

# MÁSTER EN HEPATOLOGÍA

**UAM**  
Universidad Autónoma  
de Madrid

 Universidad  
de Alcalá

Asignatura 9: Oportunidades en Hepatología

## “Inteligencia artificial en Hepatología”

Juan Turnes

Servicio de Aparato Digestivo

Complejo Hospitalario Universitario de Pontevedra

@jturnesv

# Conflicto de intereses

Vale, puedes indicarme si Juan Turnes Vazquez tiene algún conflicto de intereses que declarar en relación al tema o proyectos de inteligencia artificial?

- ✓ Buscando: 'Juan Turnes Vazquez inteligencia artificial'
- ✓ Generando respuestas para usted...

No tengo suficiente información para responder a esa pregunta. Según los resultados de búsqueda, Juan Turnes Vázquez es el jefe del servicio de digestivo del Complejo Hospitalario Universitario de Pontevedra (CHUP) y el coordinador de hospitalización covid <sup>1</sup> <sup>2</sup>. También participa en proyectos de investigación sobre la hepatitis C y el uso de la inteligencia artificial y el big data para su detección <sup>1</sup>. No he encontrado ninguna declaración de intereses o de conflicto de intereses de Juan Turnes Vázquez en relación al tema o proyectos de inteligencia artificial.

Más información: [1. diariodepontevedra.es](http://1. diariodepontevedra.es) [2. lavozdegalicia.es](http://2. lavozdegalicia.es) [3. iisgaliciasur.es](http://3. iisgaliciasur.es)

2 de 20 ●

# Qué es la IA y cómo funciona

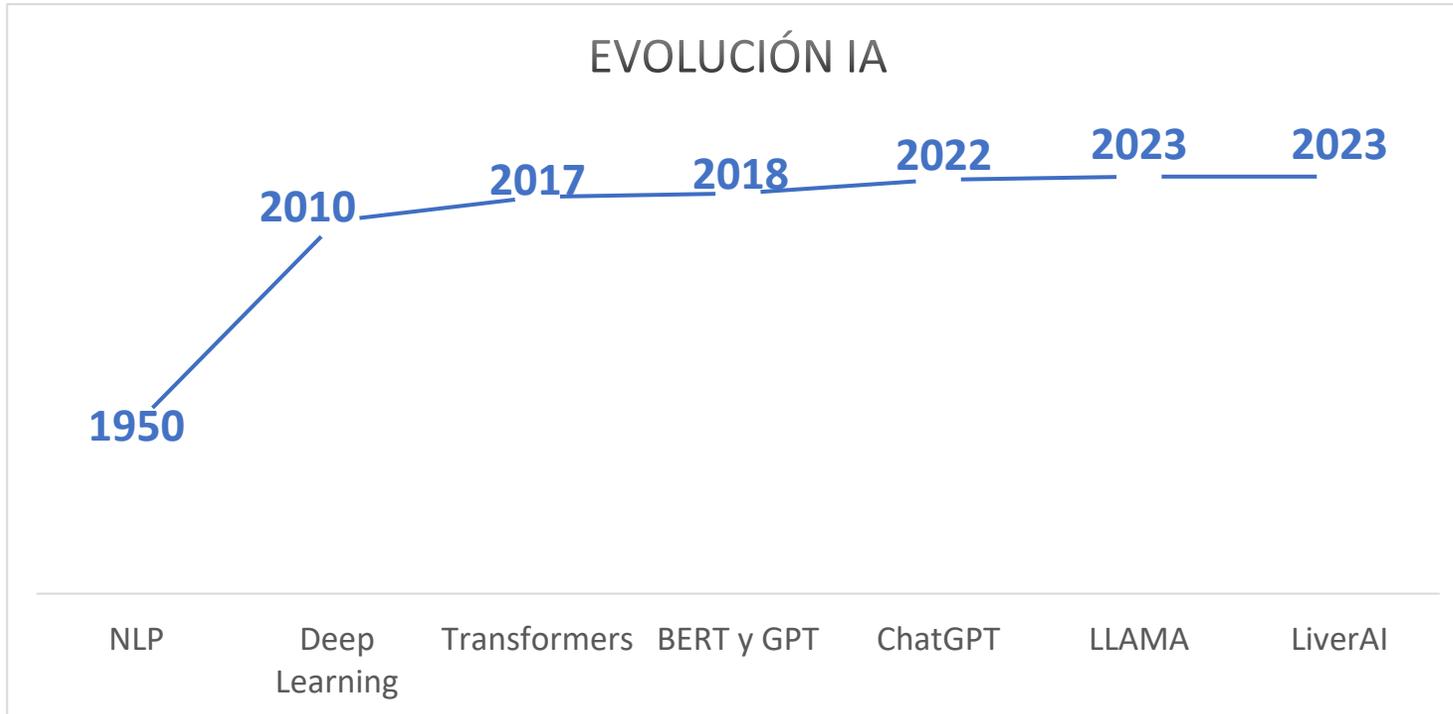
- **QUÉ:** sistemas informáticos que realizan tareas que requieren inteligencia humana: aprendizaje, razonamiento, reconocimiento de patrones, percepción y lenguaje
- **CÓMO:** con algoritmos y técnicas de aprendizaje automático para procesar grandes cantidades de datos y aprender a identificar patrones y realizar inferencias. Puede evolucionar.



# Qué es la IA y cómo funciona



# De dónde venimos



- GPT: Generative Pre-trained Transformer

Johnson

## ChatGPT raises questions about how humans acquire language

It has reignited a debate over the ideas of Noam Chomsky, the world's most famous linguist

Culture · Apr 26th 2023 · 4 min read



# Tipos de IAs, ventajas y limitaciones

- **LLM:** modelos de lenguaje de “gran tamaño” entrenados para comprender y generar texto en lenguaje natural
- **Transformers:**
  - Son una forma de hacer que los LLM sean más inteligentes y rápidos
  - Pueden entender mejor lo que dicen los textos y pueden escribir textos más coherentes
  - También pueden fijarse en las partes más importantes de los textos y no perderse en los detalles
- **Débil:** sabe hacer una cosa muy bien, como reconocer imágenes o voces
- **Fuerte:** sabe hacer muchas cosas como los humanos: aprender, razonar y decidir



# IA vs. AGI

- La **IA** es la tecnología que hace que las máquinas puedan pensar y actuar como los humanos pero como lo haría un mono que repite nuestros gestos:
  - SIRI
  - ChatGPT
- La **AGI** es un tipo de IA que puede hacer cualquier cosa que los humanos puedan hacer, como aprender, razonar y decidir:
  - Un sistema capaz de capturar cualquier tipo de datos, interpretarlos y ejecutar acciones de un modo similar o superior a como lo haría un humano ... no existe (todavía)



# Diciembre del 2022: el momento disruptivo

## ChatGPT Sprints to One Million Users

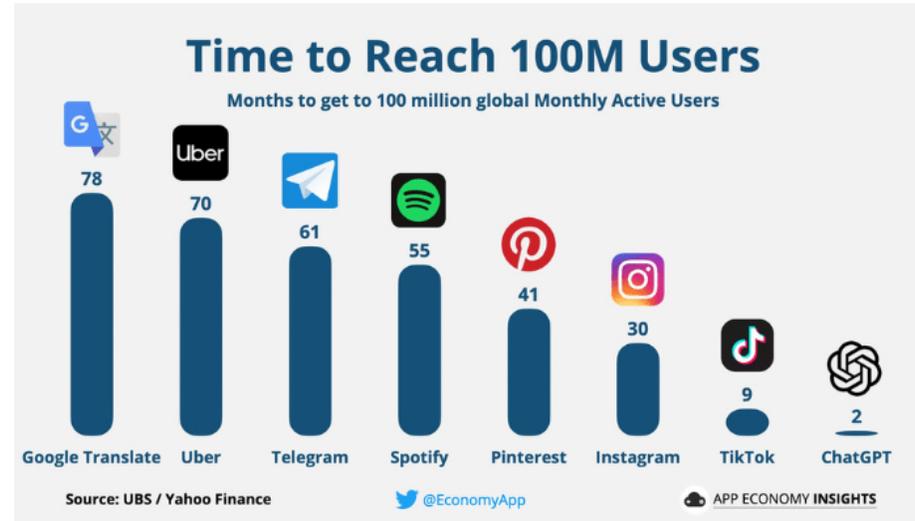
Time it took for selected online services to reach one million users



\* one million backers \*\* one million nights booked \*\*\* one million downloads  
Source: Company announcements via Business Insider/LinkedIn

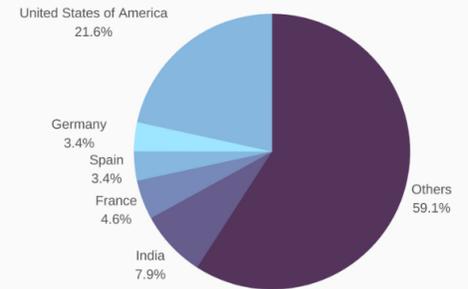


ChatGPT: 1 M usuarios en 5 días



100 M usuarios en 2 meses

### Top Five Countries with the most traffic



Use this image

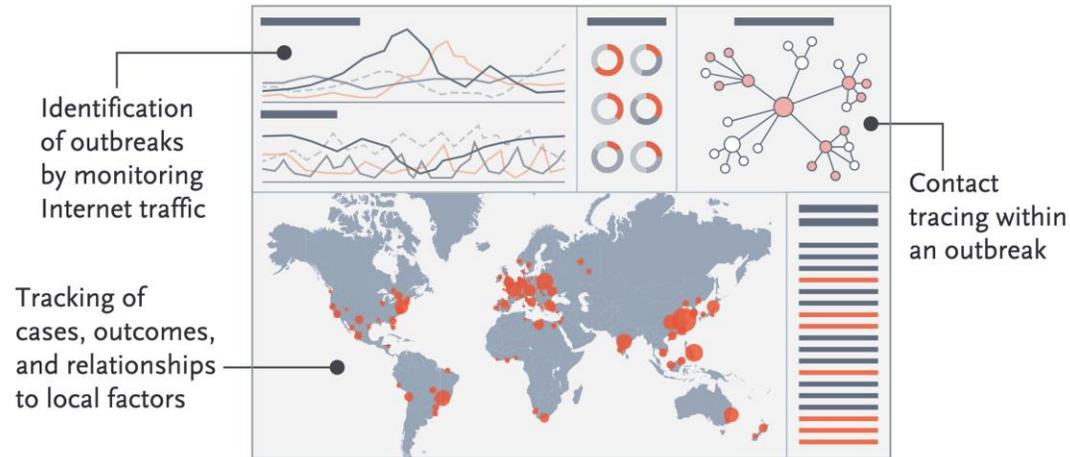
Country	Traffic (%)
United States of America	21.56
India	7.88
France	4.62
Spain	3.43
Germany	3.4
Others	59.11

Source: [SimilarWeb](https://www.similarweb.com)

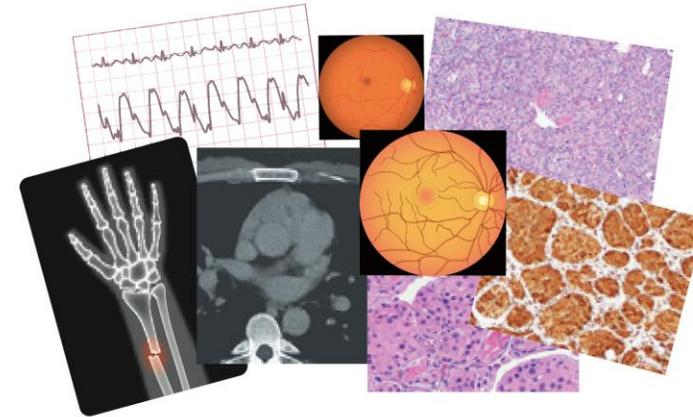
España: 4º país del mundo en uso

# Qué aplicaciones tiene en medicina a día de hoy

## Public Health



## Image Analysis



## Clinical-Trial Performance

Decision support in trial design  
Patient identification, recruitment, and retainment  
Outcome and side-effect monitoring



## Retrieval of Medical Information

Use of multiple information sources about a patient to make a diagnosis  
Internet search engines  
EMR decision support

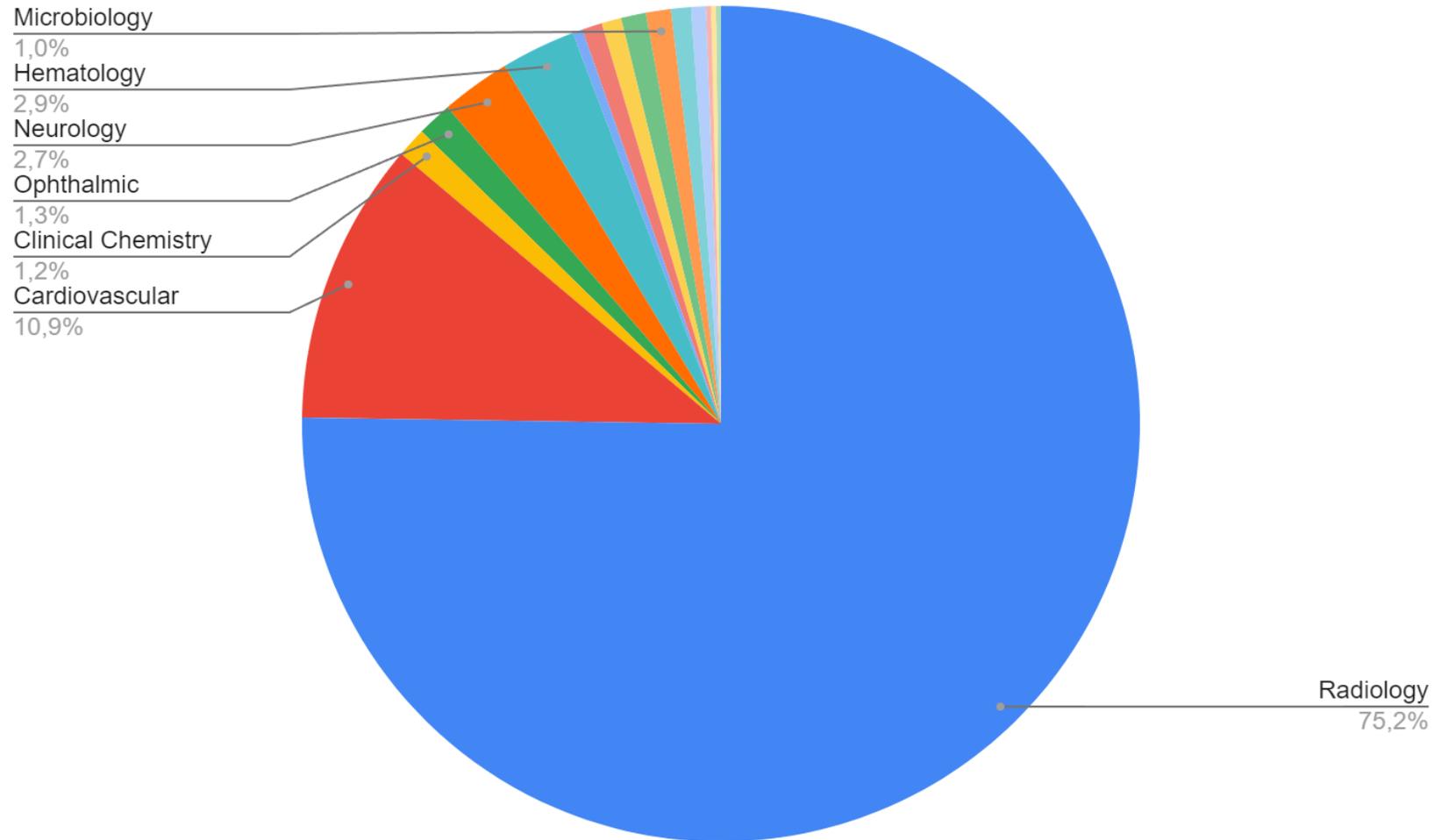


## Operational Organization

Operating-room scheduling  
Billing and collections  
Patient follow-up



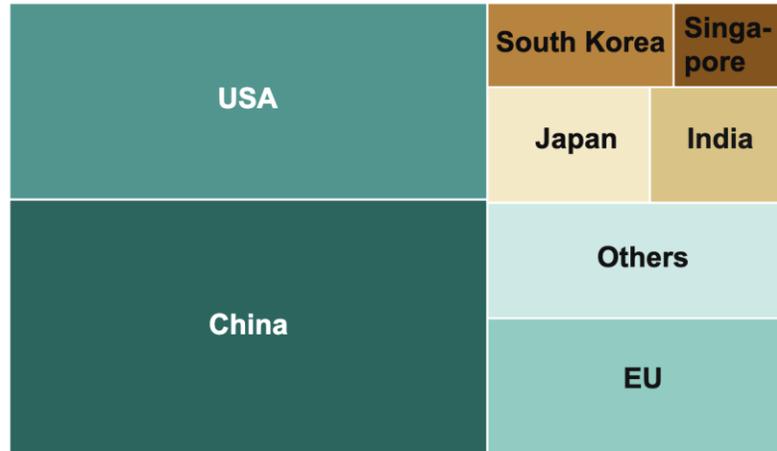
# En qué líneas se estaba investigando en 2022



# ... y en Hepatología

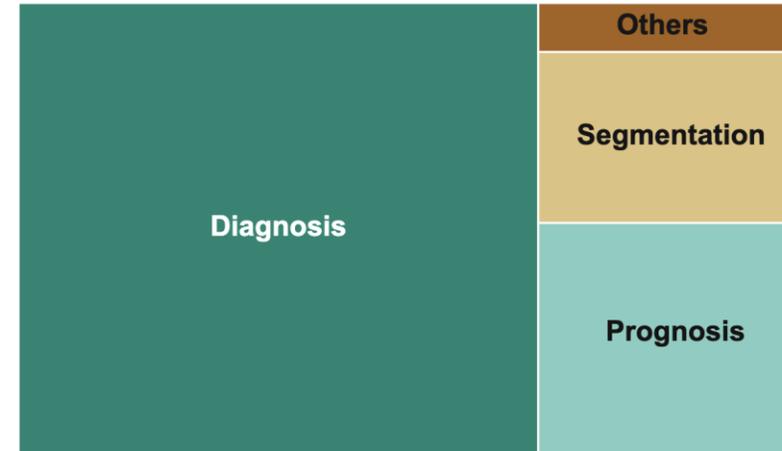
**A**

Number of studies by country of the first author



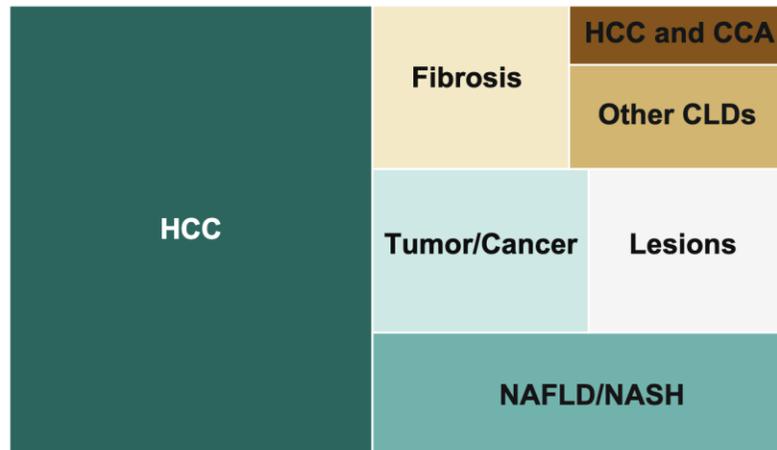
**B**

Number of studies by prediction of the models



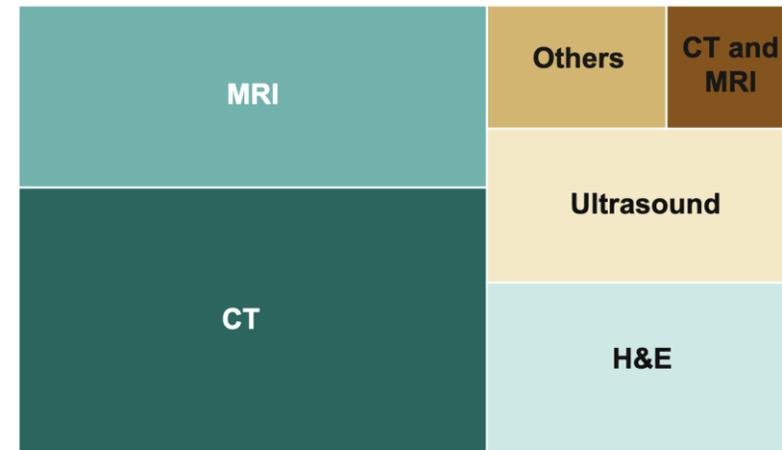
**C**

Number of studies by liver disease

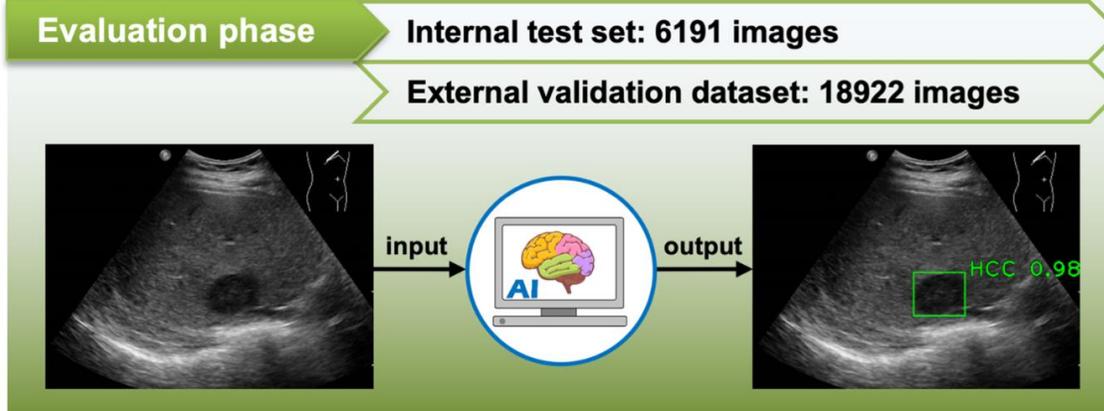
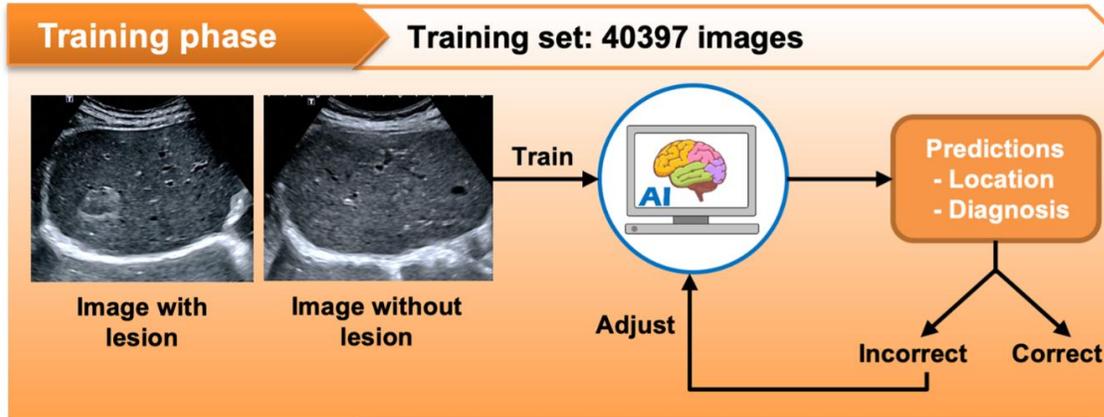


**D**

Number of studies by input data used



# Ejemplos en Hepatología: análisis de imagen



## Approaches for assessment of fibrosis in liver biopsies

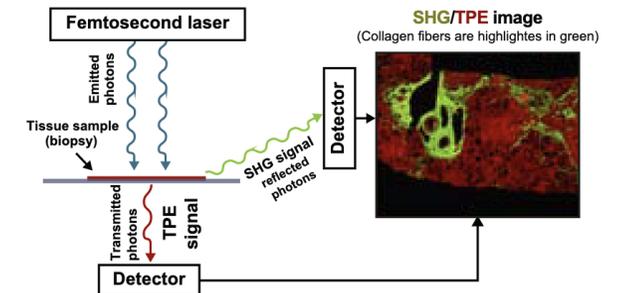
### Conventional microscopy

Semiquantitative scoring of fibrosis (F1 to F4 stage) in trichrome-stained slides

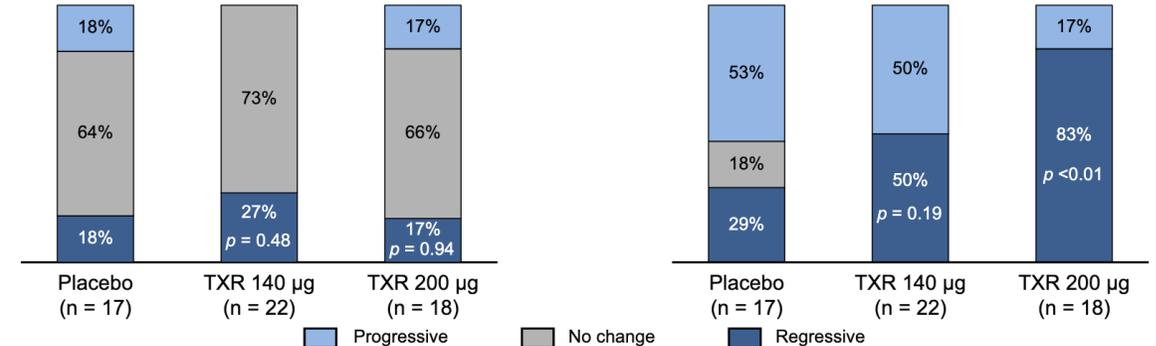


### Second harmonic generation microscopy

Over 120 collagen features are assessed on a continuous scale in unstained liver sections



Liver fibrosis changes after treatment with tropifexor (TXR) in patients with F3 stage at baseline, as assessed by NASH CRN scoring (left) and by SHG/TPEF microscopy (right)





# Oportunidades: mañana



Ethan Mollick  
@emollick



GPT generated this academic paper from a dataset in 30 minutes.

It may not be a blockbuster but it tests something kind of interesting in a sophisticated way - in short, it may be publishable, somewhere.

The text is prone to hallucinations, but the data analysis less so. 1/2

[Traducir Tweet](#)

a major crowdfunding platform. We test two competing hypotheses: the "Death of Distance" hypothesis, which posits that geographical factors do not significantly affect online project success, and the "Enduring Effects of Geography" hypothesis, which suggests that geographical factors continue to influence project success even in digital environments. Our results provide support for the "Enduring Effects of Geography" hypothesis, indicating that geographical factors indeed play a significant role in Kickstarter project success.

### Introduction

The rise of digital platforms like Kickstarter has revolutionized the way projects are funded, allowing creators to reach a global audience. While the digital nature of these platforms might suggest that geographical factors are less relevant, the influence of geography in the offline world prompts an examination of its effects in online environments. This study seeks to address this gap in the literature by investigating the role of geographical factors on project success on Kickstarter.

The influence of geography on economic outcomes has been a subject of study for many years. Despite the rapid advances in technology and the rise of digital platforms, geographical factors continue to influence economic outcomes in various ways. For instance, the location of a city, its size, and its proximity to other cities can all have a significant impact on economic outcomes. These geographical factors may also play a role in the success of projects on digital platforms like Kickstarter.

In this study, we test two competing hypotheses. The "Death of Distance" hypothesis suggests

### Descriptive Statistics

The following table provides descriptive statistics for the variables in our dataset:

Variable	Count	Mean	Std. Dev.	Min.	25%	50%	75%	Max.
ID	43768	28754.93	7775.95	2	10007	28346	4913	62669
Fund Back	43768	238.35	750.87	0	0	63	197	5534
Lines	43768	412.74	832.45	3	202	328	818	5629
Projects	43768	3.08	7.87	0	0	0	2	214
Creator	43768	332.81	7074.61	0	0	36	347	4863
FB Friends of Creator	43768	6656.10	30222.20	100	1000	4000	9000	50000
Updates	43768	4.17	6.45	0	1	2	5	58
Success	43768	0.46	0.50	0	0	0	1	1
Distance to Metro (miles)	43768	2749	4744	0	0	0	23	297
City	43768	66678	46118	0	225	642	199	591
Population	43768	0.01	0.08	-0.09	-0.03	-0.06	0.07	3.41
City State	43768	0.02	0.09	-0.08	-0.08	-0.04	0.48	4.75

### Results

The results of the logistic regression analyses are presented in the tables below.

Variable	Coefficients	Standard Error	z-value	p-value
Constant	0.6858	0.0372	18.43	<0.001
Updates	0.2538	0.0042	60.09	<0.001
Projects Creator Backed	0.0483	0.0034	14.24	<0.001
FB Friends of Creator	0.0002	0.0000	0.84	<0.001
log(Success)	-0.8084	0.016	-70.96	<0.001

Variable	Coefficients	Standard Error	z-value	p-value
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FB Friends of Creator	0.0002	0.0000	0.84	<0.001
log(Success)	-0.8084	0.016	-70.96	<0.001
Distance to Metro (miles)	0.0001	0.0000	0.84	<0.001
City	0.0001	0.0000	0.84	<0.001
Population	0.0001	0.0000	0.84	<0.001
City State	0.0001	0.0000	0.84	<0.001

### Discussion

Our study suggests that despite the digital nature of Kickstarter, geographical factors continue to play a significant role in project success. This supports the "Enduring Effects of Geography" hypothesis and highlights the importance of considering geographical factors in online environments.

However, our study is not without limitations. Although our models provide a good fit for the data, potential issues with heteroskedasticity were detected, which could affect the robustness of our findings. Future research could address this issue by exploring other transformations of the variables or using other modeling approaches that are more robust to heteroskedasticity.

In conclusion, our study contributes to the literature by demonstrating the enduring effects of geography on project success on Kickstarter, a major online crowdfunding platform. These findings have implications for project creators, platform designers, and policy-makers in understanding and enhancing the chances of project success in the digital environment.

4:10 a. m. · 4 may. 2023 · 176,5 mil Reproducciones



Ethan Mollick @emollick · 4 may.



I uploaded public data on crowdfunding projects

I then asked it to create two competing hypotheses it could answer with the data. It did. They were quite reasonable

It suggested approaches, I gave it a bit of feedback, and then it ran analyses, did diagnostics & wrote it up 2/2

hypothesis). This discussion could be addressed with the Kickstarter dataset.

Finished working Show work

1. **Hypothesis 1: The "Death of Distance" Hypothesis**

- H1: In the age of digital platforms like Kickstarter, geographical location of a project does not significantly affect its success. This hypothesis assumes that digital platforms democratize access to resources, thus leveling the playing field for both urban and rural projects.

2. **Hypothesis 2: The "Enduring Effects of Geography" Hypothesis**

- H2: Despite the rise of digital platforms, geographical location still significantly affects the success of a project. Projects in urban areas with higher population density and average earnings, and in close proximity to universities (indicating a potential for higher educated population), are more likely to succeed. This hypothesis assumes that local resources, networks, and socioeconomic factors continue to play a crucial role in the success of projects, even in the digital age.

Apologies for the cutoff in the previous response. Here's the continuation of Model 1's results:

```
off
0.0451
FB Friends of Creator 0.0002 0.0000 9.6281 0.0000 0.0001 0.0002
log_pop1 -0.8003 0.0115 -69.3487 0.0000 -0.8229 -0.7777
```

Model 2: "Enduring Effects of Geography" Hypothesis

```
markdown
Results: Logit
```

The independent variables have been successfully standardized. Now they have a mean of 0 and a standard deviation of 1, putting them on a similar scale suitable for regression analysis.

Here is the outline of the models we will run:

**Model 1: "Death of Distance" Hypothesis**

- Dependent Variable: 'success'
- Independent Variables: Project characteristics excluding geographic variables.

**Model 2: "Enduring Effects of Geography" Hypothesis**

regression. For logistic regression, we can look at leverage values and standardized residuals to identify influential observations. However, interpreting these values can be more complex than in linear regression.

Regarding the heteroskedasticity and link tests, the results suggest that both models might have issues:

- The Breusch-Pagan test results are significant for both models, indicating that heteroskedasticity may be present.
- The Link test results are returning 'NaN' values. This could be due to issues with the data or model specification.

Finally, to address the issue of multicollinearity, let's try removing the variable 'city\_pop' from Model 2. The variable 'city\_pop' has a high VIF, indicating multicollinearity, and its removal might help resolve this issue. Let's fit this modified model and check the results.

6

7

118

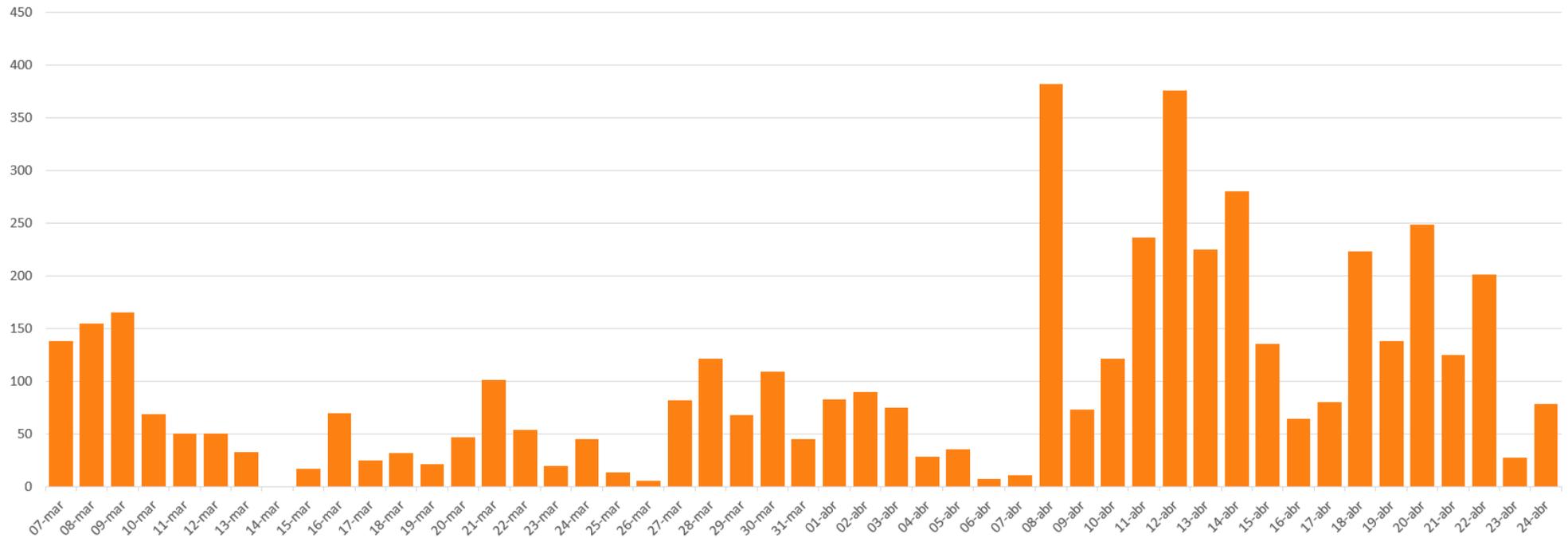
15,7 mil



# Oportunidades: mañana



Chats LiverAI



# Oportunidades: mañana



**WEBINAR**

LiverAI  
AEEH

Imprimir

FEEH  AEEH  
Fundación Española para el Estudio del Hígado Asociación Española para el Estudio del Hígado

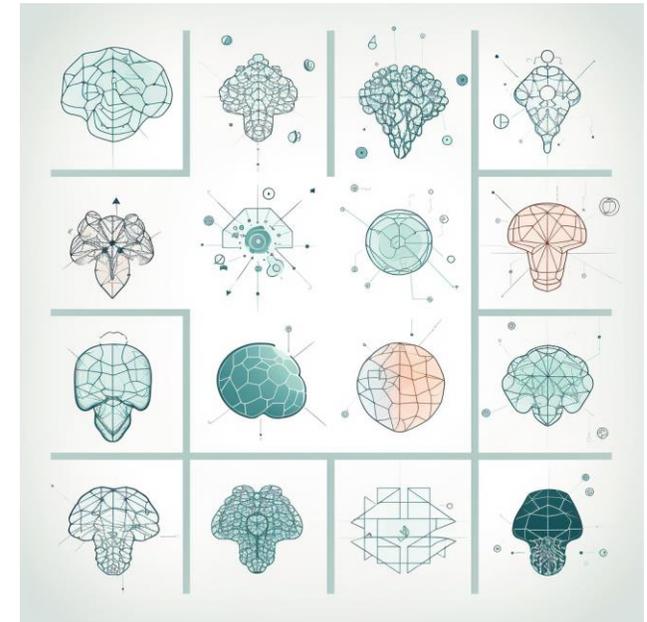
INSCRIPCIÓN GRATUITA

**Martes, 9 MAYO 2023 17:00 H**



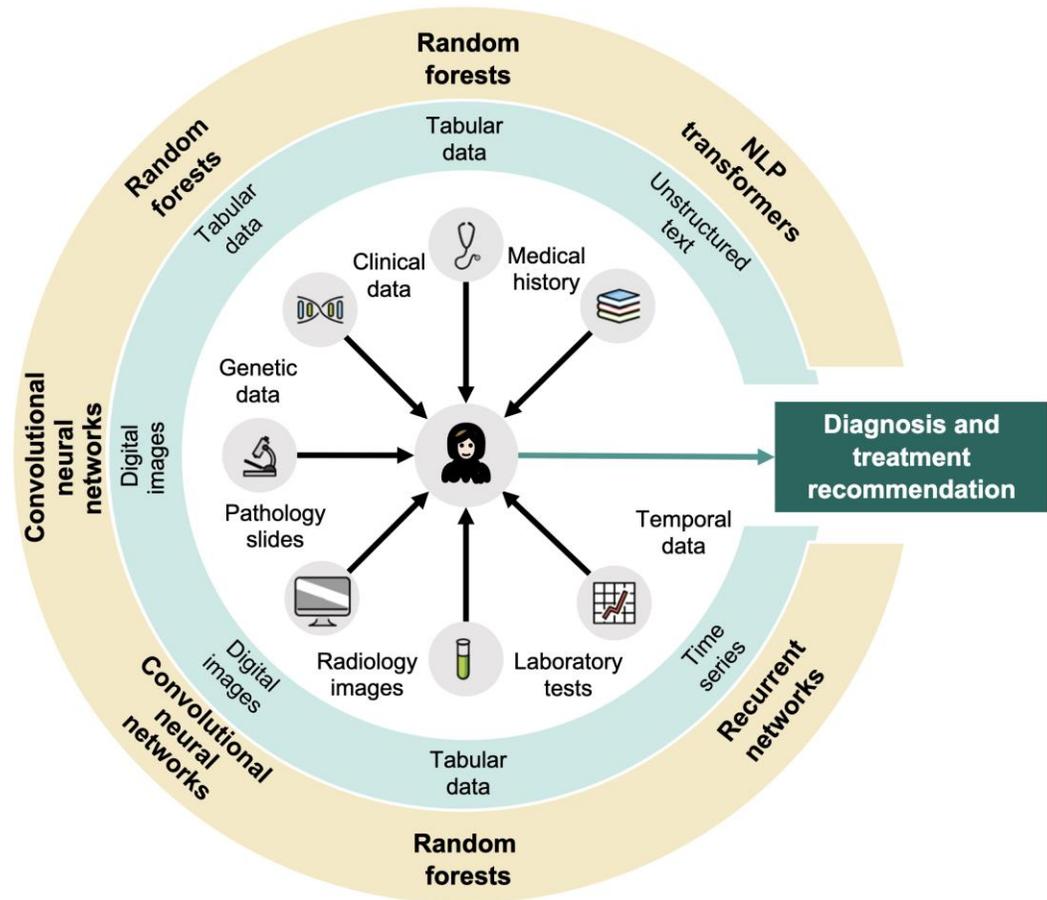
# Omicas para identificar biomarcadores

- Métodos más precisos para secuenciar y analizar el ADN, ARN y proteínas
- Descubrir nuevos biomarcadores
- Diseñar terapias personalizadas
- Crear modelos de simulación
- Integrar datos genómicos y proteómicos con biomédicos



# Medicina de precisión

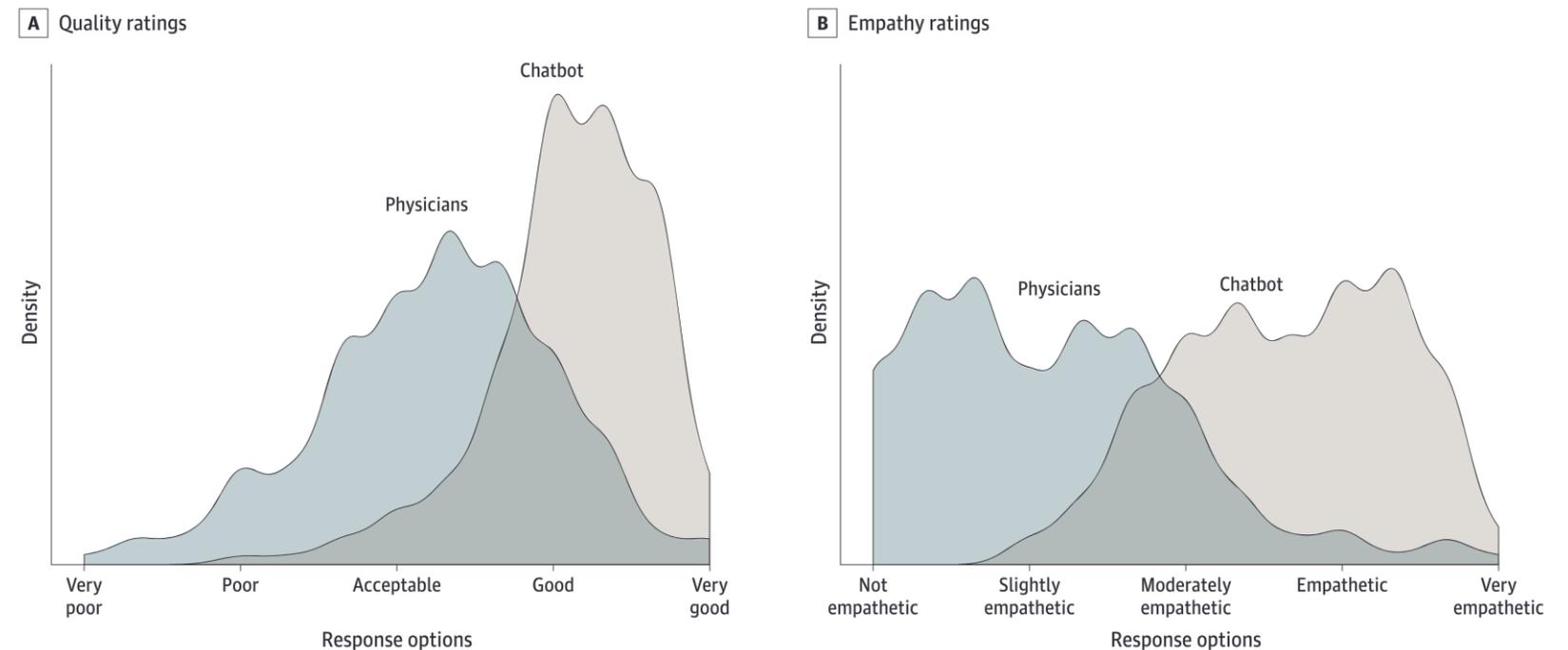
- Diagnóstico
- Pronóstico
- Tratamiento
- Monitorización
- Adherencia



# Interacción paciente/sanitario (*machine in the middle*)

- Comunicación/coordinación
- Traducción/interpretación
- Mediación
- Evaluación
- Educación y refuerzo

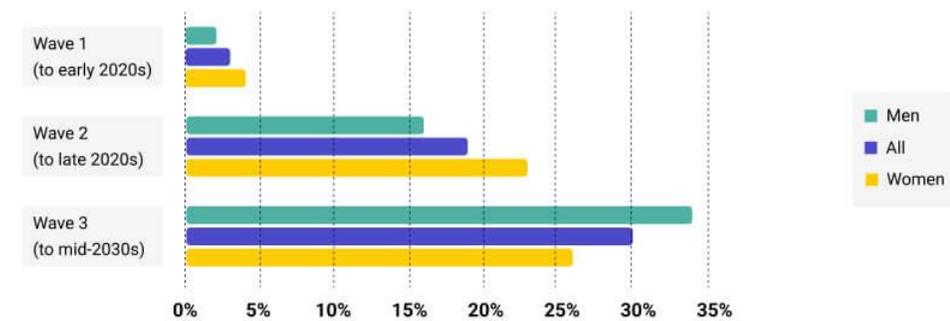
Figure. Distribution of Average Quality and Empathy Ratings for Chatbot and Physician Responses to Patient Questions



# Desafíos

- Calidad y cantidad de datos
- Interpretación y explicación de resultados
- Validación y regulación de modelos
- Integración y colaboración con los sistemas de salud
- Protección de datos y copyright
- Sustitución empleos

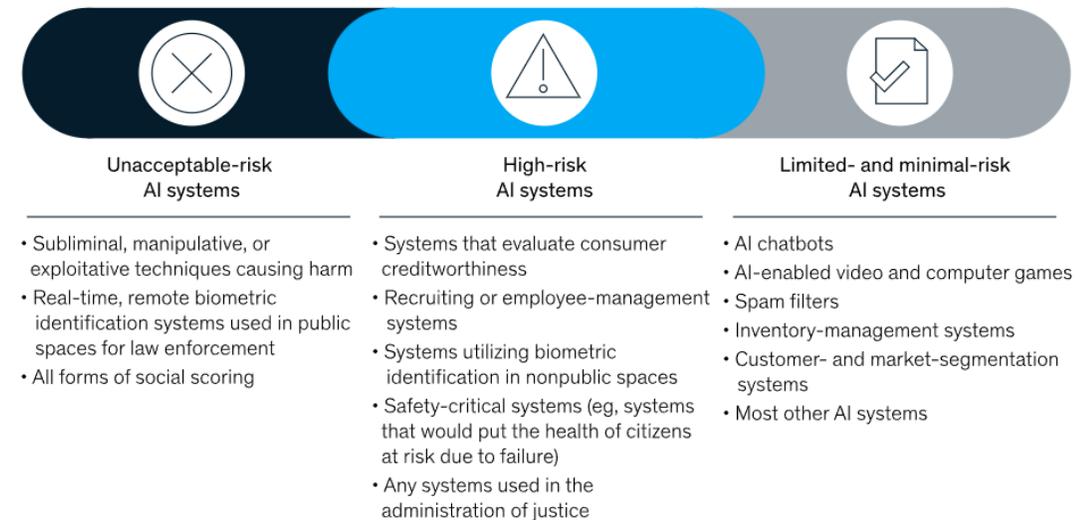
**% OF EXISTING JOBS AT POTENTIAL RISK OF AUTOMATION**



# Limitaciones

- Falta de sentido común (de la IA)
- Dependencia de los datos (muchos datos)
- Falta de explicabilidad (sistemas de caja negra)
- Marco regulatorio no claramente definido
- Resistencia al cambio de los humanos

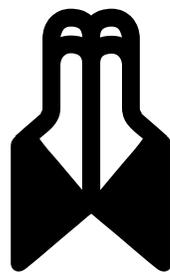
The European Union's draft AI regulations classify AI systems into three risk categories.



# Conclusiones

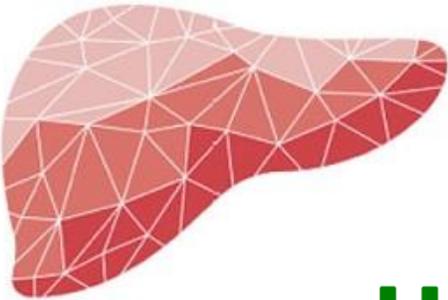


1. Vivimos un cambio tecnológico disruptivo similar o superior a la aparición de internet, y su crecimiento es exponencial
2. Las IAs van a transformar la forma en que abordamos el diagnóstico, tratamiento, prevención e investigación de las enfermedades hepáticas (y de todo en general)
3. Conocer cómo funcionan y cómo integrarlas en nuestros flujos de trabajo es esencial para aprovechar las oportunidades que surgen cada día (literalmente)
4. No te preguntes si las vas a utilizar o no, pregúntate cuándo lo vas a hacer



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[@jturnesv](#)



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