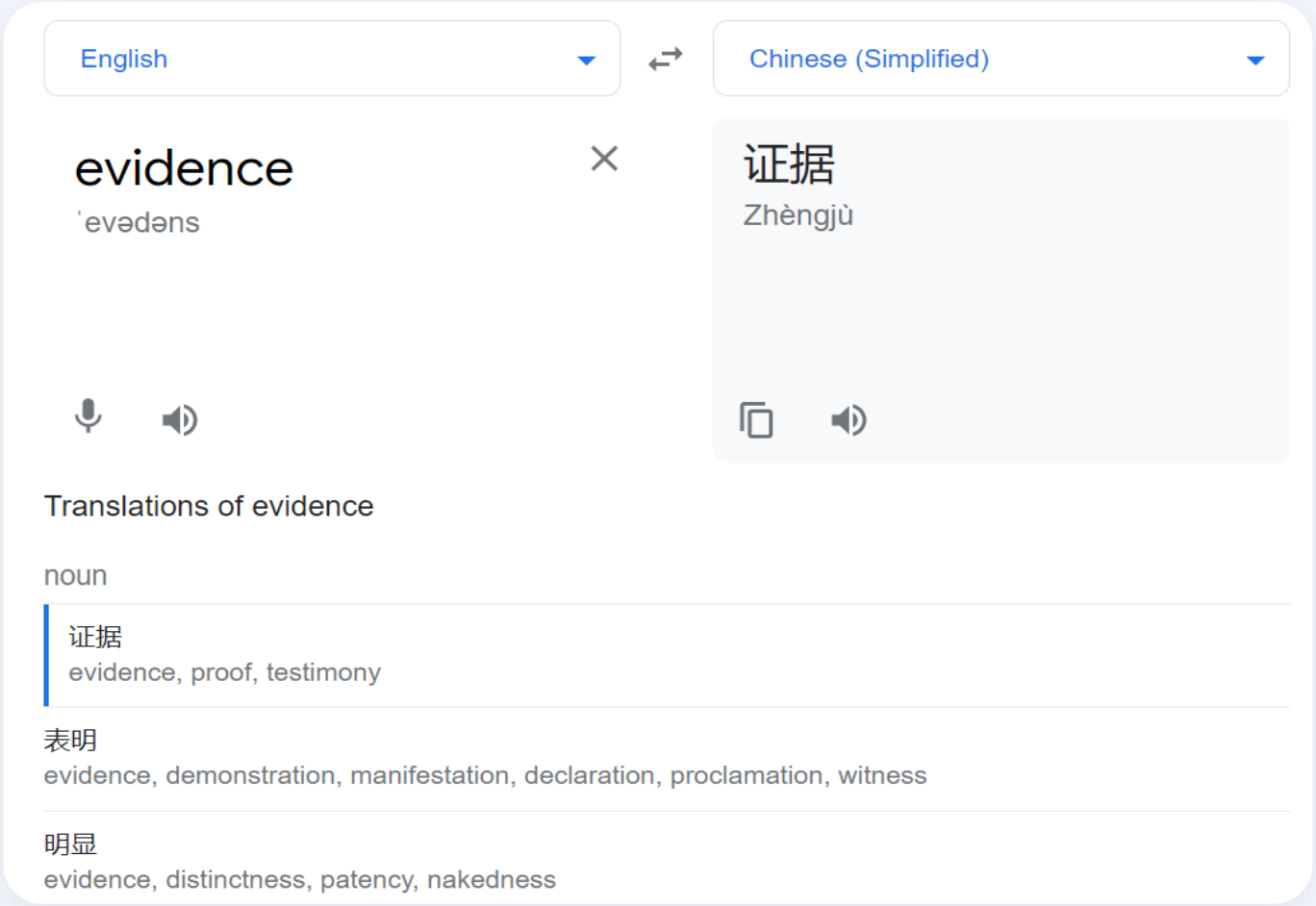
Medicine *beyond* human capabilities

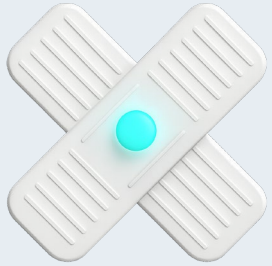
Ignacio H. Medrano

Dec 9th 2025



Machine Learning

Set of
Solved Problems



Interference
of rules

Anticipations
of unseen problems

PLOS ONE

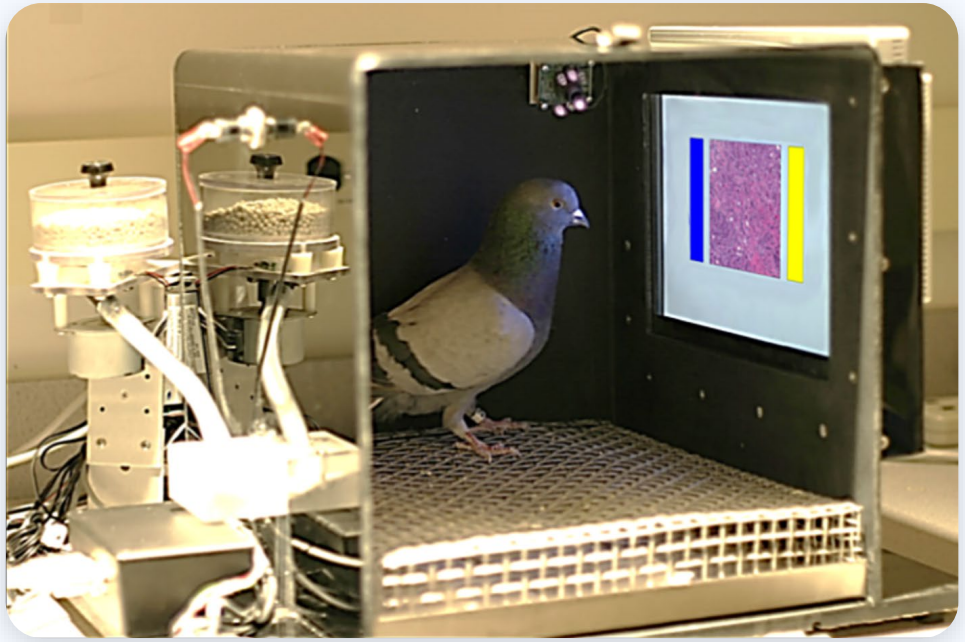
OPEN ACCESS PEER-REVIEWED

RESEARCH ARTICLE

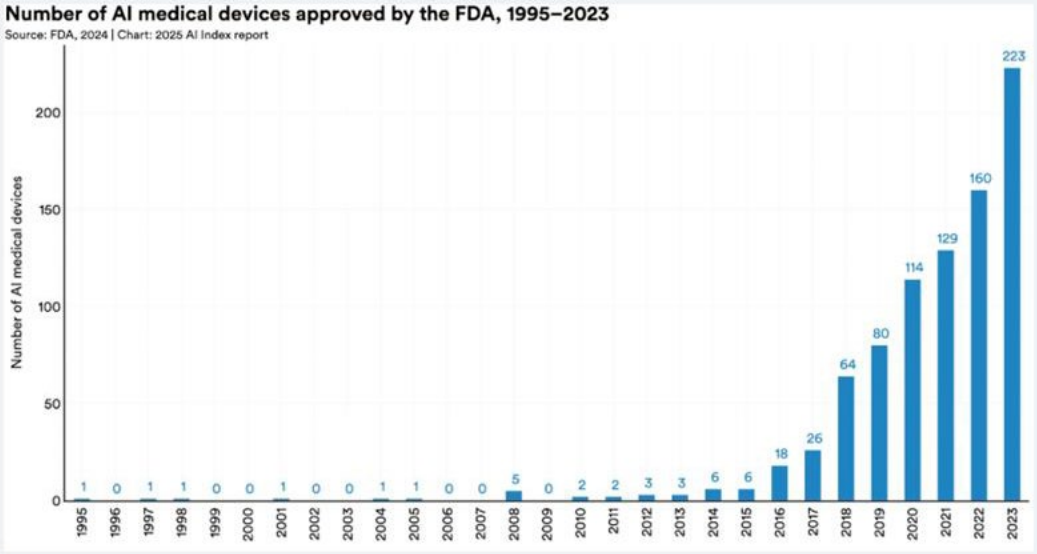
Pigeons (*Columba livia*) as Trainable Observers of Pathology and Radiology Breast Cancer Images

Richard M. Levenson, Elizabeth A. Krupinski, Victor M. Navarro, Edward A. Wasserman

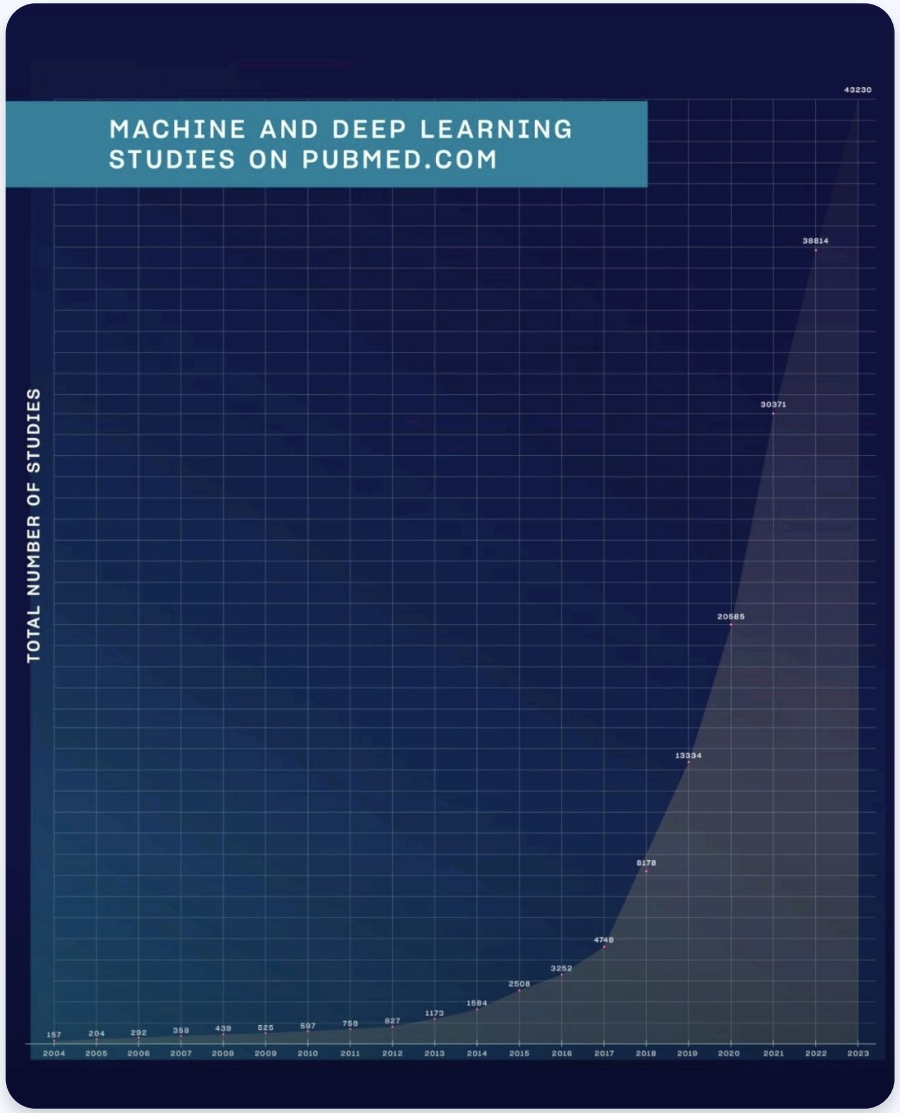
Published: November 18, 2015 • https://doi.org/10.1371/journal.pone.0141357



Health AI Floods the FDA



The number of FDA-approved, AI-enabled medical devices skyrocketed. The FDA authorized its first AI-enabled medical device in 1995. By 2015, only six such devices had been approved, but the number spiked to 223 by 2023.



News & Views | Open access | Published: 25 November 2024

Artificial Intelligence awarded two Nobel Prizes for innovations that will shape the future of medicine

Ben Li & Stephen Gilbert

npj Digital Medicine **7**, Article number: 336 (2024) | Cite this article

What the Machine sees in the ECG

Age and Sex

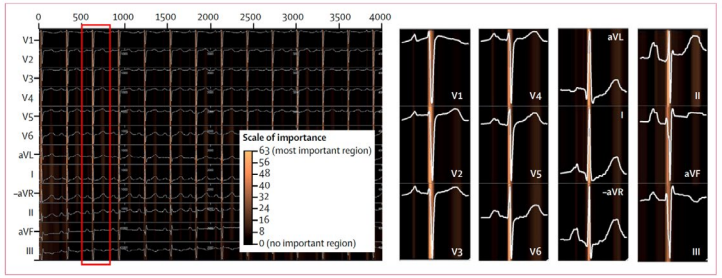
Sex = female; Age = 66 years
CNNsex = female; CNNage = 66.2 years

Sex = female; Age = 85 years
CNNsex = female; CNNage = 69.7 years

Circulation: Arrhythmia and Electrophysiology

27 August 2019

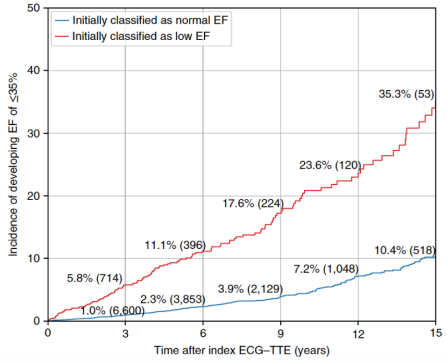
Anemia



A deep learning algorithm to detect anaemia with ECGs: a retrospective, multicentre study

Lancet Digital Health 2020; 2: e358–67

Carciac



Screening for cardiac contractile dysfunction using an artificial intelligence–enabled electrocardiogram

nature medicine

Attia et al
Jan 2019

An Artificial Intelligence-Enabled ECG Algorithm to Identify Patients with Left Ventricular Systolic Dysfunction Presenting to the Emergency Department with Dyspnea

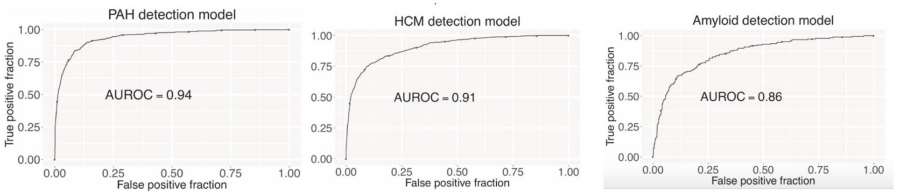
Difficult Diagnoses

Circulation: Cardiovascular Quality and Outcomes

Automated and Interpretable Patient ECG Profiles for Disease Detection, Tracking, and Discovery

Geoffrey H. Tison, MD, MPH*
Jeffrey Zhang, BA*
Francesca N. Delling, MD, MPH
Rahul C. Deo, MD, PhD

September 2019



Opportunist A.I. Medical Scan Interpretation

Imaging	Opportunistic Detection	Citation
Chest X-ray	Cardiovascular risk 10-year MACE*	Weiss J, Annals Int Med, 2024
Chest X-ray	Type 2 Diabetes	Pyrros A, Nature Comms, 2023
Chest X-ray	Ejection fraction	Ueda D, Lancet Digital Health, 2023
Chest X-ray	Coronary calcium score, CV risk	Kamel P, Radiol Cardiothoraic Imaging, 2021
Chest CT	Pancreatic cancer	Cao K, Nature Medicine, 2023
Chest CT	Coronary artery disease risk	Eng D, Nature Digital Medicine, 2021
Lung CT	Cardiovascular Risk	Chao H, Nature Comms, 2021
Lung CT	Coronary calcium	Caries, M, Canadian Med Assoc Journal, 2024
Mammography	Cardiovascular Risk	Iribarren C, Circulation: CV Imaging, 2022
Abdominal CT	Type 2 Diabetes	Tallam A, Radiology, 2022
Abdominal CT	Cardiovascular Risk	Magudia K, Am J Roentgenology, 2022
Echocardiogram	Liver Disease	Sahashi Y, NEJM AI, 2025
Breast MRI	Aortic aneurysm	Bounias D, Nature Comms, 2025

*major adverse cardiac events, better than traditional risk score @erictopol

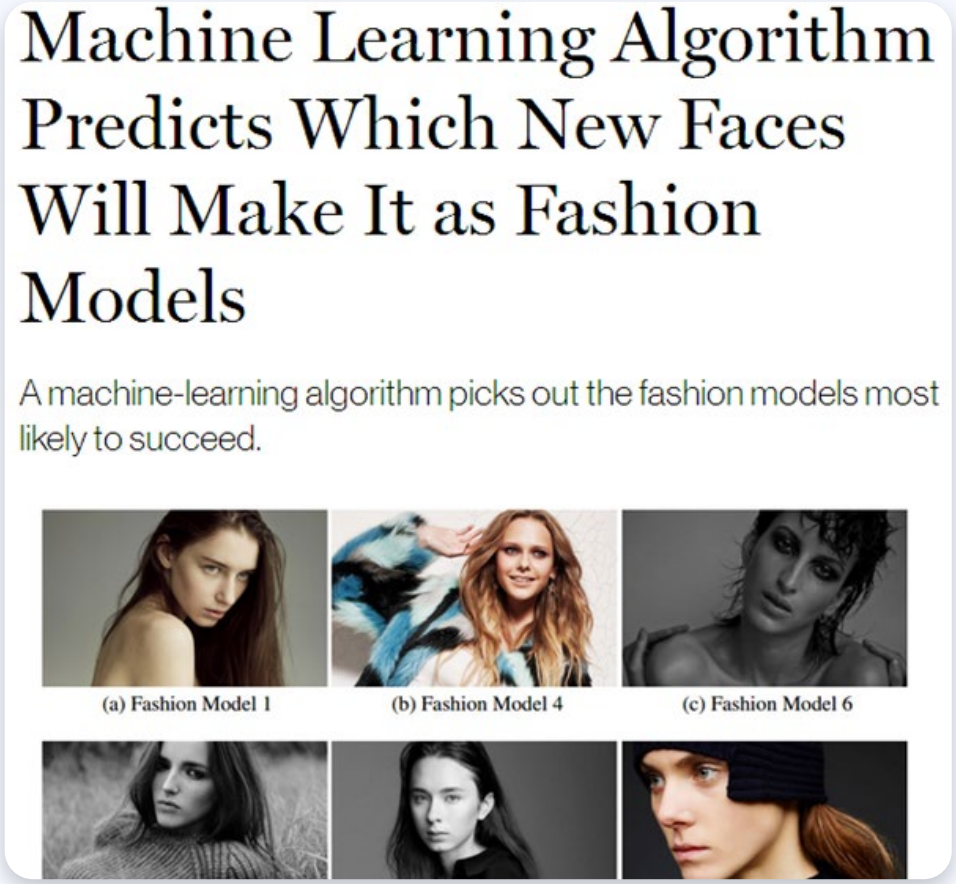
Artificial intelligence–based assessment of built environment from Google Street View and coronary artery disease prevalence FREE

Zhuo Chen, Jean-Eudes Dazard, Yassin Khalifa, Issam Motairek, Sadeer Al-Kindi ✉, Sanjay Rajagopalan ✉ Author Notes

European Heart Journal, ehae158,
https://doi.org/10.1093/eurheartj/ehae158
Published: 28 March 2024 **Article history ▾**

Classification

Forecasting



Machine Learning Algorithm Predicts Which New Faces Will Make It as Fashion Models

A machine-learning algorithm picks out the fashion models most likely to succeed.

Classification

GOV.UK

Home > Business and industry > Science and innovation > Artificial intelligence

Press release

World-leading AI trial to tackle breast cancer launched

Nearly 700,000 women across the country will take part in a world-leading trial to test how AI tools can be used to catch breast cancer cases earlier.

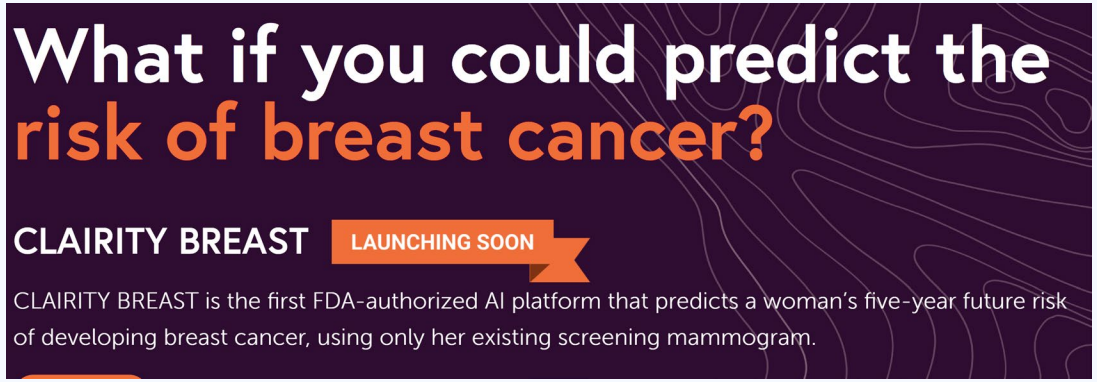
Nationwide real-world implementation of AI for cancer detection in population-based mammography screening

Nora Eisemann, Stefan Bunk, Trasias Mukama, Hannah Baltus, Susanne A. Elsner, Timo Gomille, Gerold Hecht, Sylvia Heywang-Köbrunner, Regine Rathmann, Katja Siegmann-Luz, Thilo Töllner, Toni Werner Vomweg, Christian Leibig & Alexander Katalinic

Nature Medicine **31**, 917–924 (2025) | Cite this article

52k Accesses | **888** Altmetric | Metrics

Forecasting



October 3, 2024

Artificial Intelligence Algorithm for Subclinical Breast Cancer Detection

Jonas Gjesvik, MSc[1]; Nataliia Moshina, MD, PhD[1]; Christoph I. Lee, MD, MS[2,3]; et al

» Author Affiliations | Article Information

JAMA Netw Open. 2024;7(10):e2437402. doi:10.1001/jamanetworkopen.2024.37402

nature

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nature > news > article

NEWS | 06 May 2025

Medical AI trained on whopping 57 million health records

Researchers fed an artificial-intelligence model called Foresight with anonymized data from a huge swathe of patients in England's National Health Service.

Science

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HOME > SCIENCE > VOL. 388, NO. 6750 > PREDICTING AND PREVENTING ALZHEIMER'S DISEASE

EXPERT VOICES

Predicting and preventing Alzheimer's disease

ERIC TOPOL Authors Info & Affiliations

Article | Open access | Published: 06 January 2024

Cancer drug sensitivity prediction from routine histology images

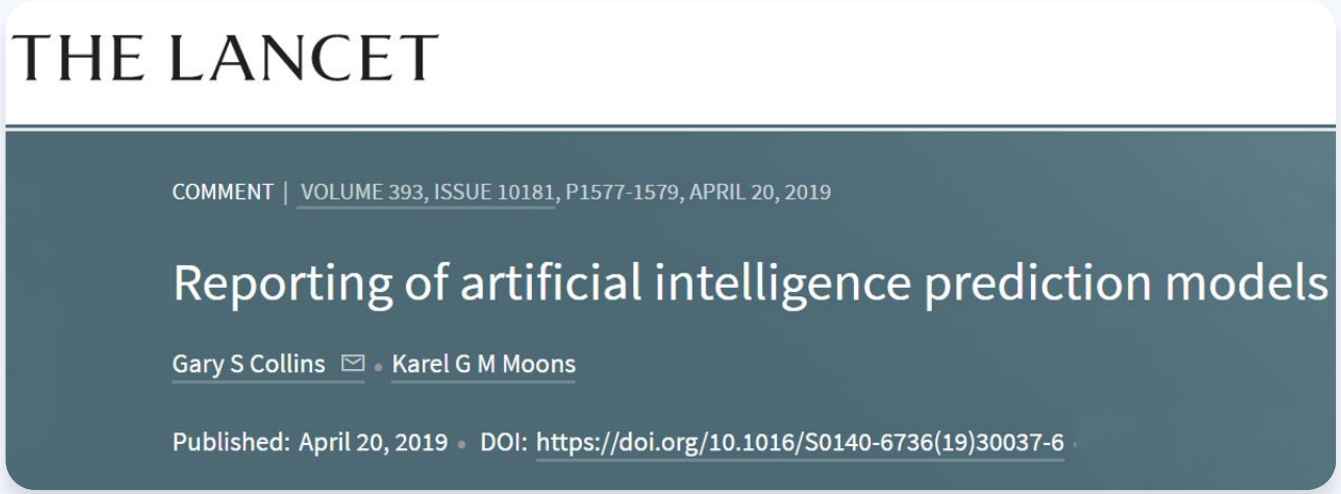
Muhammad Dawood, Quoc Dang Vu, Lawrence S. Young, Kim Branson, Louise Jones, Nasir Rajpoot & Fayyaz ul Amir Afsar Minhas

Article | Published: 20 December 2023

Emerging drug interaction prediction enabled by a flow-based graph neural network with biomedical network

Yongqi Zhang, Quanming Yao, Ling Yue, Xian Wu, Ziheng Zhang, Zhenxi Lin & Yefeng Zheng

Nature Computational Science **3**, 1023–1033 (2023) | Cite this article



nature machine intelligence

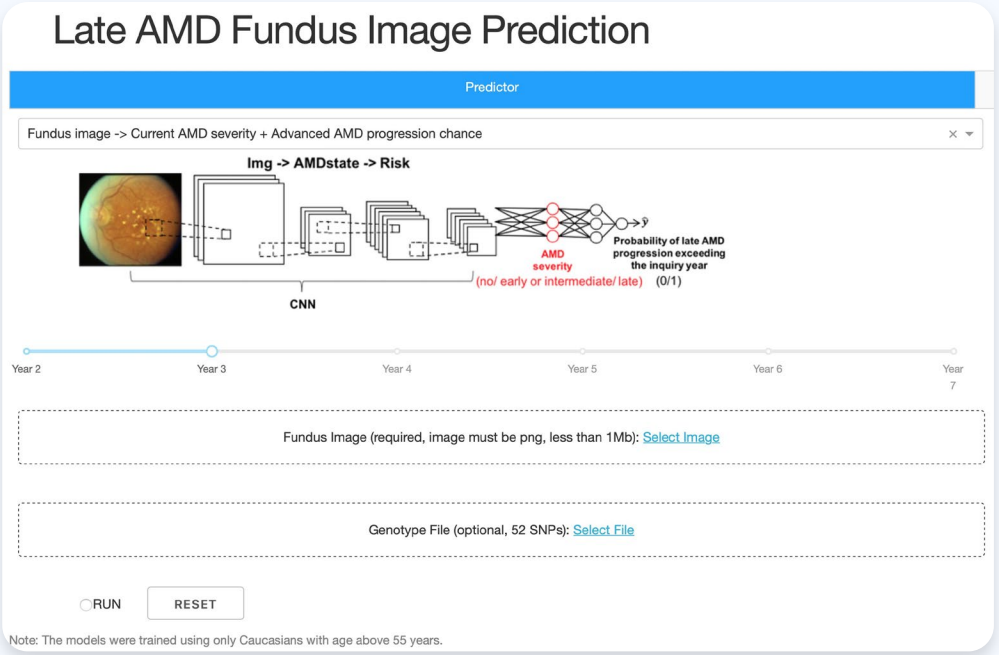
ARTICLES

https://doi.org/10.1038/s42256-020-0154-9

Deep-learning-based prediction of late age-related macular degeneration progression

Qi Yan[1,7]✉, Daniel E. Weeks[2,3], Hongyi Xin[1], Anand Swaroop[4], Emily Y. Chew[5], Heng Huang[6], Ying Ding[3,7]✉ and Wei Chen[1,2,3,7]✉

Both genetic and environmental factors influence the etiology of age-related macular degeneration (AMD), a leading cause



nature cancer

Article | Open Access | Published: 29 August 2022

Multimodal integration of radiology, pathology and genomics for prediction of response to PD-(L)1 blockade in patients with non-small cell lung cancer

Rami S. Vanguri, Jia Luo, Andrew T. Aukerman, Jacklynn V. Egger, Christopher J. Fong, Natally Horvat, Andrew Pagano, Jose de Arimateia Batista Araujo-Filho, Luke Geneslaw, Hira Rizvi, Ramon Sosa, Kevin M. Boehm, Soo-Ryum Yang, Francis M. Bodd, Katia Ventura, Travis J. Hollmann, Michelle S. Ginsberg, Jianjiong Gao, MSK MIND Consortium, Matthew D. Hellmann, Jennifer L. Sauter ✉ & Sohrab P. Shah ✉

Nature Cancer (2022) | Cite this article

MAYO CLINIC
HEALTH SYSTEM

Images

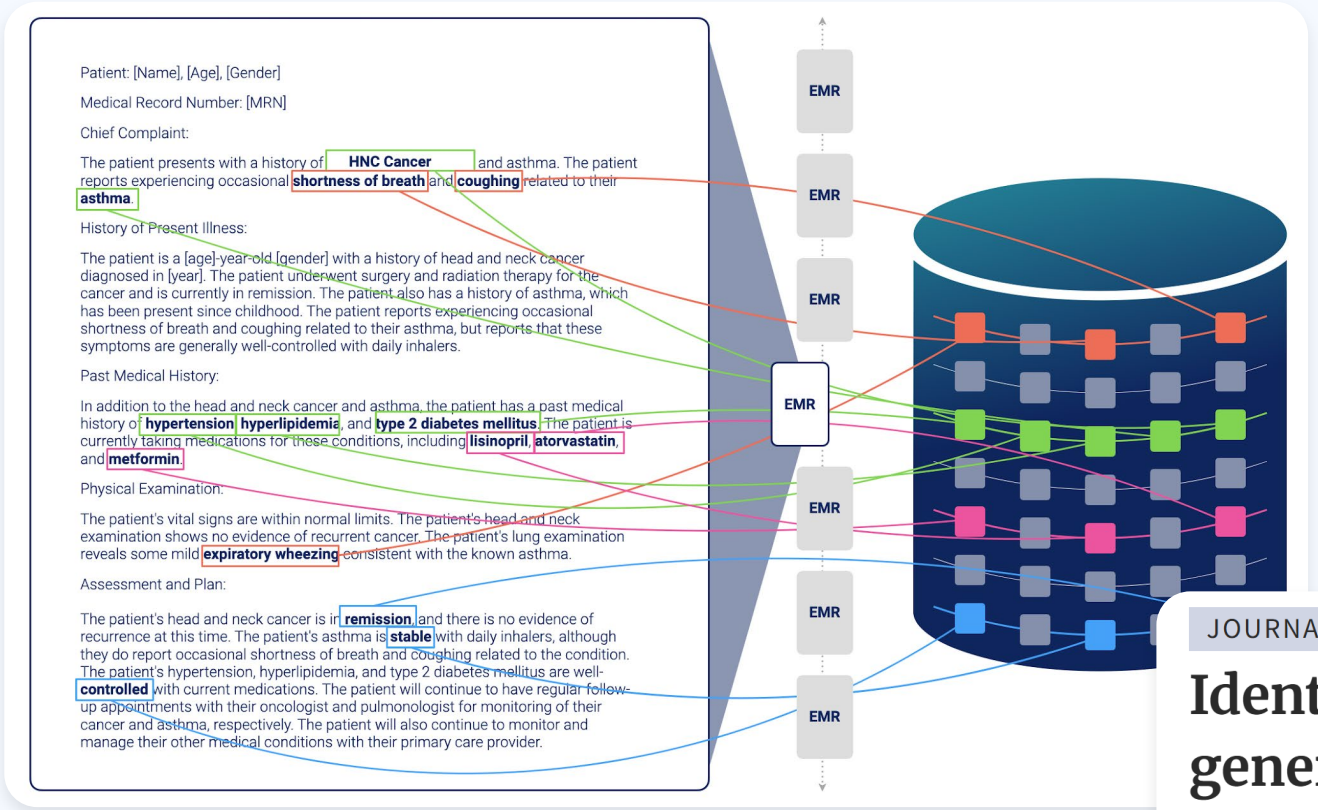
Structured (ICD codes, OMOP, prescriptions, labs…)

Unstructured (Clinical Notes)

Telemetry (wearables, sensors, devices…)

Omics

Environment (Air pollution, …)



JOURNAL ARTICLE

Identifying the capabilities for creating next-generation registries: a guide for data leaders and a case for "registry science"

Steven E Labkoff, MD ✉, Yuri Quintana, PhD, Leon Rozenblit, JD, PhD

Journal of the American Medical Informatics Association, Volume 31, Issue 4, April 2024, Pages 1001–1008, https://doi.org/10.1093/jamia/ocae024

Published: 23 February 2024 **Article history ▾**

Reverse Translational Research

Phase III failures: ~50% (Oncology: ~70%)

Why?

Wrong population

Wrong endpoints

Wrong effect size

Wrong power

RWD Impact

Better assumptions

Fewer false negatives

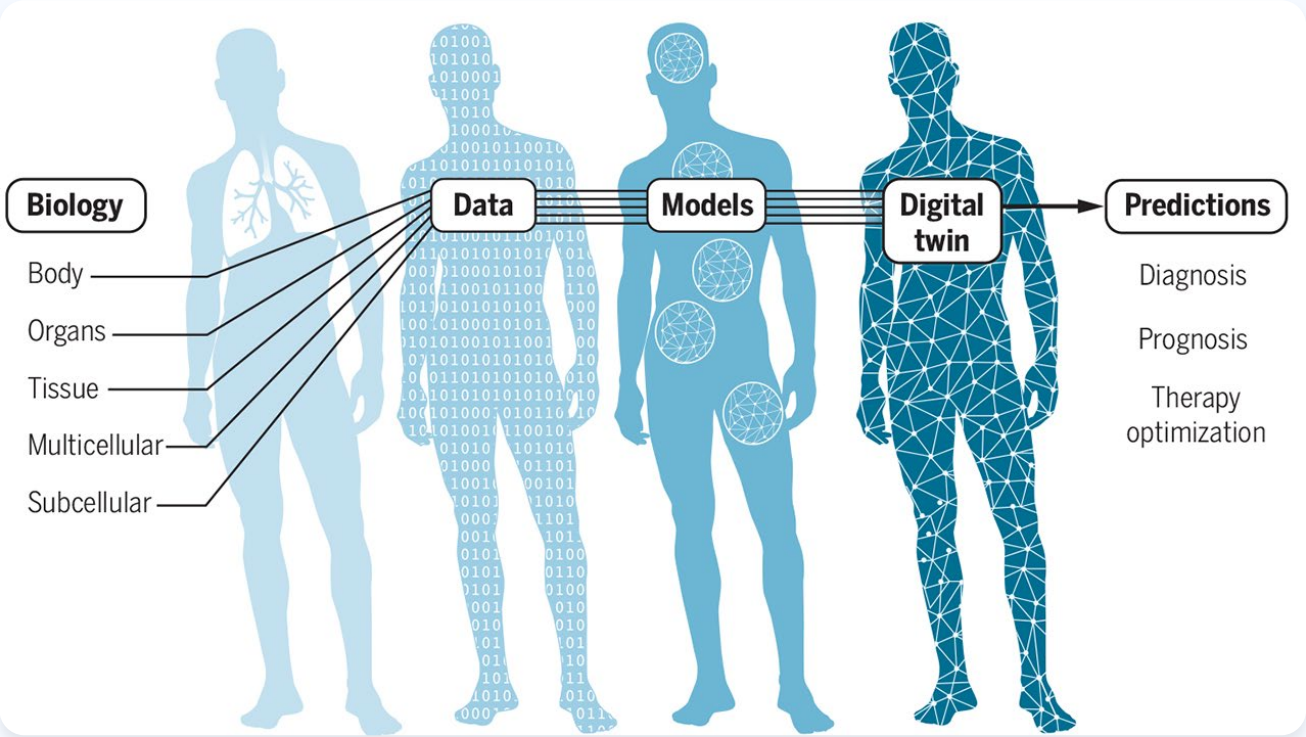
Less bias

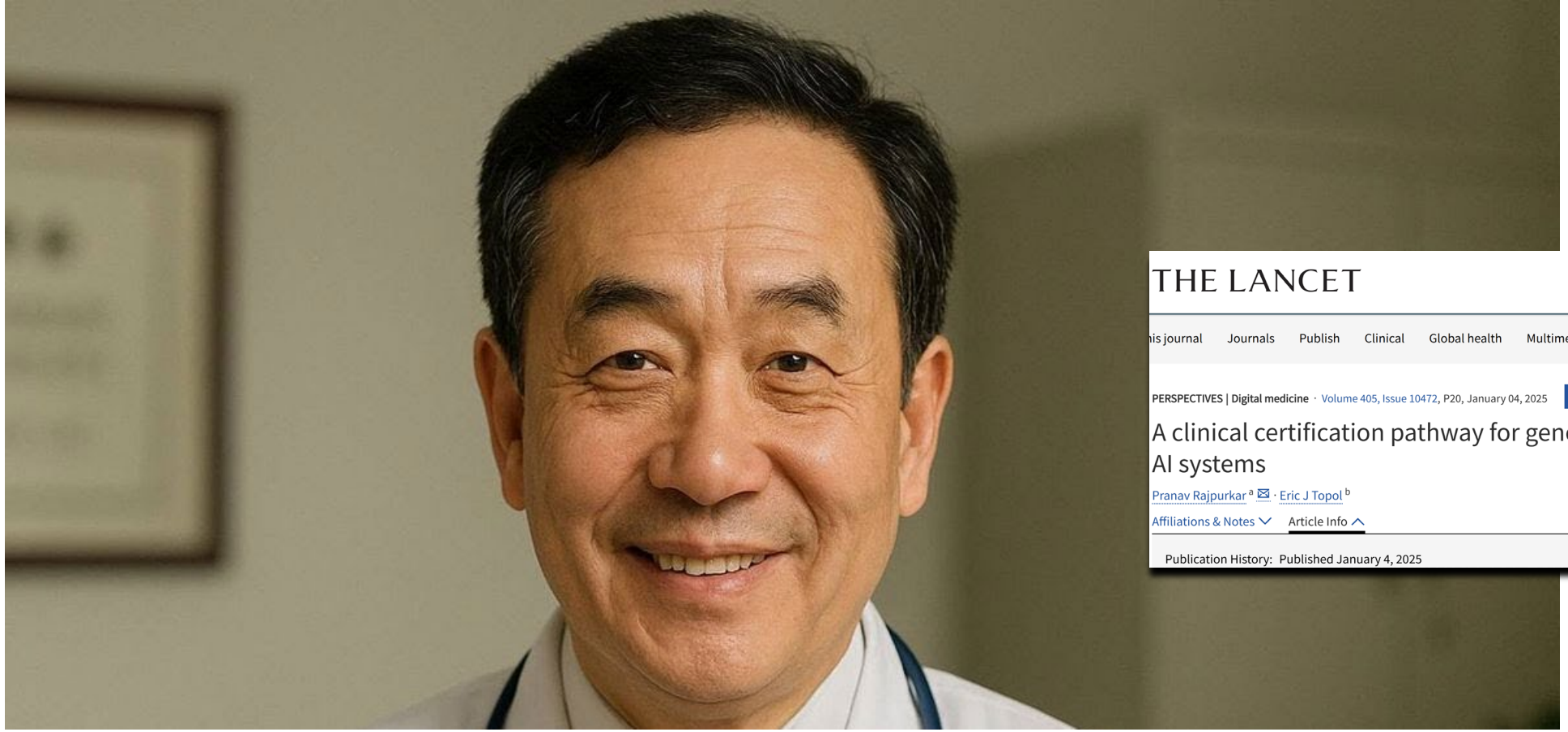
Optimizing drug discovery: An opportunity and application with reverse translational research

Pankaj Musyuni [a], Ruchika Sharma [b], Geeta Aggarwal [a]

Building a personalized digital twin

Data from multiple scales are needed to build computational representations of biological processes and body systems that are affected by viral infection. These submodels are integrated and personalized with clinical data from individual patients. The digital twin can then be used to derive predictions about diagnosis, prognosis, and efficacy and optimization of therapeutic interventions.





THE LANCET

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PERSPECTIVES | Digital medicine · Volume 405, Issue 10472, P20, January 04, 2025 Download Full Issue

A clinical certification pathway for generalist medical AI systems

Pranav Rajpurkar [a] · Eric J Topol [b]

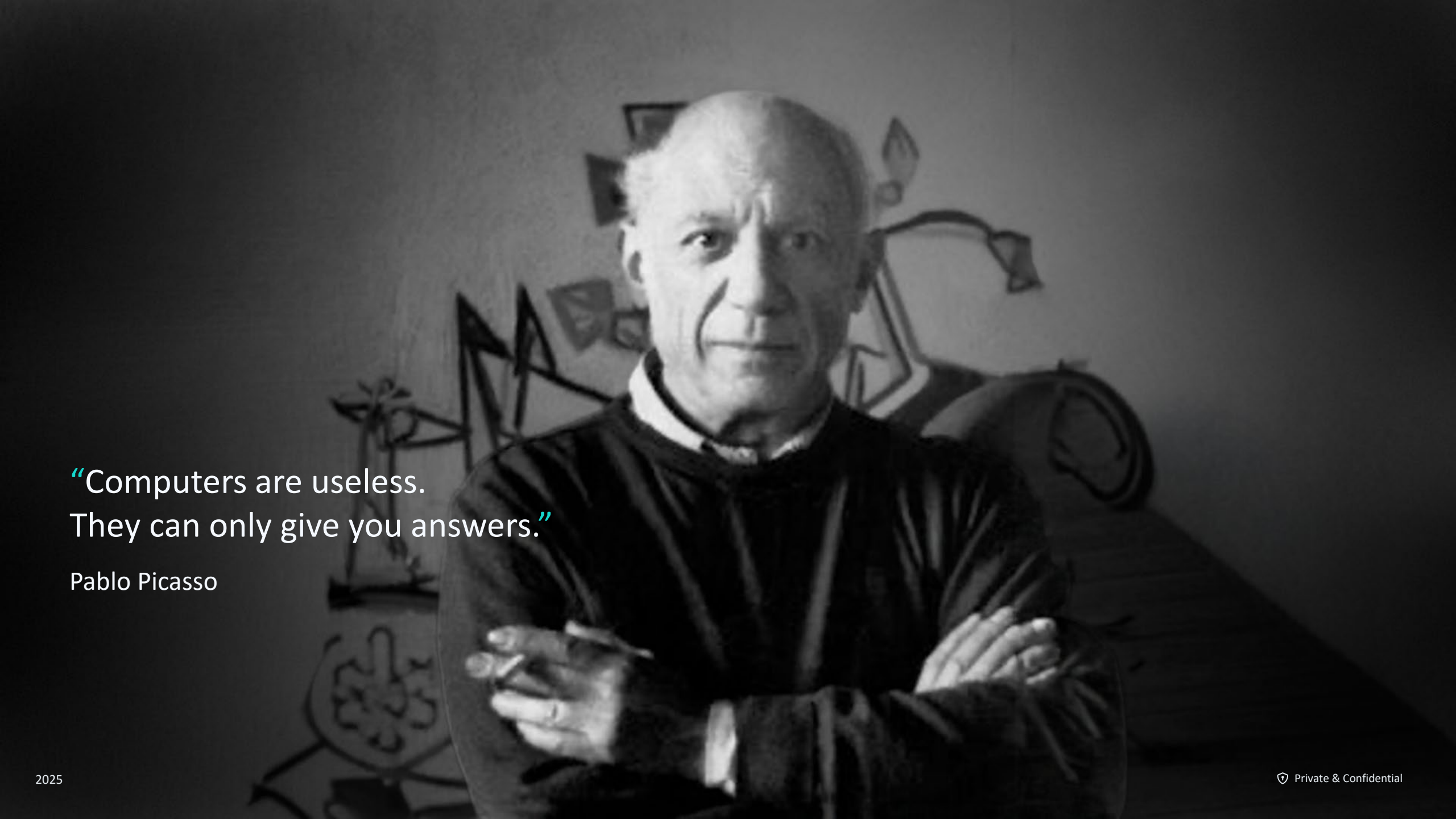
Affiliations & Notes Article Info

Publication History: Published January 4, 2025

Coordinated AI agents for advancing healthcare

Michael Moritz, Eric Topol & Pranav Rajpurkar

Nature Biomedical Engineering **9**, 432–438 (2025) | Cite this article



ihmedrano@savanamed.com