

Introducción a la IA en Salud: usos actuales y perspectivas futuras

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Servicio de Neurocirugía, Hospital Universitario, UNCuyo.

Unidad de Neuromodulación, NeuroFUESMEN, FUESMEN, UNCuyo.



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Dra. María Victoria Gómez de Ercilla



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IA en Salud

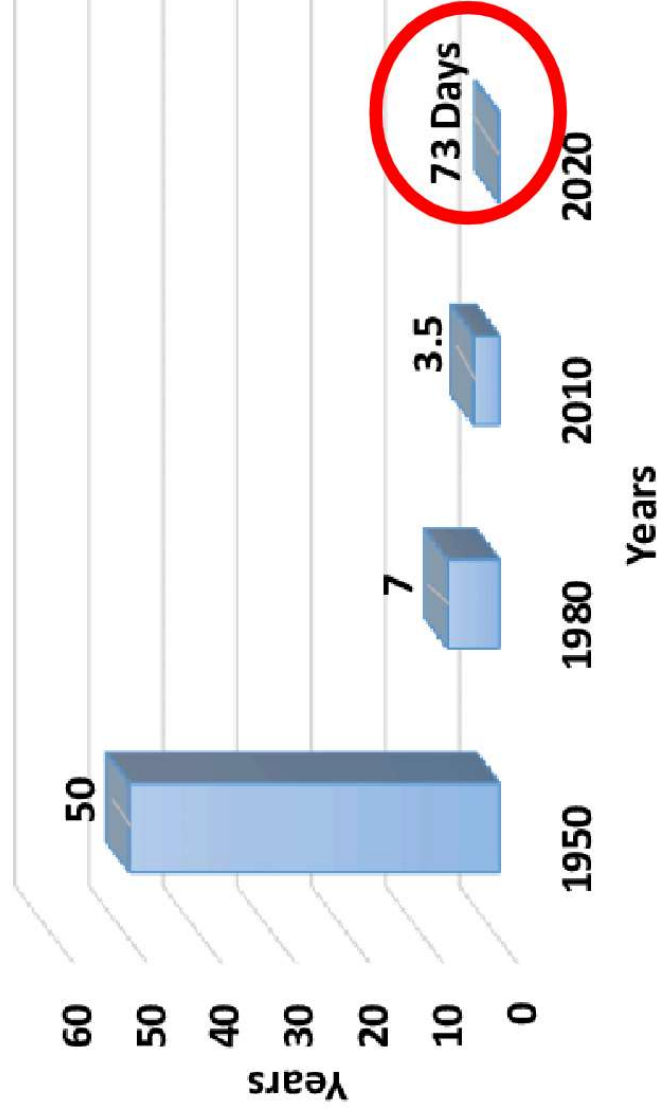


El problema... en 1991



Densen P. Challenges and Opportunities Facing Medical Education. Trans Am Clin Climatol Assoc. 2011;122:48–58.

El problema hoy... y en 2030



https://www.researchgate.net/figure/Estimated-Doubling-Time-of-Medical-Knowledge-by-Year-Students-starting-medical-school-in_fig2_328078870

30%

del volumen de los
datos mundiales son
generados por la
industria de la salud

En 2025, la tasa de crecimiento
anual compuesta (CAGR) de los

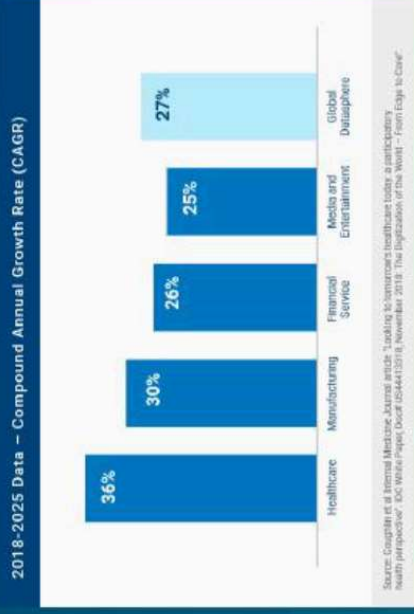
datos en salud será del **36%**

Un 6% más rápido que producción, un
10% que servicios financieros y un 11%
que media y entretenimiento

50
petabytes

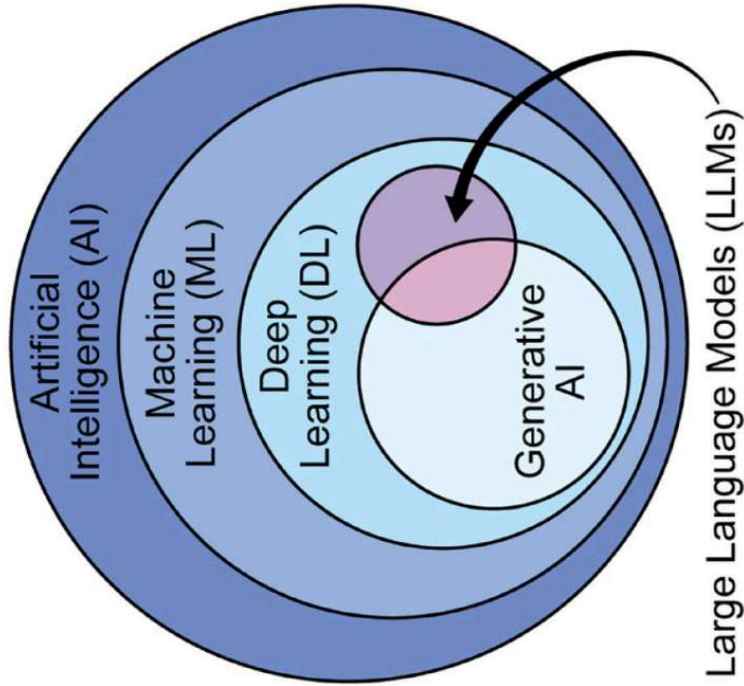
de datos son
producidos por un
hospital al año

World Economic Forum



https://www.rbcm.com/en/gib/healthcare/episode/the_healthcare_data_explosion
<https://www.aarp.org/espanol/salud/enfermedades-y-tratamientos/info-2023/peligros-de-diagnostico-erroneo.html>

La solución



@UNCUYO •transformación digital 2025

CICLO DE CHARLAS

UtoplAs

Transformando presentes
en torno a la IA

4º ENCUENTRO

MARTES 3 DE JUNIO

10.30 a 12.30

Cilindro Central (CICUNC)
Modalidad presencial
y virtual

UNCUYO

La IA hoy está en todo el proceso de atención de la salud



Pero..., ¿en qué les beneficia a **ustedes**,
como **potenciales pacientes**,
la Inteligencia Artificial en Salud?

2

10 Beneficios de la IA en mí Salud

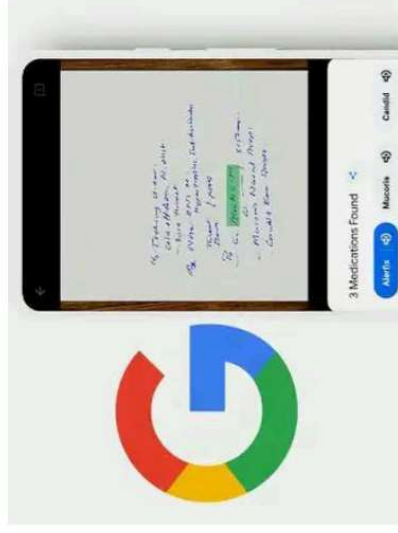
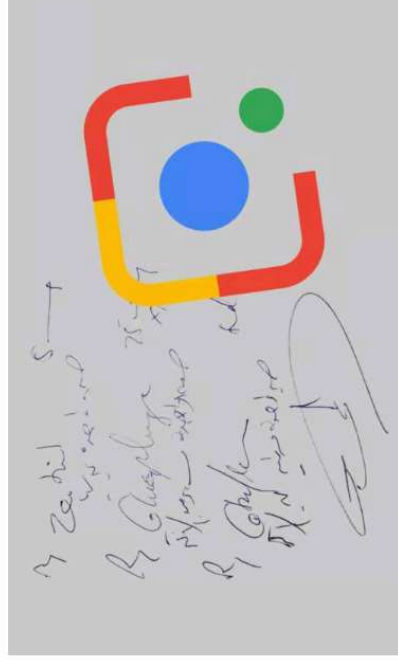


Beneficio 1: mejor relación médico-paciente

- “Síndrome de la pantalla”.



La IA ayuda desde decodificar la mala letra del médico, a...



... transcribir historias clínicas completas: Microsoft Cloud for Healthcare



The advertisement features a central image of a doctor in a white coat and blue gloves holding a clipboard. The background is a light blue gradient. The Microsoft Copilot logo is prominently displayed in the center, with the text 'Microsoft Dragon Copilot' below it. To the right, the word 'NUANCE' is written in large, bold, white letters on a dark blue background. On the left, there is a vertical sidebar with the Nuance logo and the text 'Healthcare solutions' and 'Healthcare A'. Below the sidebar, the text 'Transcribe patient experience' is visible, followed by 'Automatic visits with clinical do'. A button labeled 'Explore DAX Copilot' is located at the bottom right.

Transcribe patient experience
Automatic visits with clinical do

Explore DAX Copilot

Microsoft Dragon Copilot

NUANCE

Escritura de historias clínicas: AWS HealthScribe

SERVICES DEDICATED TO HEALTHCARE AND LIFE SCIENCES CUSTOMERS



AWS HealthLake

Store, transform, transact, and analyze health data in minutes



AWS HealthOmics

Transform genomic, transcriptomic, and other omics data into insights



AWS HealthImaging

Store, transform, and analyze medical images in the cloud at petabyte scale



AWS HealthScribe

Automatically generate clinical notes from patient-clinician conversations

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Características clave de AWS HealthScribe

AMPLIA TRANSCRIPCIÓN DE LA CONSULTA

IDENTIFICACIÓN DEL ROL DEL ORADOR

CLASIFICACIÓN DE LOS DIÁLOGOS

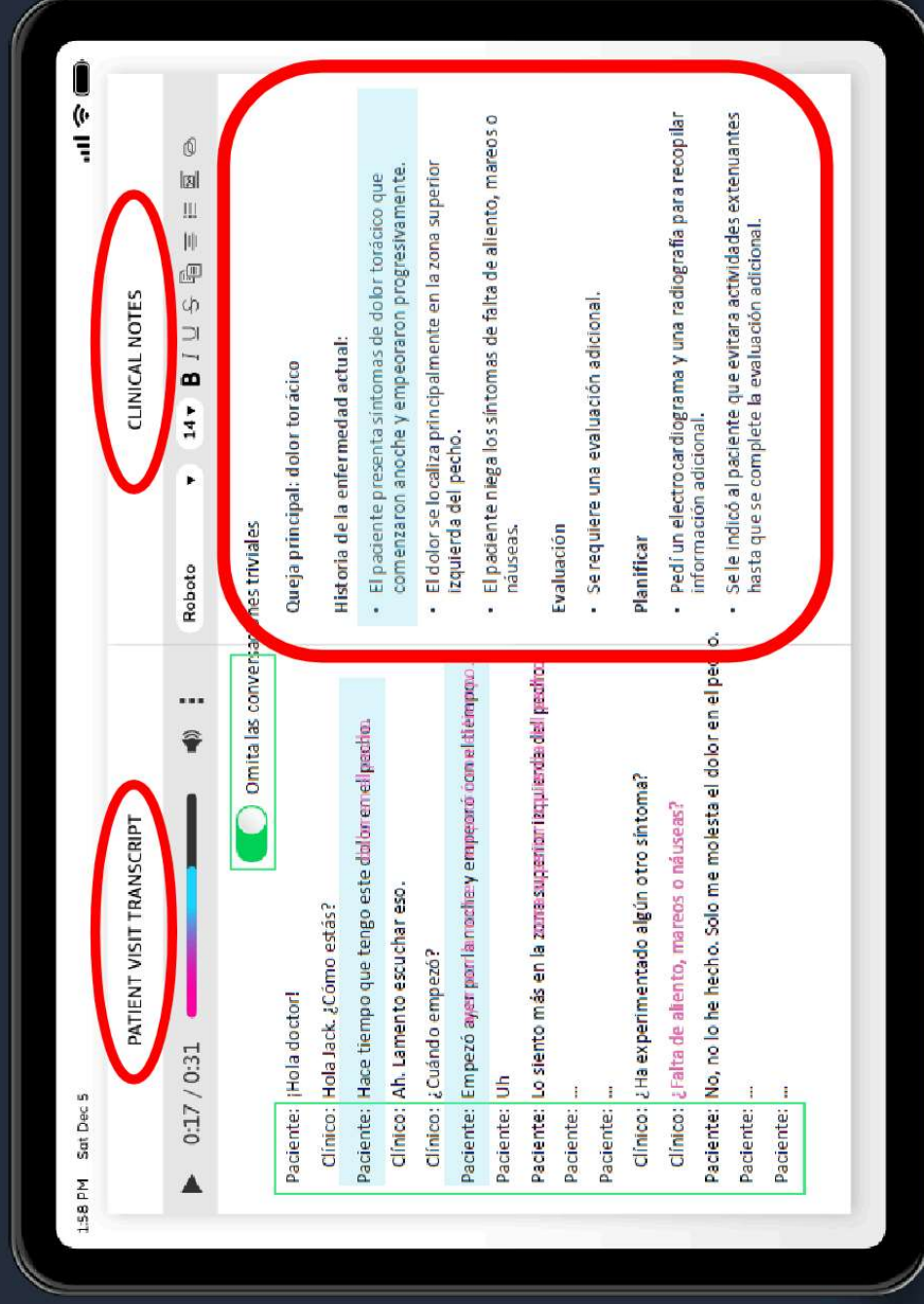
NOTAS CLÍNICAS PRELIMINARES

REFERENCIAS A LA TRANSCRIPCIÓN

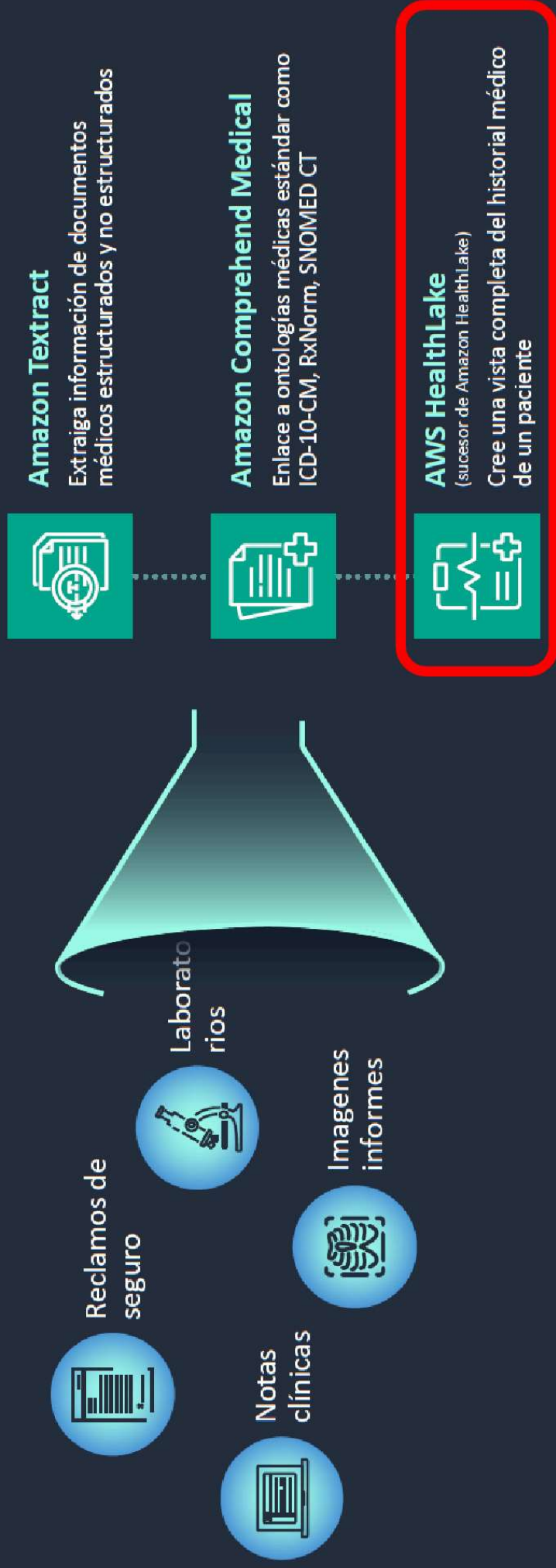
TÉRMINOS MÉDICOS EXTRAÍDOS



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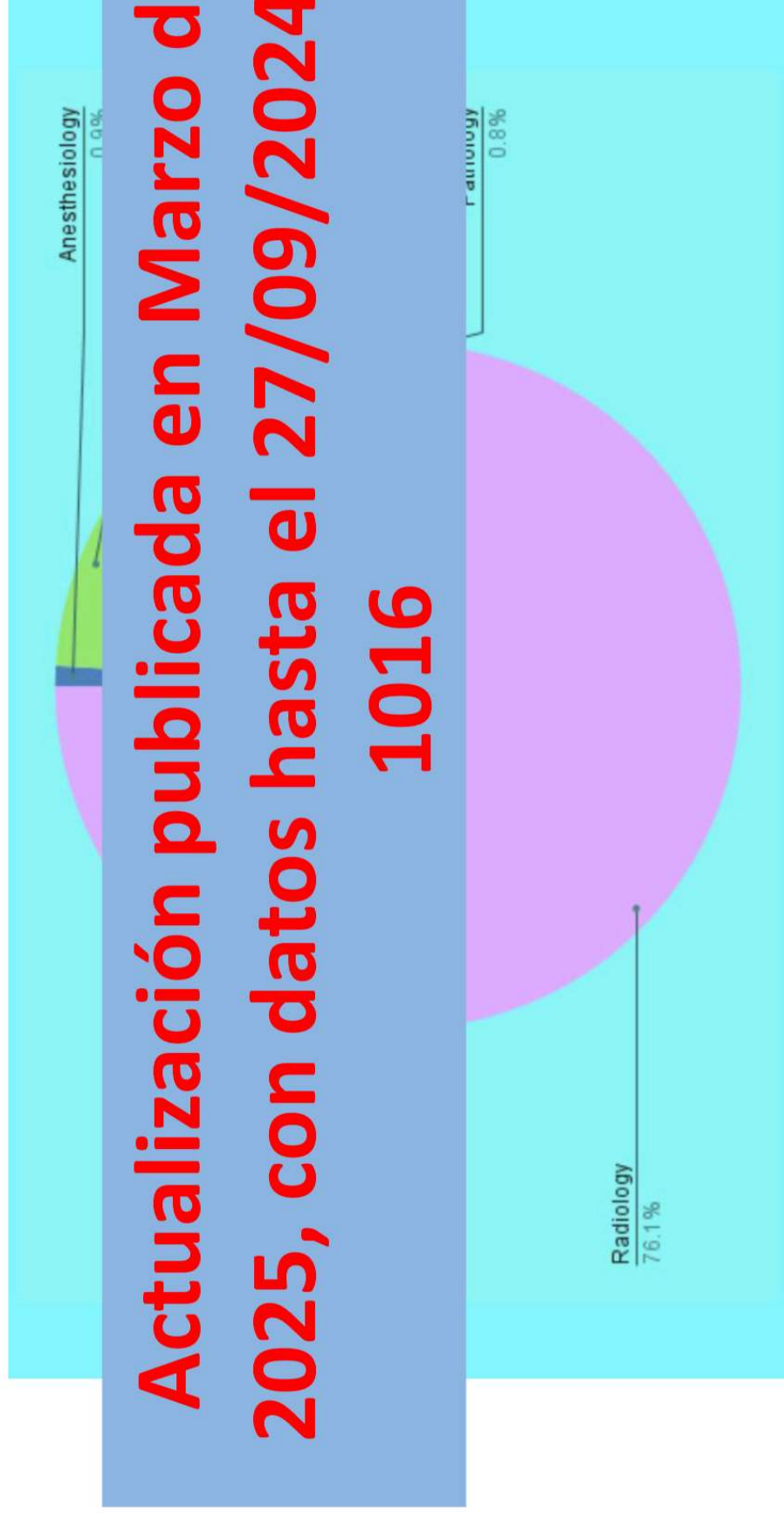
Procesamiento inteligente de documentos de salud



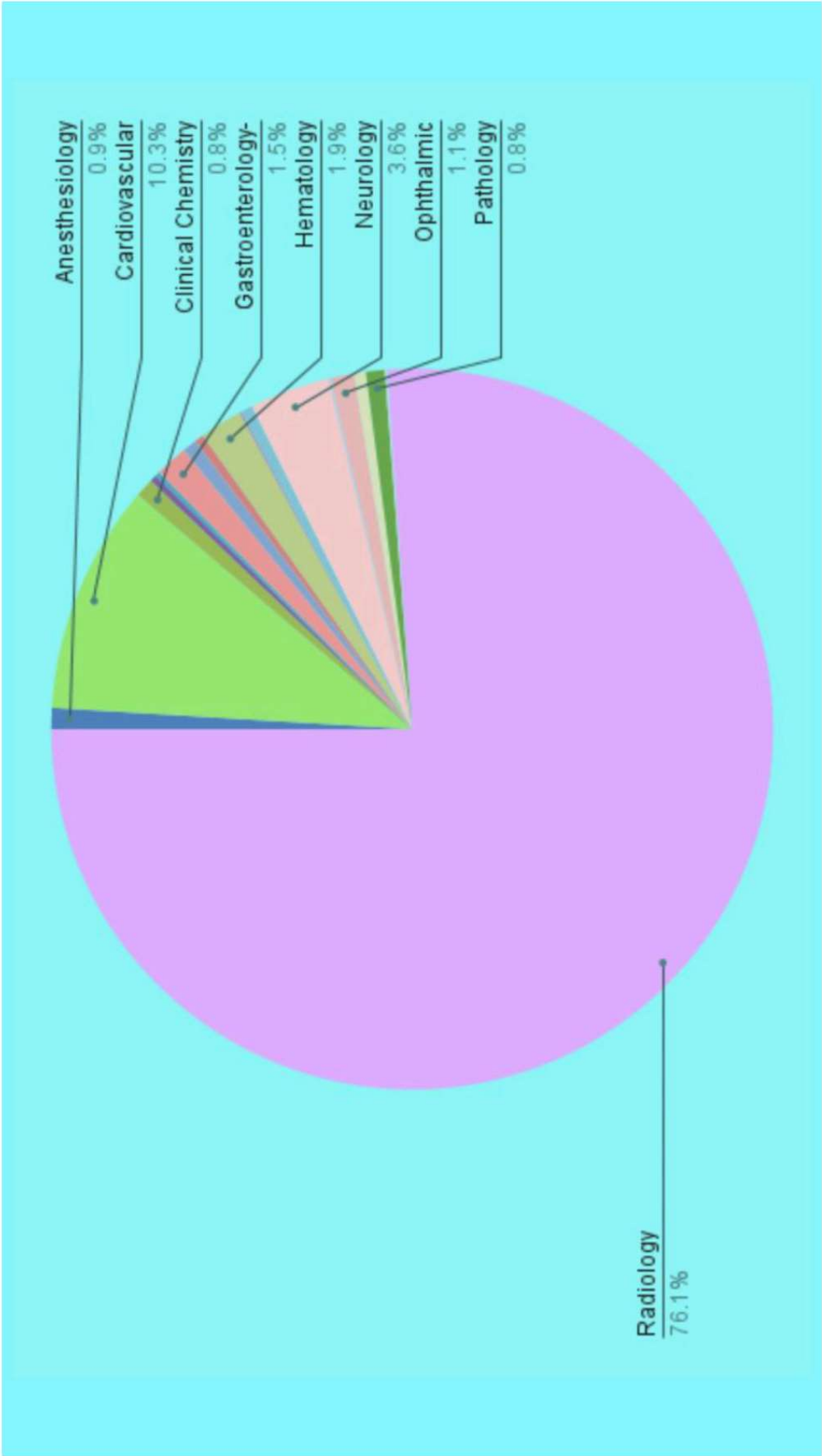
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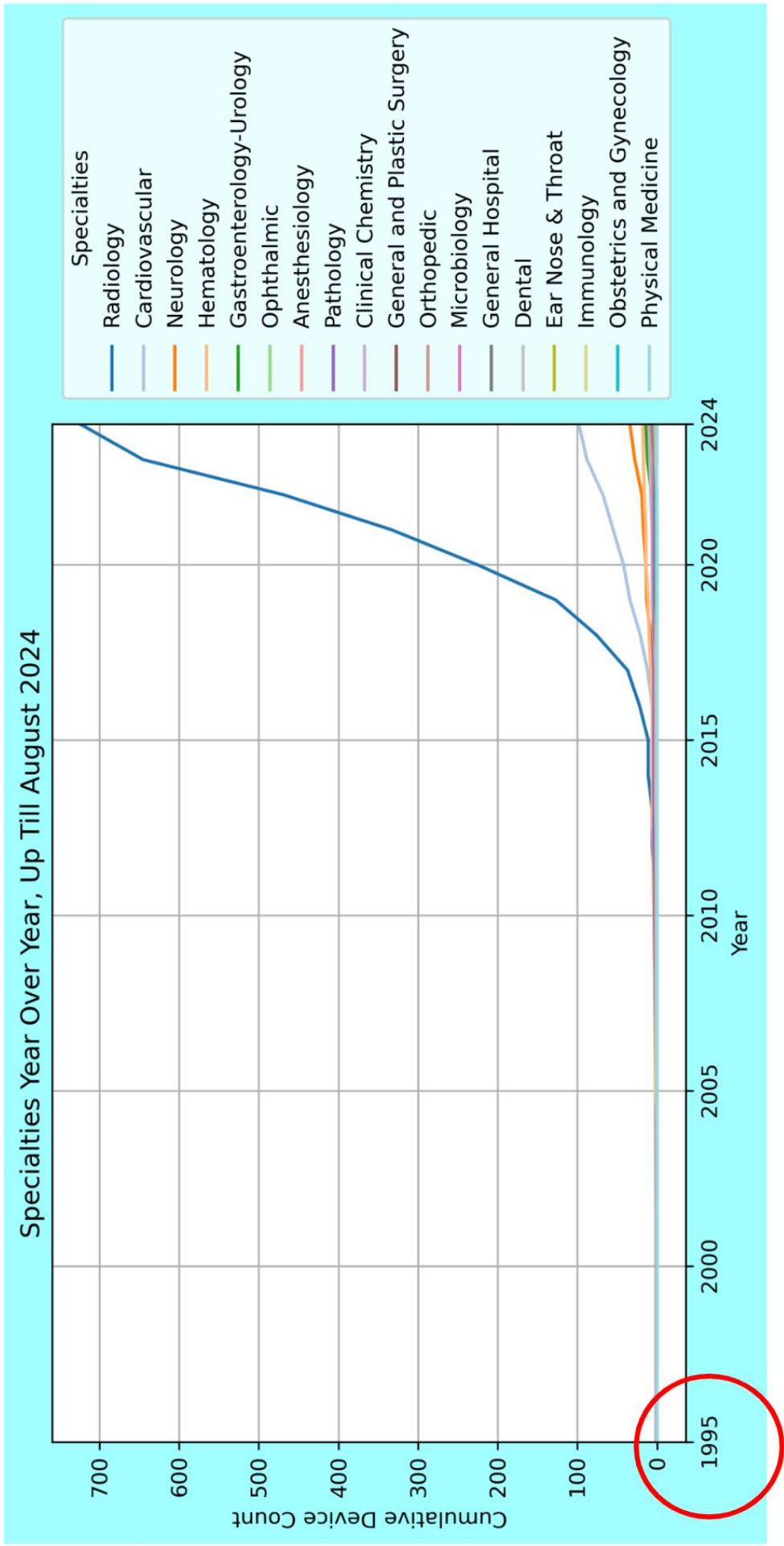
¿Qué más puede hacer la IA para beneficiarme como **potenciales pacientes?**

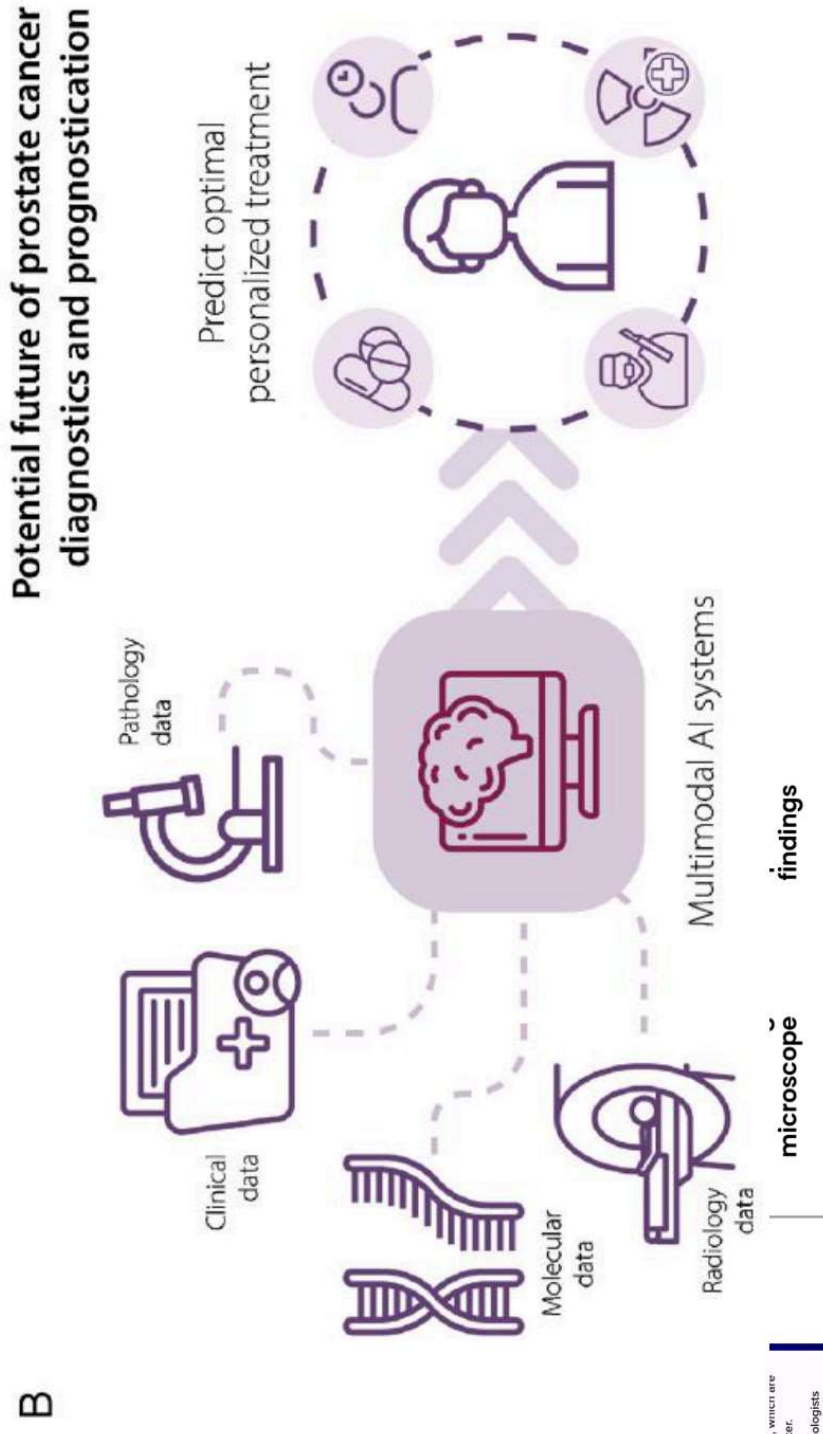
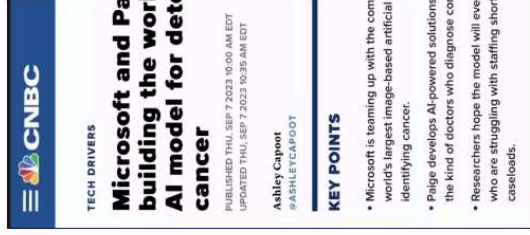
950 FDA Authorized AI-Enabled Medical Devices



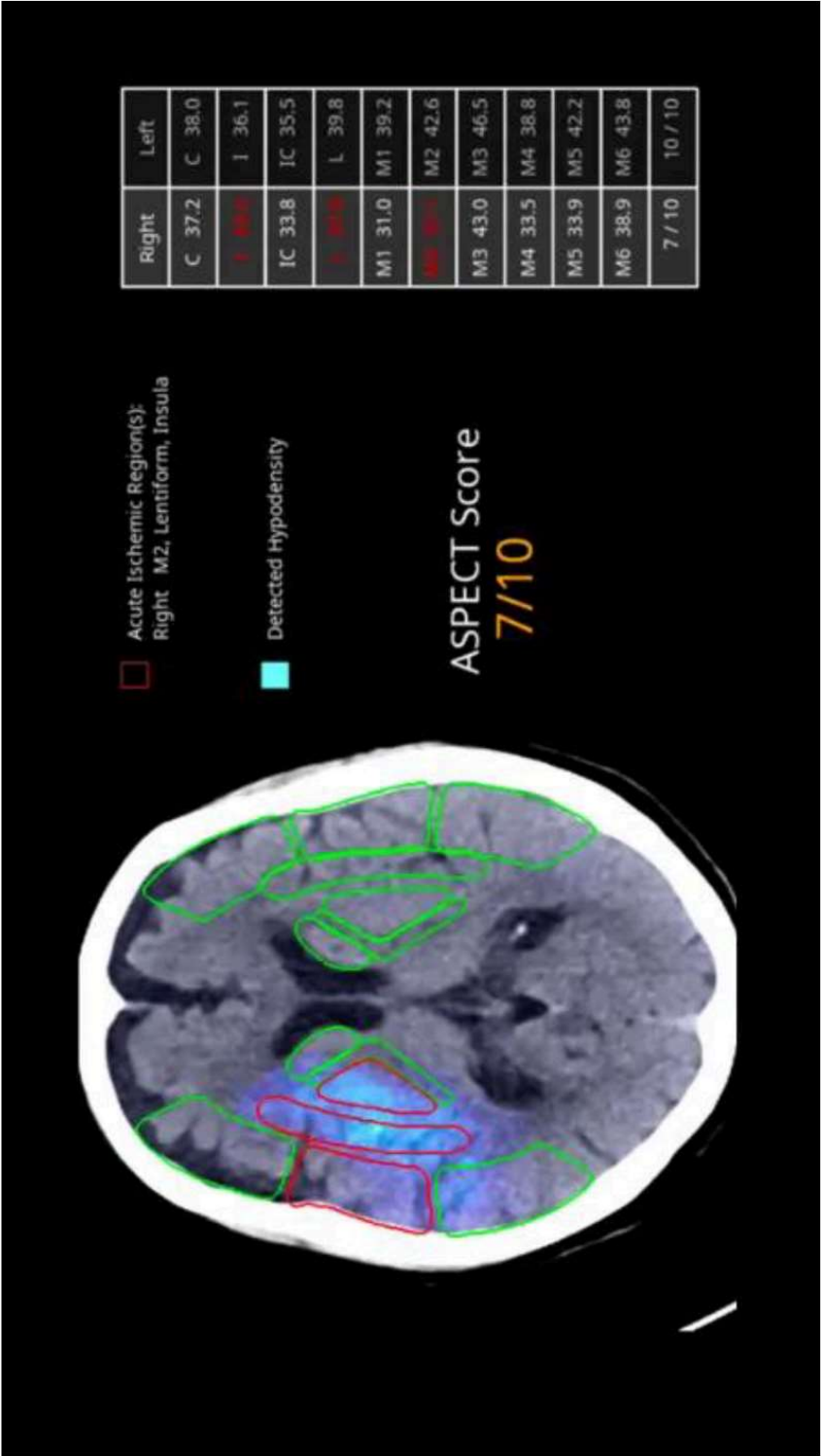
**Actualización publicada en Marzo de
2025, con datos hasta el 27/09/2024 =
1016**

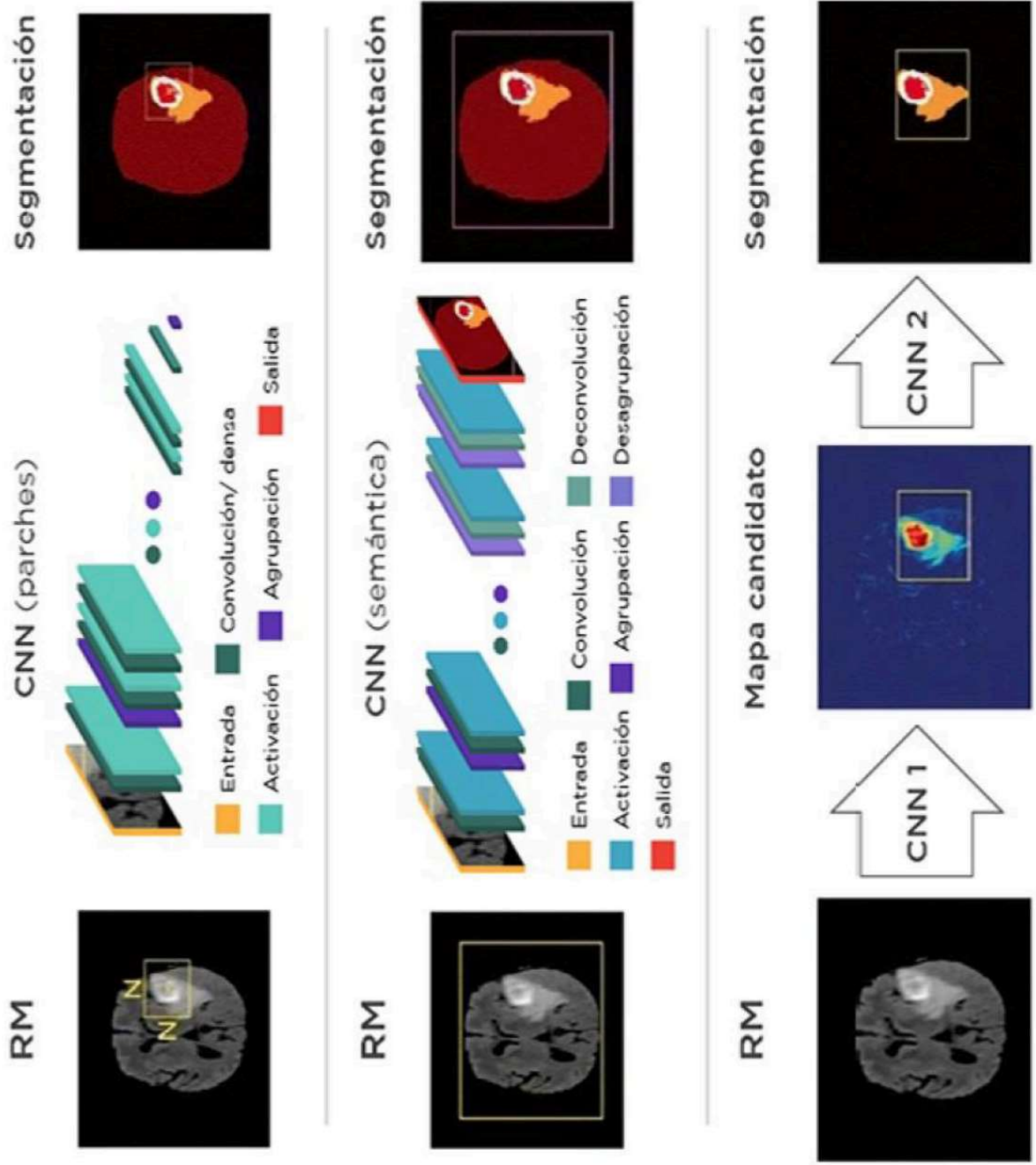






ACV





Detección temprana y prevención

JACR

Journal of the American
College of Radiology

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RESEARCH ARTICLE | ARTICLES IN PRESS

Artificial Intelligence-Driven
Mammography-Based Future
Breast Cancer Risk Prediction: A
Systematic Review

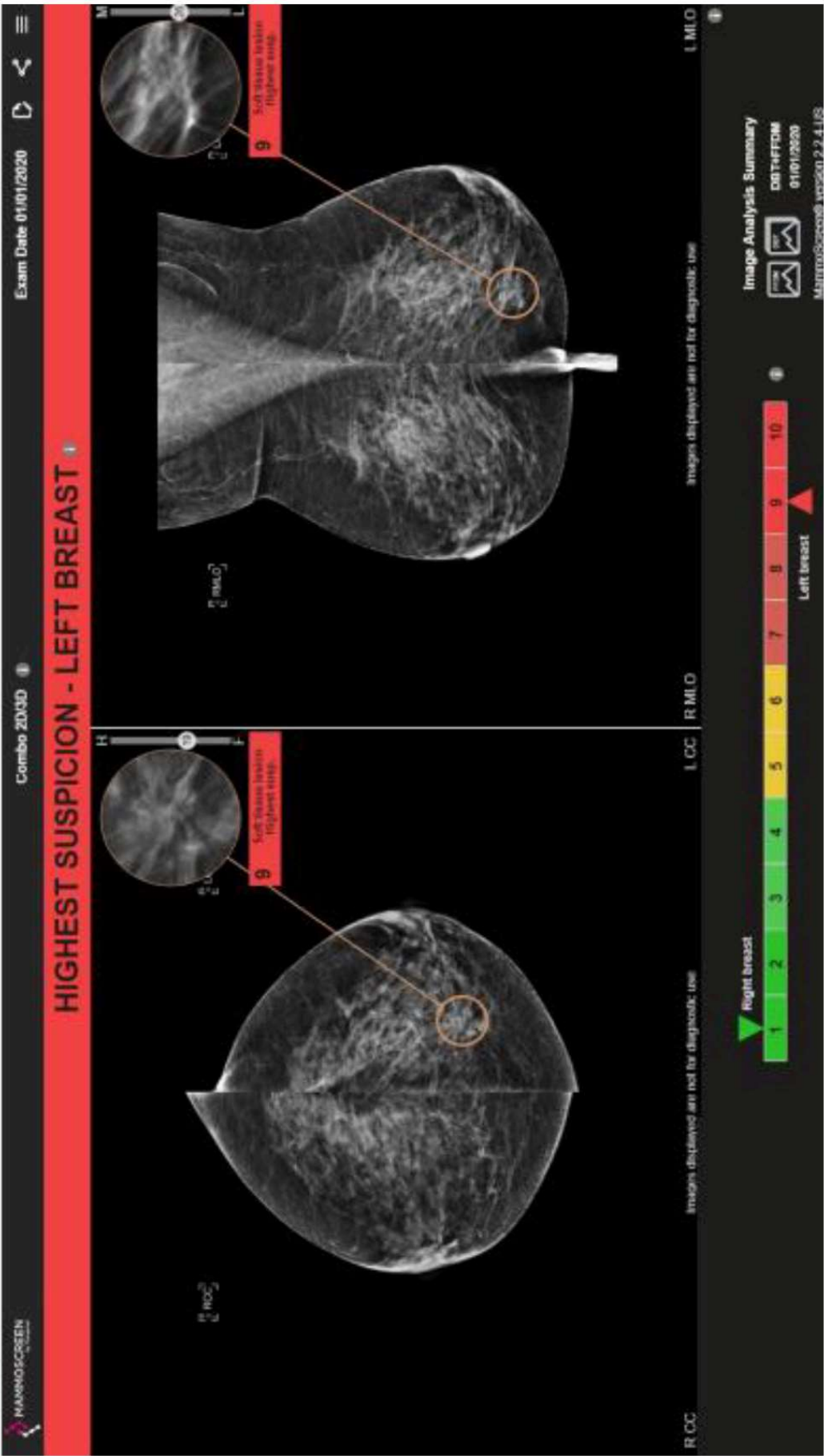
Cody M. Schopf, MD • Ojas A. Ramwala, BTech •
Kathryn P. Lowry, MD • ... Brian N. Dontchos, MD •
Janie M. Lee, MD, MSc •
Christoph I. Lee, MD, MS  • Show all authors

Published: November 07, 2023 •

DOI: <https://doi.org/10.1016/j.jacr.2023.10.018>



Mammography-based artificial intelligence (AI) image-only models had a 72 percent median area under the receiver operating characteristic curve (AUC) for predicting breast cancer in comparison to a median AUC of 61 percent for breast cancer prediction based upon breast density or clinical risk factor-based tools, according to a recent systematic review.



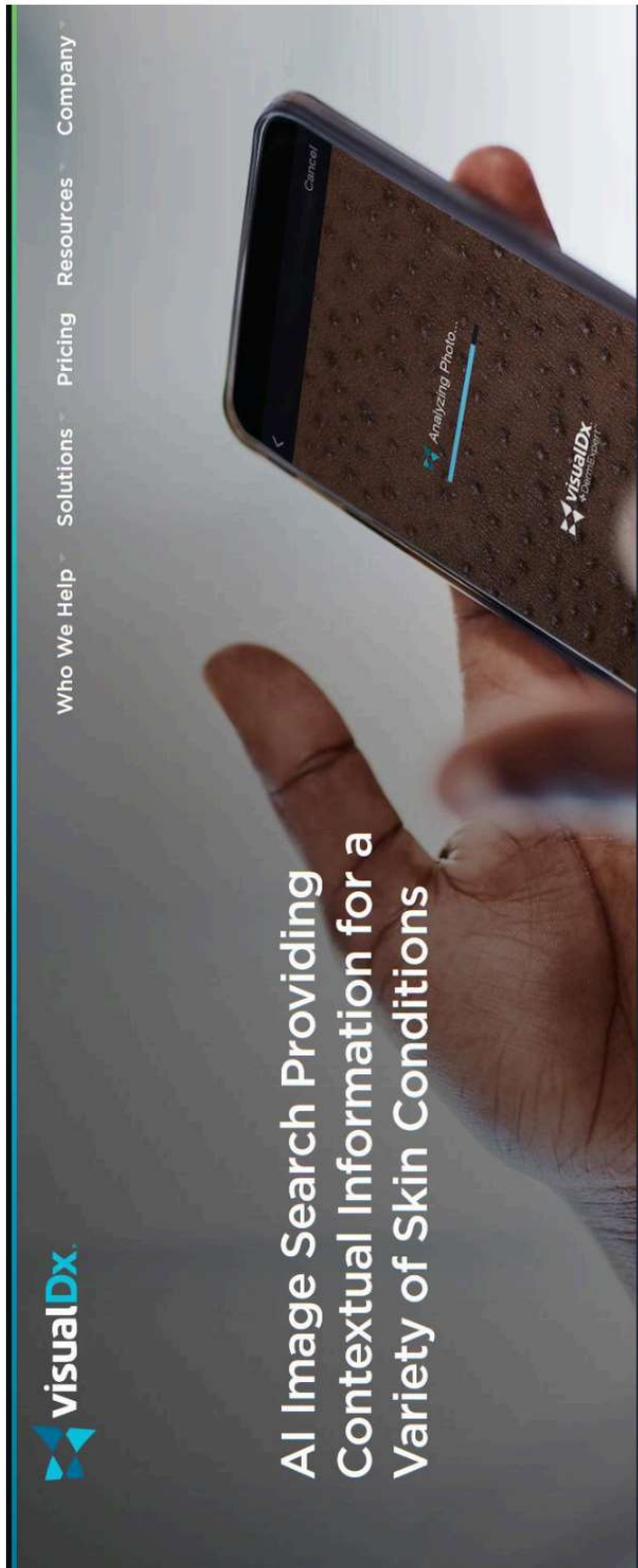
ESR EUROPEAN SOCIETY OF RADIOLOGY

- 2D CNNs (blue) 3D CNNs (yellow) can extract the outer aortic surface accurately with high Dice coefficient scores. However, CNNs may occasionally fail the discrimination between the aortic wall and periaortic structures, especially when the periaortic structures have similar attenuation values with the aortic wall. Ground truth segmentations in red.



Eur Radiol Exp (2023) Kesävuori R et al. DOI: 10.1186/s41747-023-00342-z





Beneficio 3: detección temprana de enfermedades

- Mayor precisión, menos falsos positivos y negativos.

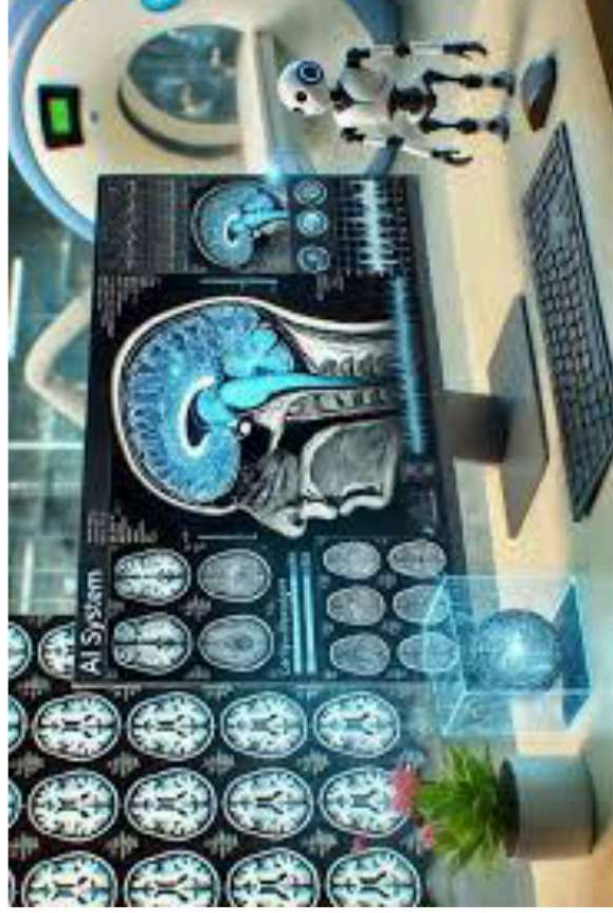
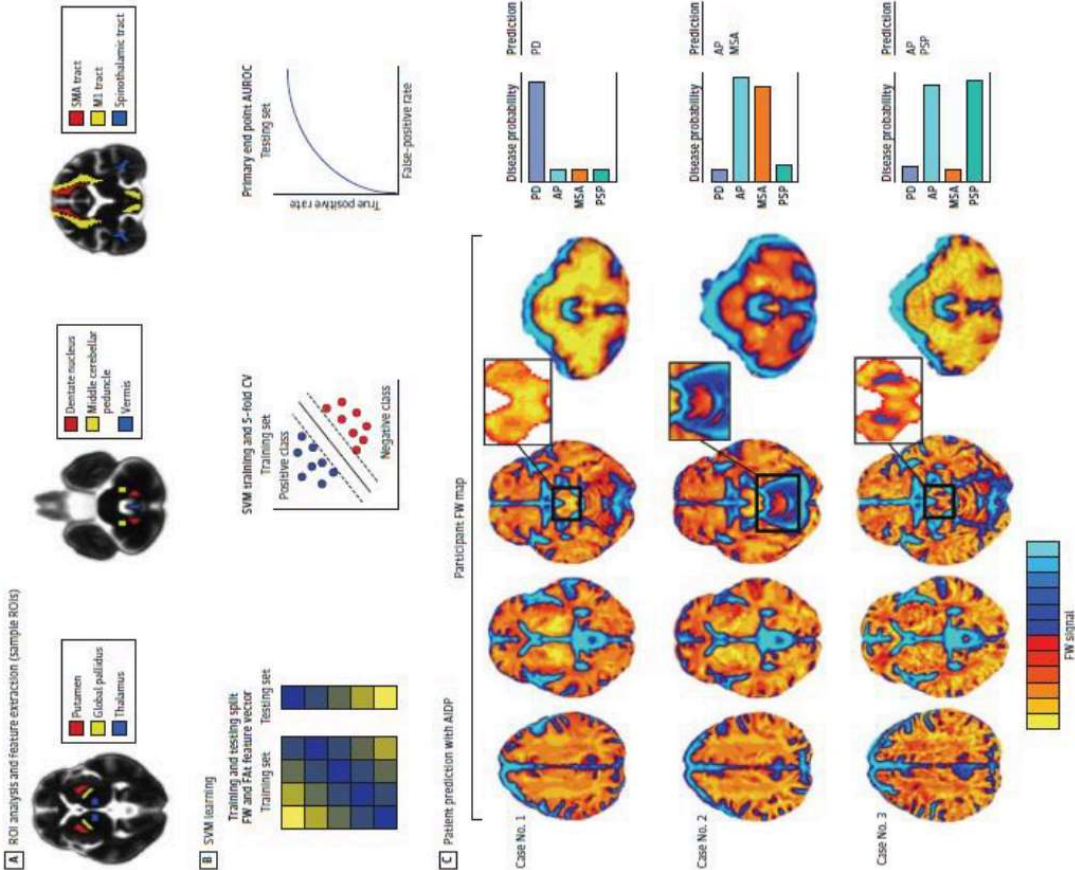


Figure 2. Automated Imaging Differentiation for Parkinsonism (AIDP) for Disease-Specific Classification of Parkinsonism



JAMA Neurology | Original Investigation | AI IN NEUROLOGY

Automated Imaging Differentiation for Parkinsonism

David E. Vaillancourt, PhD; Angelos Barmpoutis, PhD; Samuel S. Wu, PhD; Jesse C. DeSimone, PhD; Marissa Schauder, BS; Robin Chen, BS; Todd B. Parrish, PhD; Wei-en Wang, PhD; Eric Molloy, MD; John C. Morgan, MD, PhD; David K. Simon, MD, PhD; Burton L. Scott, MD, PhD; Liana S. Rosenthal, MD, PhD; Stephen N. Comperts, MD, PhD; Rizwan S. Akhtar, MD, PhD; David Grimes, MD; Sol De Jesus, MD; Natividad Stover, MD; Ece Bayram, MD, PhD; Adolfo Ramirez-Zamora, MD; Stefan Prokop, MD; Ruogu Fang, PhD; John T. Slevin, MD, MBA; Prabesh Kanel, PhD; Nicolaas I. Bohmen, MD, PhD; Paul Tuite, MD; Stephen Aradi, MD; Antonio P. Strafella, MD, PhD; Mustafa S. Siddiqui, MD; Albert A. Davis, MD, PhD; Xuemei Huang, MD, PhD; Jill L. Ostrem, MD; Hubert Fernandez, MD; Irene Litvan, MD, MSc; Robert A. Hauser, MD, MBA; Alexander Pantelyat, MD; Nikolaus R. McFarland, MD, PhD; Tao Xie, MD, PhD; Michael S. Okun, MD; and the AIDP Study Group

JAMA Neurol. 2025;82(5):495-505. doi:10.1001/jamaneurol.2025.0112
Published online March 17, 2025.

Diagnóstico precoz de la EP



Acta de resultados de la convocatoria de proyectos de investigación

según Res. Nº 597/2018-CS

En la sede de la SIIP UNCUYO, a cinco días del mes de abril de 2019, se reúnen la Sra. Secretaria de Investigación Internacionales y Posgrado de la UNCUYO la Dra. Jimena Estrella y el Dr. Raúl Marino, Coordinador del área de Investigación y Posgrado con la finalidad de elaborar la propuesta de aprobación de proyectos de Investigación Tipo 4 según lo dispuesto en la Res. Nº 597/2018-CS, correspondiente a la convocatoria.

Para la lista propuesta se ha tenido en cuenta lo establecido en los artículos 3º y 4º de la Res. Nº 597/2018-CS.

11	CREMASCHI, Fabián	FCM	Detección, análisis y clasificación de patrones mioeléctricos en pacientes con Enfermedad de Parkinson.
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Beneficio 4: control personalizado de enfermedades crónicas

- **Dispositivos portables con IA integrados**

Desde relojes hasta ropa inteligente que monitorean ritmo cardíaco, glucosa, apnea del sueño, y más... alertando en tiempo real a vos y a tu médico.

Beneficio: Prevención continua, incluso sin que lo notes.

- Apps de IA ajustan insulina y dieta en diabetes.
- Seguimiento en tiempo real.

Cefaly™. FDA-Cleared. CE Marked.



Neurolief Relivion® (App: e-Relief™). FDA-Cleared.



Nerivio™ (App). FDA-Cleared.



Otros:

FDA-Cleared Devices

Current Pain and Headache Reports (2021) 25: 71
<https://doi.org/10.1007/s11916-021-00988-7>

NEUROMODULATION (A ABD-ELSAEED, SECTION EDITOR)

Update of Neuromodulation in Chronic Migraine

Hsiangkuo Yuan¹ · Tzu-Ying Chuang²

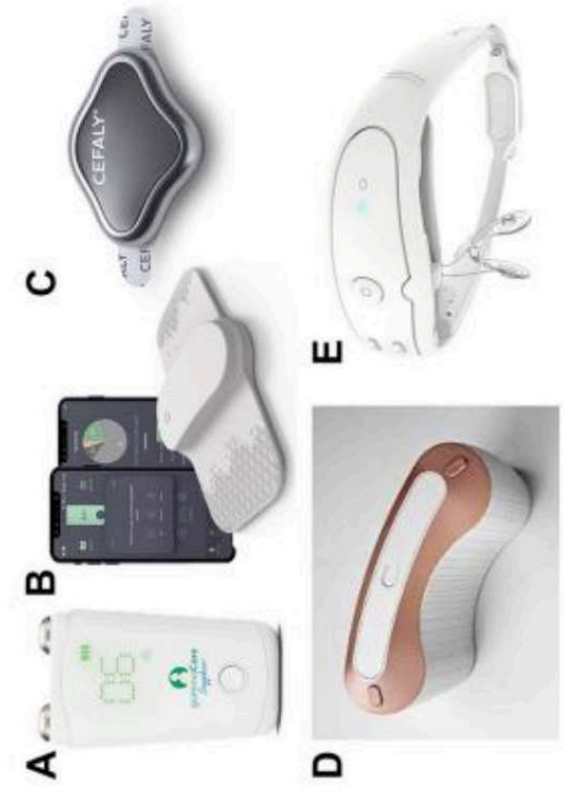


Fig. 1 A gammaCore Sapphire™, B Nerivio®, C Cefaly®, D sTMS mini™, E Relivion®. Images were adapted from the companies' websites

AI FOR SURGERY

- Preoperative planning**
A practical example of AI in Orthopedics for preoperative planning is automated bone segmentation, patterns identification or to select which implant you would need.
- Intraoperative guidance**
During the surgery, AI can be used to boost how intraoperative guidance is done. Tasks might include tissue tracking, augmented reality and to create a 3D visualization in real time.
- Surgical robotics**
Combining AI and Robotics, orthopedic surgeons may identify the anatomy of a patient and have a enhanced performance and control over instruments.

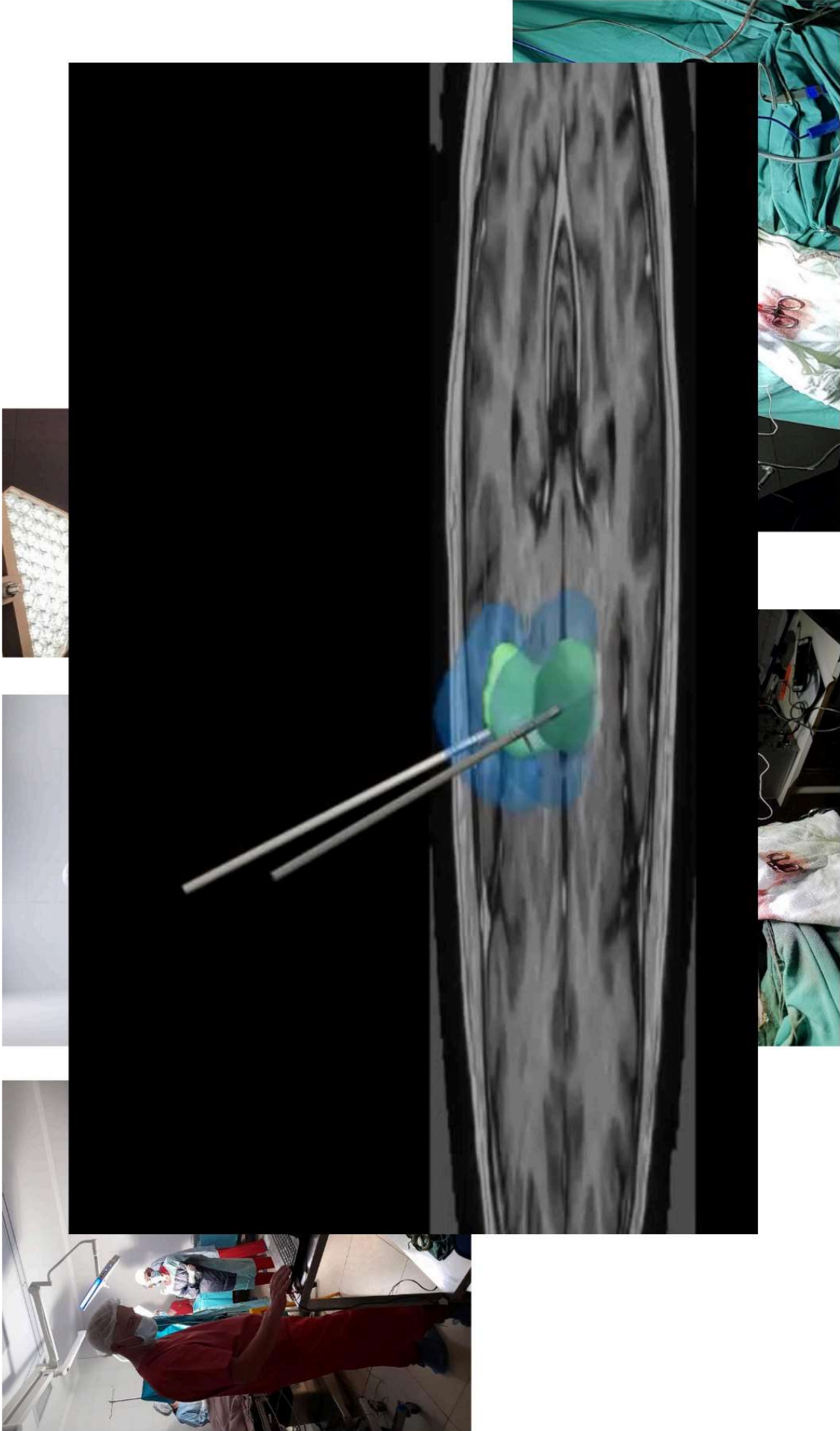
35/62

ROSA® Brain & ROSA® Spine

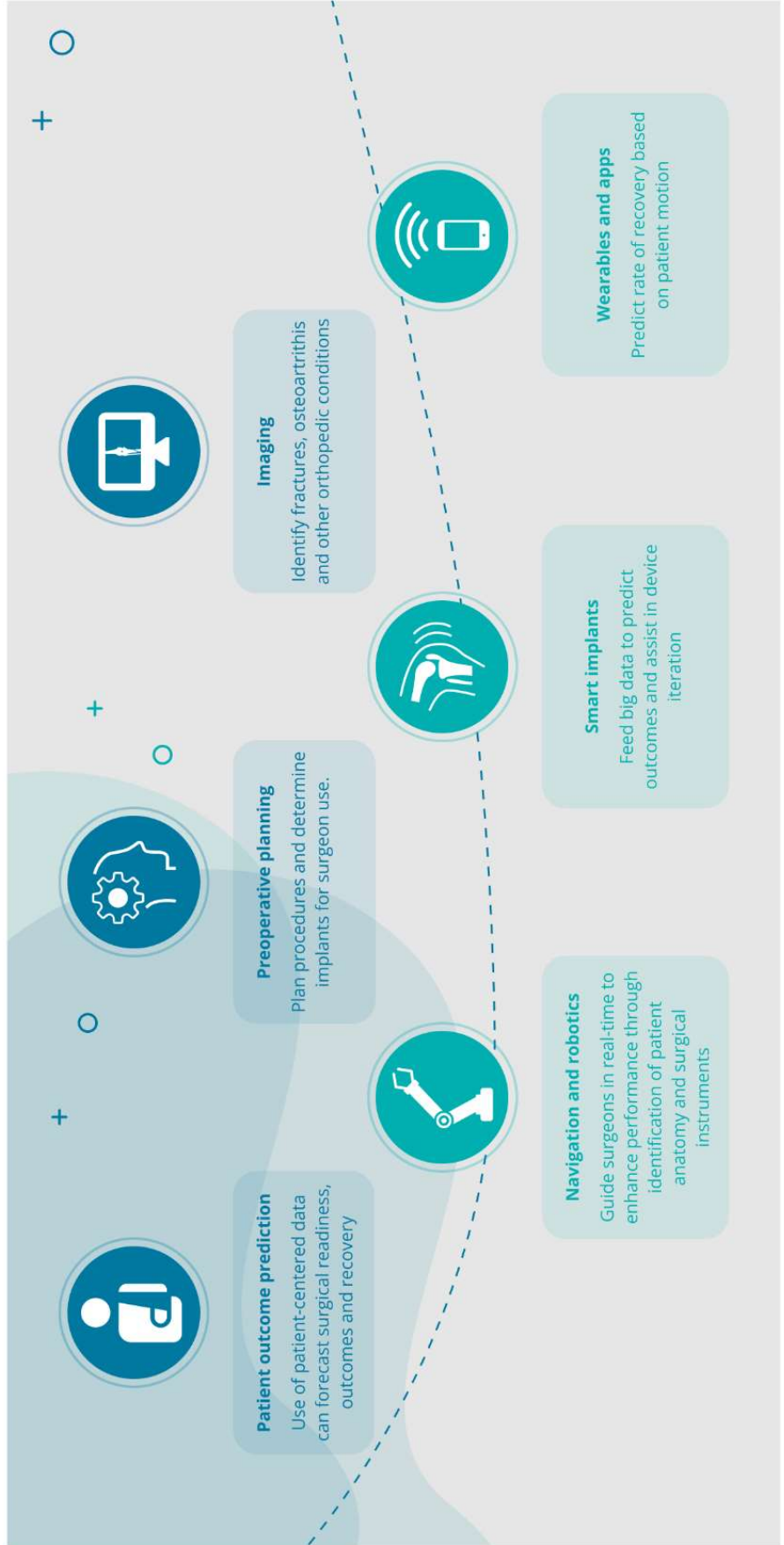
- Sistema ROSA (**RO**botic **S**tereotactic **A**ssistance) (Zimmer -Biomet): 1 brazo robóticos de 6 GDL.
- Robot especializado para neurocirugía guiada por imágenes.
- Permite planificación preoperatoria precisa e integración con neuronavegación.
- Utilizado en epilepsia, estimulación cerebral profunda, biopsias, evacuación de lesiones y otras.

<https://www.zimmerbiomet.com/en/products-and-solutions/zb-edge/robotics/rosa-brain.html>





Tratamiento quirúrgico



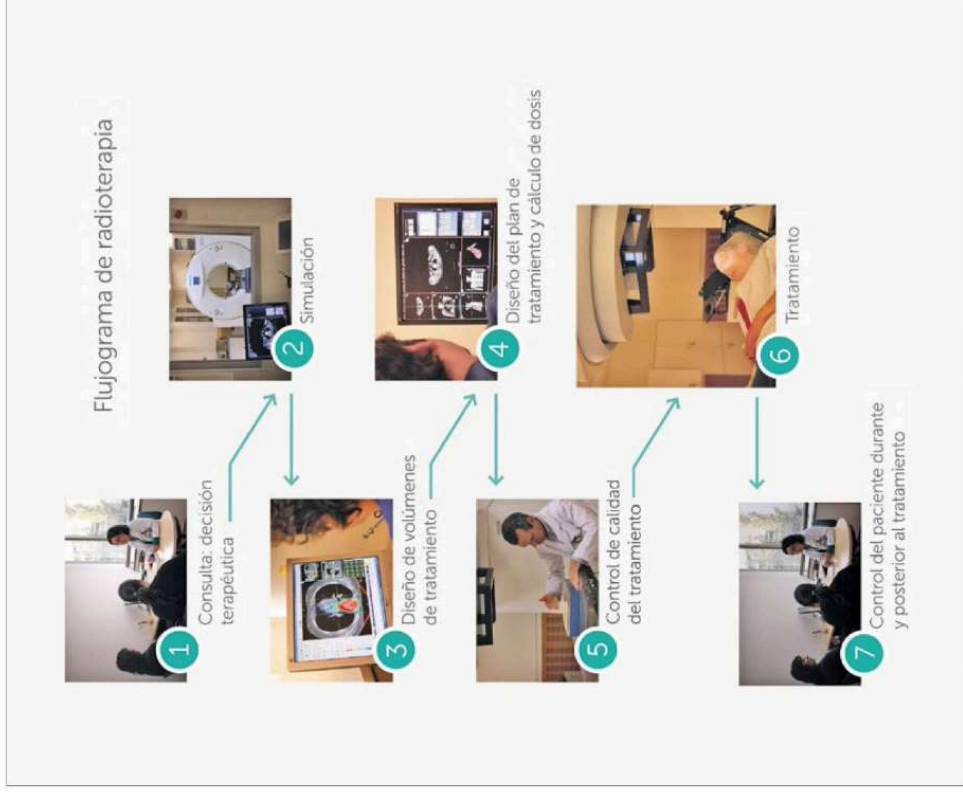
<https://blog.peekmed.com/artificial-intelligence-in-surgery>



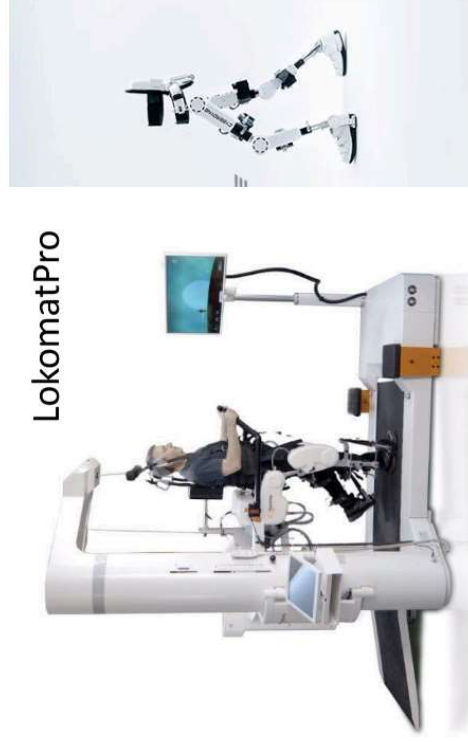
<https://news.iscas.co/fats-faculty-of-advanced-techno-surgery/>

Tratamiento radioterapéutico

- Reducción de los tiempos de planificación y entrega de dosis.
- Mejora en la precisión.
- Personalización de los tratamientos.
- Optimización de recursos y costos.



PMID: 18953732 DOI: 10.1179/016164108X269312



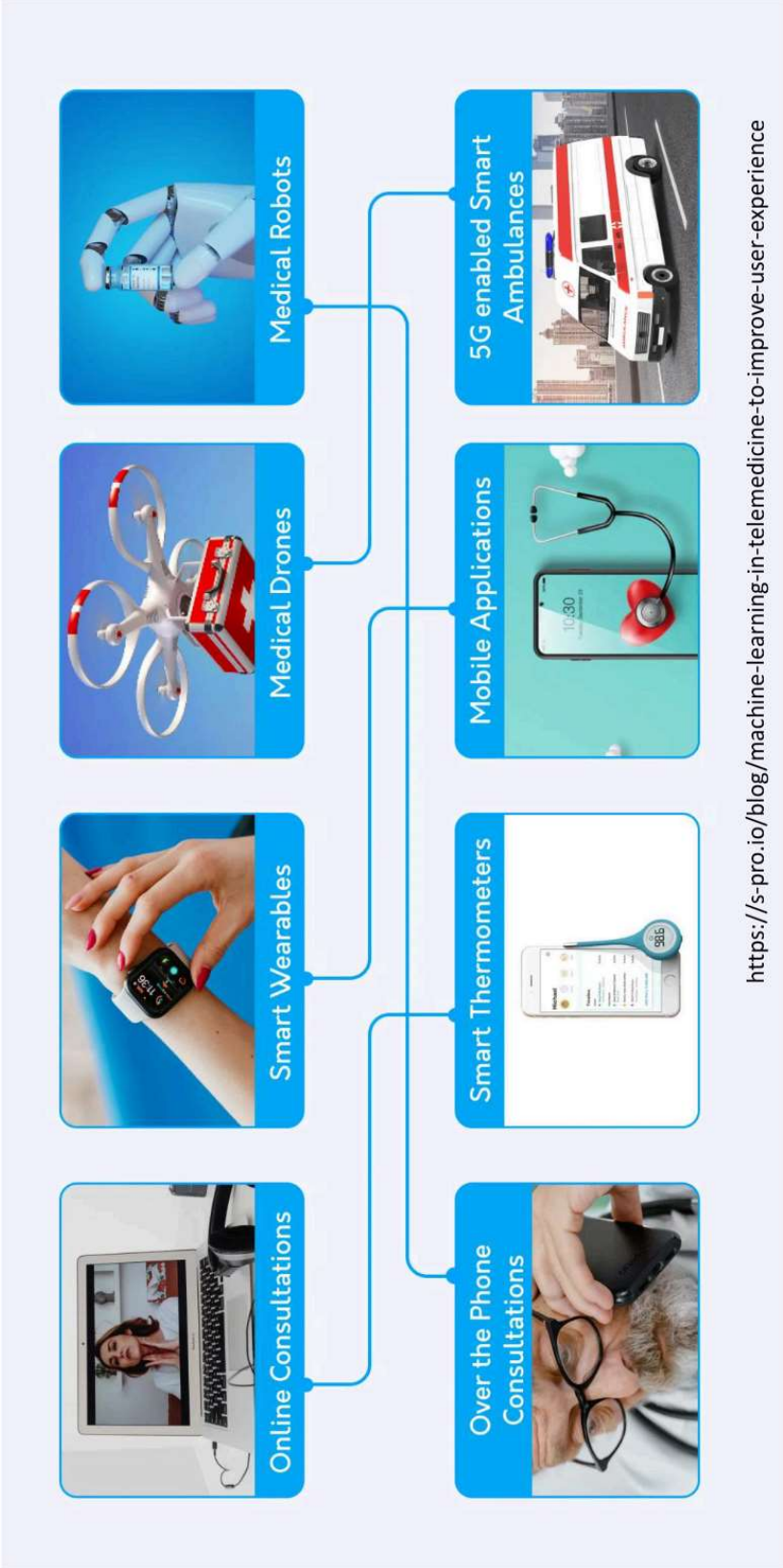
(g)



<https://outlook.office.com/mail/txd@uncuyo.edu.ar/inbox/id/AAQkADJhZGI4YlBjLTJkNzEhNDJRjOS0Tc1LTXZGZnNTA4ZDU2YgAQAN7tzcdfL1Aqs11dFD6SWU%3D/sxs/AAMkADJhZGI4YlBjLTJk...>

Beneficio 7: acceso a salud en zonas rurales

Telemedicina



Beneficio 8: apoyo en salud mental con IA conversacional

- Empatía con los pacientes

JAMA Network

JAMA Oncology

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Enter Search Term

This Issue

Views **2,737** | Citations **3** | Altmetric **165**

Brief Report

May 16, 2024

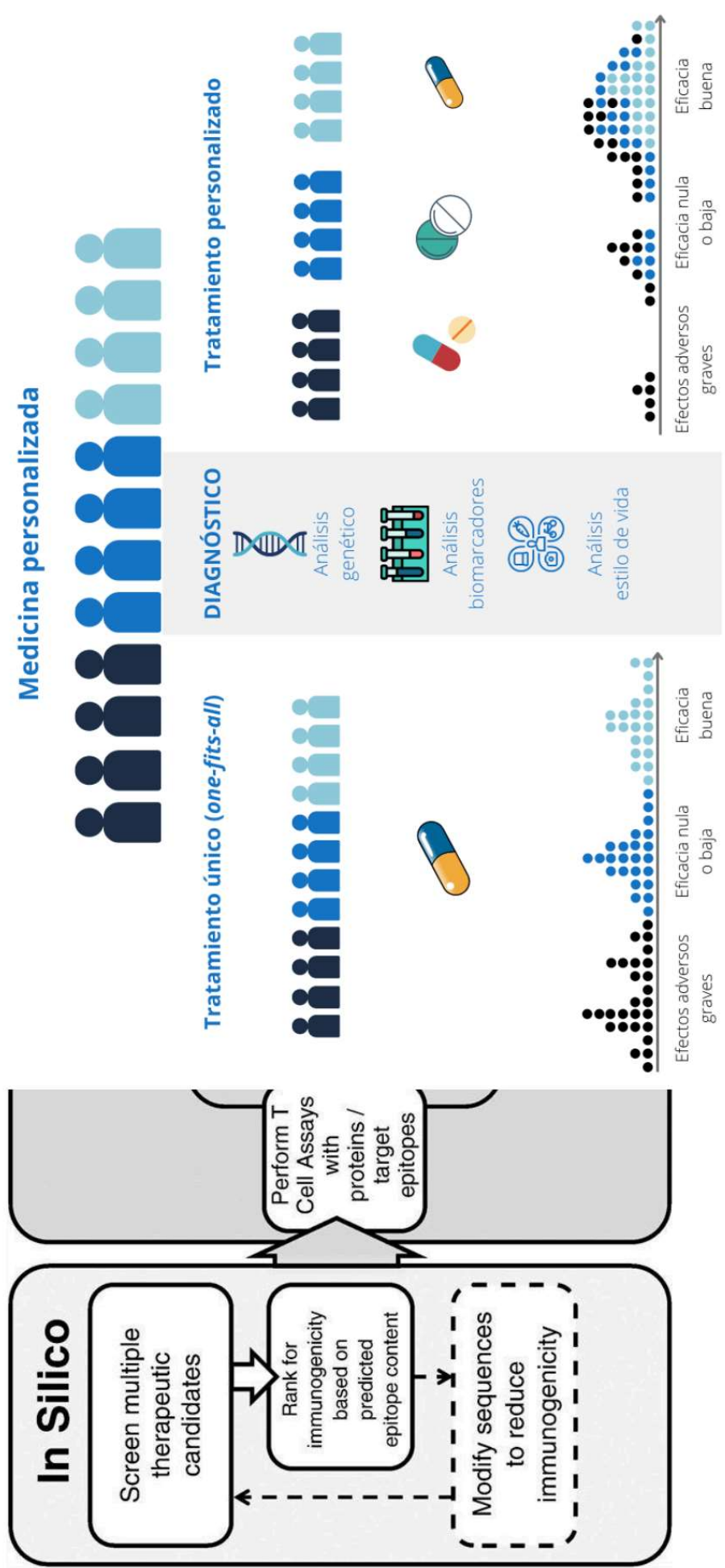
Physician and Artificial Intelligence Chatbot Responses to Cancer Questions From Social Media

David Chen, BMSc^{1,2}; Rod Parsa, MSc^{1,3}; Andrew Hope, MD^{1,4}; [et al](#)

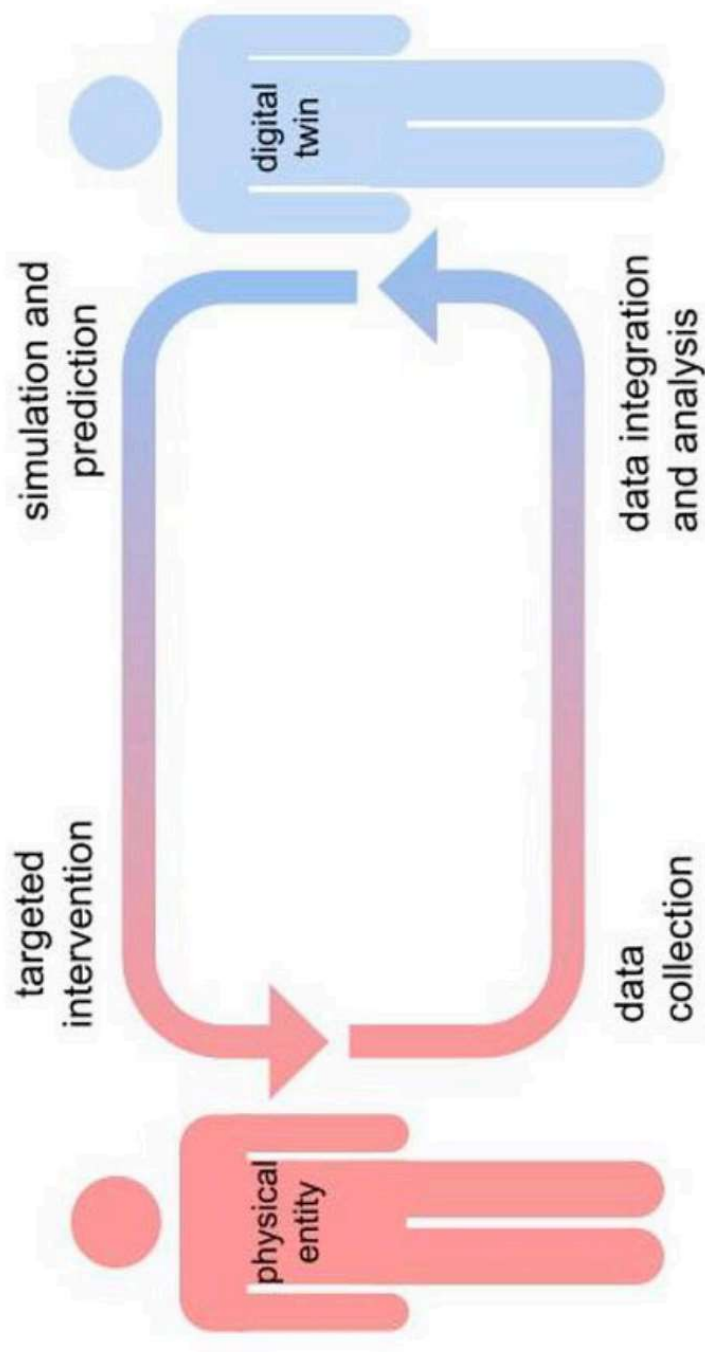
» Author Affiliations

JAMA Oncol. 2024;10(7):956-960. doi:10.1001/jamaoncol.2024.0836

Beneficio 9: tratamientos personalizados según tu ADN



Gemelos digitales en salud



Medicina de Precisión

Citation: Clin Transl Sci (2021) 14, 86–93; doi:10.1111/cts.12884

REVIEW

Precision Medicine, AI, and the Future of Personalized Health Care

Kevin B. Johnson^{1,2,*}, Wei-Qi Wei¹, Dilhan Weeraratne³, Mark E. Frisse¹, Karl Misulis^{1,4}, Kyu Rhee³, Juan Zhao¹ and Jane L. Snowdon³

The convergence of artificial intelligence (AI) and precision medicine promises to revolutionize health care. Precision medicine methods identify phenotypes of patients with less-common responses to treatment or unique healthcare needs. AI leverages sophisticated computation and inference to generate insights, enables the system to reason and learn, and empowers clinician decision making through augmented intelligence. Recent literature suggests that translational research exploring this convergence will help solve the most difficult challenges facing precision medicine, especially those in which nongenomic and genomic determinants, combined with information from patient symptoms, clinical history, and lifestyles, will facilitate personalized diagnosis and prognostication.

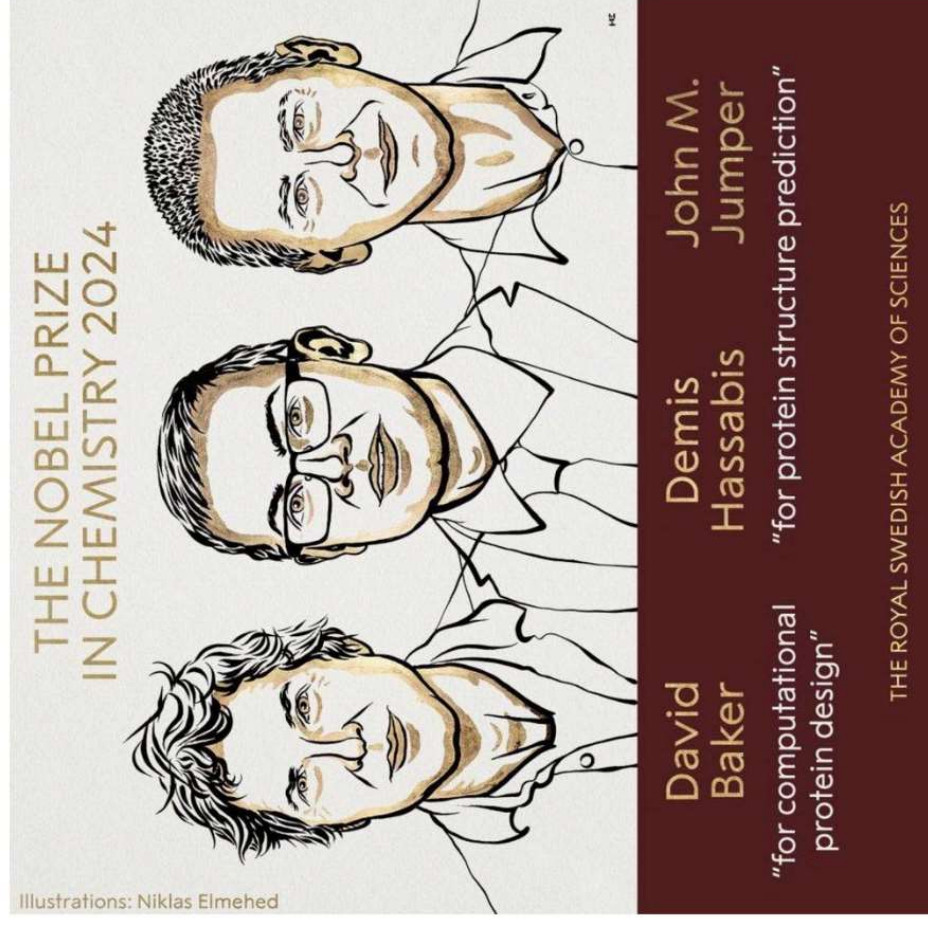
Google Deepmind Alpha Fold 2 in understanding the Protein

90.7 GDT

93.3 GDT

- Computational prediction

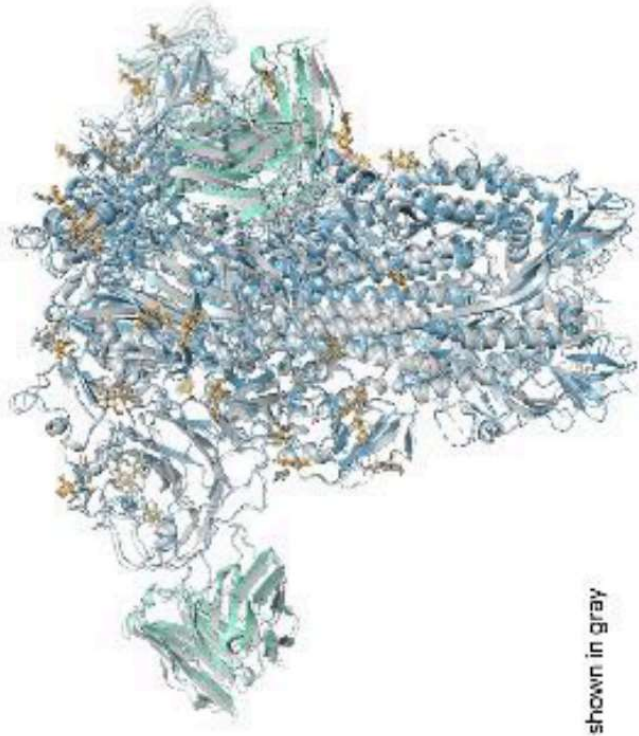
Premio Nobel de Química 2024



Beneficio 10: ¿no morir por envejecimiento ni enfermedades?

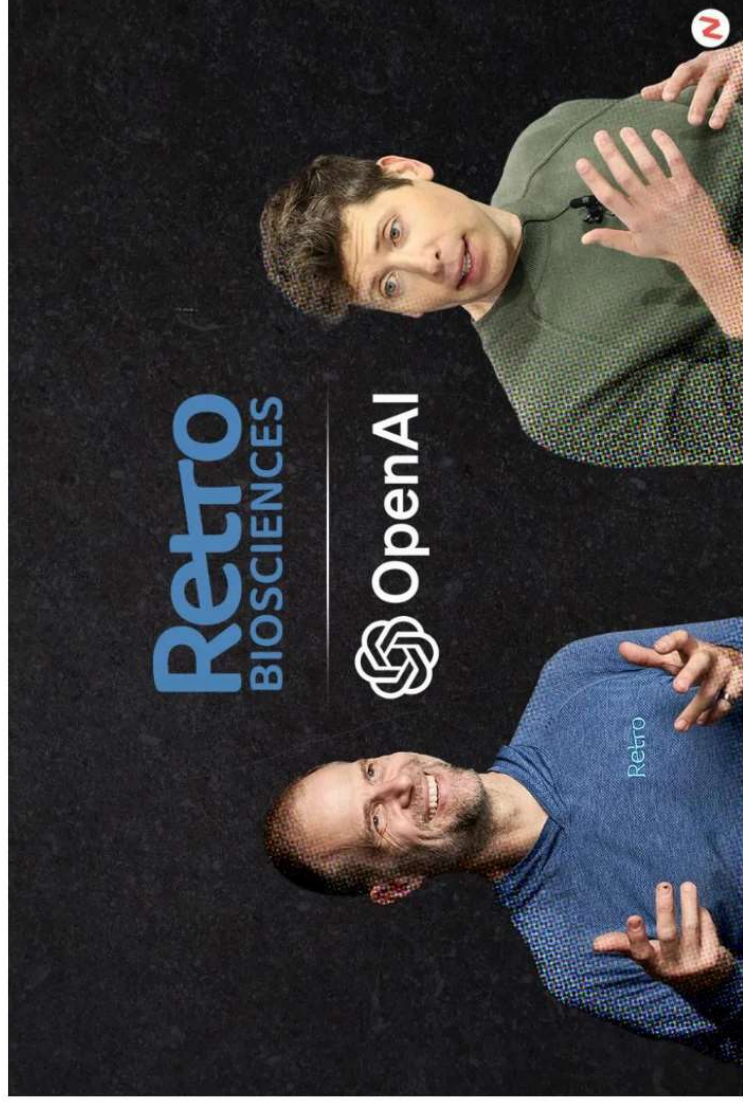
- Medicina regenerativa.

7PNM



Ground truth shown in gray

GPT-4b micro: ¿camino a la amortabilidad?



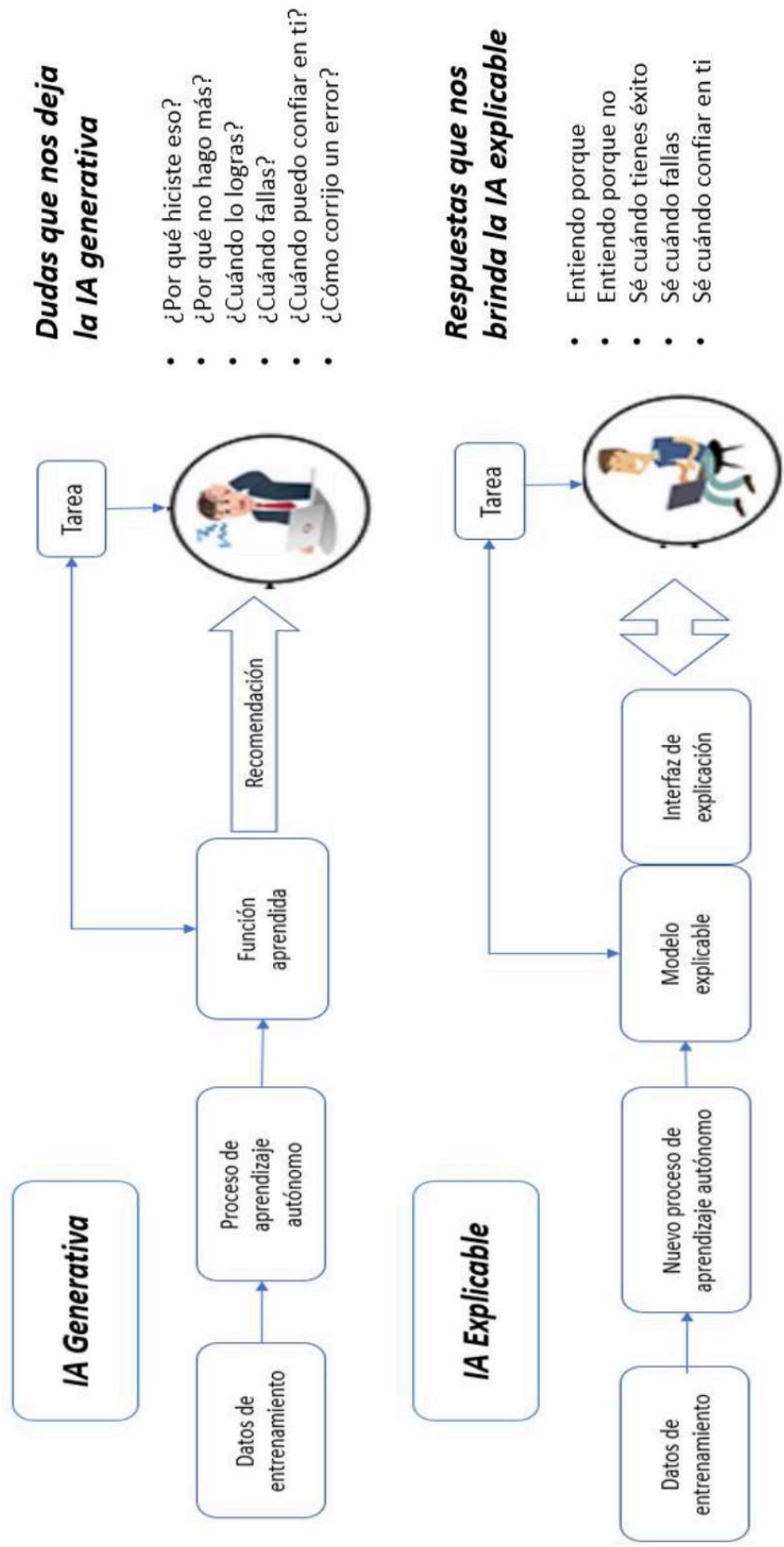
<https://www.linkedin.com/pulse/gpt-4b-micro-core-revolution-protein-engineering-cellular-jabar-riaz-laqif/>

2

Desafíos y perspectivas... ¿futuras?



IA Explicable



Aprendizaje federado

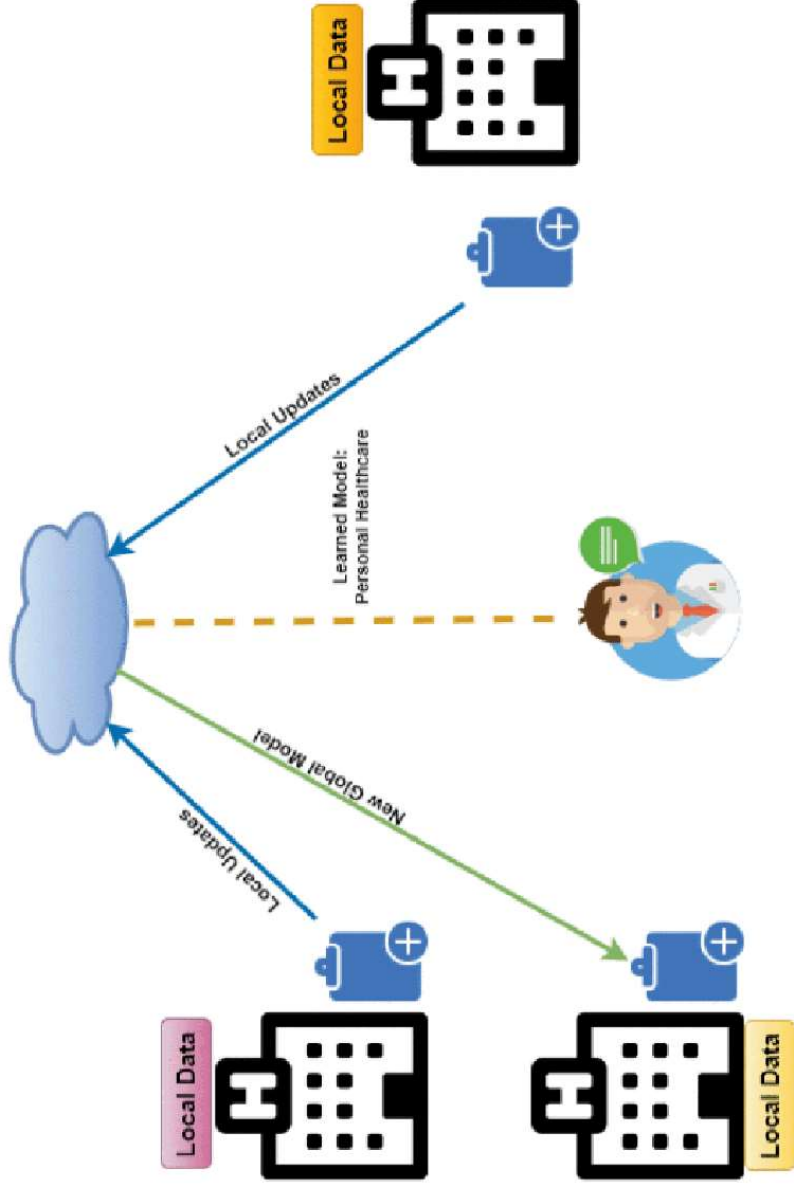
Cluster Computing
<https://doi.org/10.1007/s10586-022-03658-4>



Federated learning-based AI approaches in smart healthcare: concepts, taxonomies, challenges and open issues

Anichur Rahman^{1,2} · Md. Sazzad Hossain² · Ghulam Muhammad³ · Dipanjali Kundu¹ · Tanoy Debnath² · Muaz Rahman¹ · Md. Salkat Islam Khan² · Prayag Tiwari² · Shahab S. Band³

Received: 2 February 2022 / Revised: 10 May 2022 / Accepted: 17 June 2022
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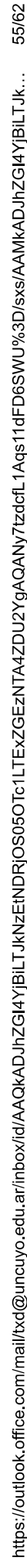


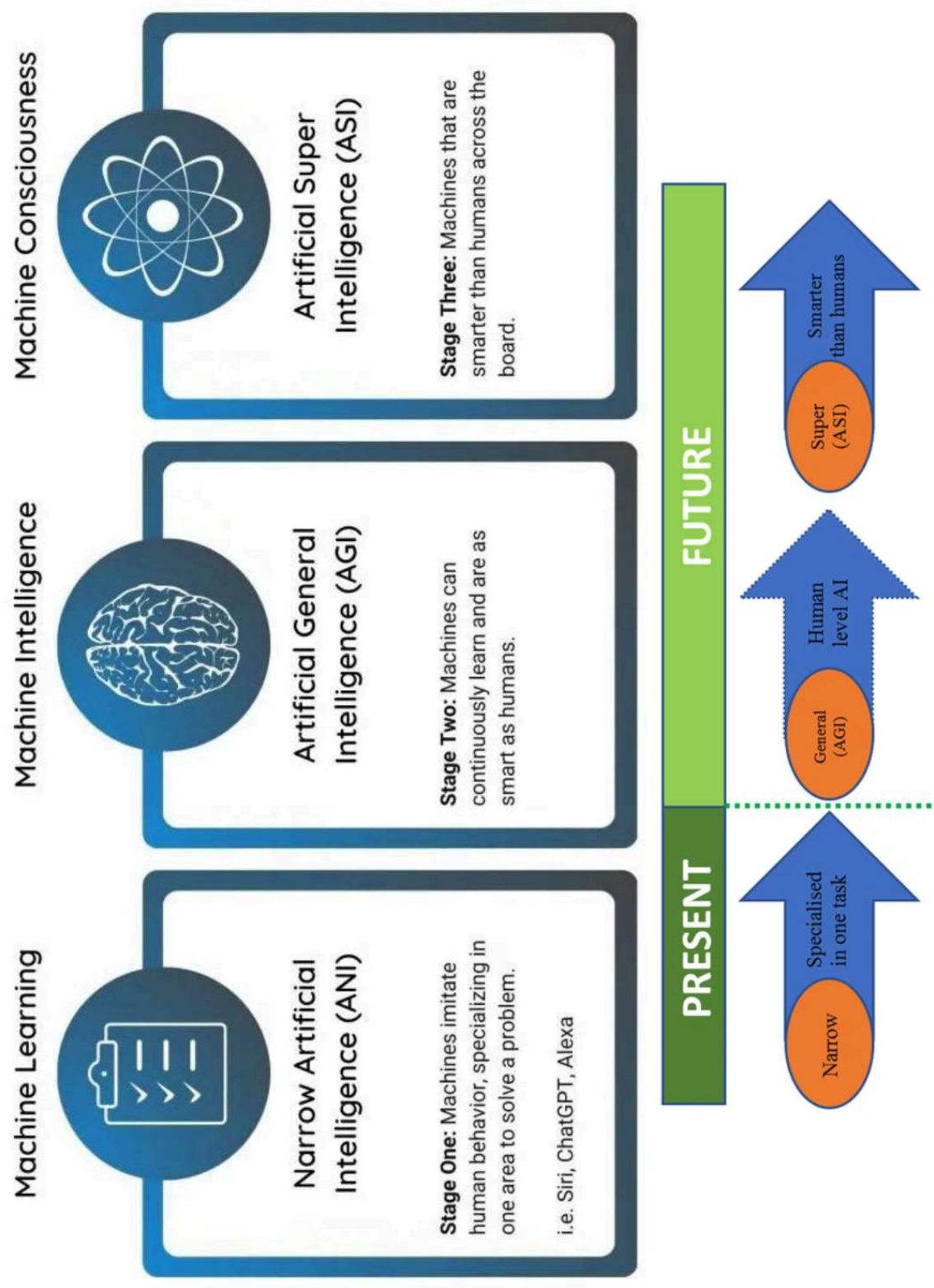
The diagram illustrates a multimodal fusion framework for machine learning tasks in healthcare. It is organized into four main data categories around a central hub:

- Omics (Blue Segment):** Includes Genomics, Proteomics, Molecular Tests, and Lab Tests.
- Imaging (Green Segment):** Includes Histopathology, MRI, and CT.
- Clinical Data (Purple Segment):** Includes EHR, Recurrence, and Segment.
- Disease Spaces (Pink Segment):** Includes Lung Cancer, Prostate Cancer, Breast Cancer, Liver Cancer, and Cervical Cancer.

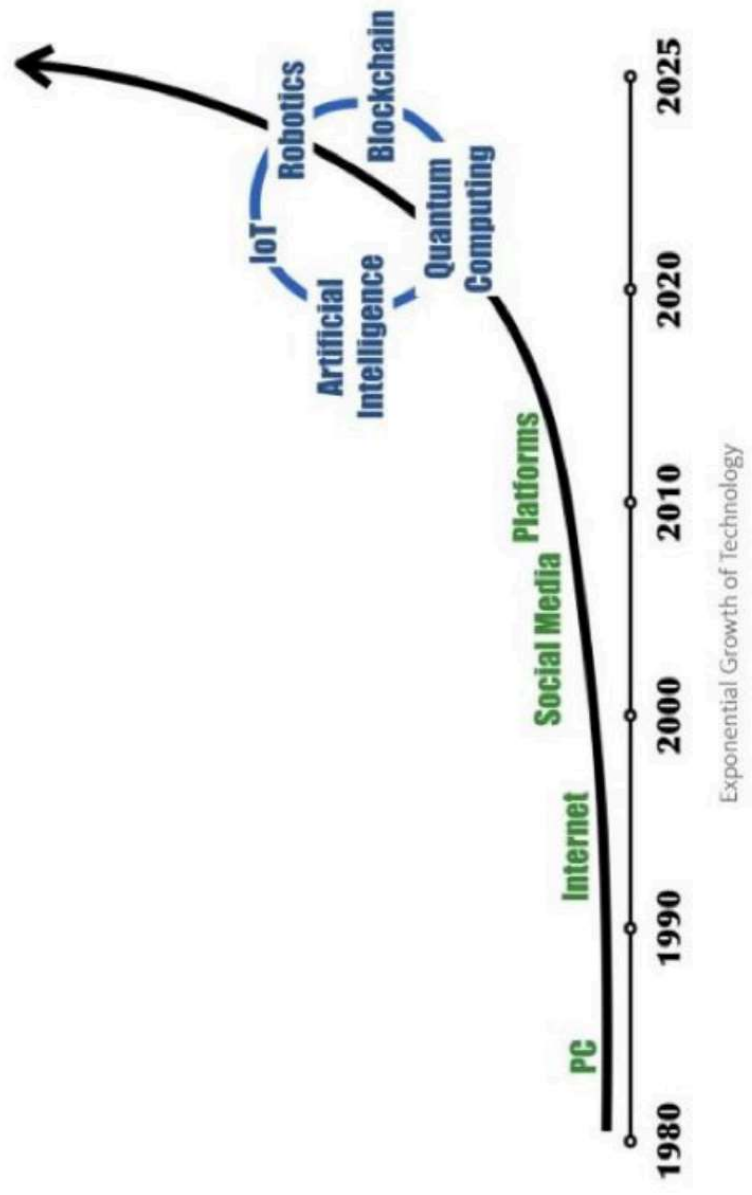
These data sources feed into a central **Multimodal Fusion** hub. The hub then informs various **Machine Learning Tasks**, which are arranged around the perimeter of the circle:

- Diagnosis
- Treatment Selection
- Mortality
- Cervical Cancer
- Liver Cancer
- Breast Cancer
- Prostate Cancer
- Lung Cancer
- CT
- MRI
- Histopathology
- Epigenomics
- Genomics
- Proteomics
- Molecular Tests
- Lab Tests
- EHR
- Recurrence
- Segment



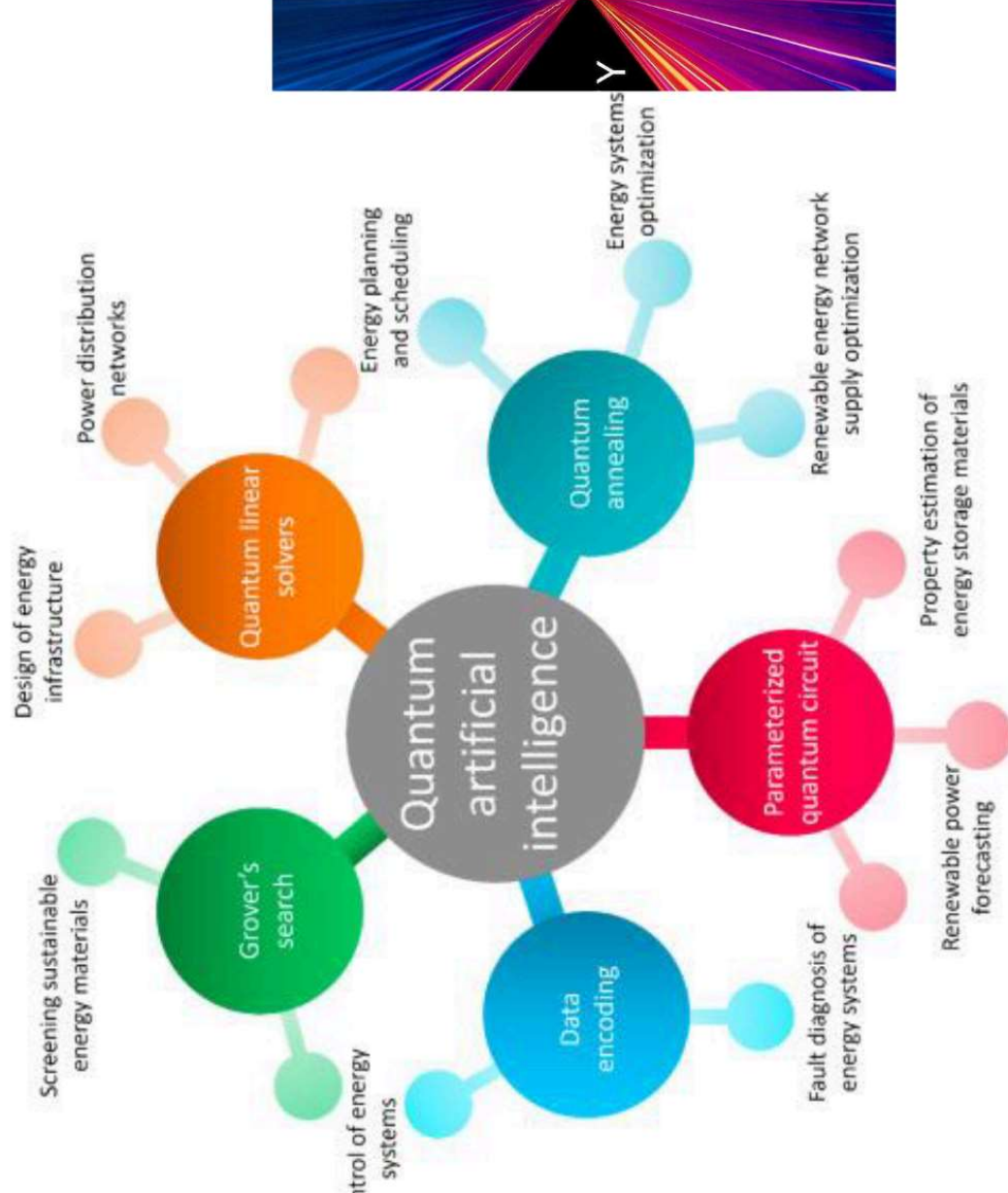


Camino a la singularidad



- Es el I hipot que la fusior huma a nanoi comp cuánt tecnol

- Vernor
- Ray Kur

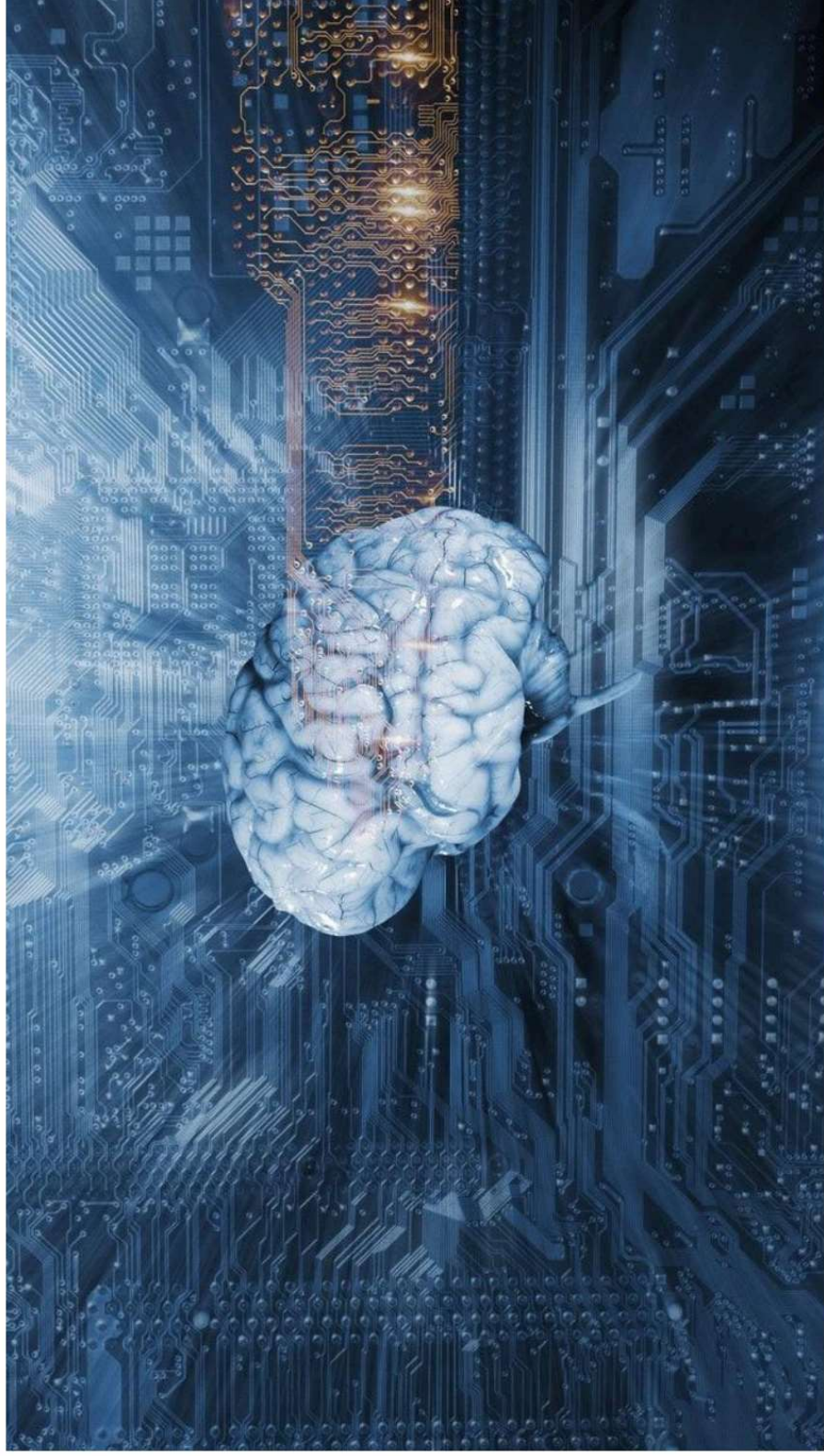


3

Reflexiones finales



Inteligencia Aumentada





NeurologIA y NeurocirugIA

“El médico que perderá su trabajo por la IA es el
que NO aprenda a trabajar con la IA”

Bernard S. Chang

Harvard School of Medicine. Dean for Medical Education

JAMA. 2023;330(19):1820-1823. doi:10.1001/jama.2023.19295



Muchas gracias

Fabián Cremaschi

**Médico Neurocirujano
Magíster en Neurociencias
Magíster en Investigación Clínica
Profesor Titular Efectivo
Área de Neurología Clínica y Quirúrgica
FCM – UNCuyo.
Mendoza. ARGENTINA.**

