La inteligencia artificial y su impacto social

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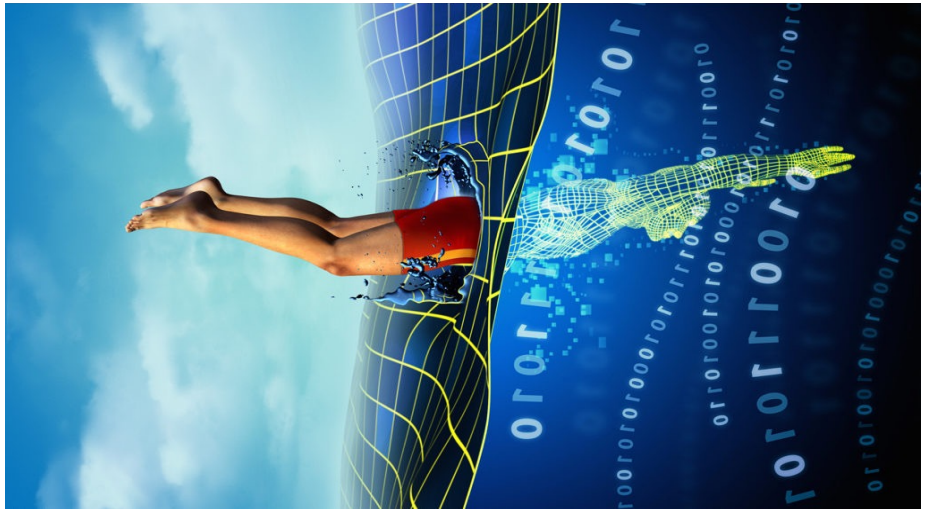
Inteligencia Artificial

1. La IA y su interés político
2. Definiendo una estrategia
3. Su impacto social



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1. La IA y su interés político

Inteligencia artificial

«Sistema de IA»: software que …
puede, para un conjunto determinado de objetivos definidos por seres humanos, generar información de salida como contenidos, predicciones, recomendaciones o decisiones que influyan en los entornos con los que interactúa.

IA != software
IA != automatización

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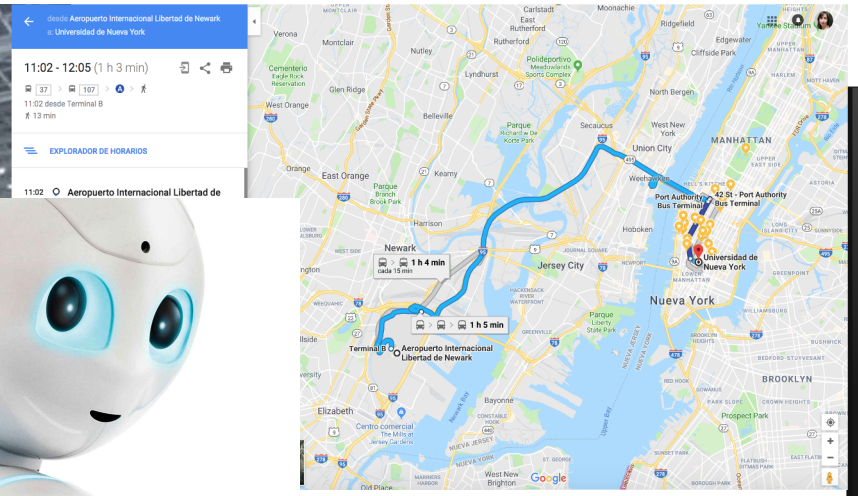

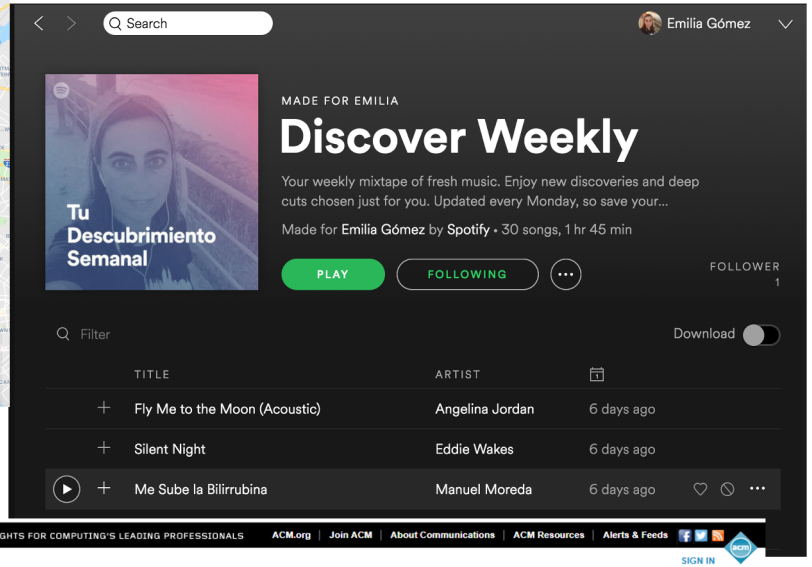

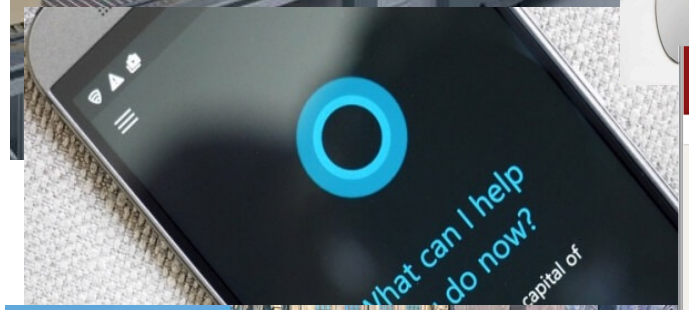

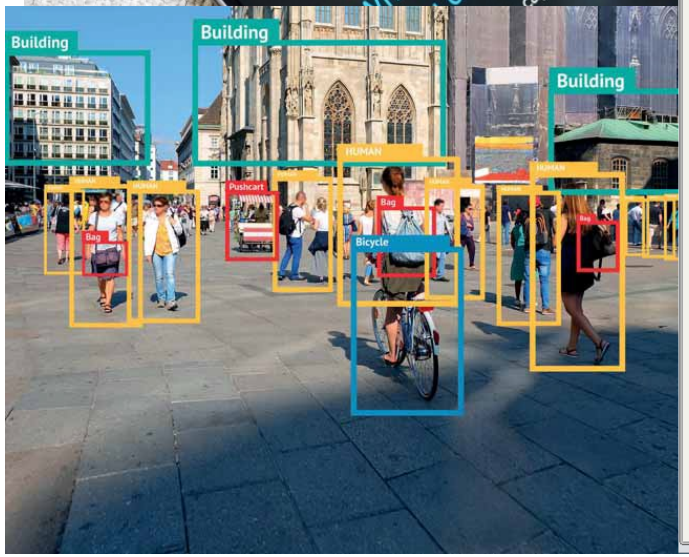

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NOVEMBER 15, 2017

Stanford algorithm can diagnose pneumonia better than radiologists

Stanford researchers have developed a deep learning algorithm that evaluates chest X-rays for signs of disease. In just over a month of development, their algorithm outperformed expert radiologists at diagnosing pneumonia.

BY TAYLOR KUBOTA

Stanford researchers have developed an algorithm that offers diagnoses based off chest X-ray images. It can diagnose up to 14 types of medical conditions and is able to diagnose pneumonia better than expert radiologists working alone. A paper about the algorithm, called CheXNet, was published Nov. 14 on the open-access, scientific preprint website arXiv.

"Interpreting X-ray images to diagnose pathologies like pneumonia is very challenging, and we know that there's a lot of variability in the diagnoses radiologists arrive at," said Pranav Rajpurkar, a graduate student in the Stanford Machine Learning Group and co-lead author of the paper. "We became interested in developing machine learning algorithms that could learn from hundreds of thousands of chest X-ray diagnoses and make accurate

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Características

1. Tecnología de Utilidad General

Máquina de vapor, el ferrocarril, la electricidad, la electrónica, los mecanizados, el automóvil, la informática e Internet.

Artificial Intelligence: A European Perspective. Joint Research Centre, 2018.
https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/artificial-intelligence-european-perspective

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Características

1. Tecnología de Utilidad General
2. Escalable globalmente

Características

1. Tecnología de Utilidad General
2. Escalable globalmente
3. Habilidades cognitivas

- Memory processes (MP)
- Sensorimotor interaction (SI)
- Visual processing (VP)
- Auditory processing (AP)
- Attention and search (AS)
- Planning and sequential decision-making and acting (PA)
- Comprehension and compositional expression (CE)
- Communication (CO)
- Emotion and self-control (EC)
- Navigation (NV)
- Conceptualisation, learning and abstraction (CL)
- Quantitative and logical reasoning (QL)
- Mind modelling and social interaction (MS)

Songul Tolan, Annarosa Pesole, Fernando Martínez-Plumed, Enrique Fernandez-Macias, José Hernández-Orallo & Emilia Gómez, "Measuring the Occupational Impact of AI: Tasks, Cognitive Abilities and AI Benchmarks", JRC Working Papers on Labour, Education and Technology 2020-02, Joint Research Centre (Seville site).

Características

1. Tecnología de Utilidad General
2. Escalable globalmente
3. Habilidades cognitivas
4. Automatización

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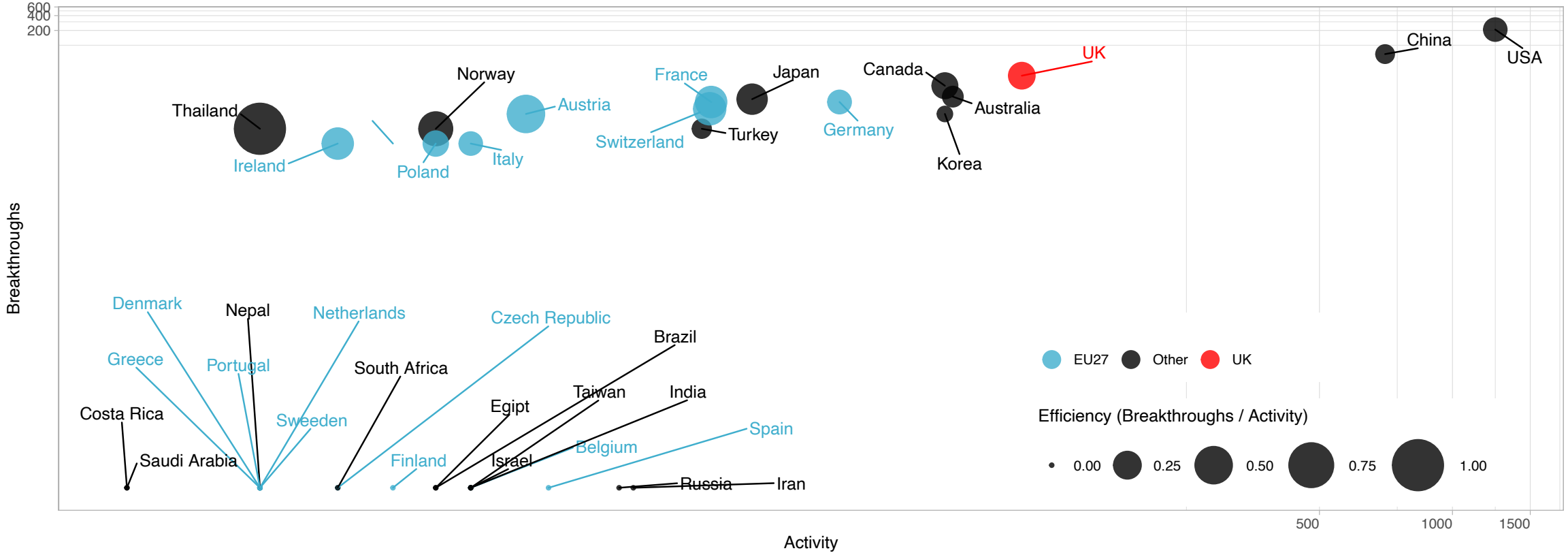
Inteligencia artificial == poder

La IA, como TUG, tiene el potencial de alterar drásticamente las sociedades a través de su impacto en las estructuras económicas y sociales preexistentes.

- Geopolítico, económico, social, cultural, ético



(Martínez-Plumed et al., Nature Machine Intelligence, 2021)

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2. Definiendo una estrategia

Inteligencia Artificial para Europa

COM(2018)237 25.04.2018

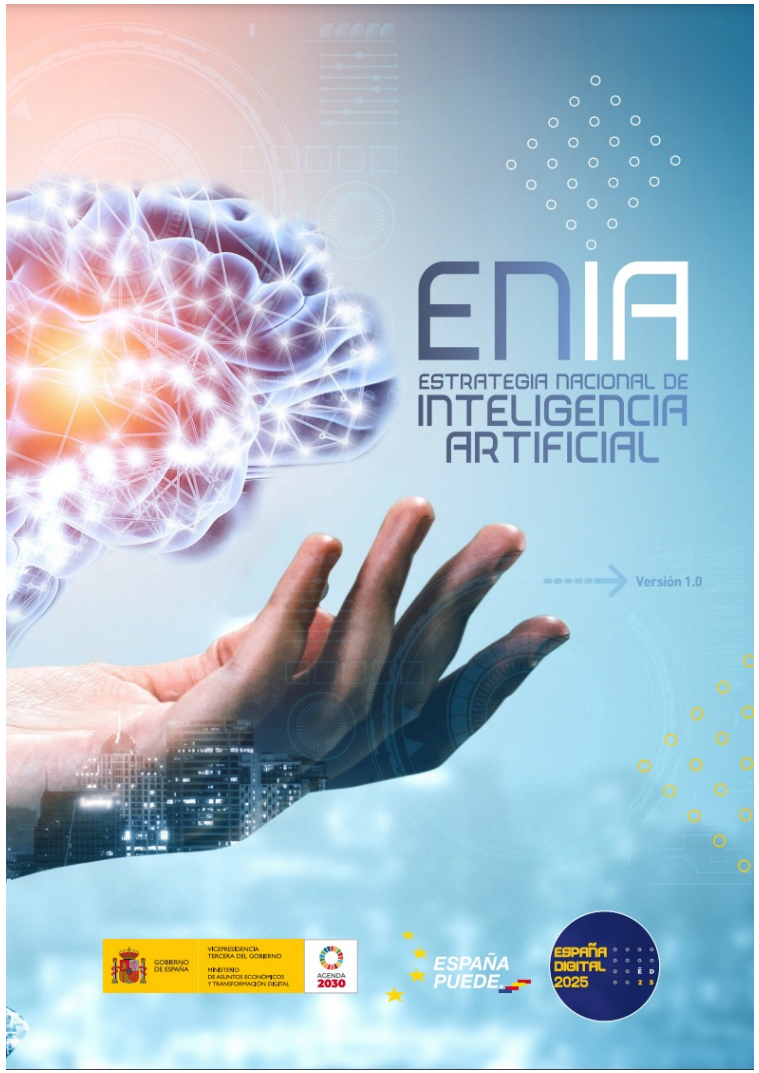
I: Potenciar la capacidad tecnológica e industrial y la adopción de la IA	II: Preparar para las transformaciones socio-económicas	III. Asegurar un marco ético y jurídico apropiado
En todos los ámbitos de la economía (sector privado y público)	Educación, talento, mercado laboral	Basado en los valores de la UE y en consonancia con su Carta de los Derechos Fundamentales

Unir fuerzas – Plan coordinado

European Commission

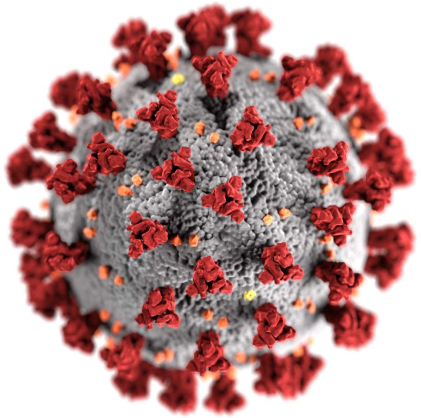
Estrategias nacionales

- ENIA (2020):
  - 6 ejes estratégicos: investigación, talento, infrastructuras, integración, administración pública/misiones, marco ético.
  - 4 desafíos sociales: igualdad (género, brecha digital), transición ecológica, vertebración territorial.
  - Áreas estratégicas: **salud**, educación, energías y cambio climático, turismo y cultura, lenguaje, seguridad, agricultura.



https://knowledge4policy.ec.europa.eu/ai-watch/national-strategies-artificial-intelligence_en
https://portal.mineco.gob.es/es-es/ministerio/areas-prioritarias/Paginas/inteligencia-artificial.aspx

2020…



1. Transformación digital
2. Importancia de los datos
3. Aceptación de robots

https://publications.jrc.ec.europa.eu/repository/handle/JRC121305

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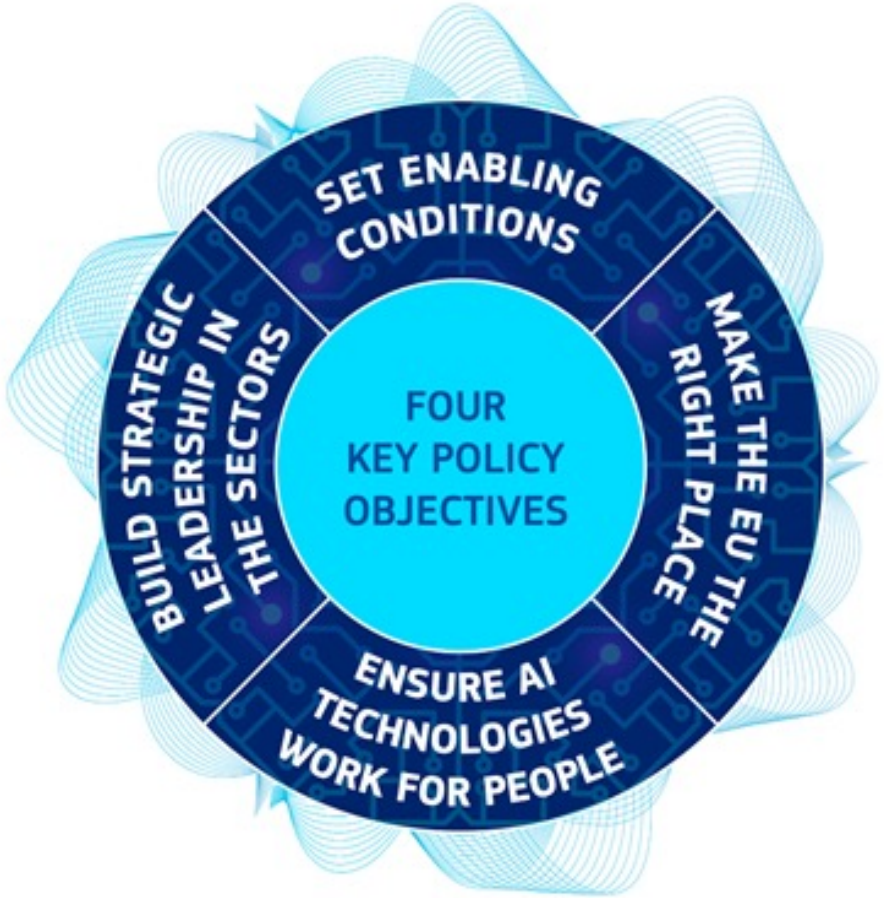
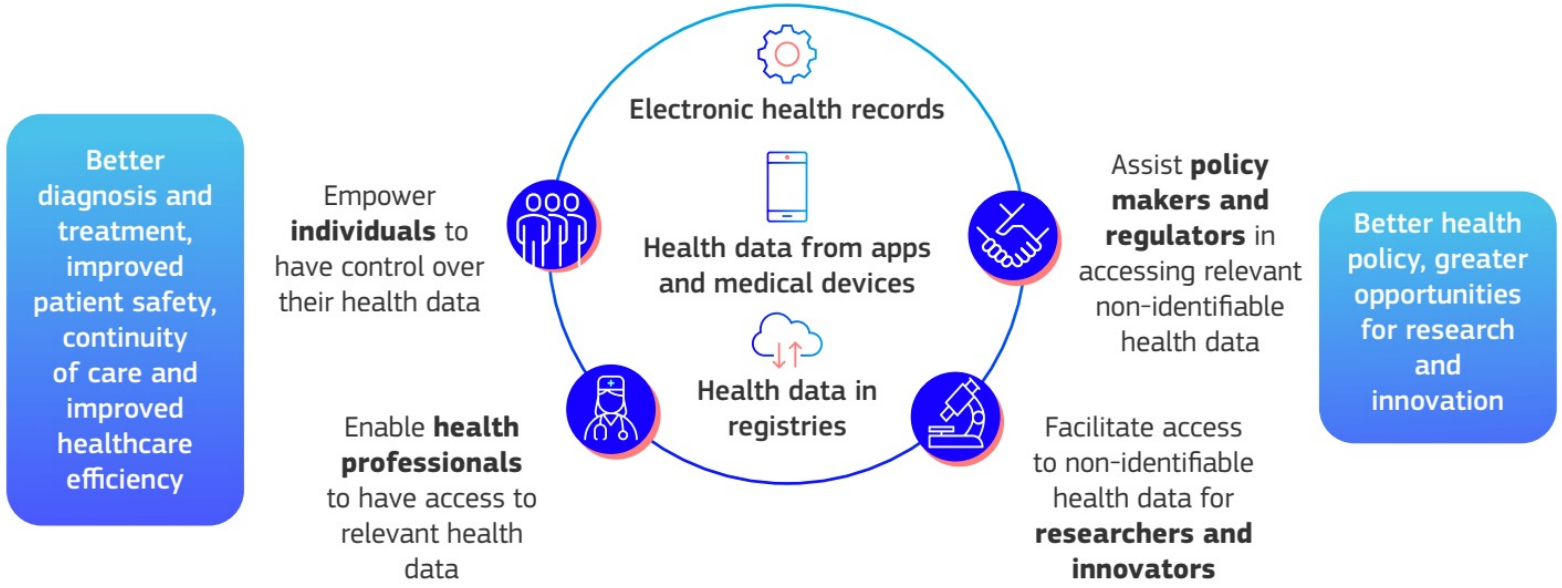
Ecosistema de excelencia

- Recuperación económica - transición digital y ecológica
- Plan coordinado de IA 2021
  - 4 áreas.
  - 7 sectores: medio ambiente, **salud,** robótica, sector público, transporte, orden público, agricultura.



Espacio Europeo de Datos Sanitarios (05/2022)

- Intercambio y acceso a historias clínicas electrónicas, datos genómicos, registros de pacientes, etc.
  - Prestación sanitaria
  - Investigación
  - Elaboración de políticas



https://ec.europa.eu/health/ehealth-digital-health-and-care/european-health-data-space_es

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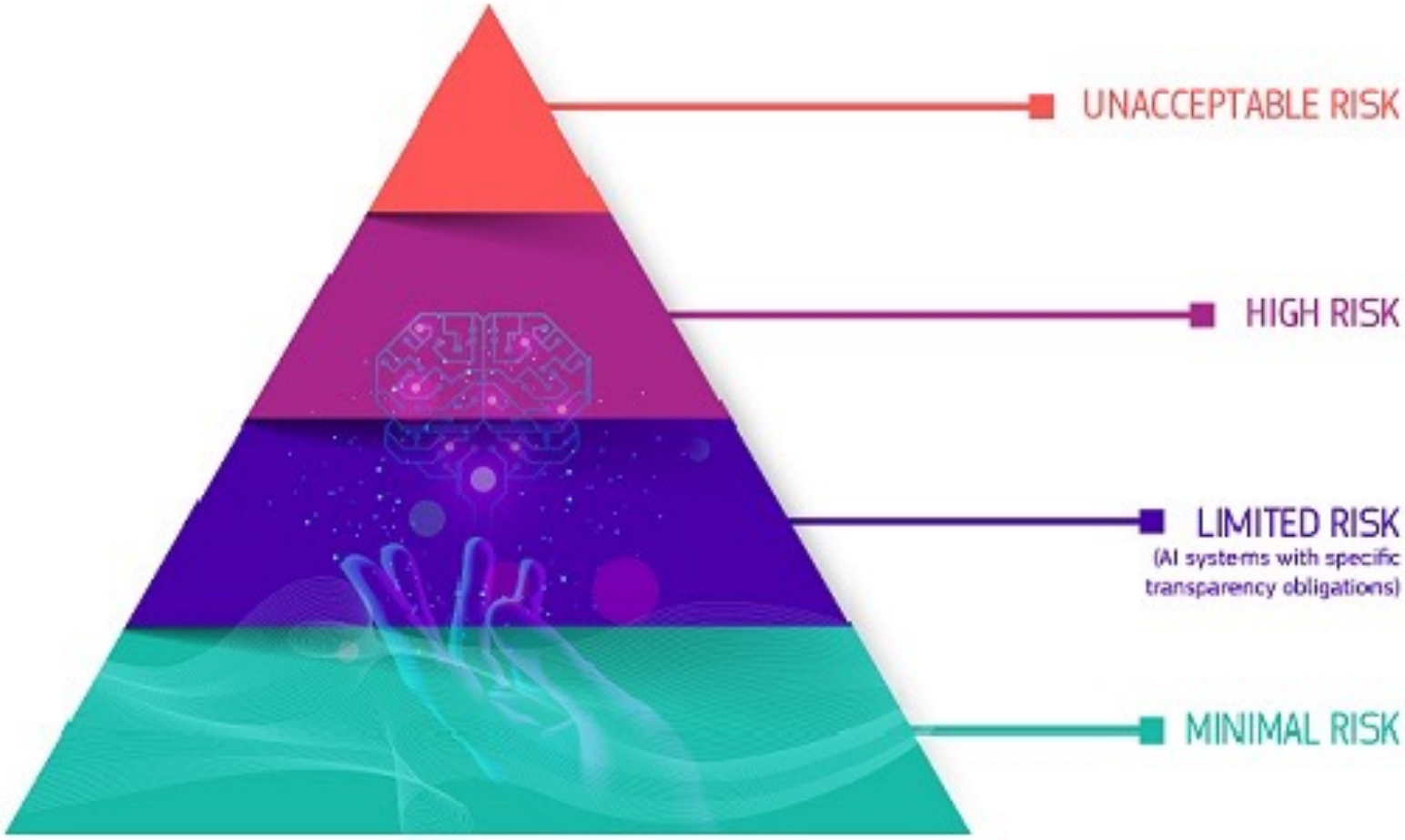
Ecosistema de confianza: AI Act (2021)



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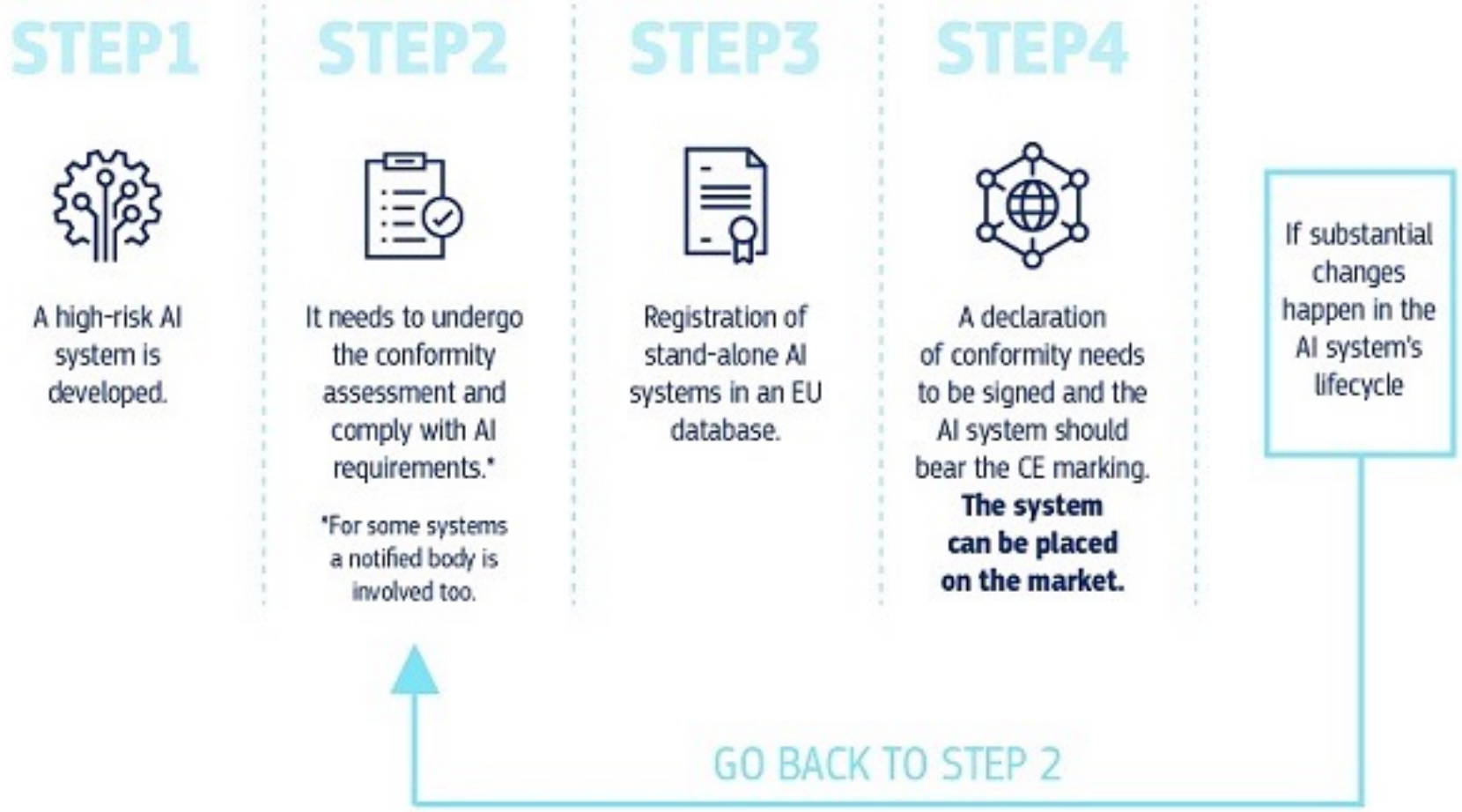
Ecosistema de confianza: AI Act (2021)



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Ecosistema de confianza: AI Act (2021)

Requisitos para sistemas de alto riesgo

1. Sistema de gestión de riesgos.
2. Datos y su gobernanza.
3. Documentación técnica.
4. Registros (logs).
5. Transparencia y comunicación a los usuarios.
6. Supervisión humana.
7. Precisión, solidez (robustez), ciberseguridad.

https://eur-lex.europa.eu/legal-content/ES/TXT/HTML/?uri=CELEX:52021PC0206&from=EN

3. Su impacto social

Buscando el equilibrio

HUMAINT
HUman behaviour and
MAchine INTelligence

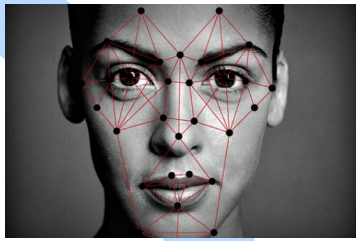
https://ec.europa.eu/jrc/communities/en/community/humaint

@emiliagogu

Vehículos autónomos

Toma de decisión

Computación afectiva



Niños

Mundo laboral

Escucha de música

https://ec.europa.eu/jrc/communities/en/community/humaint

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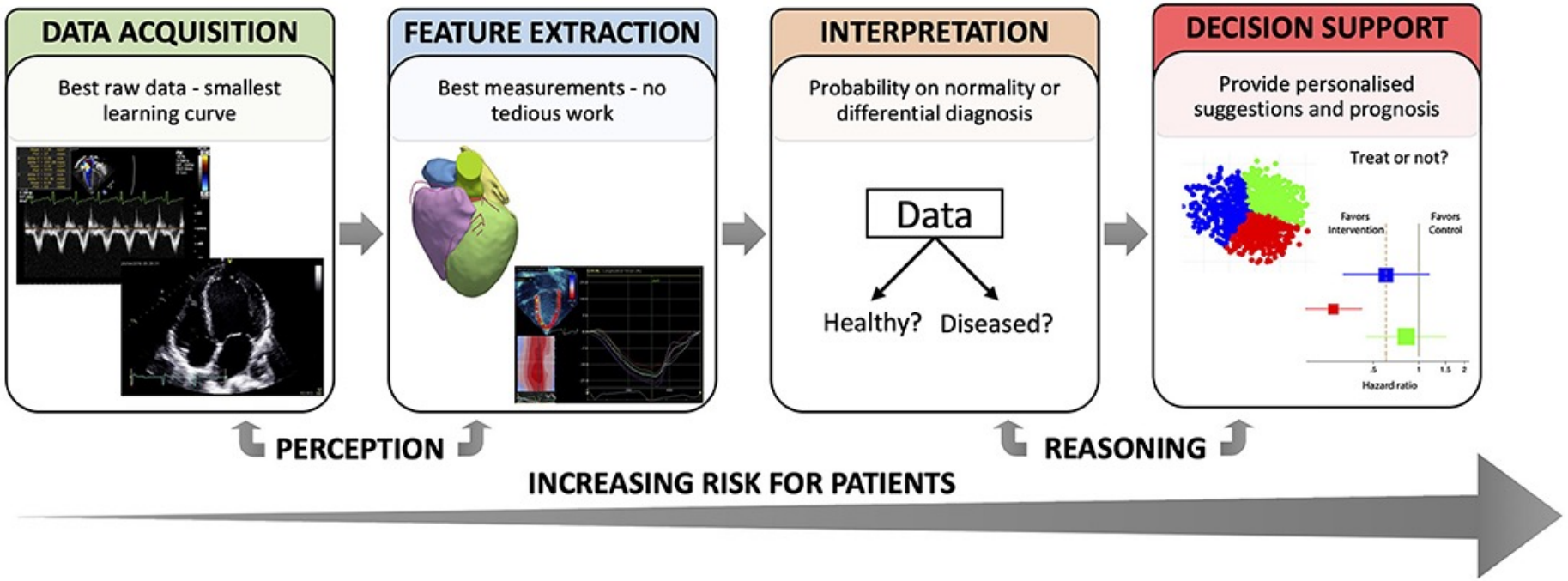
Oportunidades y retos



Machine Learning for Clinical Decision-Making: Challenges and Opportunities in Cardiovascular Imaging

Sergio Sanchez-Martinez[1], Oscar Camara[2], Gemma Piella[2], Maja Cikes[3], Miguel Ángel González-Ballester[2,4], Marius Miron[5], Alfredo Vellido[6], Emilia Gómez[2,5*], Alan G. Fraser[7] and Bart Bijnens[1,4,8]

https://www.frontiersin.org/articles/10.3389/fcvm.2021.765693/full

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Oportunidades y retos

Strengths

- Allow objective and thorough comparison to populations
- Allow the integration of complex, heterogenous features
- May enhance the prediction of clinical outcomes, or the prediction of response to a given treatment or intervention.

Weaknesses

- Need well-curated, representative databases for training
- Affected by data reliability, representativeness, and bias
- Need to extract meaningful, interpretable concepts
- Need thorough validation–prospective trials
- Need to integrate longitudinal data
- Ensure transference of knowledge across populations
- Need to prove clinical benefit
- Need to be integrated within clinical systems
- Need to prove cost-effectiveness

Opportunities

- Stimulate the man/machine collaboration
- Reach diagnosis in a shorter time
- Separate ambiguous cases that deserve more attention from clear cases–triaging
- Help in the organization of healthcare—diagnosis, risk assessment and urgency assessment
- Lower cost of healthcare by suggesting cost-effective decisions

Threats

- Harm patients if wrong decisions are taken—high-risk
- Disappoint users, especially after all the striking news on ML failures
- Affect human decisions in a negative way—automation bias
- Make decisions for the average patient, not at the individual level

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Figure 1. Classification of AI and AI-mediated technologies in Medicine and Healthcare according t their ethical and social impact. SW: software, AR: augmented reality, VR: virtual reality, IoT: interne of things. TAL: Technology Availability Level.

AI and AI-mediated technologies	Specific implementations.	TAL	Social Impact
Algorithms for computer-aided diagnosis.	SW for decision support in (most) clinical areas.	8, 9	Positive
Structured reports, eHealth.	SW for improved workflow, efficiency.	8, 9	
AR/VR, advanced imaging tools.	Tools for information visualization and navigation.	6, 7, 9	
	Image-guided surgery. Teleoperation.	4, 6, 9	
Digital pathology, 'virtopsy'.	SW for automated, extensive analysis.	4-9	
Personalized, precision medicine.	Tailored treatments. Prediction of response.	4-9	
	'In-silico' modeling and testing. The 'digital twin'.	4-8	
	Drug design.	4, 8	
Apps, chatbots, dashboards, online platforms.	The 'digital doctor' (assistance for professionals and for patients).	8, 9	
Companion and social robots.	For hospitalized persons, children & the elderly.	4-9	
Big Data collection and analysis.	Epidemiology, prevention and monitoring of disease outbreaks.	2-9	
	Fraud detection. Quality control, monitoring of physicians and treatments.	4-9	
IoT, wearables, mHealth.	Automated clinical/health surveillance in any environment/institution.	7, 8	
	Monitoring, automated drug delivery.	7-9	
Gene editing.	Disease treatment, prevention.	7, 8	
Merging of medical and social data. 'Social' engineering.	Prevention of episodes with clinical relevance (e.g. suicide attempts).	6, 8	Controversial
	Tailored marketing (e.g. related to female cycles).	6, 8	
Reading and decoding brain signals. Interaction with neural processes.	Treatment of diseases. Restoring damaged functions.	3-8	
	Brain-machine inferfaces.	5-8	
	Control of prostheses, exoskeletons. 'Cyborgs'.	2-7	
	Neurostimulation. Neuromodulation.	4-8	
	Neuroprostheses (for the central nervous system).	2-5	
	Mind 'reading' and 'manipulation'.	1-3	
Genetic tests. Population screening.	Disease tests. Direct-to-consumer tests.	4-9	
Personalized, precision medicine.	Individual profiling. Personalized molecules (for treatment) at 'impossible' prices.	3-8	
Gene editing.	'Engineered' humans.	2, 6	
	Gene-enhanced 'superhumans'.	2	
	Self-experimentation medicine. Biohacking.	2, 6	
Fully autonomous AI systems.	The 'digital doctor'.	2-5	
	'Robotic surgeon'.	2, 4	
Human-animal embryos.	Organs for transplants.	2, 4, 5	
	Hybrid beings ('chimera').	2, 4	
The quest for immortality.	Whole-brain emulation / 'transplant'.	1, 2	
The search for artificial life forms.	'Living machines' ('biological robots', 'biobots')	4, 6	
	Military.	2, 3	
Evil biohacking.	Targeting specific individuals or groups.	1, 2	
Weaponization.	From 'small labs' to military labs.	1, 2	
Bioterrorism.	From 'small labs'.	1, 2	Negative

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Conclusión: la IA

- **Ofrece oportunidades**: personalización, asistencia cognitiva, optimización de recursos.
- **Conlleva unos riesgos:** necesidad de preverlos y de evaluar nuestros sistemas de forma adecuada.
- **Conocimiento e interdisciplinariedad:** ingenieros - personal sanitario para que se utilicen de una forma adecuada.

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