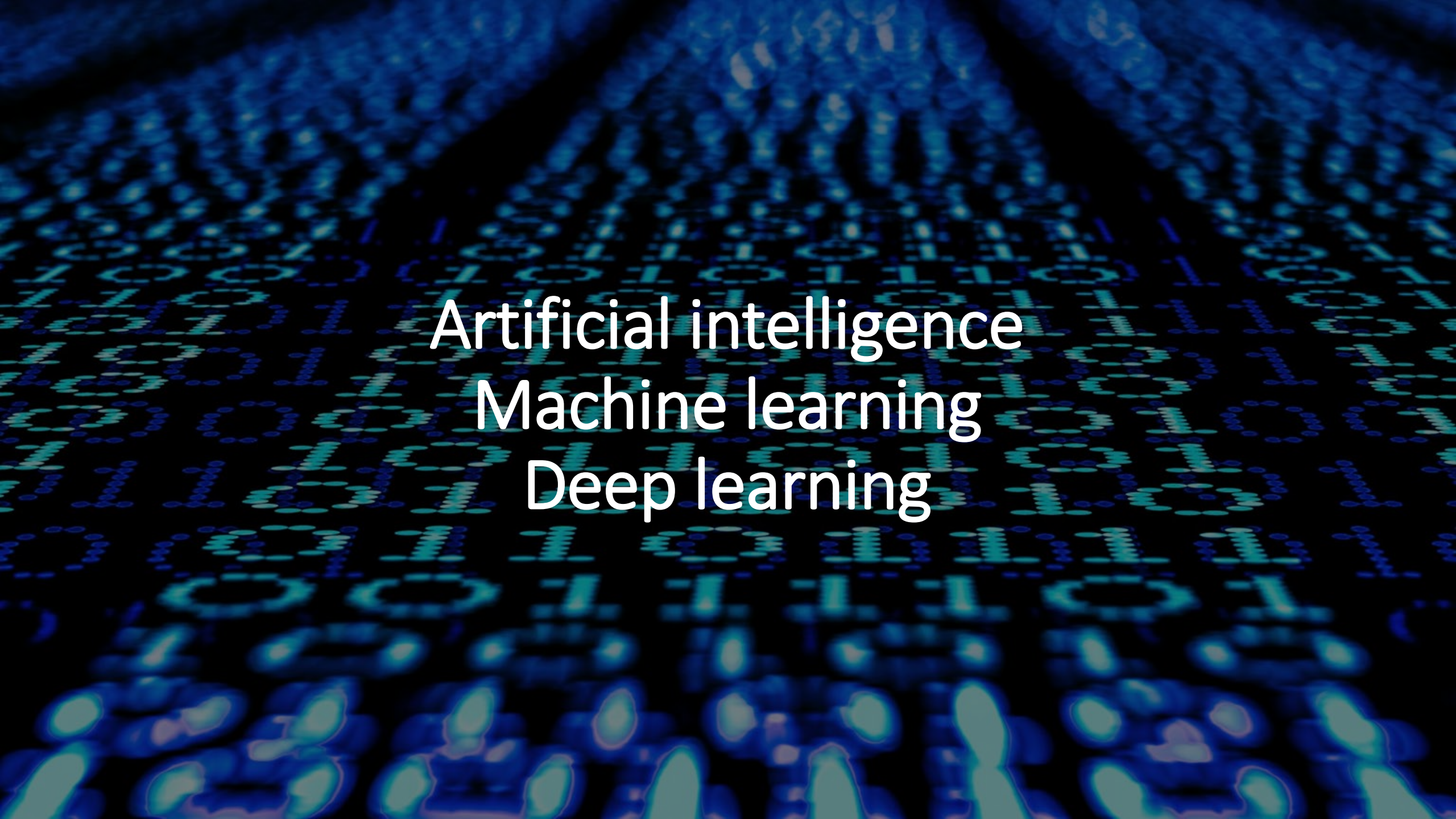


Medical applications of deep learning

Sonja Aits

Lund University





Artificial intelligence
Machine learning
Deep learning

What is artificial intelligence?

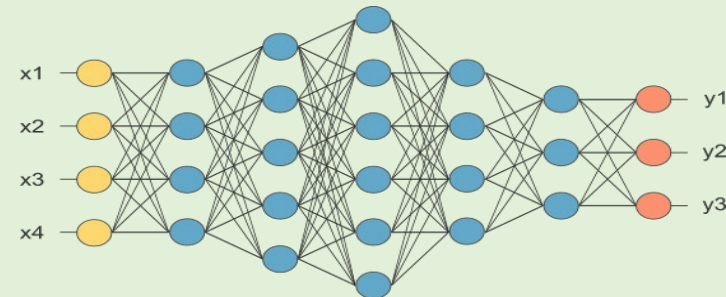
Artificial intelligence

Imitation of human intelligence in computers

Machine learning

Computers learn decision rules from examples

Deep learning



What can we do with AI?

Natural language processing



What are the symptoms of covid19?



what are the symptoms of **covid 19** in dogs

what are the symptoms of **covid 19** virus

what are the symptoms of **covid 19** in babies

what are the symptoms of **covid 19** in toddlers

what are the symptoms of **covid 19** *

what are the symptoms of **covid 19** uk

AI chatbots

ChatGPT

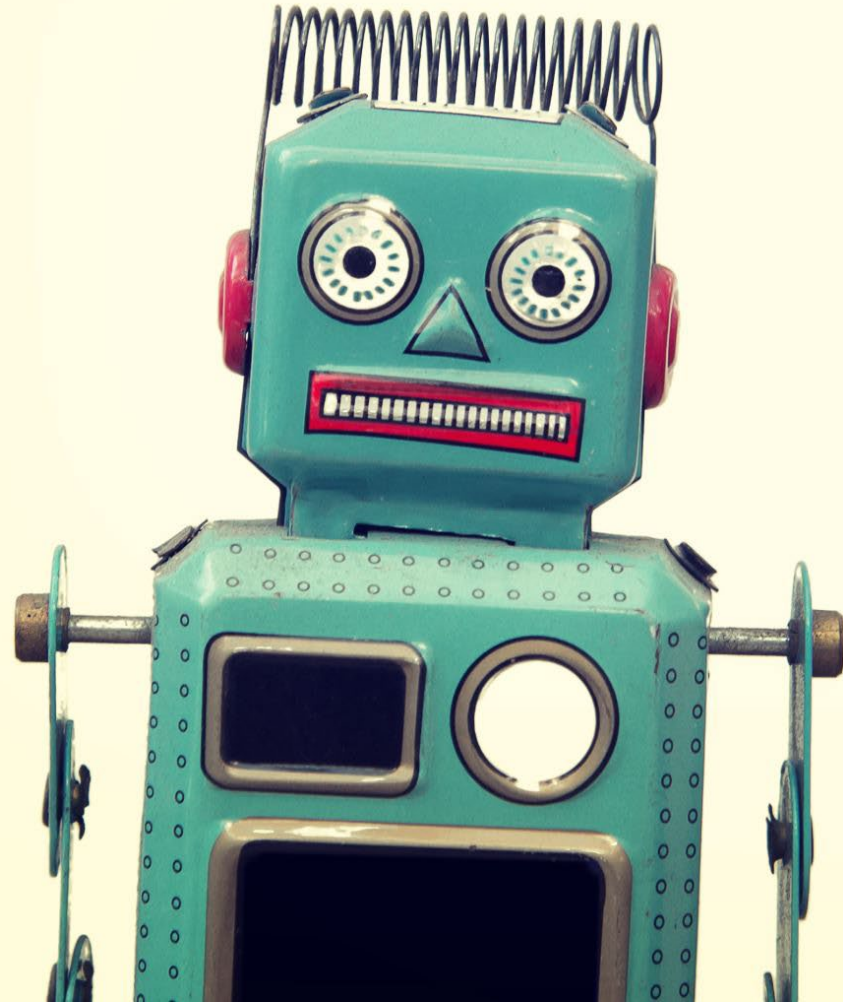
Google Gemini

Microsoft Copilot

HuggingChat

Claude

Perplexity



Computer vision

Image analysis

**Classifying and
scoring images**



**Counting and
tracking objects**



**Distinguishing
structures**



AI-based diagnostic tools



Structural biology

Google's DeepMind aces protein folding

By Robert F. Service | Dec. 6, 2018, 12:05 PM

Google's DeepMind predicts 3D shapes of proteins

INTELLIGENCE ARTIFICIELLE SCIENCE

DeepMind a développé une IA pour modéliser des protéines

Une avancée majeure dans le monde scientifique, qui devrait notamment permettre de d'améliorer considérablement le traitement de

Technology

Alphabet's DeepMind AI Algorithm Wins Protein-Folding Contest



Demis Hassabis

@demishassabis

Follow

Proteins are essential to life. Predicting their 3D structure is a major unsolved challenge in biology and could impact disease understanding and drug discovery. I'm excited to we have won the CASP competition! #AlphaFold



AlphaFold Protein Structure Database

Developed by DeepMind and EMBL-EBI

Search for protein, gene, UniProt accession or organism or sequence search

BETA

Search

Examples: MENFQKVEKIGEGTYGV...

Free fatty acid receptor 2

At1g58602

Q5VSL9

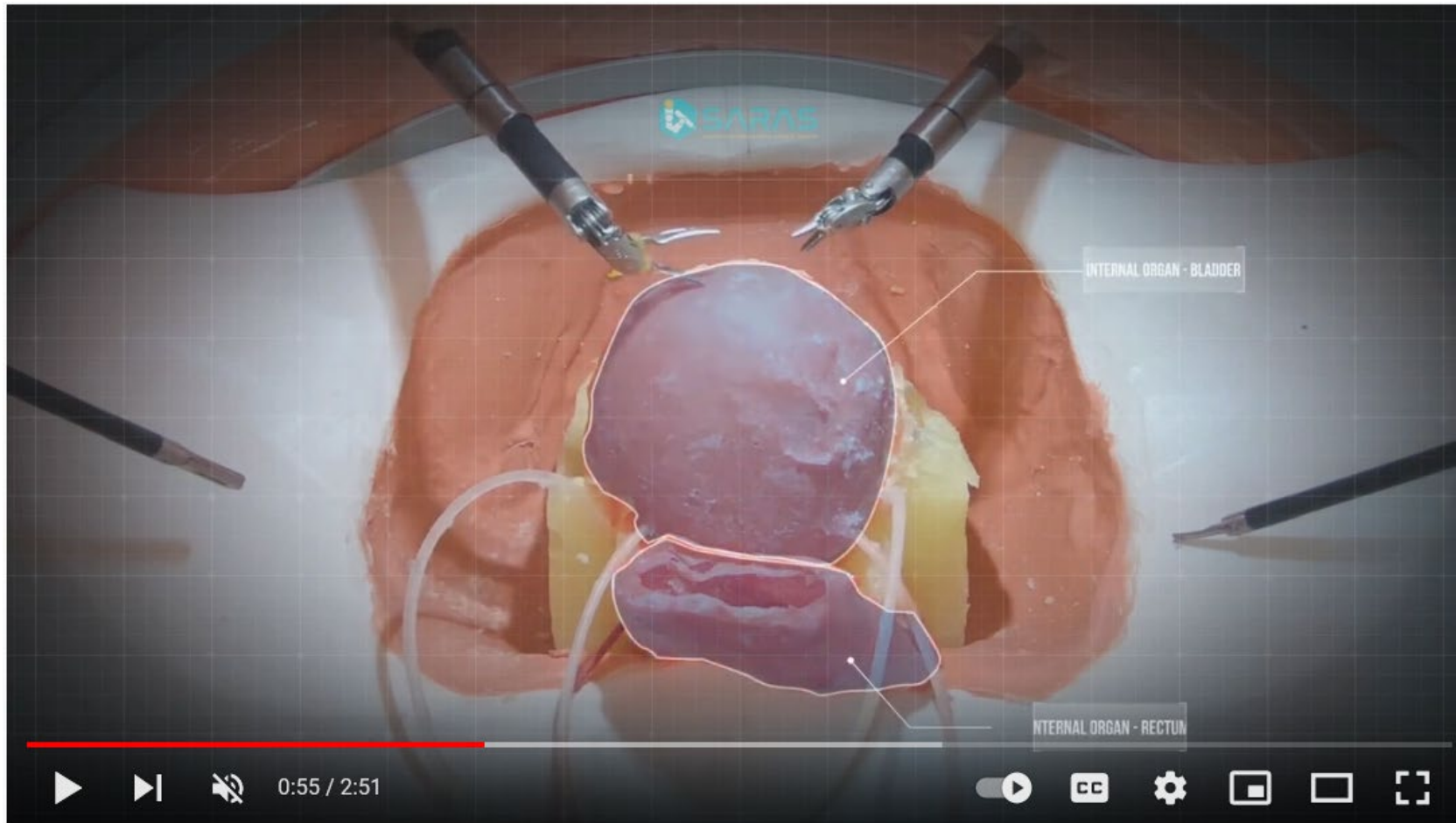
E. coli

See search help →

AlphaFold DB provides open access to over 200 million protein structure predictions to accelerate scientific research.

Robotics

Robotic surgery

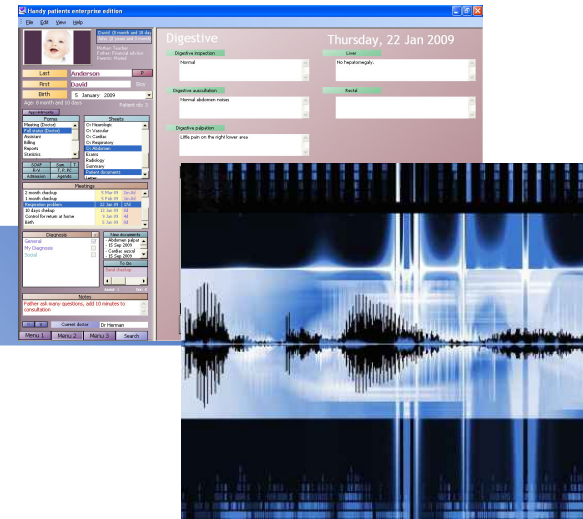
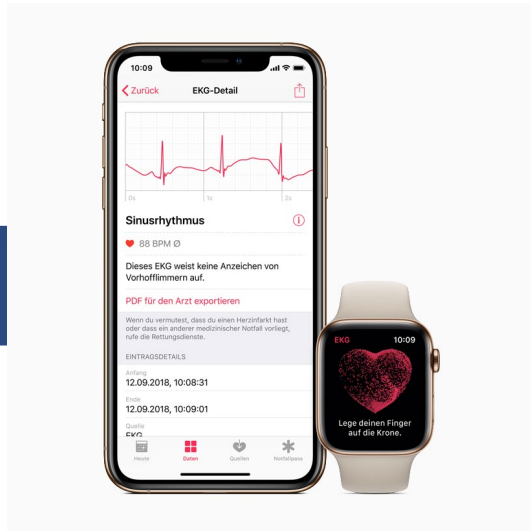


AI-supported transport/surveillance



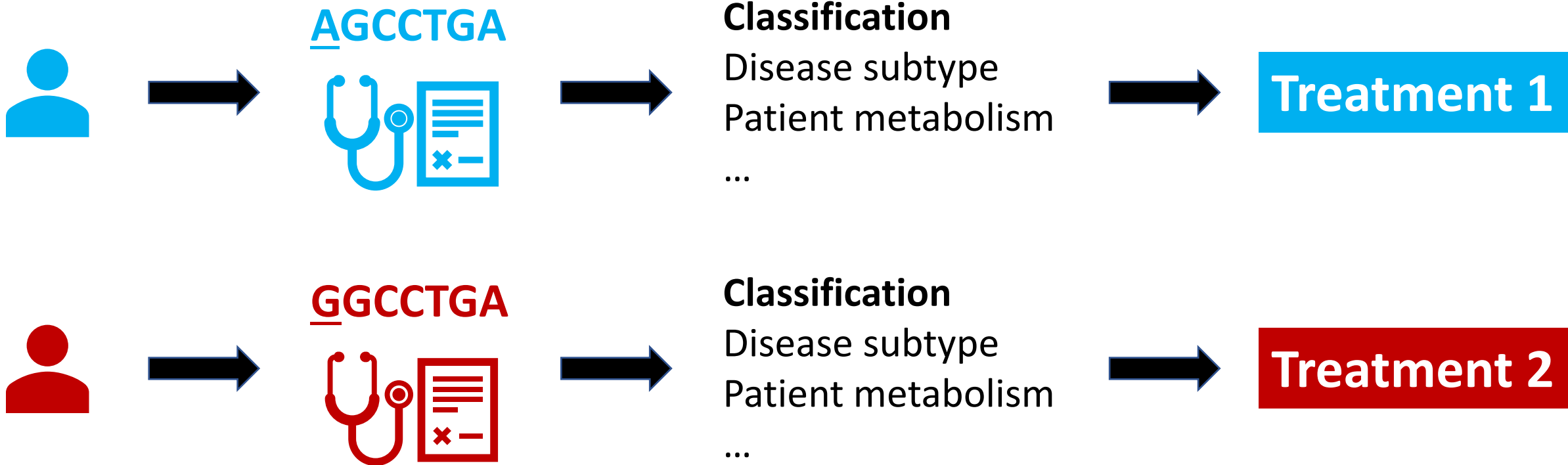
Personalized health care

Health apps and speech recognition for collection of patient history



**Structured and
comprehensive
patient history**

AI-based predictions for personalized medicine



Custom-made implants



Other applications

AI for omics analysis

- Denoising
- Peak calling
- Variant calling
- Clustering
- Outlier detection
- Spatial omics analysis
- Multi-omics integration
- ...

AI for drug development



Drug discovery

- Gene-disease mapping
- Biomarker discovery
- Drug repurposing
- Drug target identification
- Lead ranking
- Adverse event prediction

Clinical trials

- Patient identification
- Patient monitoring
- Pharmacogenomics
- Regulatory document preparation

Pharmacovigilance

- Adverse event detection
- Drug-drug interaction mapping
- Patient data anonymization

AI for public health monitoring

Research Article | [Open Access](#) | Open Peer Review | Published: 08 November 2019

Deep learning for pollen allergy surveillance from twitter in Australia

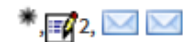
[Jia Rong](#), [Sandra Michalska](#) 

[BMC Medical Informatics and](#)

243 Accesses | 11 Altmetric

Forecasting influenza activity using self-adaptive AI model and multi-source data in Chongqing, China

[Kun Su](#)^{a,b,1}, [Liang Xu](#)^{c,1}, [Guanqiao Li](#)^{d,1}, [Xiaowen Ruan](#)^c, [Xiong](#)^b, [Shaofeng Lu](#)^c, [Li Qi](#)^b, [Chaobo Shen](#)^c, [Wenge Tang](#)^c, [Xuanling Shi](#)^d, [Zhihong Yang](#)^c, [Qi Zhang](#)^d, [Ziqi Zhu](#)^a



[Open Access](#)  PlumX Metrics

DOI: <https://doi.org/10.1016/j.ebiom.2019.08.024>



Article | [Open Access](#) | Published: 18 April 2019

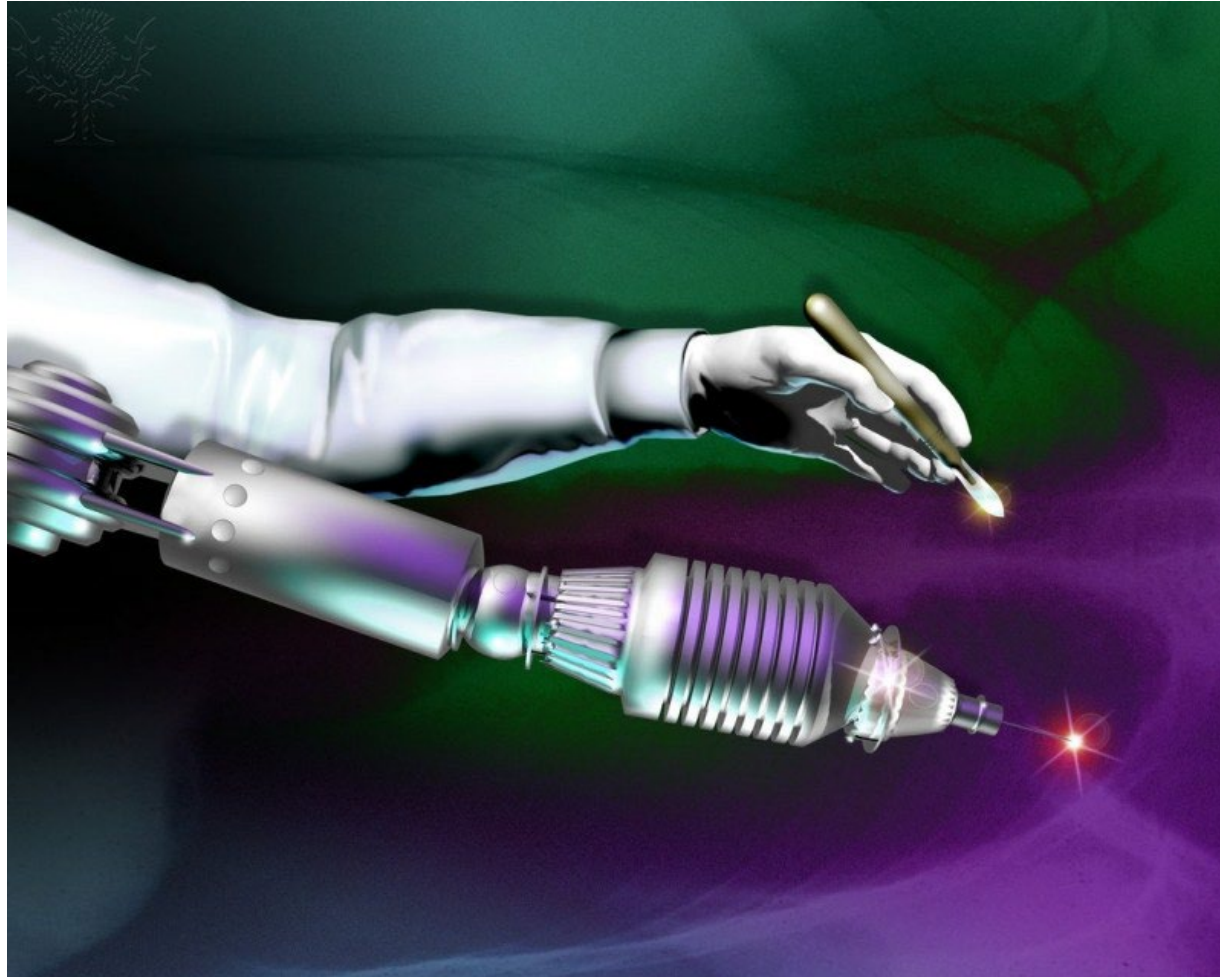
Measuring social, environmental and health inequalities using deep learning and street imagery

[Esra Suel](#) , [John W. Polak](#), [James E. Bennett](#) & [Majid Ezzati](#)

[Scientific Reports](#) **9**, Article number: 6229 (2019) | [Cite this article](#)

5986 Accesses | 1 Citations | 141 Altmetric | [Metrics](#)

Is AI the doctor and scientist of the future?



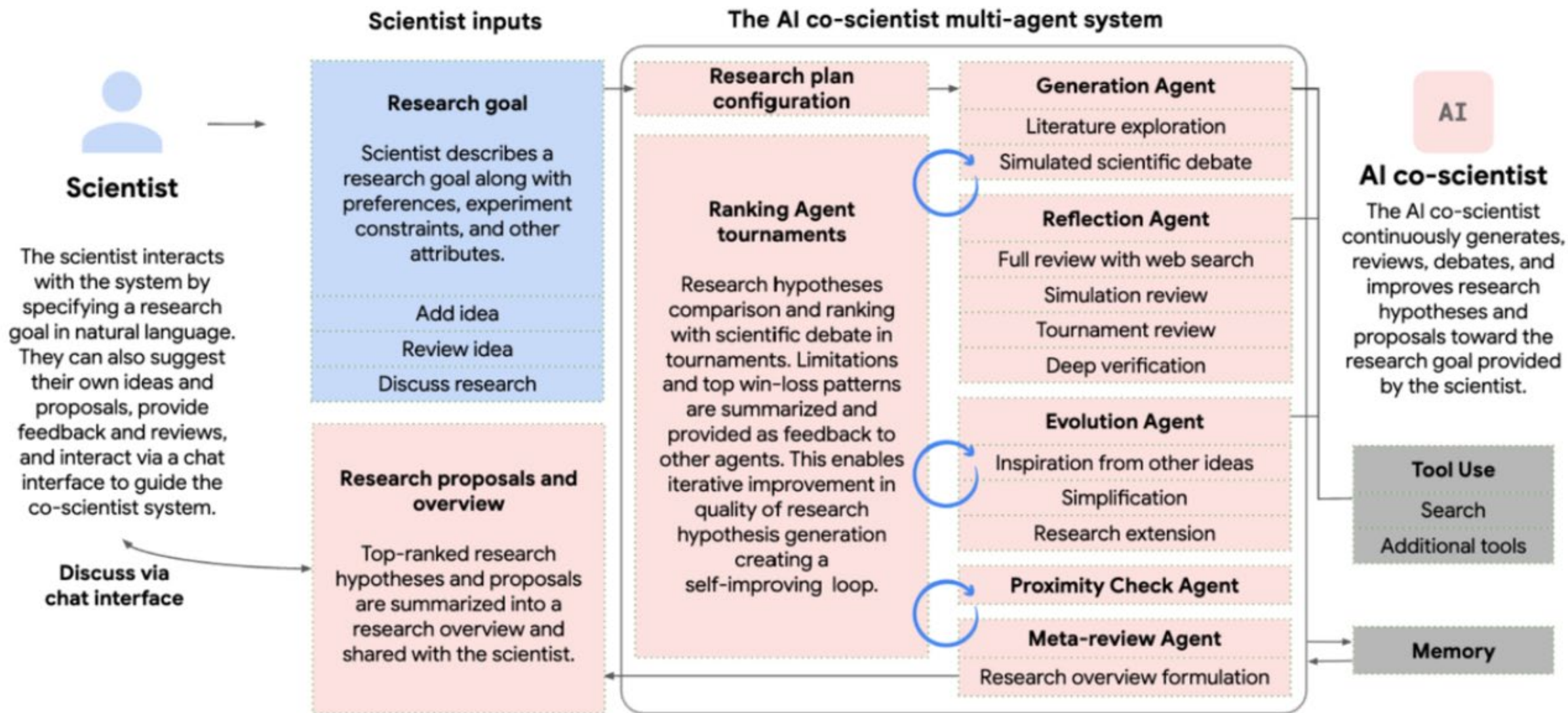
Microsoft says AI system better than doctors at diagnosing complex health conditions

NEWS | 09 May 2025

Google AI better than human doctors at diagnosing rashes from pictures

Chatbot can analyse health-care imagery, such as PDFs of test results, to accurately diagnose a range of medical conditions.

Company	FDA Approval	Indication
Apple	September 2018	Atrial fibrillation detection
Aidoc	August 2018	CT brain bleed diagnosis
iCAD	August 2018	Breast density via mammography
Zebra Medical	July 2018	Coronary calcium scoring
Bay Labs	June 2018	Echocardiogram EF determination
Neural Analytics	May 2018	Device for paramedic stroke diagnosis
IDx	April 2018	Diabetic retinopathy diagnosis
Icometrix	April 2018	MRI brain interpretation
Imagen	March 2018	X-ray wrist fracture diagnosis
Viz.ai	February 2018	CT stroke diagnosis
Arterys	February 2018	Liver and lung cancer (MRI, CT) diagnosis
MaxQ-AI	January 2018	CT brain bleed diagnosis
Alivecor	November 2017	Atrial fibrillation detection via Apple Watch
Arterys	January 2017	MRI heart interpretation



The AI co-scientist system design

Using AI for medicine/life science is challenging

Report: IBM Watson delivered 'unsafe and inaccurate' cancer recommendations

JULY 25, 2018 BY [FINK DENSFORD](#) — [LEAVE A COMMENT](#)

Biased Data the Real Danger of AI

By Oliver Mitchell | March 19, 2018

REGULATION

There's No Such Thing as Anonymous Data

by [Scott Berinato](#)

FEBRUARY 09, 2015

'Godfather of AI' shortens odds of the technology wiping out humanity over next 30 years

Geoffrey Hinton says there is 10% to 20% chance AI will lead to human extinction in three decades, as change moves fast

- 'We need dramatic changes': is societal collapse inevitable?



Take home message

Machine learning has MANY applications in
medicine/life sciences
but ensuring its responsible use is a MAJOR
challenge