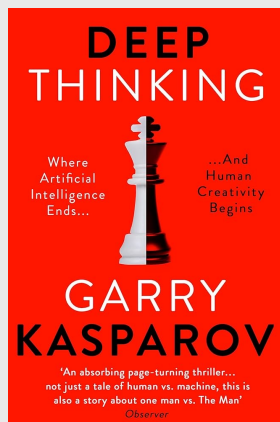
**Inteligência artificial na
Pneumologia de Intervenção**



Helder Novais e Bastos



- Campeão Mundial de Xadrês
- Enorme conhecimento de xadrês
- Joga com **intuição** e é capaz de avaliar o seu oponente
- **É capaz de aprender com seus erros**
- **Pode adaptar o seu jogo a qualquer instante**



- Enorme capacidade de cálculo calcula **200.000.000 posições de xadrez/segundo**
- Menor conhecimento de xadrez
- Não se adapta
- **Não é afectado por estímulos externos**



O que é a inteligência artificial (IA)?

Como funciona a IA?

Quais as suas aplicações na pneumologia de intervenção (nas diferente etapas)?

Como otimizar o treino e simulação através de IA?



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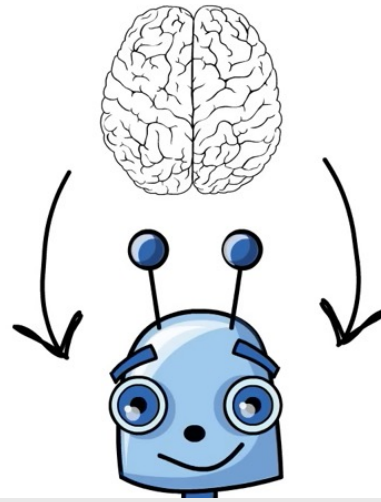
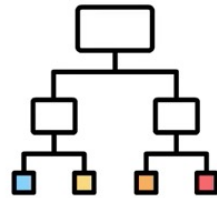
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IA

Algoritmos



Modelos matemáticos

$$f(x)$$

Adaptado de ©Simplilearn

Dados +
modelos/algoritmos



Assimilação de
dados



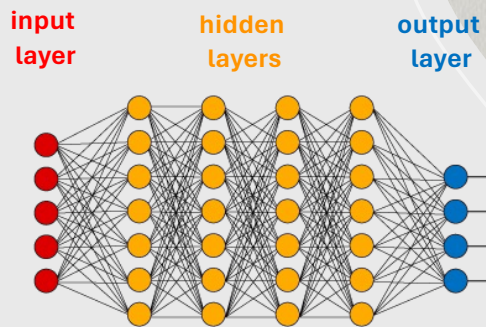
Modelos evoluem



Melhoram a
previsão

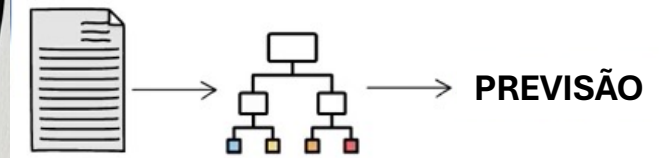
IA

- *Natural Language Processing / Large Language Models*
- *Machine vision*
- Texto $\rightleftharpoons$ Discurso
- Locomoção (robotização)



Deep Learning

Machine Learning

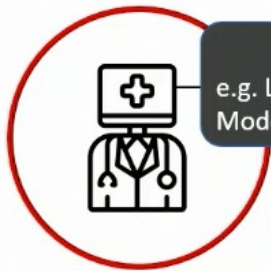


IA

- Generalized learning
- Reasoning
- Problem solving



- Adapt
- Reason
- Provide solutions



GenAI
e.g. Large Language Model (LLM)

Conclusions:

ChatGPT marks a significant improvement in natural language processing in medical question answering. In the **Step-1 data set**, we show that the **medical student**. Additional context across the majority of potential applications of ChatGPT.

JMIR Med Educ 2023;9:e4

NEJM AI

PERSPECTIVE

Use of GPT-4 to Diagnose Cases

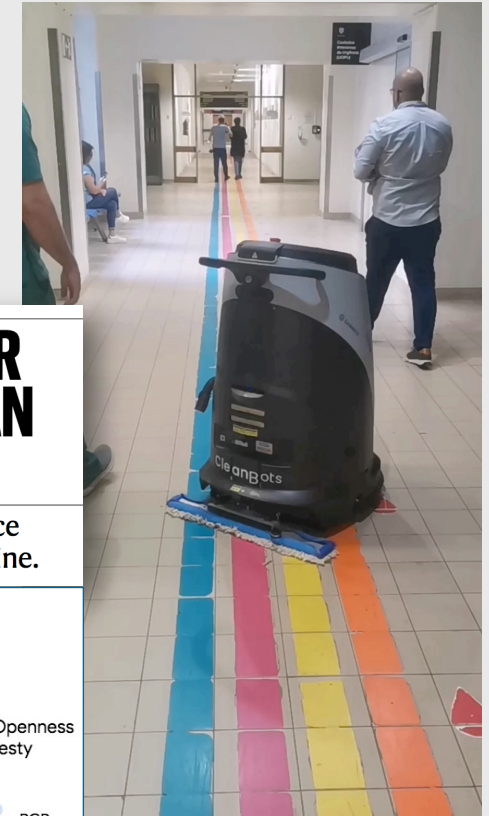
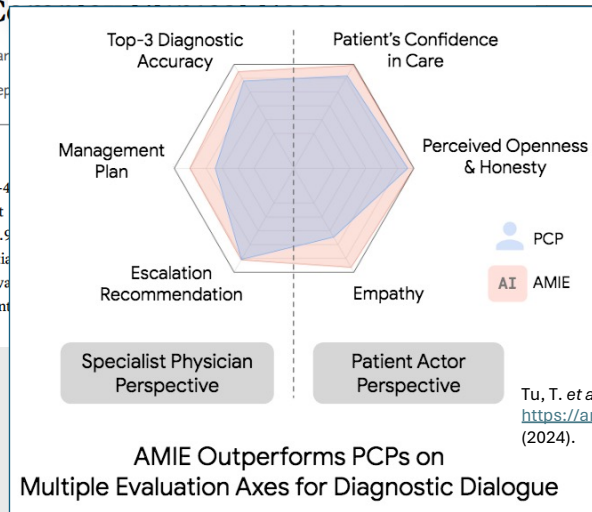
Alexander V. Eriksen , M.D.,^{1,2} Sören Möller , M.Sc., Ph.D.,^{3,4} and others
Received: July 10, 2023; Revised: September 15, 2023; Accepted: September 20, 2023

Abstract

We assessed the performance of the newly released AI GPT-4 on medical case challenges and compared the success rate to that of human experts. **GPT-4 correctly diagnosed 57% of cases**, outperforming 99.5% of human readers generated from online answers. We highlight the potential of GPT-4 as a supportive tool for diagnosis; however, further improvements, validation, and ethical considerations are needed before clinical implementation can be obtained for this study.)

GOOGLE AI HAS BETTER BEDSIDE MANNER THAN HUMAN DOCTORS

Researchers say their artificial-intelligence system could help to democratize medicine.



Surgical Robots, Telerobotic System



Da Vinci

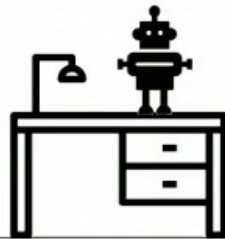


Monarch | Ion
Robotic bronchoscopy

Assistive Robot, Socially Assistive Robot, Services Robots



Spot



Moxie



ElliQ



Sphero



NAO



Kirobo



Paro



Lovot



Pepper



Care-O-bot 4

Humanoid Robot



When GenAI is embedded in a human-like robot, the robot is able to 'speak' with human like an actual human.



AMECA



Nadine



Sophia



Alter 3



Optimus



Figure 1



Apollo



Eve



Atlas

ADMISSÃO



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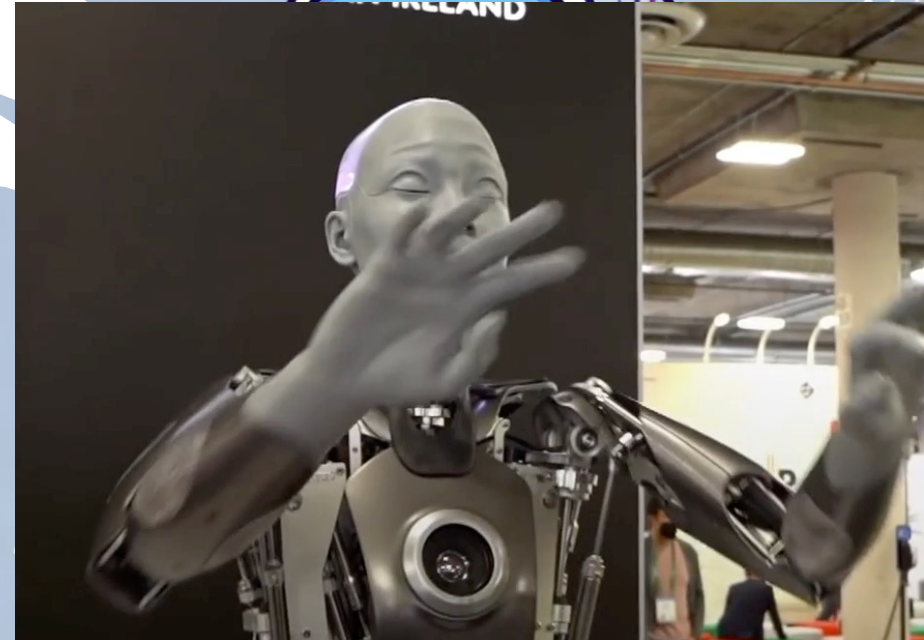
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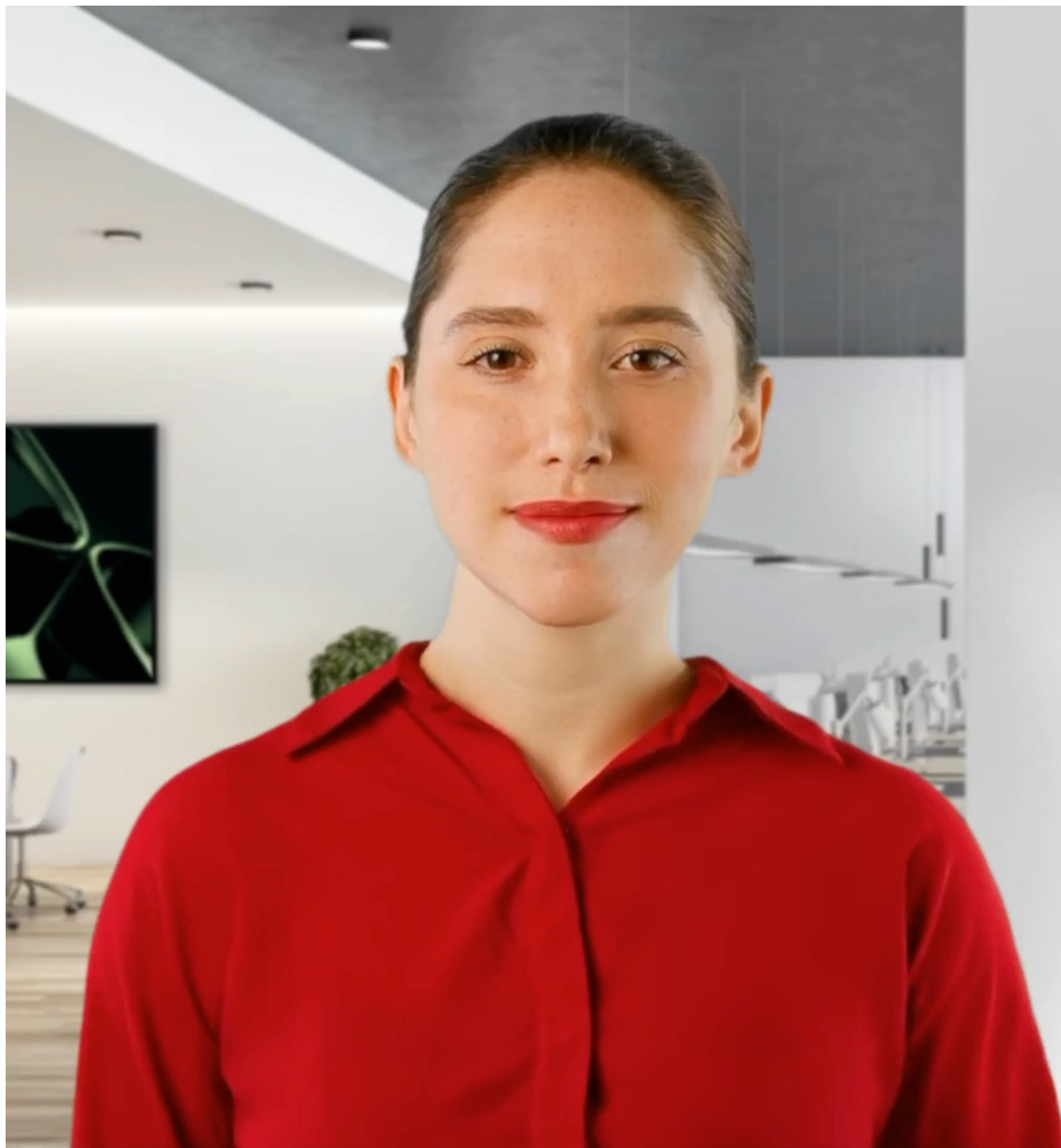
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EVE



AMECA



SÃO JOÃO

 **synthesia**

Optimização do conforto e sedoanalgesia



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Fiber-bronchoscopy under local anesthesia with VRH (published with the patient's consent). VRH

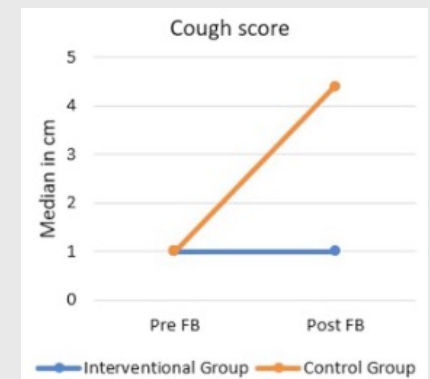
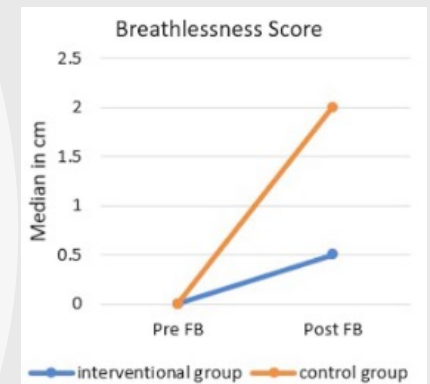
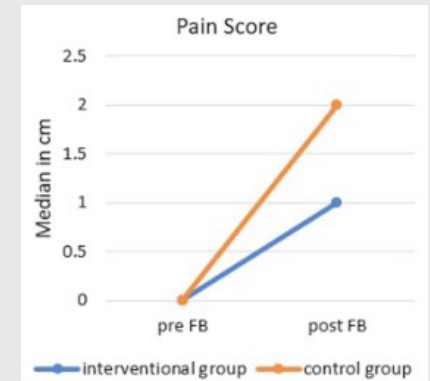
Lachkar et al. [Virtual reality hypnosis during bronchoscopy](#). J Thorac Dis 2022

VR com vídeos relaxantes de natureza Música instrumental



- Menos dor
- Menos dispneia
- Menos tosse
- Menos ansiedade
- Potencialmente com redução na dose sedativa
- Menor duração do exame

Sooriyaghandan et al. BMC Pulmonary Medicine (2023)



Optimização do procedimento



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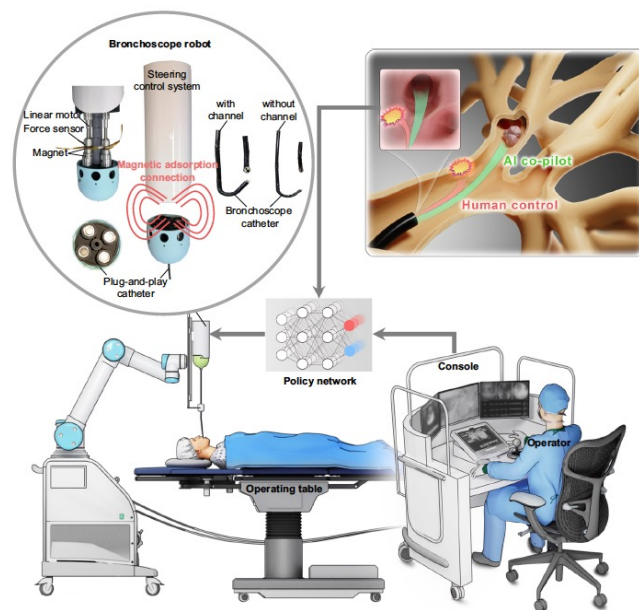


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VR FOR BRONCHOSCOPY?



AI co-pilot bronchoscope robot

Received: 13 June 2023

Accepted: 12 December 2023

Published online: 04 January 2024

Check for updates

Jingyu Zhang^{1,2,4}, Lili Liu^{1,2,4}, Pingyu Xiang^{1,2}, Qin Fang^{1,2}, Xiuping Nie^{1,2}, Honghai Ma³, Jian Hu³, Rong Xiong^{1,2}✉, Yue Wang^{1,2}✉ & Haojian Lu^{1,2}✉

The unequal distribution of medical resources and scarcity of experienced practitioners confine access to bronchoscopy primarily to well-equipped hospitals in developed regions, contributing to the unavailability of bronchoscopic services in underdeveloped areas. Here, we present an artificial intelligence (AI) co-pilot bronchoscope robot that empowers novice doctors to conduct lung examinations as safely and adeptly as experienced colleagues. The system features a user-friendly, plug-and-play catheter, devised for robot-assisted steering, facilitating access to bronchi beyond the fifth generation in average adult patients. Drawing upon historical bronchoscopic videos and expert imitation, our AI-human shared control algorithm enables novice doctors to achieve safe steering in the lung, mitigating misoperations. Both in vitro and in vivo results underscore that our system equips novice doctors with the skills to perform lung examinations as expertly as seasoned practitioners. This study offers innovative strategies to address the pressing issue of medical resource disparities through AI assistance.

Without GI Genius™
intelligent endoscopy module



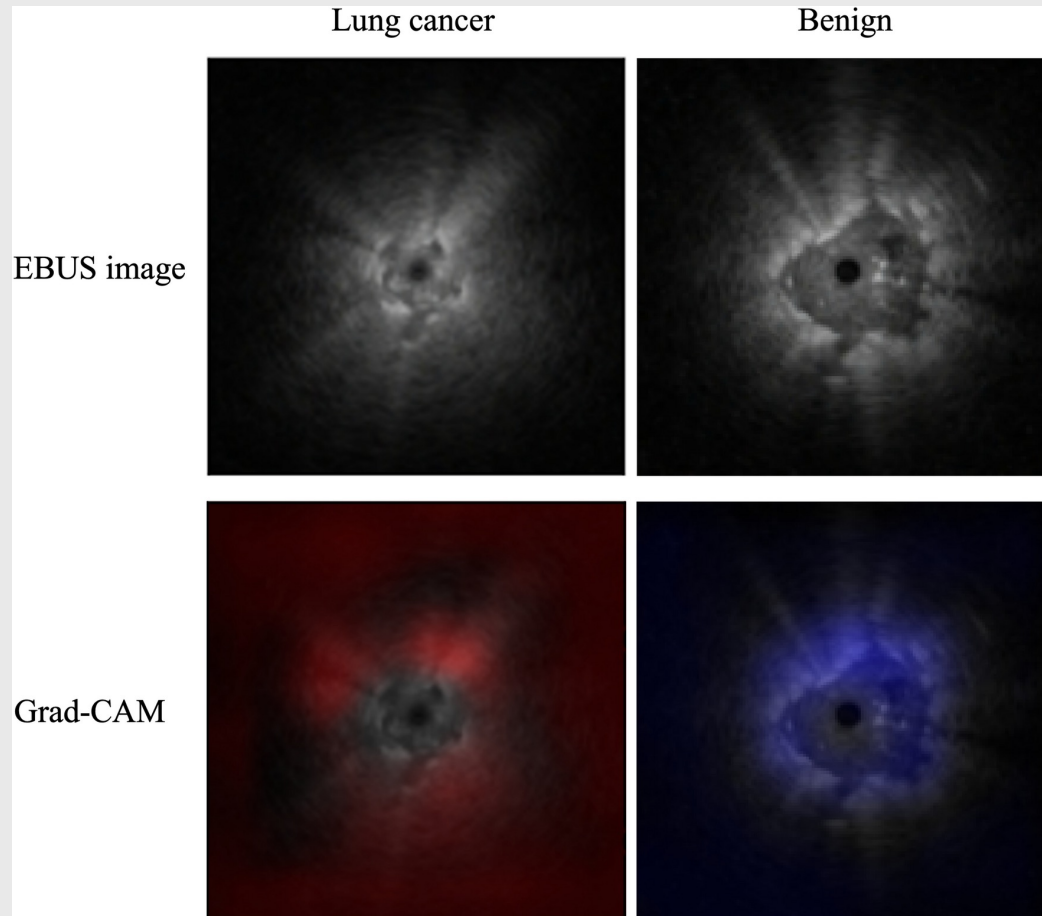
With GI Genius™
intelligent endoscopy module



Medtronic

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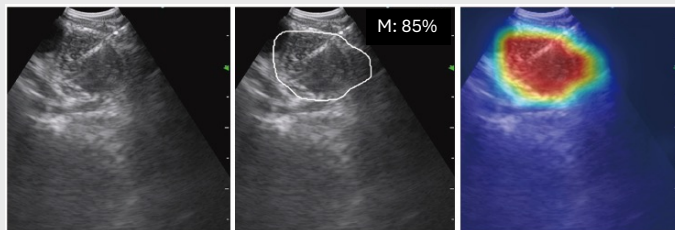
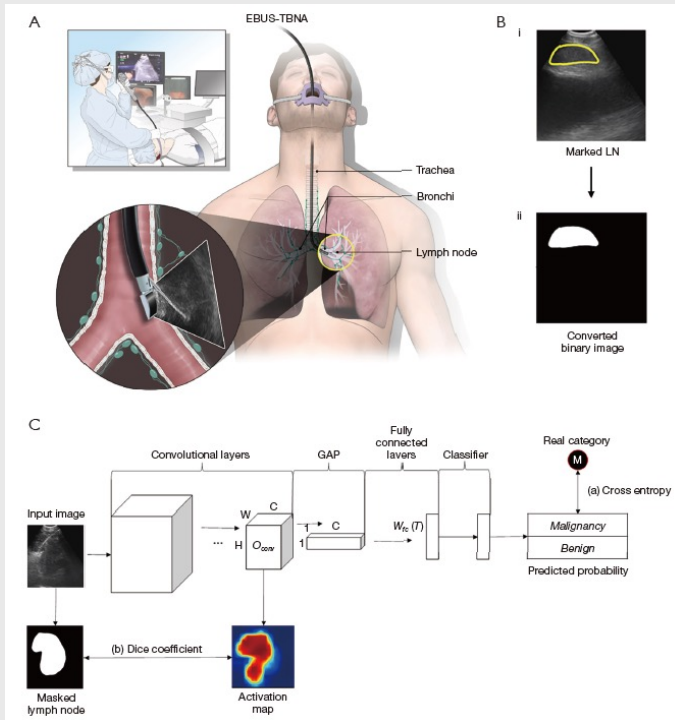
EBUS radial (nódulos periféricos)



	Broncoscopista	Modelo CNN
Precisão (VP+VN)	68.4%	83.4%
Sensibilidade (VP)	80%	95.3%
Especificidade (VN)	39.6%	53.6%
VPP	76.8%	83.8%
VPN	44.2%	82%

EBUS data for 213 participants
2,421,360 images extracted from the learning dataset
Test was performed using 26,674 images

EBUS-TBNA (estadiamento)



Yong et al. Transl Lung Cancer Res 2022

➤ 2394 imagens EBUS

○ 1459 gânglios benignos de 193 doentes

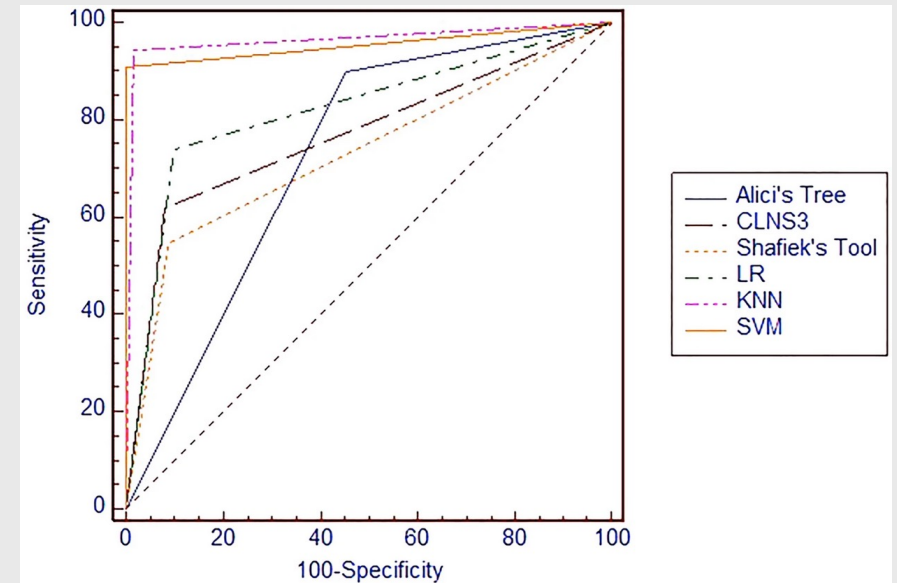
○ 935 gânglios malignos de 177 doentes

➤ Visual geometry group (VGG)-16

S 72.7%

E 79%

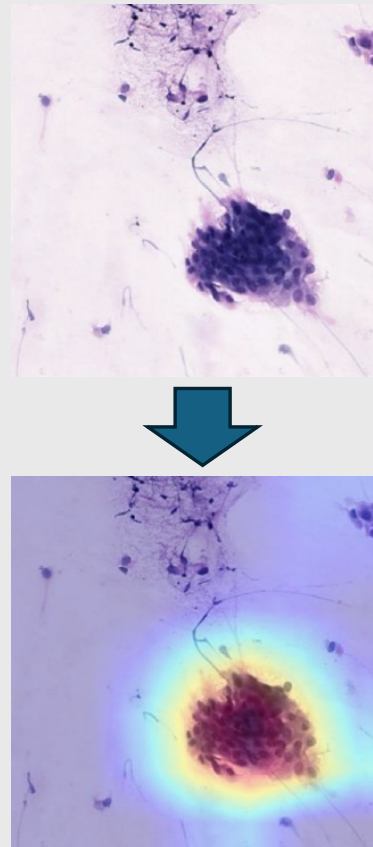
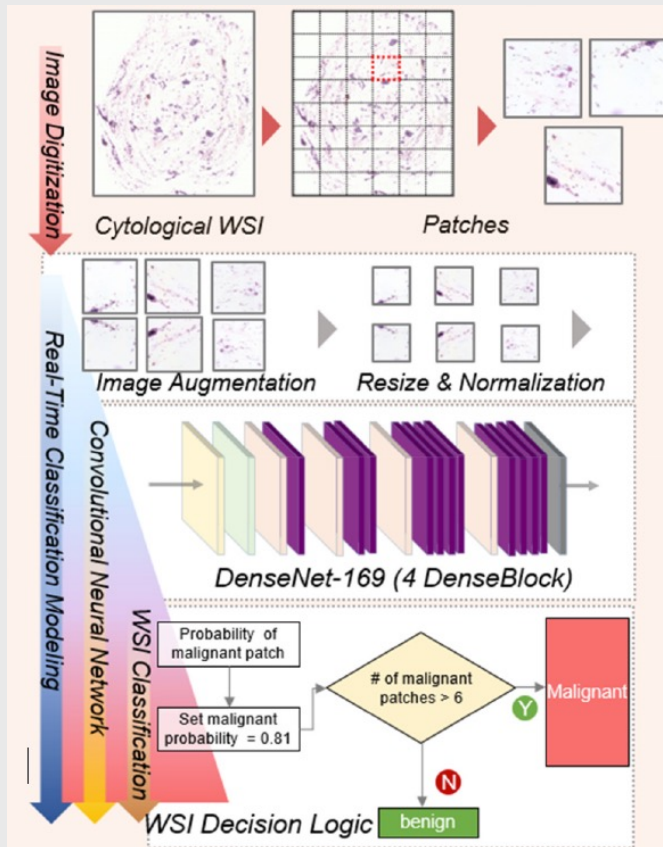
➤ 992 adenopatias, 420/992 (42.3%) malignos



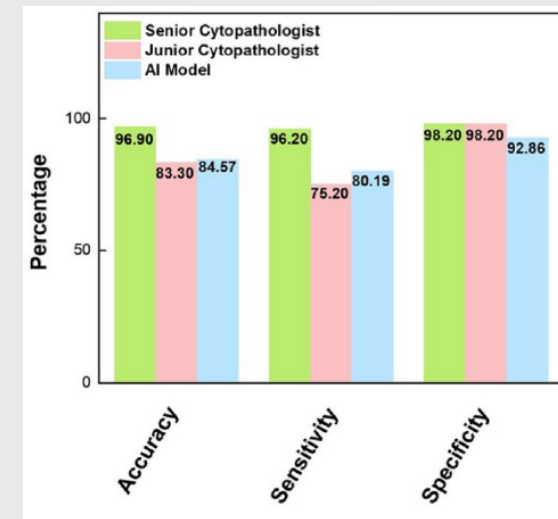
	Sens	Espec	VPP	VPN	AUC
KNN	94.4%	98.2%	97.6%	95.5%	0.963
SVM	91%	100%	100%	93.2%	0.955

Koseoglu et al. Surgical Endoscopy 2023

Rapid On-site Examination (ROSE)



N=627
TBNA, TBLB ±rEBUS
ROC AUC 0.9846



Treino e simulação



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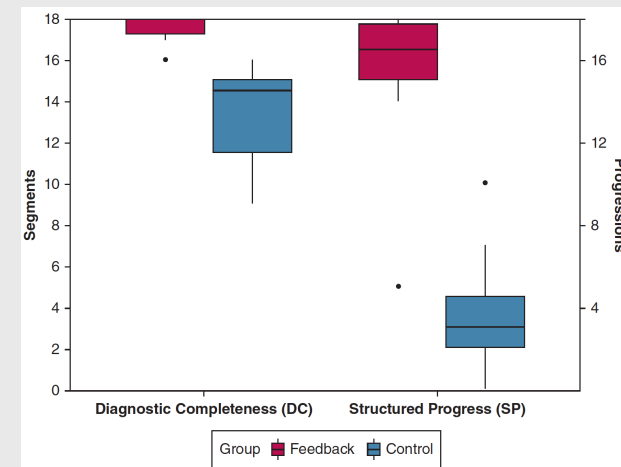
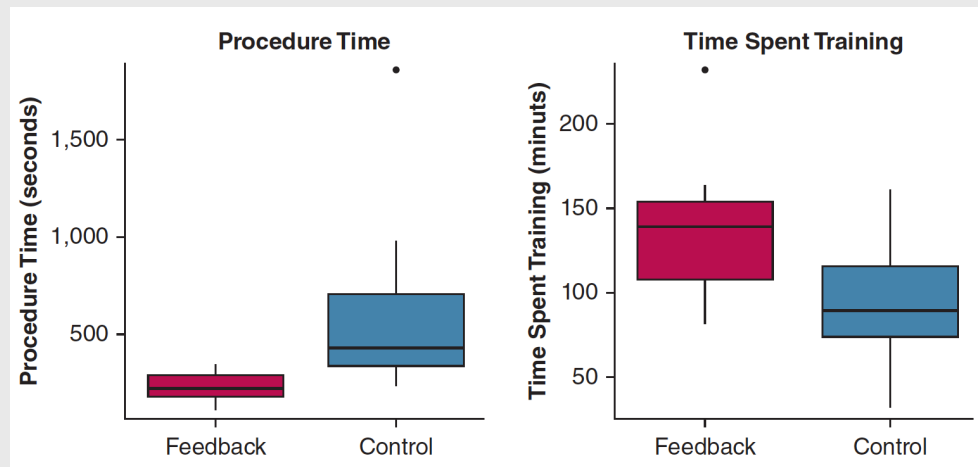
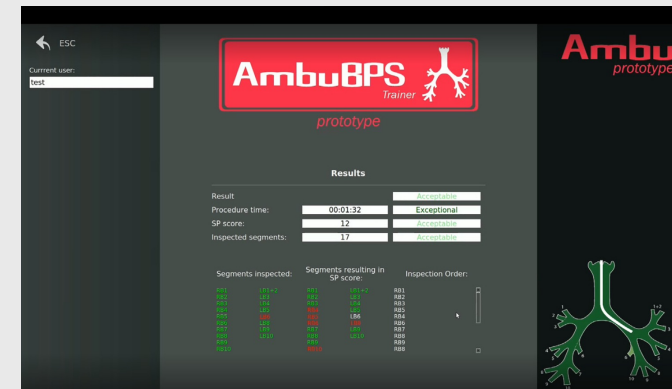
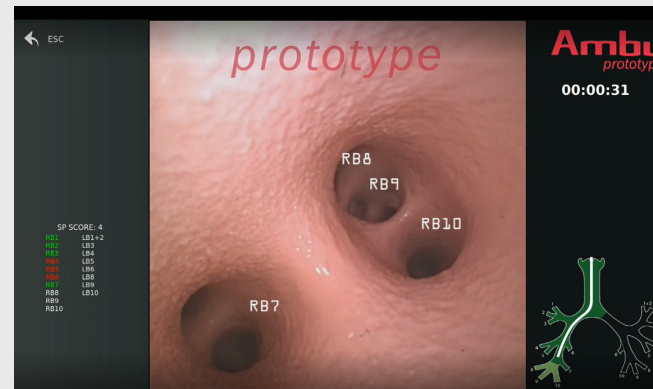
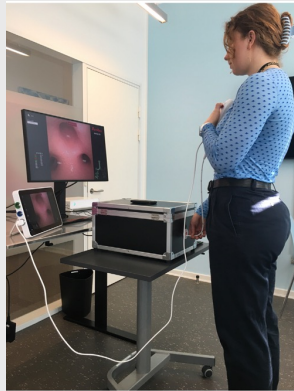
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Artificial Intelligence Improves Novices' Bronchoscopy Performance

A Randomized Controlled Trial in a Simulated Setting



Notas finais



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Causas comuns do erro médico	Onde a tecnologia pode ajudar?	Riscos
Pobre comunicação	Tradução, adequação de linguagem	Uso inadequado de IA, desinformação
Fluxo de informação inadequado	AI faz uma pré-análise dos dados do doente, produz relatórios com base na informação	Privacidade de dados
Erros manuais durante o registo médico	Consulta sem teclado, resumo clínico produzido por gravação áudio	Desigualdade nos cuidados
Falta de treino ou formação médica inadequada	Experiências formativas imersivas (simulação), novas oportunidades de empreendedorismo tecnológico	Diminuição do contacto clínico
Recursos humanos escassos ou mal alocados	Simplificação de procedimentos, ganho de eficiência do trabalho médico, nomeadamente em tarefas automatizáveis	Desemprego?
Fadiga		
Falência técnica de dispositivos médicos e outro equipamento	Diagnósticos assistidos por IA, análise preditiva (prognóstico, alertas), recomendações de tratamento personalizadas	Uso inadequado de IA, desinformação

A inteligência artificial não vai substituir os médicos, mas estes serão substituídos pelos médicos que a sabem usar.

