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AI als nieuwe systeemtechnologie



Prof. Dr. Bart De Moor
www.bartdemoor.be

ESAT-STADIUS, KU Leuven (https://www.esat.kuleuven.be/stadius/)

Co-coordinator FAIR (https://www.flandersairesearch.be/en)

Chairman of:
- VAIA (www.vaia.be)
- Leuven.AI (https://ai.kuleuven.be)
- Leuven Gravity Institute (https://www.kuleuven.be/lgi)
- athumi (Flanders Data Utility Company, https://athumi.be/en)
- Alamire Foundation (https://www.alamirefoundation.org/en/)

- Systeemtechnologieën

- De vele moeders en vaders van AI

- Wat is AI ?

- AI in Vlaanderen

- Niet-technologische en politieke dimensies

- athumi (Flanders Data Utility Company)

Systeemtechnologieën

Technologische doorbraken:

- die de samenleving drastisch en blijvend pervasief impacteren: energie-technologie, ICT, nutsvoorzieningen, biotechnologie, …

- die het wetenschappelijk, technologisch en economisch wiel blijvend aandrijven

- die cross-/multi-/inter-disciplinaire doorbraken en innovaties recurrent induceren en versnellen

- Enz…

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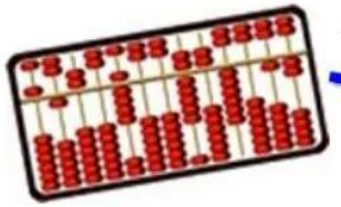
Vele vaders en moeders…

- Computing
- Data
- Automatisatie en ‘control’
- Biologie
- Geld

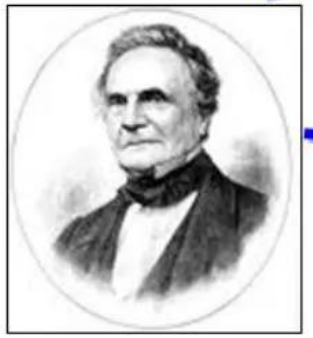
History of Computers



Abacus – 1100 BC



Slide rule - 1617
Mechanical calculator - 1642
Automatic loom (punched cards) - 1804



Babbage's computer – 1830s
Boolean logic – 1850s

Hollerith's electric tabulator - 1880
Analog computer – 1927
EDVAC – 1946
ENIAC - 1947





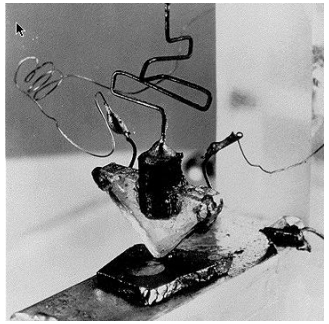
Transistor - 1947



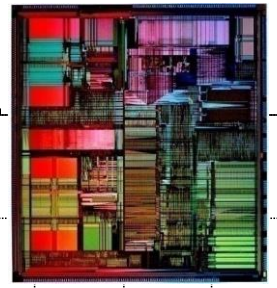
Integrated circuit – late 1950s
UNIVAC – 1951
Microprocessor – 1971
Altair 8880 – 1975
Apple II – 1977
IBM PC – 1981
World Wide Web – 1990s

collegesearch

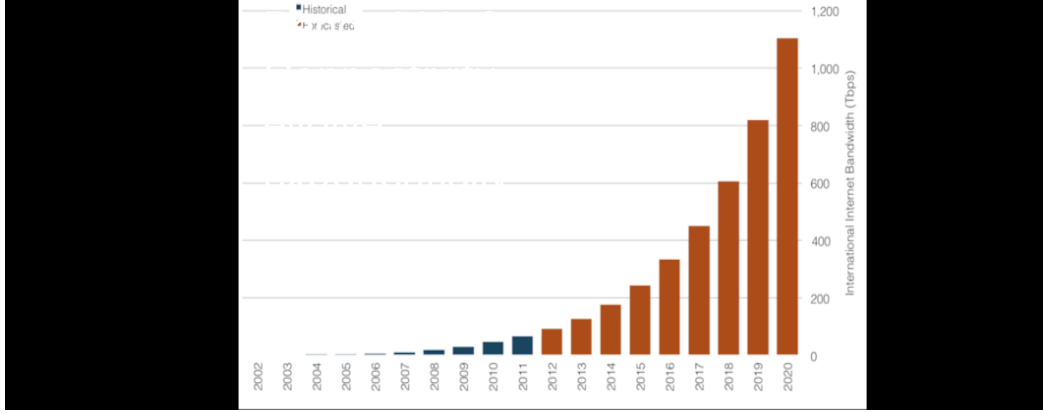
Technology and Engineering Design:
The third industrial revolution (1945…)

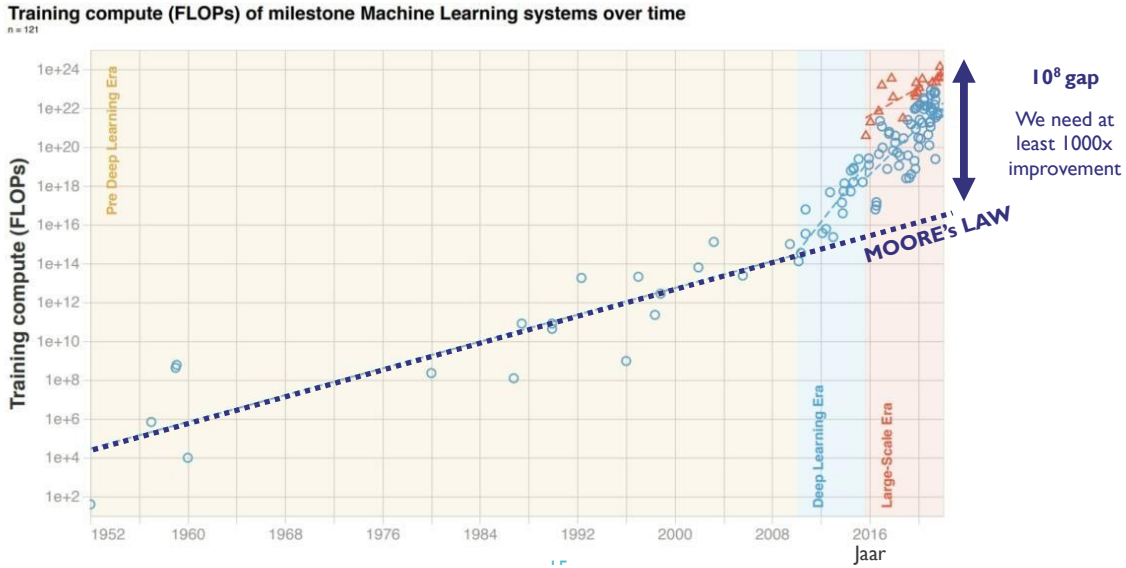






Computational power x 2 every 18 months





Neuromorphic chips ?

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What Year was your First Computer?
1966
1977
1982
1984
1989
1995
1998
Google!
IBM
Microsoft Windows98
2001
2005
2007
2009
2010
2015
2020
2025
YouTube
zoom
ChatGPT

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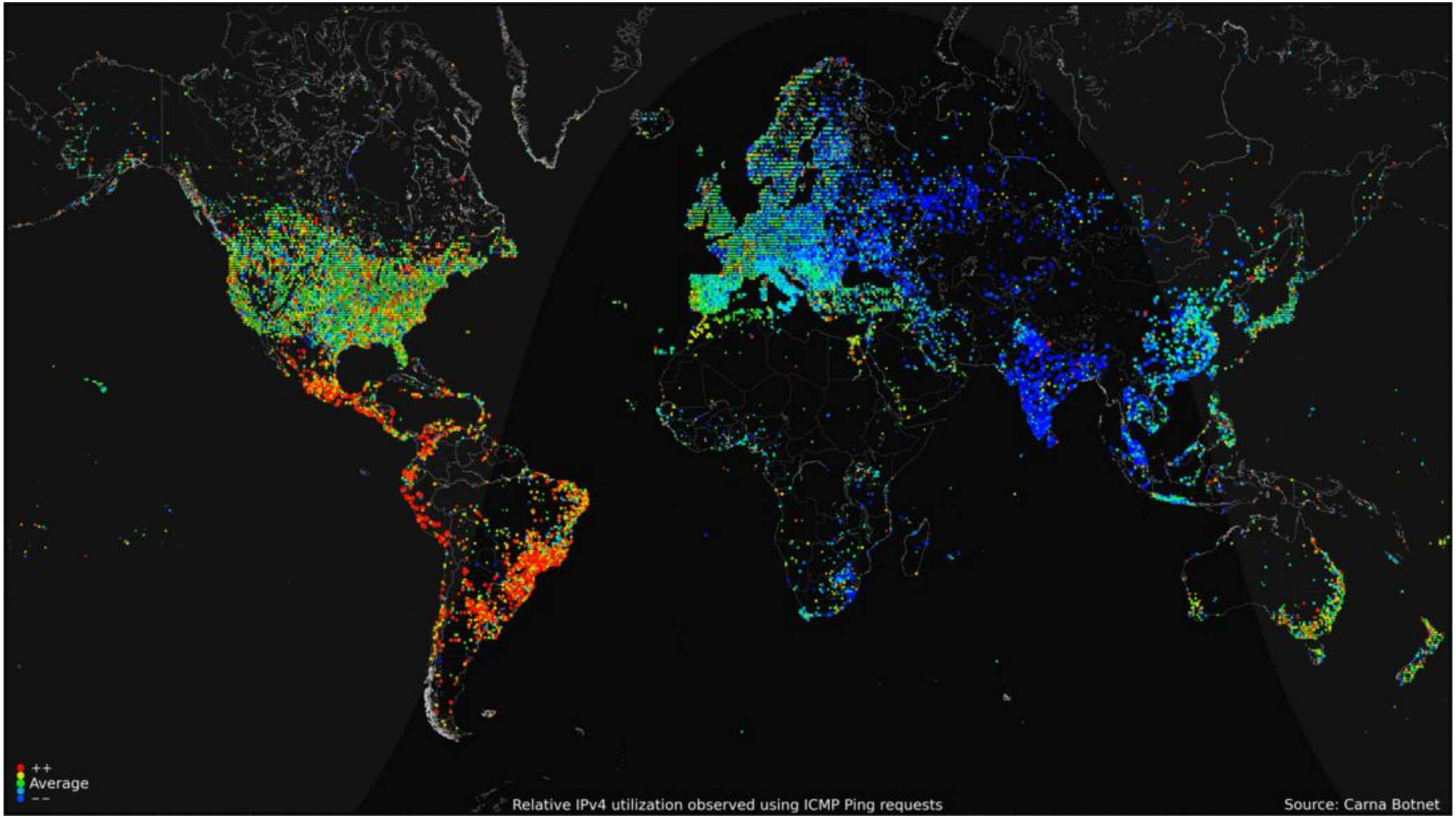
++
Average
--
Relative IPv4 utilization observed using ICMP Ping requests
Source: Carna Botnet

Vele vaders en moeders…

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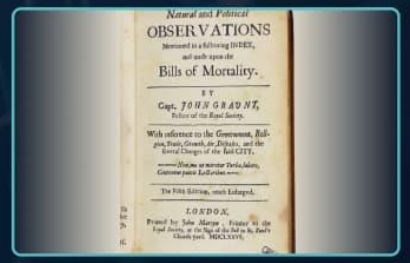
HISTORY OF DATA

19,000 BC



The Ishango bone holds the first evidence of data collection and storage.

1600s



John Graunt introduces the concept of data analysis in 1663.

1800s



Herman Hollerith designs a machine that helped complete the US census in 1890.

1900s



Fritz Pfleumer invents the magnetic tape which later inspired the invention of floppy disks and hard disk drives.

1990s



Sir Tim Berners Lee invents the World Wide Web.

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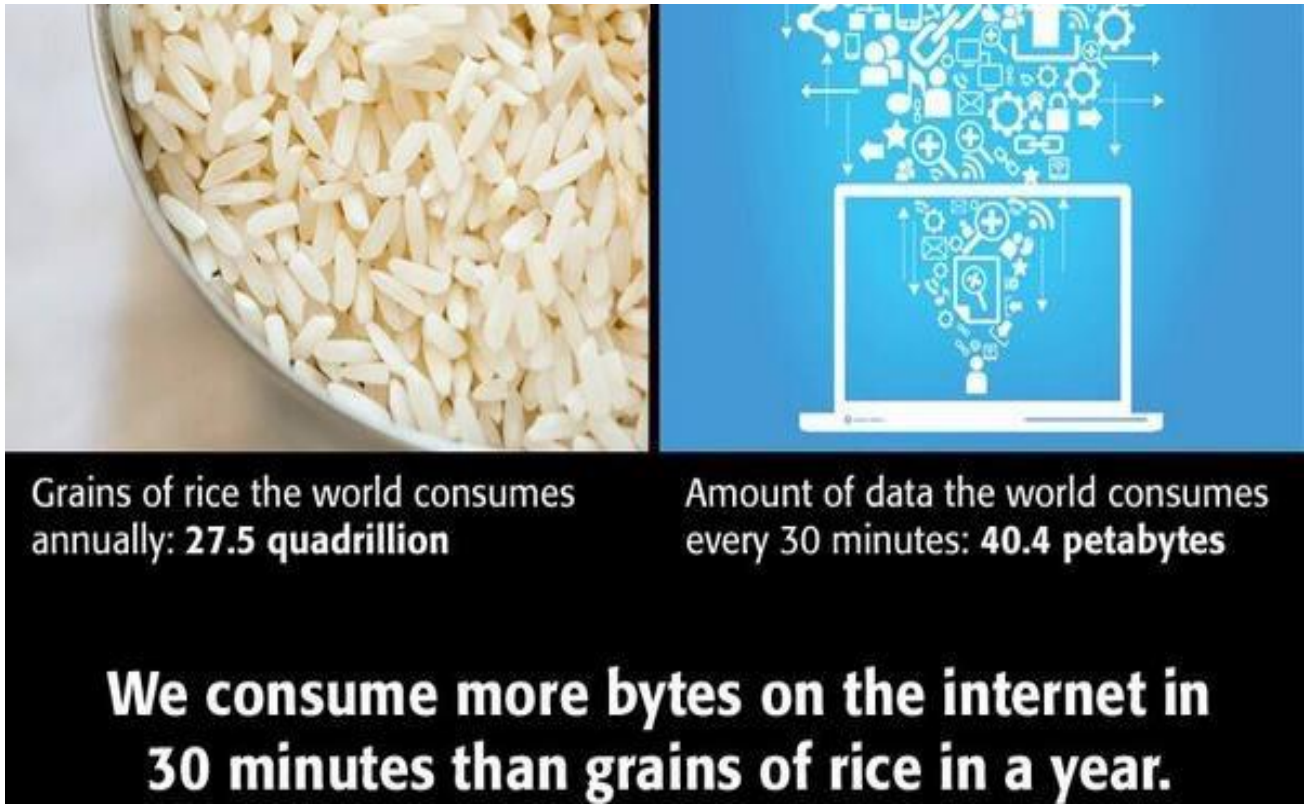
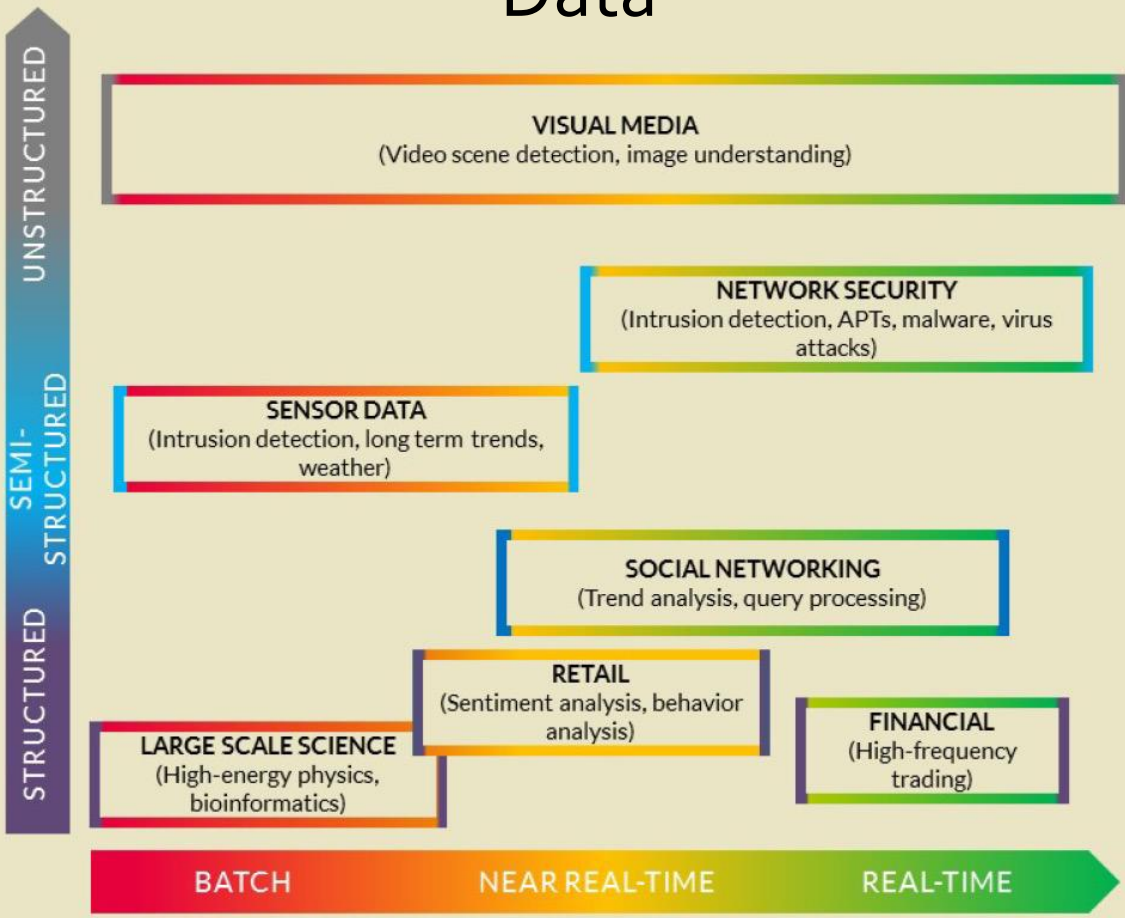


1 million = 1 000 000
1 billion = 1 000 000 000
1 trillion = 1 000 000 000 000
1 quadrillion =
1 000 000 000 000 000

1 kB = 1 000
1 MB = 1 000 000
1 GB = 1 000 000 000
1 TB = 1 000 000 000 000
1 PB = 1 000 000 000 000 000

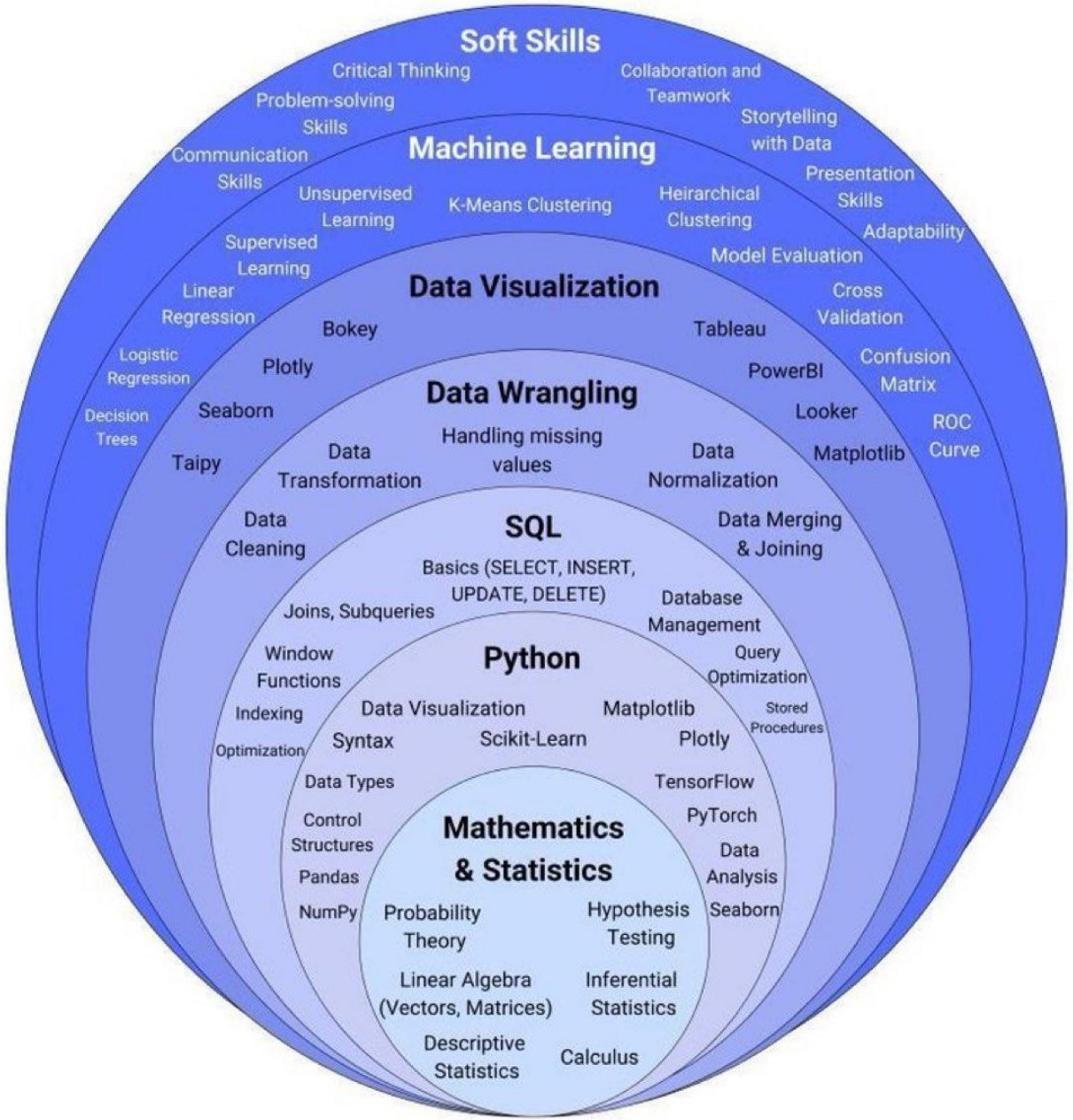
1 TB
= large university library
= 212 DVD discs
= 1430 CDs
= 3 year music CD quality

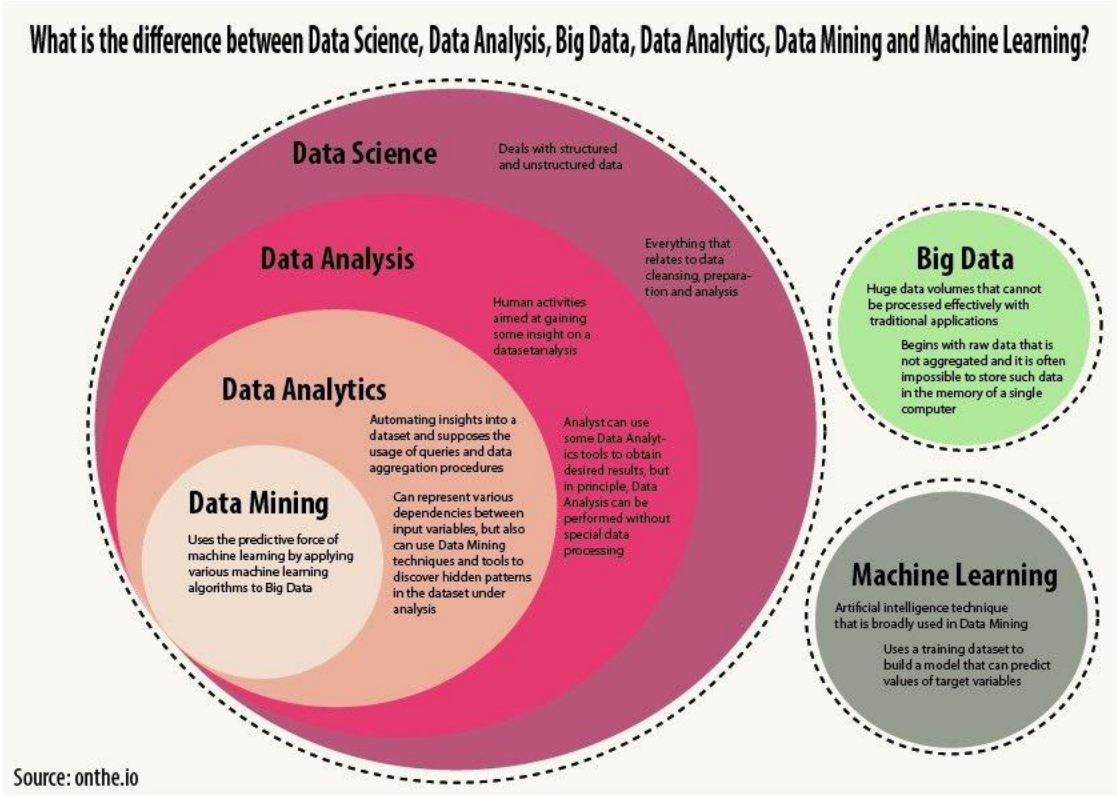
Data



datasciencedojo
data science for everyone

Data Scientist Roadmap





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The Fourth Paradigm

Paradigm	Time Ago	Method
First	A millenium	Empirical
Second	A few centuries	Theoretical
Third	A few decades	Computational
Fourth	Today	Data-driven



From

I have a hypothesis

⇩

I need data to check it

Evolution

⇨

To

I have data

⇩

Which hypotheses can I check?

⇨ Data first!

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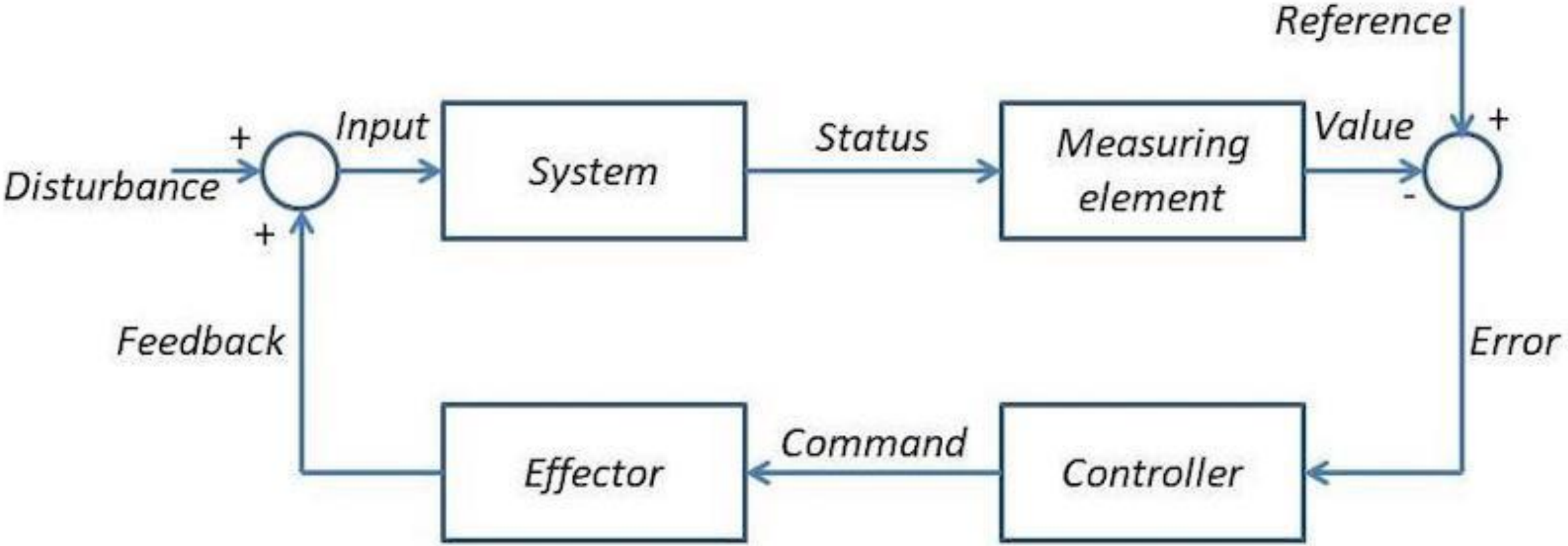
Reference
Input
Status
Value
+
Disturbance
+
System
Measuring element
+
-
+
Feedback
Error
Effector
Command
Controller

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The Map of Control Theory

pontryagin's maximum principle

Max(H)

model reference adaptive

extremum-seeking

$\hat{u}$ +

hamilton-jacobi-bellman equation

value → act

iterative learning control

Again!

adaptive

lqr

vs.

optimal

linear mpc

predictive

model predictive control

robust mpc

backstepping

fuzzy control

gain scheduling

nonlinear

intelligent

feedback linearization

dynamic inversion

G^{-1} G

bang-bang

reinforcement learning

explore vs exploit

genetic algorithms

sliding mode

multi-agent

leader-follower

graph theoretic control

swarm

active disturbance rejection control

robust

Hinf

mu synthesis

loop shaping

pid

$K_p e(t)$

$K_i \int e(\tau)\, d\tau$

$K_d \frac{de(t)}{dt}$

full state feedback

K

lead-lag

control methods

linear

continuous

time

feedback

D2C

C2D

laplace

discrete

frequency

feedforward

step

sine

impulse

planning

constraints

RRT

A*

optimal

holonomic nonholonomic redundant

observer

mapping

filtering

$f_2 - f_1$

kalman filter

calibration

$y_p = [\,]\,y + b$

moving horizon estimation

state estimation

tracking

sigma-point

sensor fusion

IMU

GPS

camera

particle

modeling & simulation

linear state space

$\dot{x} = Ax + Bu$

$y = Cx + Du$

nonlinear state space

$\frac{dx}{dt} = f(x,u)$

$y = g(x,u)$

simulation

hybrid system

transfer functions

$G(s) = \frac{\omega^2}{s^2 + 2\zeta\omega s + \omega^2}$

block diagrams

system id

Hello my name is

$G(s) = \frac{s}{s^2+1}$

minimum realizations

first principles

m_1 k b m_2

linearization

system analysis

performance

stability

nonminimum phase

controllability observability

$C_m = [B, AB, A^2B]$

$O_m = [C, CA, CA^2]'$

margins

SAFETY

nyquist

passivity

phase plane

pole-zero plot

lyapunov stability

bode plots

nichols chart

gang of six

root locus

brian douglas © aug 2020
Engineering Media

Vele vaders en moeders…

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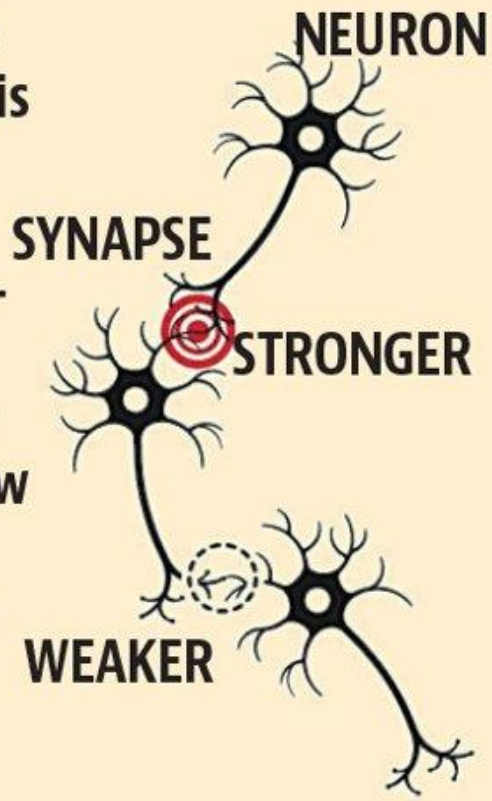
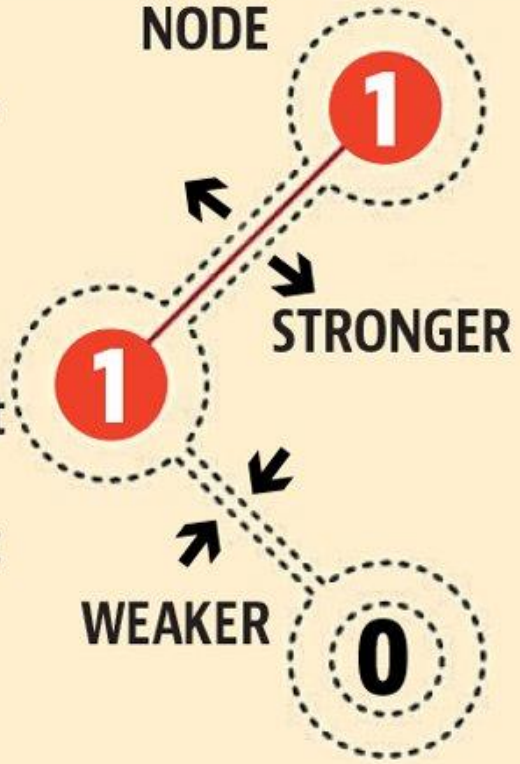
Recreating the brain

How an artificial neural network emulates the brain

In the brain, the neural network is made of actual nerve cells, which communicate through synapses. When we learn any new thing, some neural links get stronger and others weaker.

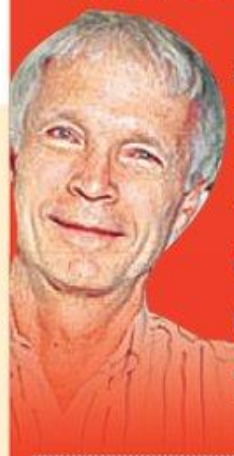


In an artificial neural network, interconnected nodes are trained to act like the brain's neurons, so that some of the connections get stronger while others get weaker.



SOURCE: THE ROYAL SWEDISH ACADEMY OF SCIENCES

THE WINNERS



John Hopfield, with Princeton University, created a structure that can store and reconstruct info

Geoffrey Hinton, with the University of Toronto, trained a machine to generate new data based on data fed into it



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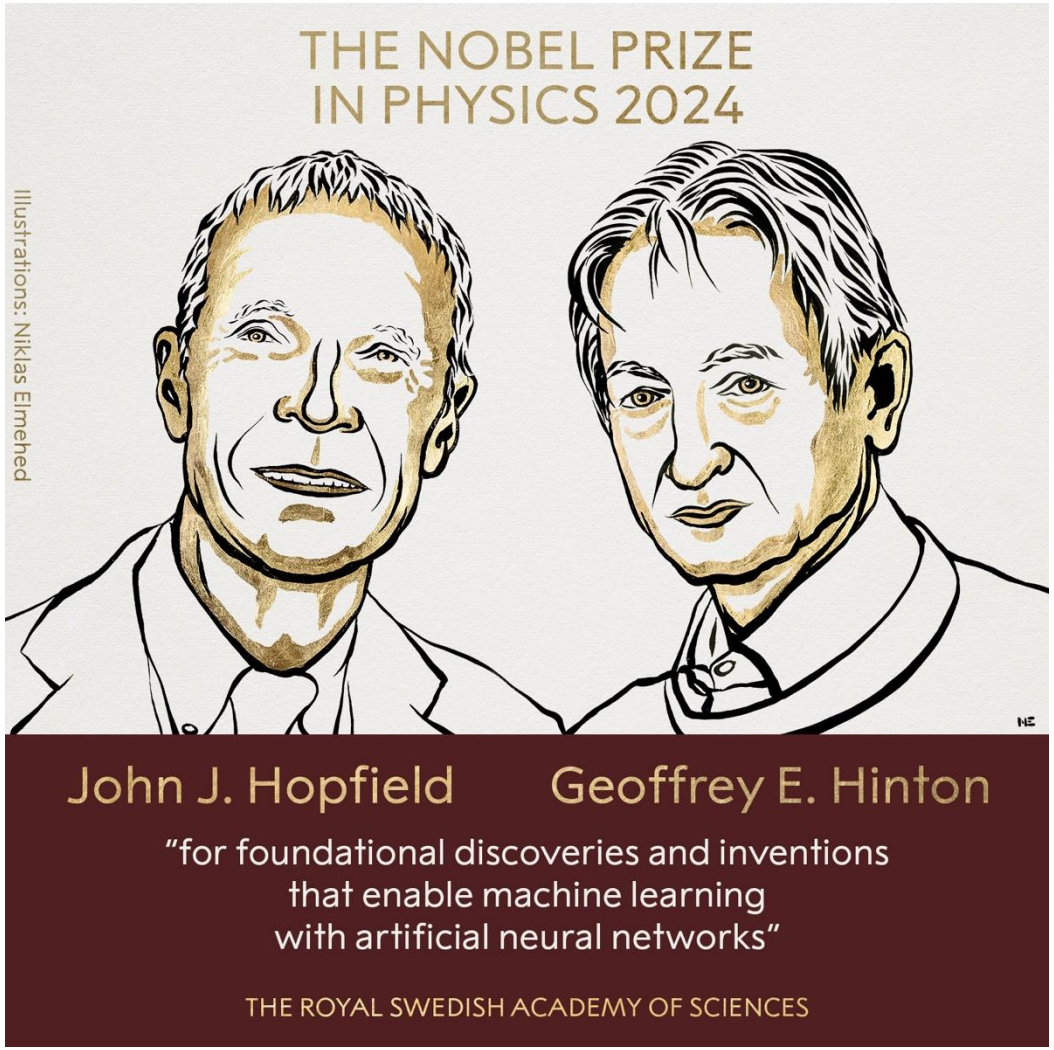
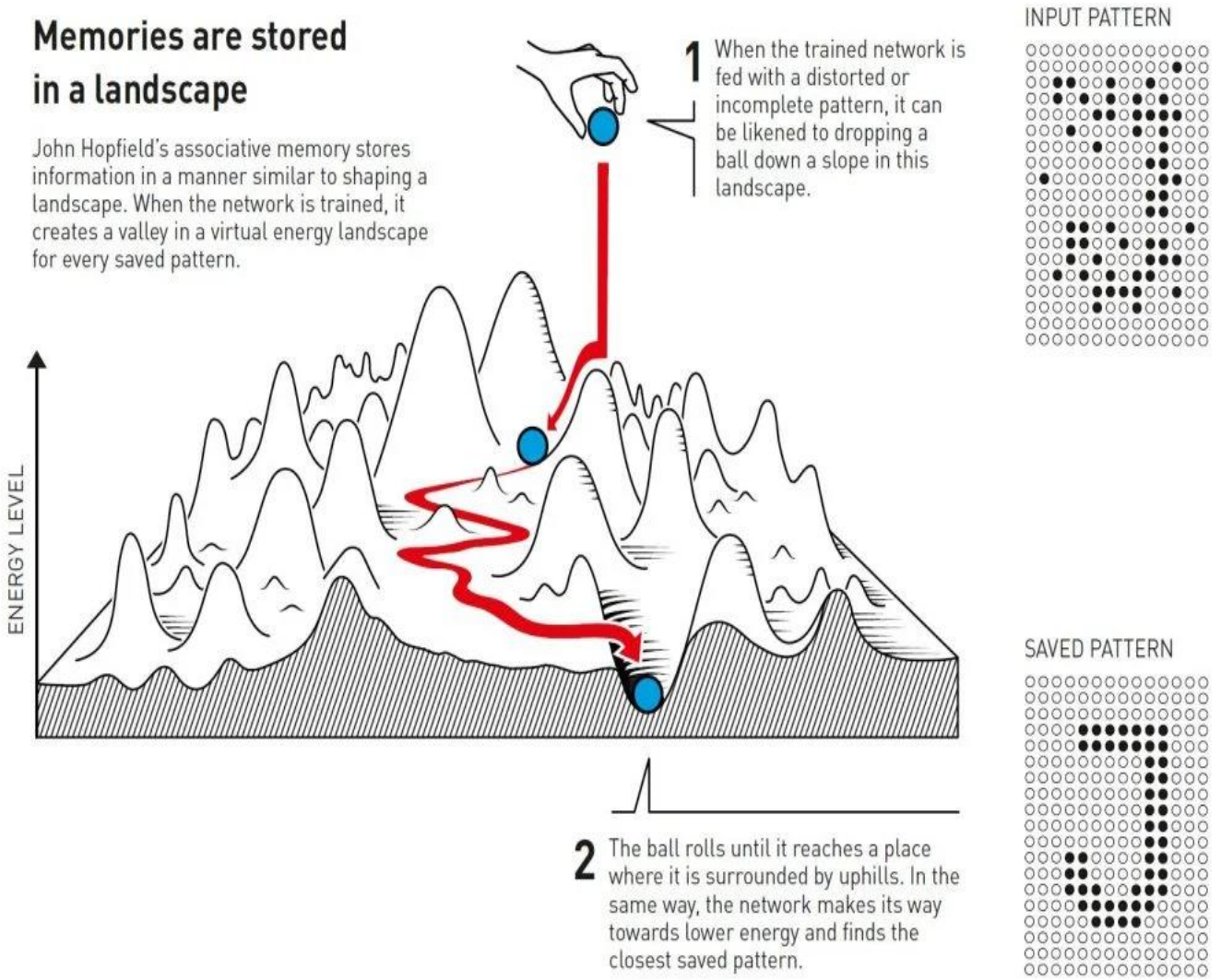

THE NOBEL PRIZE
IN PHYSICS 2024
Illustrations: Niklas Elmehed
John J. Hopfield
Geoffrey E. Hinton
"for foundational discoveries and inventions
that enable machine learning
with artificial neural networks"
THE ROYAL SWEDISH ACADEMY OF SCIENCES


Memories are stored in a landscape
John Hopfield's associative memory stores information in a manner similar to shaping a landscape. When the network is trained, it creates a valley in a virtual energy landscape for every saved pattern.
1 When the trained network is fed with a distorted or incomplete pattern, it can be likened to dropping a ball down a slope in this landscape.
INPUT PATTERN
ENERGY LEVEL
SAVED PATTERN
2 The ball rolls until it reaches a place where it is surrounded by uphills. In the same way, the network makes its way towards lower energy and finds the closest saved pattern.

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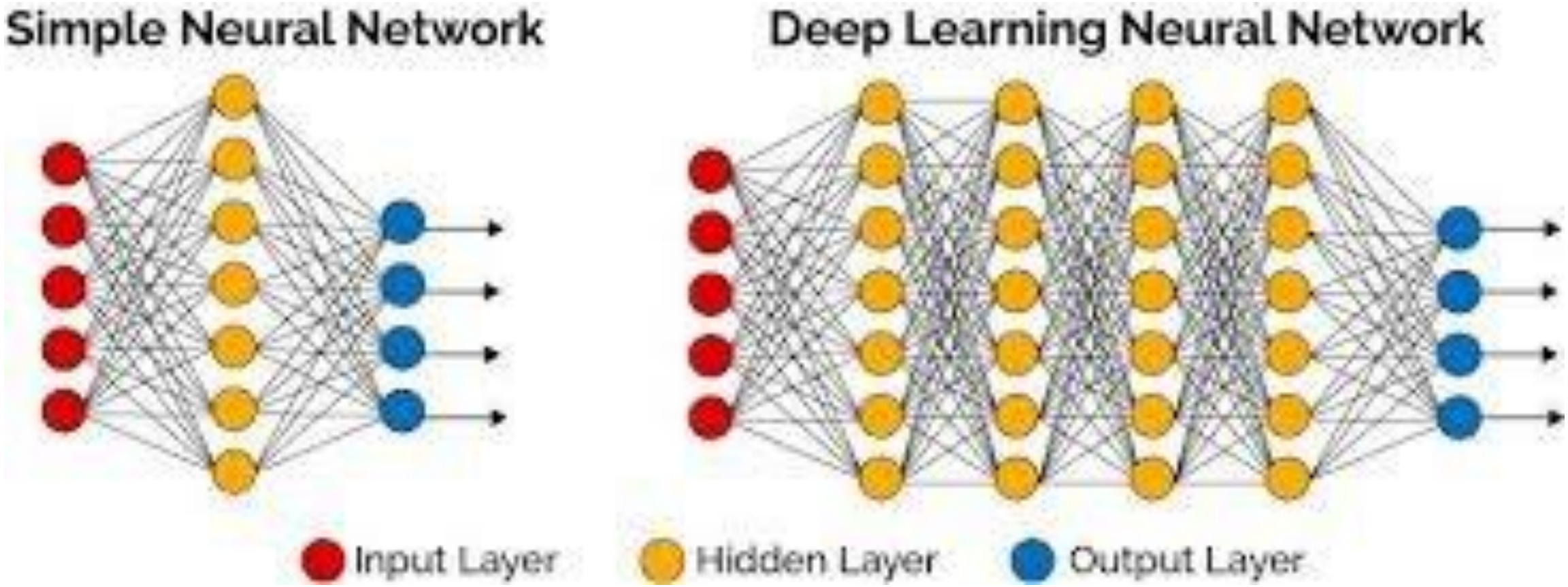

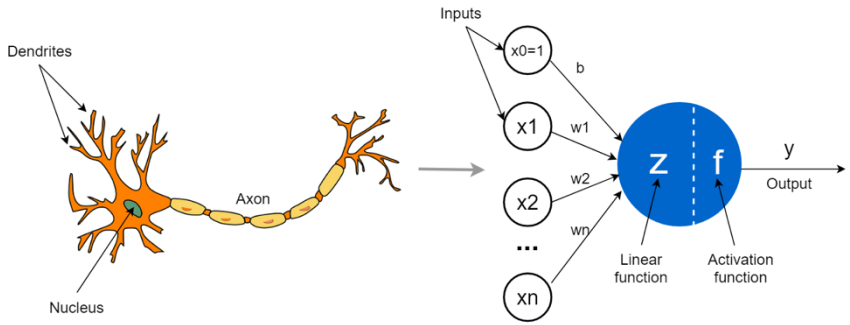

Universal approximation

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Last but not least….



- Systeemtechnologieën

- De vele moeders en vaders van AI

- Wat is AI ?

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- Niet-technologische en politieke dimensies

- athumi (Flanders Data Utility Company)

What is Artificial Intelligence and Machine Learning?

- Artificial intelligence
  - “Intelligence” as demonstrated by a machine unlike ‘natural (animal, human) intelligence’
  - Mimic the human mind in ‘cognitive functions’ and ‘problem solving’
  - Mimic = by massive computing power, exploiting tsunami of data
  - Inter/cross-disciplinary: mathematics, computer information science, control engineering, psychology, linguistics,…
  - AI = pattern recognition; ‘Automated’/’Augmented’/‘Assisted’/ Intelligence’ ? (cfr. Decision support systems)
  - Emotionality ? (Self-)consciousness ? ’Free Will’ ?

- Machine **Learning**
  - Computer algorithms that ‘improve’ their performance through experience/data processing
  - Supervised (e.g. by providing classification labels) or unsupervised (e.g. data reduction)
  - Interdisciplinary: mathematics, statistics, numerical optimization, …
  - Training and validation data
  - Generalization, Transfer Learning, Generative AI, …

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review articles

DOI:10.1145/3495256

Given the complexity of data science projects and related demand for human expertise, automation has the potential to transform the data science process.

BY TIJL DE BIE, LUC DE RAEDT, JOSÉ HERNÁNDEZ-ORALLO, HOLGER H. HOOS, PADHRAIC SMYTH, AND CHRISTOPHER K.I. WILLIAMS

Automating Data Science

Data Engineering:
data wrangling,
data integration,
data preparation,
data transformation,
...

Model Building:
algorithm selection,
parameter optimization,
performance evaluation,
model selection,
...

Data Exploration:
domain understanding,
goal exploration,
data aggregation,
data visualization,
...

Exploitation:
model interpretation and visualization,
reporting and narratives,
predictions and decisions,
monitoring and maintenance,
...

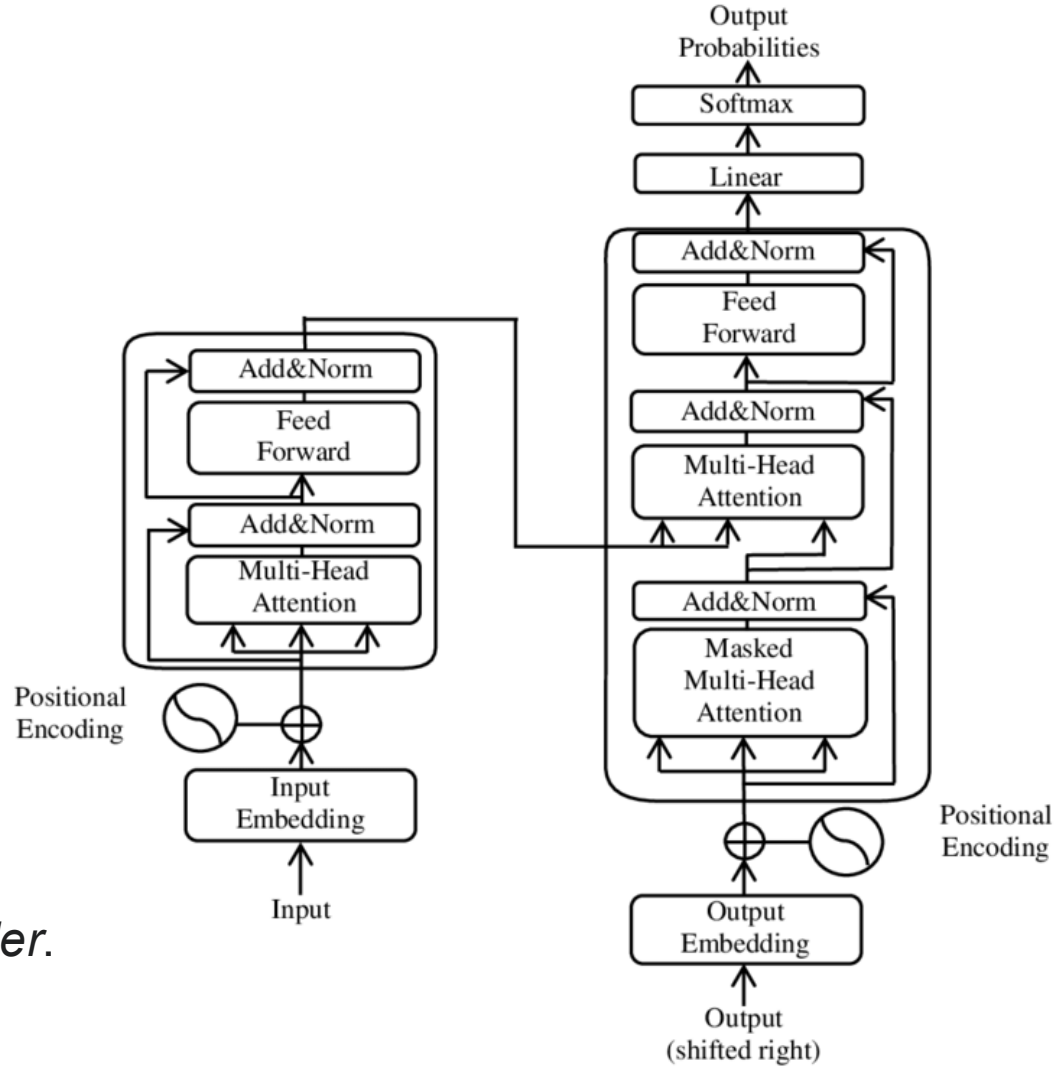
Generic data processing tasks

- Data preprocessing, denoising, normalization
- Clustering and classification; feature detection; profiling;
- Relevance detection, ranking
- Dynamic modelling, time series, longitudinal modelling
- Decorrelation, modelling, (Kalman) filtering
- Predictive analytics
- Vizualisation
- Heterogeneous data fusion
- Prediction, processing and monitoring

Chat-gpt

All transformers have the same primary components:
•Tokenizers, which convert text into tokens.
•A single embedding layer, which converts tokens and positions of the tokens into vector representations.
•Transformer layers, which carry out repeated transformations on the vector representations, extracting more and more linguistic information. These consist of alternating attention and feedforward layers.
•(optional) Un-embedding layer, which converts the final vector representations back to a probability distribution over the tokens.

Transformer layers can be one of two types, *encoder* and *decoder*.



NLP; Trained on MASSIVE amounts of data (books, articles, web,…) or images; +/- 200 BILLION parameters; To be used in: writing, learning, efficiency,…; Problems: bias, ethics, domain knowledge, privacy, language





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Hallo liefste familie

Ik wil jullie laten weten dat jullie geen lessen Italiaans meer nodig hebben om vloeiend Italiaans te spreken.

Je kan makkelijk online laten vertalen en je mond wordt automatisch aan jou aangepast.

Dat is erg indrukwekkend.

Ik moet hier een video van dertig seconden opnemen en die duur blijkt verbazingwekkend lang.

Ik ben momenteel pas aan vijfentwintig seconden en het blijft maar duren, ik hoop nu de dertig seconden gehaald te hebben.

Tot ziens!



Ciao famiglia più cara

Voglio farvi sapere che non avete più bisogno di lezione d'italiano per parlare fluentemente l'italiano.

Puoi facilmente fare tradurre online e la tua bocca verrà adeguamento adattata a te.

Questo è molto impressionante.

Devo registrare un video qui di trenta secondi e questa durata si rivela sorprendente lunga.

Sono solo a venticinque secondi e continua a durare, spero di superare i trenta ora.

Ciao!

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Flanders AI Program: 32 mio €/year

1 RESEARCH (12 mio)

Flanders AI Research Program

One Program: critical mass of AI Researchers on a coordinated demand-driven research roadmap

www.flandersairesearch.be

2 IMPLEMENTATION (15 mio)



www.vlaio.be/ai

3 SUPPORTING ACTIVITIES (5 mio)

Skills/Training

Ethics & Legal

Knowledge Centre Data & Society

Citizen Projects and Public Outreach

www.vaia.be

data-en-maatschappij.ai/en

Flanders AI Research Program: One Program

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imec

GHENT UNIVERSITY

FLANDERS MAKE

University of Antwerp

vito

VUB VRIJE UNIVERSITEIT BRUSSEL

VIB

UHASSELT

sirris

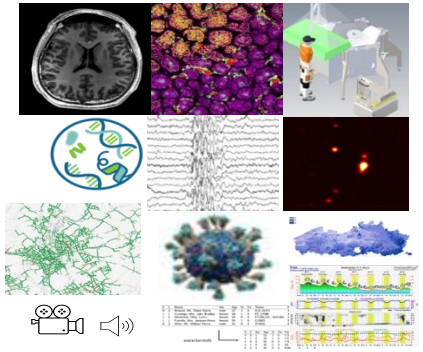
Involved in the Program

10 Knowledge Centers
40 Research Groups
90 Professors

150-300-1000-... AI Researchers
Direct funding of 100 PhD
+ 50 other researchers

Flanders AI Research Program

Research Challenge Structure (2024-2028)



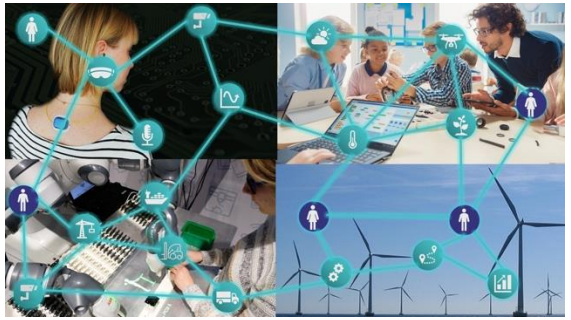
AI-Driven Data Science

*Supporting complex **decision making and actionable insights creation** with powerful and intuitive AI-Driven Data Science*

Responsible

Resilient and Performant

Sustainable Energy-efficient



Situated AI

*Supporting complex **task execution** in a dynamic environment with (semi-)autonomous AI Systems, collaborating in real time with each other and with people*

Human-centered

Productive Data-efficient

Use cases in four domains

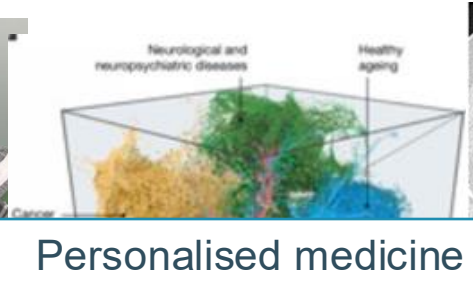
HEALTH

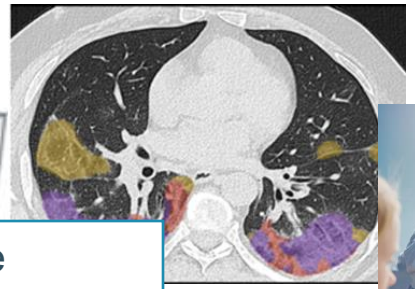
INDUSTRY

PLANET & ENERGY

SOCIETY

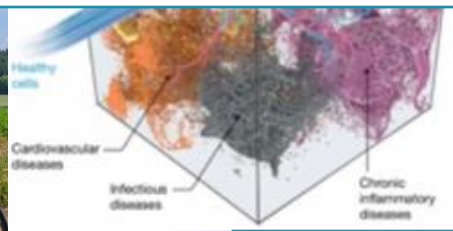


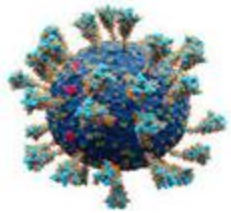




Personalised medicine









Lifelong learning



Precision agriculture







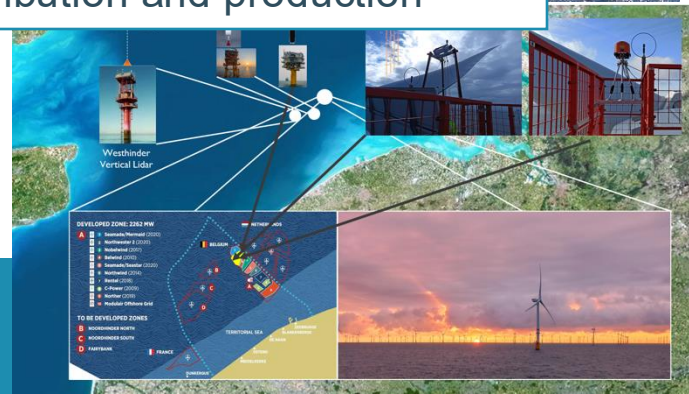
Energy transition
Energy distribution and production

Flexibility and improvement of productivity in manufacturing industry











Safe & mobile



HEALTH



INDUSTRY



PLANET & ENERGY



SOCIETY

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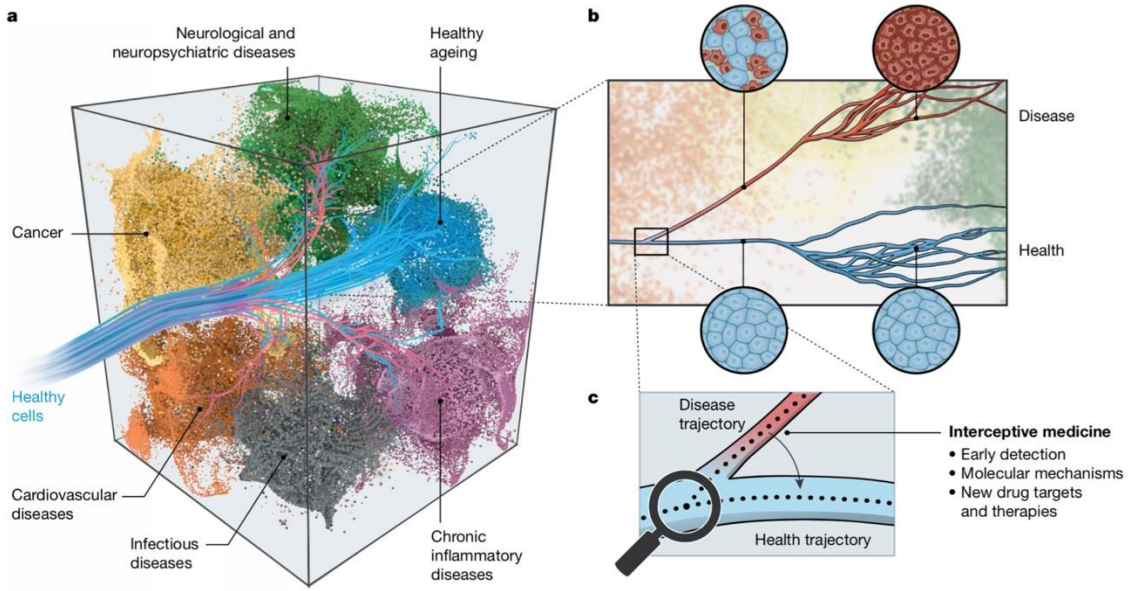
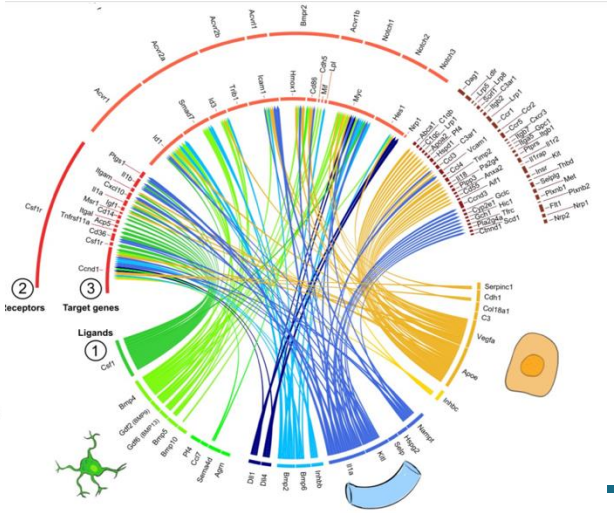
Single Cell Technologies

How normal and disease cells evolve and interact, including spatial resolution

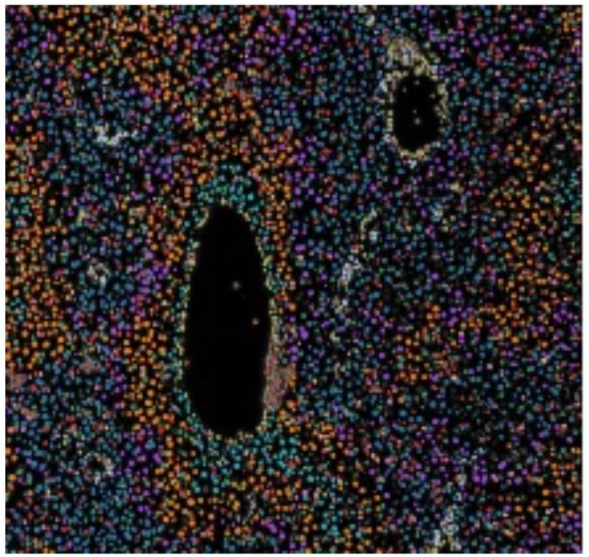
Evolution over time



Cell interactions



New spatial dimension



- New technologies create novel and much richer data types that should be integrated and interpreted to yield novel biological insights
- Multimodal measurements at single cell resolution (genomics, transcriptomics, epigenomics, …)
- Spatial omics (convergence of 'omics' and imaging) and imaging cytometry

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Dr. Algorithm is coming



"In the next 10 years, data science and software will do more for medicine than all the biological sciences together."

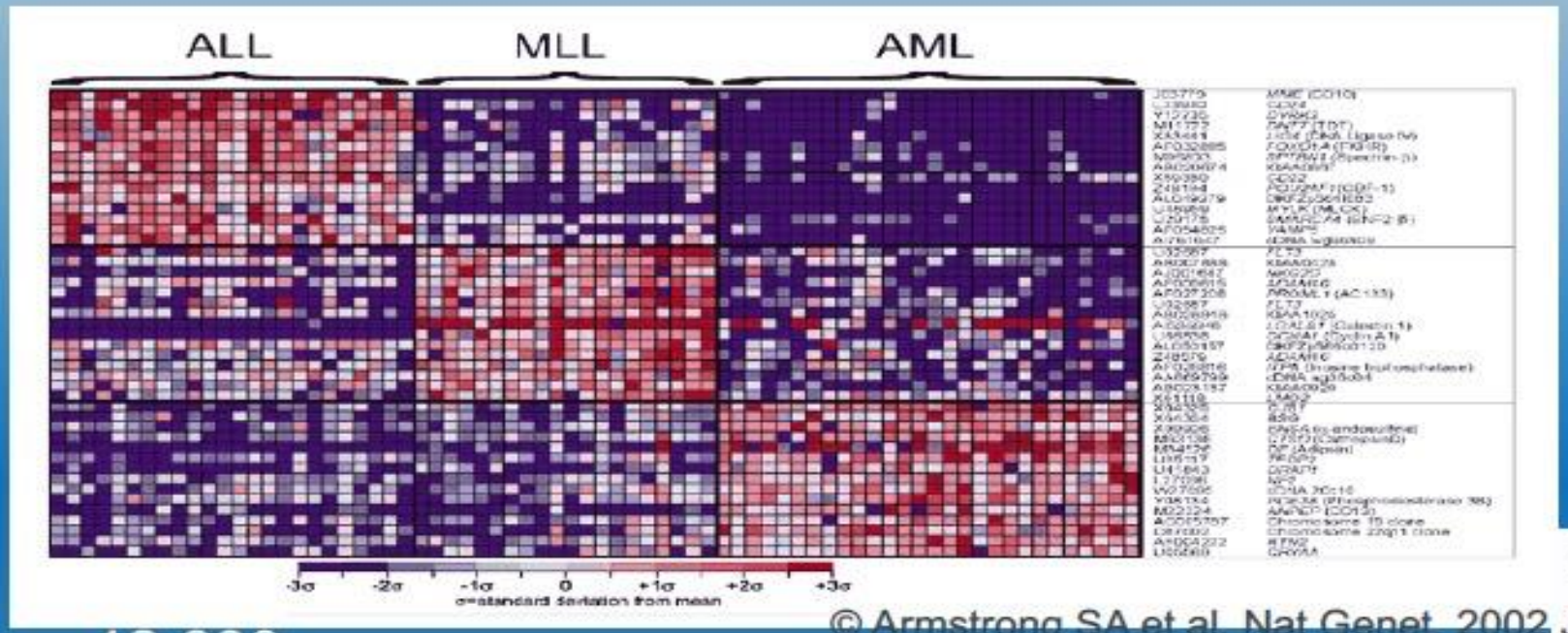
– Vinod Khosla, Khosla Ventures

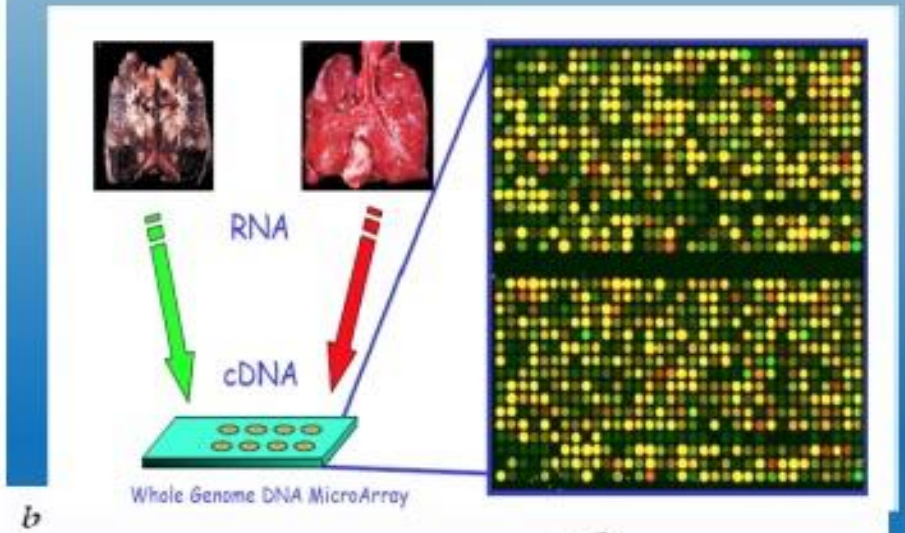
An AI revolution is brewing in medicine

Excitement seems to be growing about generalist medical artificial intelligence (AI). Unlike the tools available now, which serve specific functions such as detecting lung nodules in a chest scan, generalist models would act more like a physician.

They could assess every anomaly in a scan and even create something like a diagnosis. Inspired by the models underlying chatbots such as ChatGPT, they would be trained on massive data sets in the hope that it will give them broad capabilities.

Example: Genomic markers for Leukemia

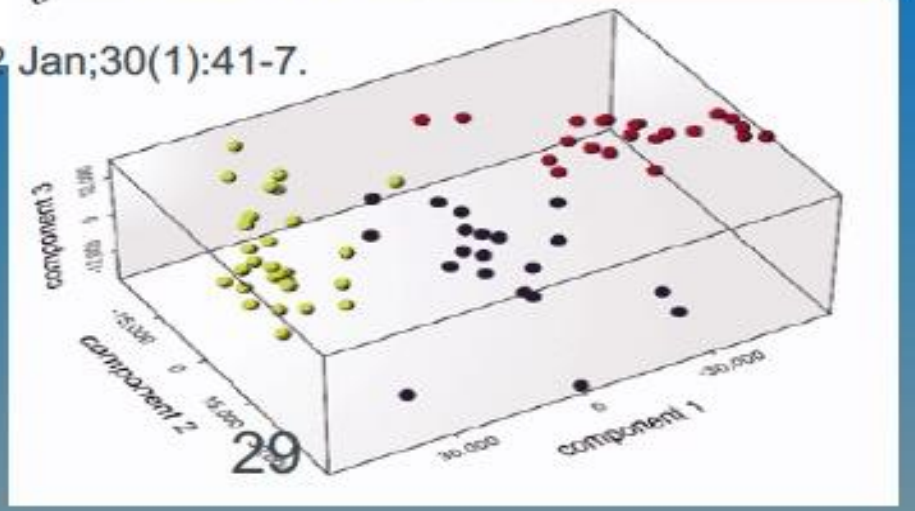




© Armstrong SA et al. Nat Genet. 2002 Jan;30(1):41-7.

12 600 genes
72 patients

- 28 Acute Lymphoblastic Leukemia (ALL)
- 24 Acute Myeloid Leukemia (AML)
- 20 Mixed Linkage Leukemia (MLL)



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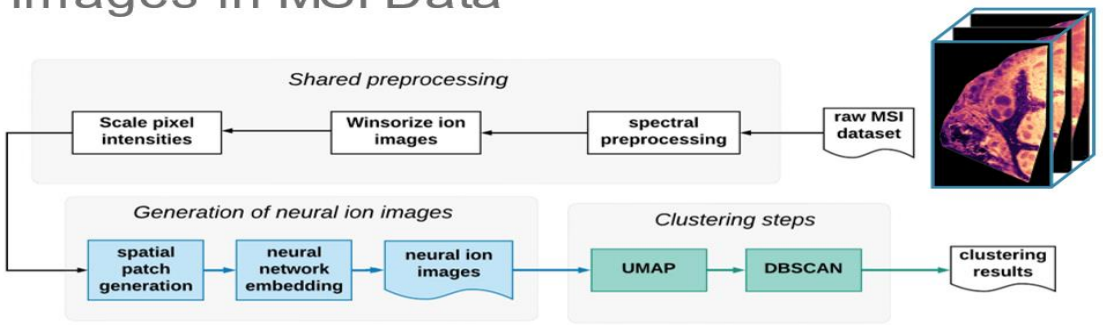
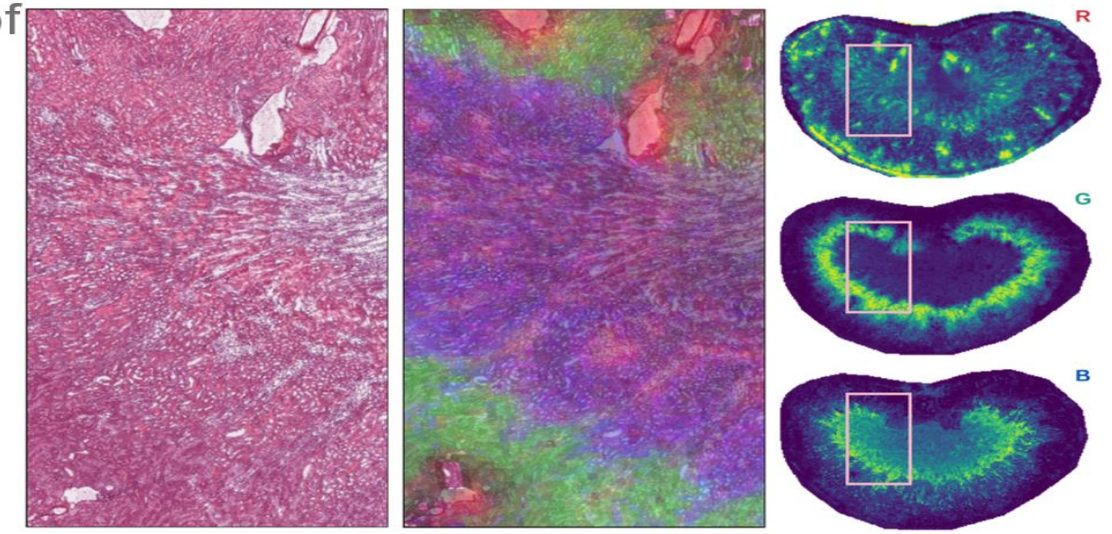
cDSS for enhanced interpretation of Mass Spectrometry Imaging data using Deep Learning

Deep Learning Enables Spatially-aware Clustering of Ion Images in MSI Data

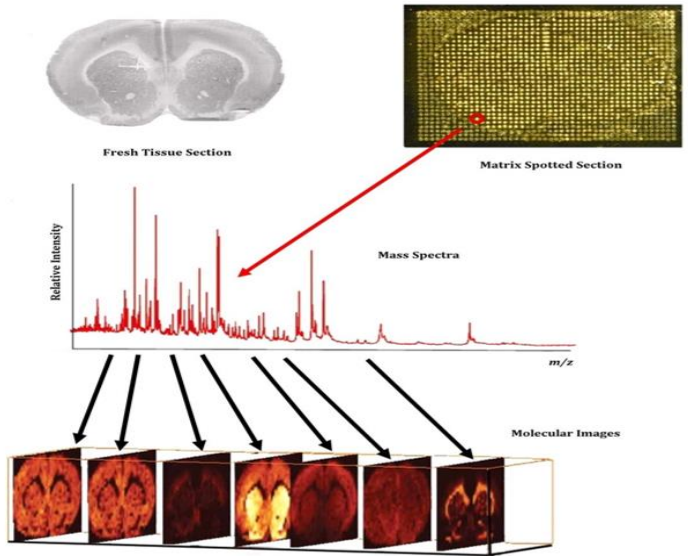


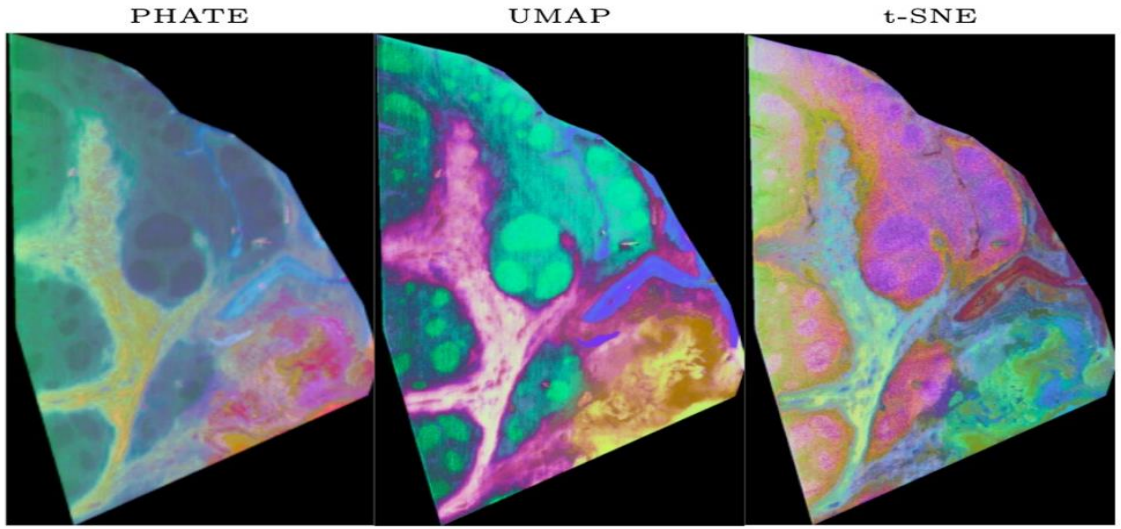


Neuron ion images using pre-trained neural networks enabled direct incorporation of spatial expression patterns, improving clustering of similar ion images, making them readily available as inputs for any downstream machine learning pipeline

Mass Spectrometry Imaging Data Analysis Using Unsupervised Machine Learning

UMAP, with it's very memory efficient GPU implementation, outperforms the other methods in computational time, and gives the most intuitive visualisations on our datasets available.





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Data-driven derivation and validation of novel phenotypes for acute kidney transplant rejection using semi-supervised clustering

JASN
JOURNAL OF THE AMERICAN SOCIETY OF NEPHROLOGY

BACKGROUND

The Banff classification for kidney transplant histology is increasingly complex with intermediate and mixed rejection phenotypes.

METHODS

Training cohort | Validation cohorts



1 Belgian kidney transplant center
3510 biopsies

2 French transplant centers with
3835 biopsies

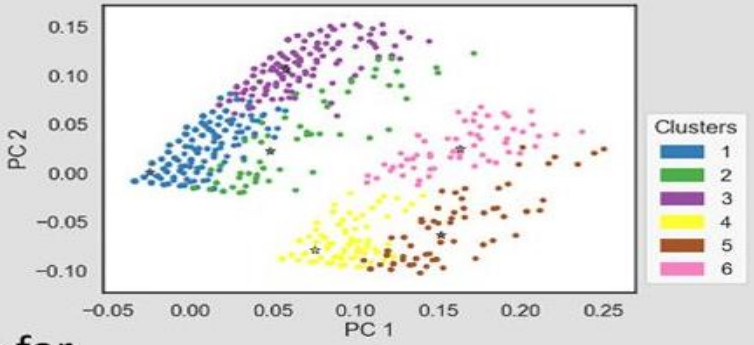
Semi-supervised clustering

Acute Banff lesion scores
+
Graft survival information

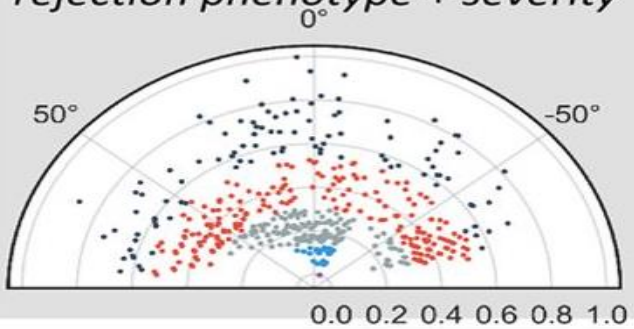


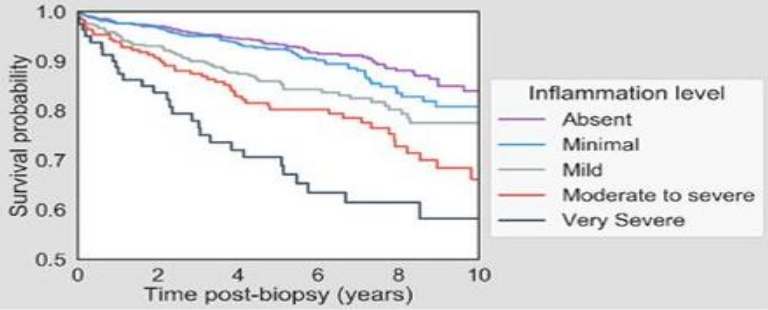
RESULTS

Six data-driven histological (rejection) phenotypes that are clinically sound and that associate with graft failure



Intuitive visualization algorithm for *rejection phenotype + severity*





Conclusion

Based on data-driven clustering, six novel clinically and histologically meaningful phenotypes are discovered and validated on external data. Each of them significantly associates with graft failure and overcomes the current limitations of intermediate and mixed Banff phenotypes.

doi: 10.1681/ASN.2020101418

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Automate and generalize the development and implementation of AI solutions for Real-World-Evidence generation for several complex clinical finalities

3 clinical finalities



Multiple sclerosis



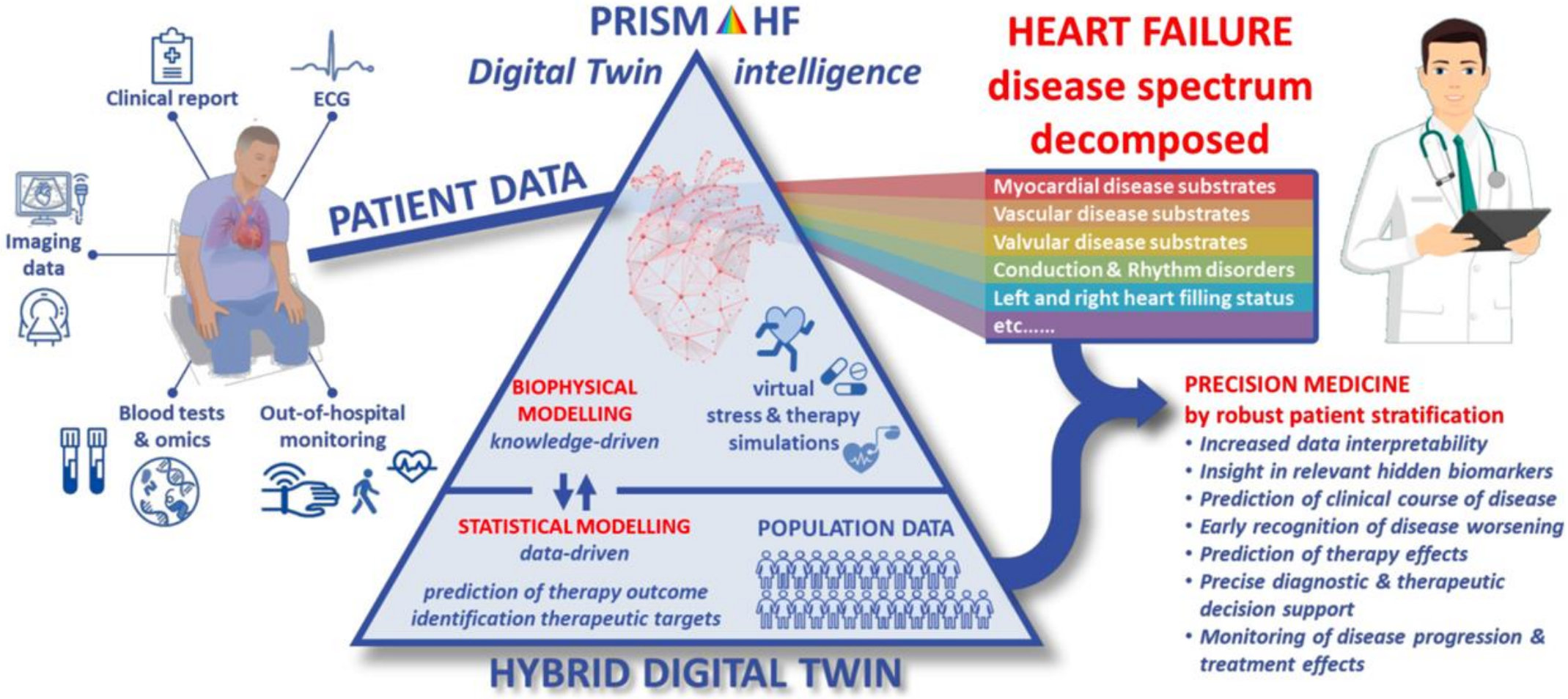
Cardiovascular disorders



Risk pregnancy

- During the recent years, several (isolated) demonstrator projects have shown the potential of the use of AI for improved RWE generation - Technical challenges that are tackled in specific demonstrators are not always use-case specific. It remains unclear how easily lessons learned from one use case can be leveraged to a variety of clinical research questions
- Urgent need to scale and speed-up the development of so called “AI solutions” and reduce recurring costs and increased time to address several clinical research questions

Digital Twin Cardio



The **objective** of this use case is **to provide disease-tailored treatments for each individual patient at the right time according to their individual pathophysiological disease spectrum** by harvesting multimodal and heterogeneous data and allowing to dynamically update those predictions when additional data becomes available.

NOBEL PRIZE IN CHEMISTRY

'FOR COMPUTATIONAL PROTEIN DESIGN' & 'FOR PROTEIN STRUCTURE PREDICTION'



DAVID BAKER, 62

Professor at University of Washington; PhD from University of California



DEMIS HASSABIS, 48

CEO of Google DeepMind; PhD from University College London



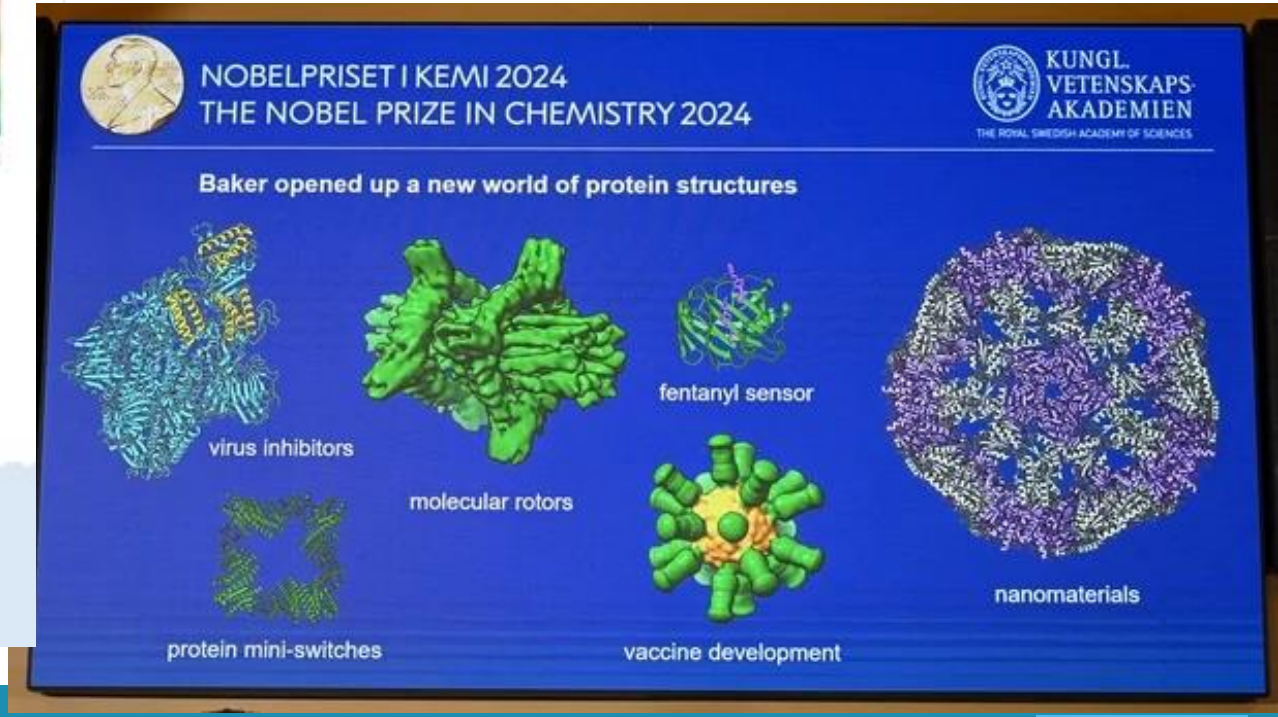
JOHN M JUMPER, 39

Senior Research Scientist at Google DeepMind; PhD from University of Chicago



IN 2023: Awarded to Moungi G Bawendi, Louis E Brus, and Aleksey Yekimov for the discovery and synthesis of quantum dots.





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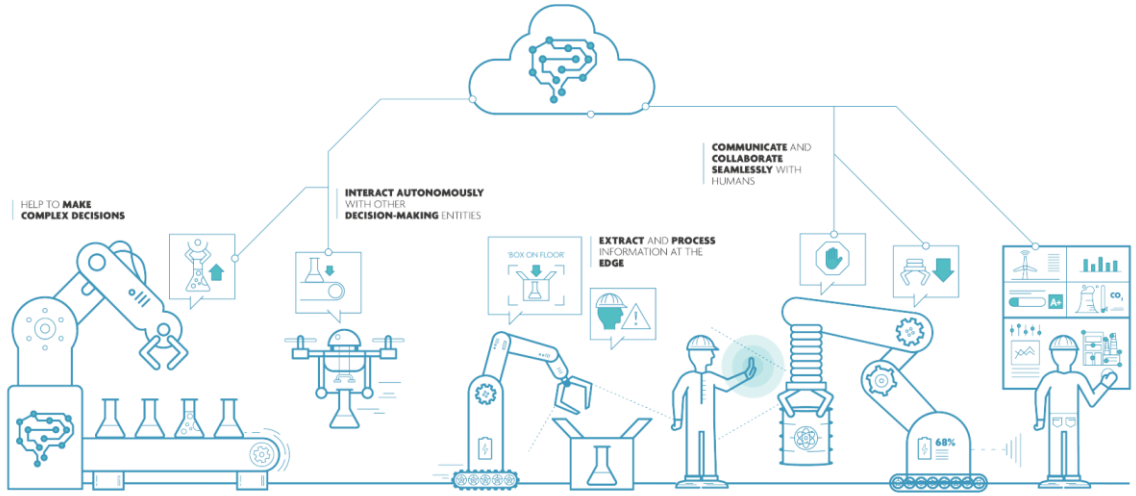
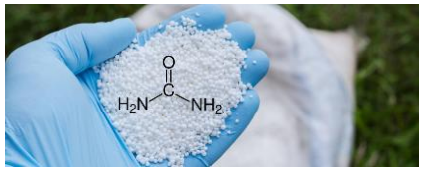
USE CASE EXAMPLE: INDUSTRY 4.0



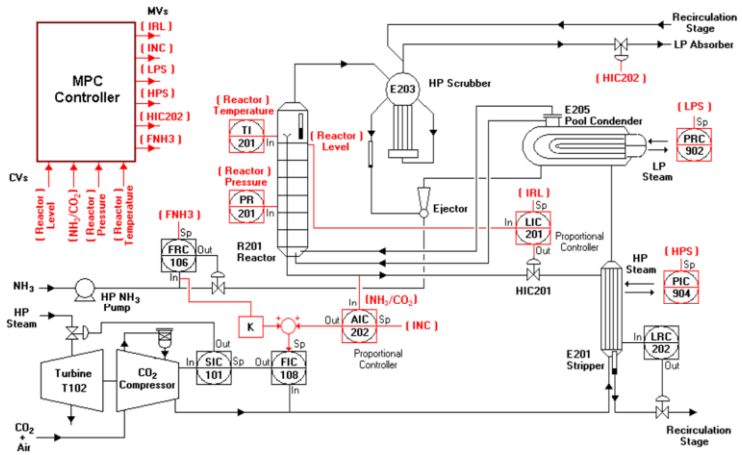
Control of the synthesis section of a Urea plant using MPC control techniques



Urea plant of Yara at Brunsbüttel (Germany)



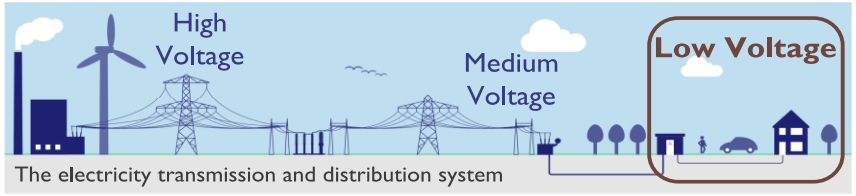
Urea: nitrogenous fertilizer



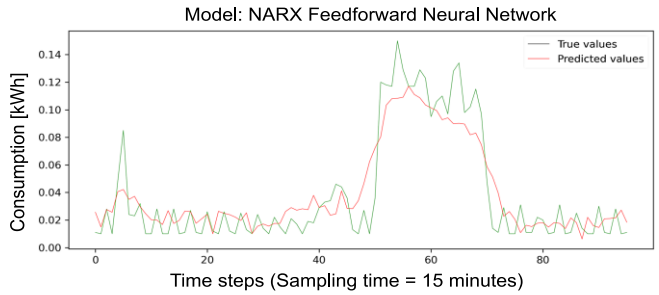
Model Predictive Control (MPC) strategies were used for stabilizing and maximizing the throughput of the synthesis section of a urea plant, while satisfying the process constraints.

Day-ahead consumption forecasting in the Low Voltage (LV) grid using Deep learning

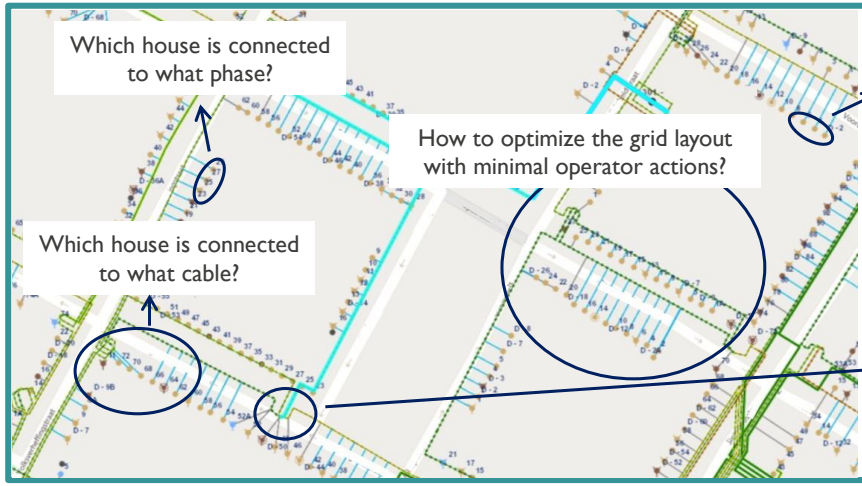
AI FLANDERS
BUILDING OUR DIGITAL FUTURE







The goal is to build data-driven mathematical models to forecast the electricity consumption of households one day ahead.



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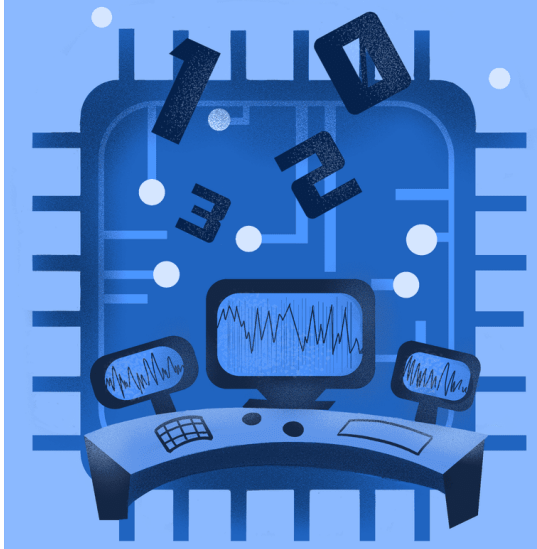

High-Frequency Trading (HFT)

[ˈhī ˈfrē-kwən(t)-sē ˈtrā-diŋ]

Using powerful computer programs to transact a large number of orders in fractions of a second.

Investopedia







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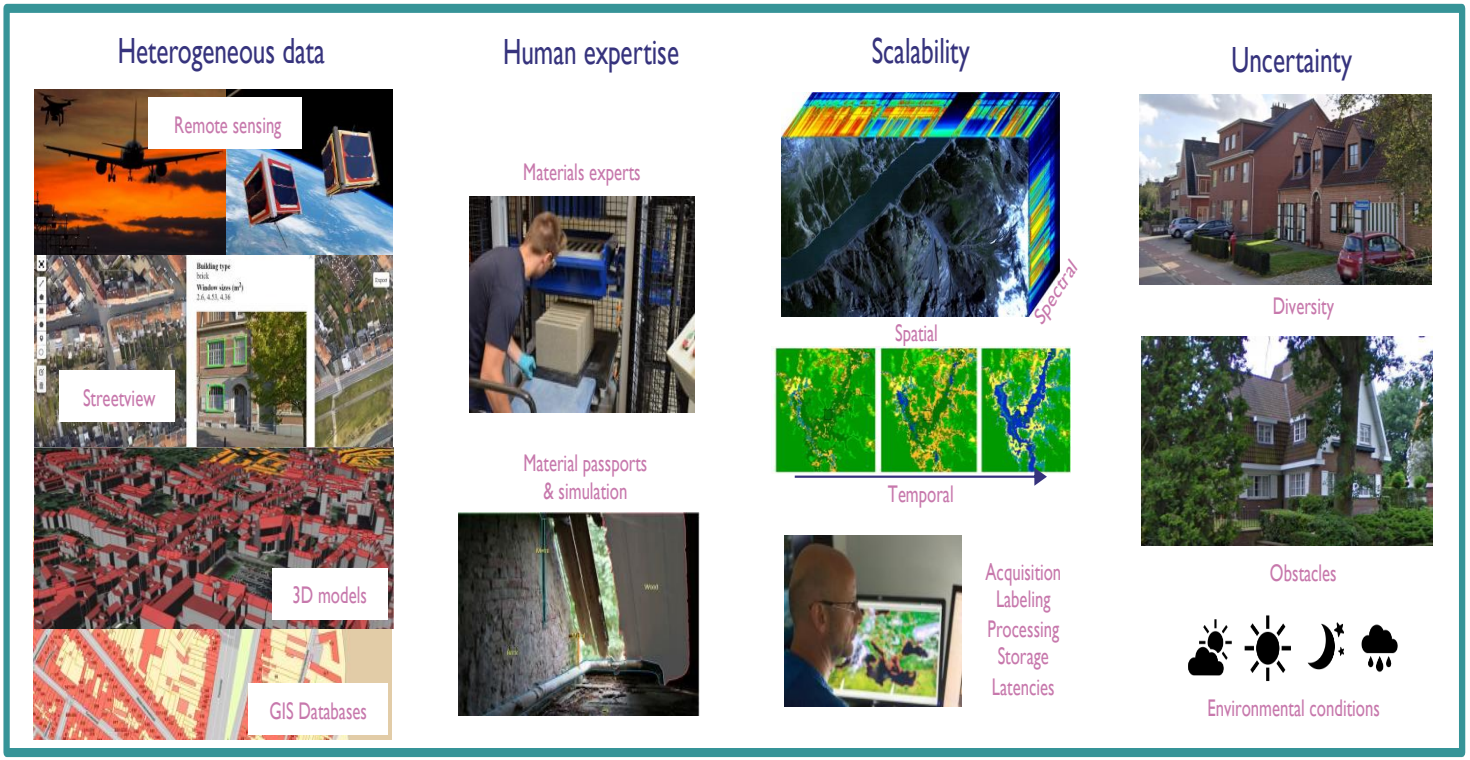
AI in and for urban and geographical research

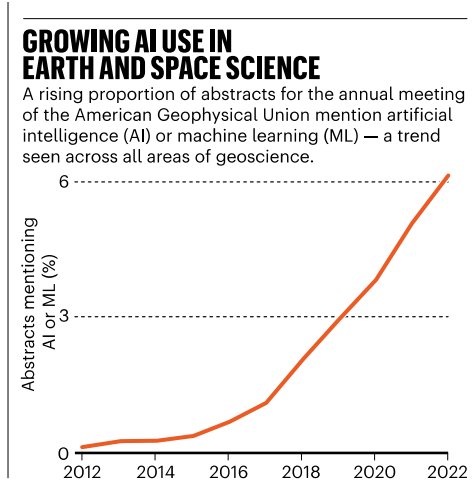


- Data transformations for heterogeneous data
- Integrated information extraction from imagery, databases, graphs, ...
- Multimodal data exploration and modeling

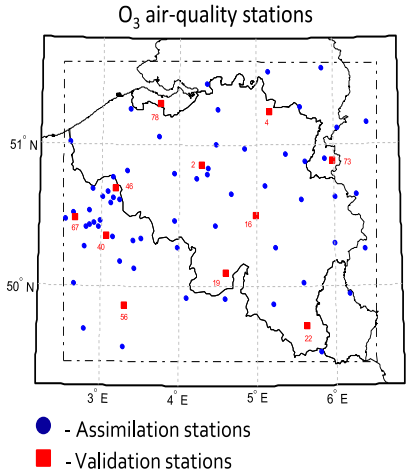
- Dealing with limited ground truth
- Incorporate spatial structure cues
- Expert knowledge-based learning
- Explainable to human experts

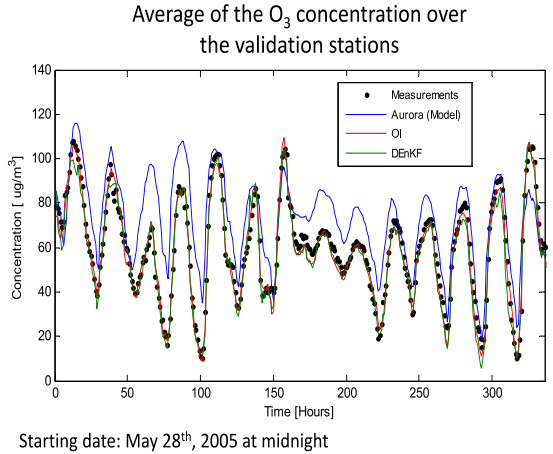
- Dense representation learning
- Unsupervised learning at object level
- Efficient data acquisition strategies
- 3D shape/volume extraction

- Uncertainty aware decision making
- Scene decomposition
- Continual learning
- Domain shifts



Data assimilation in the Air-quality model Aurora





The objective was to improve the concentration estimates of the air-quality model Aurora by using data assimilation techniques such as Optimal Interpolation (OI), and the Deterministic Ensemble Kalman Filter (DEnKF).

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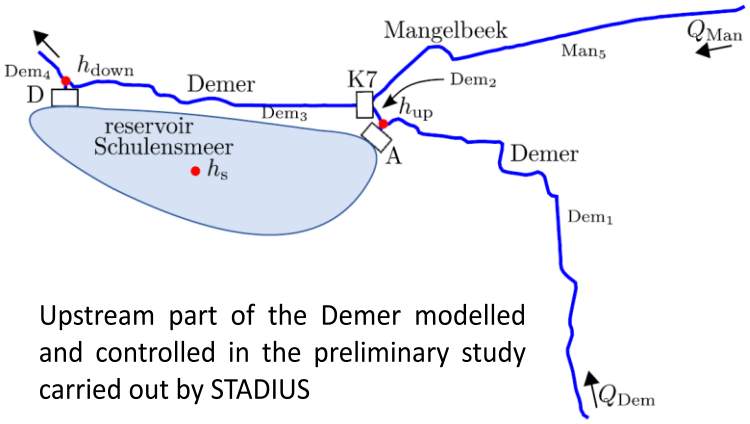
Implementation of a Nonlinear Model Predictive controller (NMPC) for the Demer

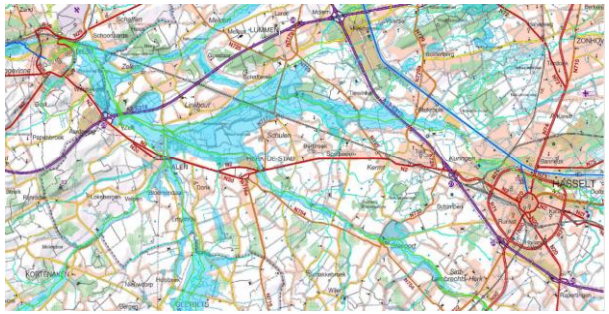


Upstream part of the Demer modelled and controlled in the preliminary study carried out by STADIUS

The control goal was to avoid future floodings of the Demer river in Belgium by using NMPC

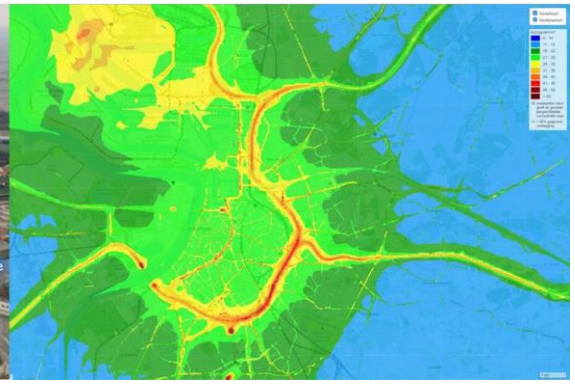


The Demer in Hasselt



Flooded area during the flood event of 1998
Financial Damage: **> 16 million euro!**





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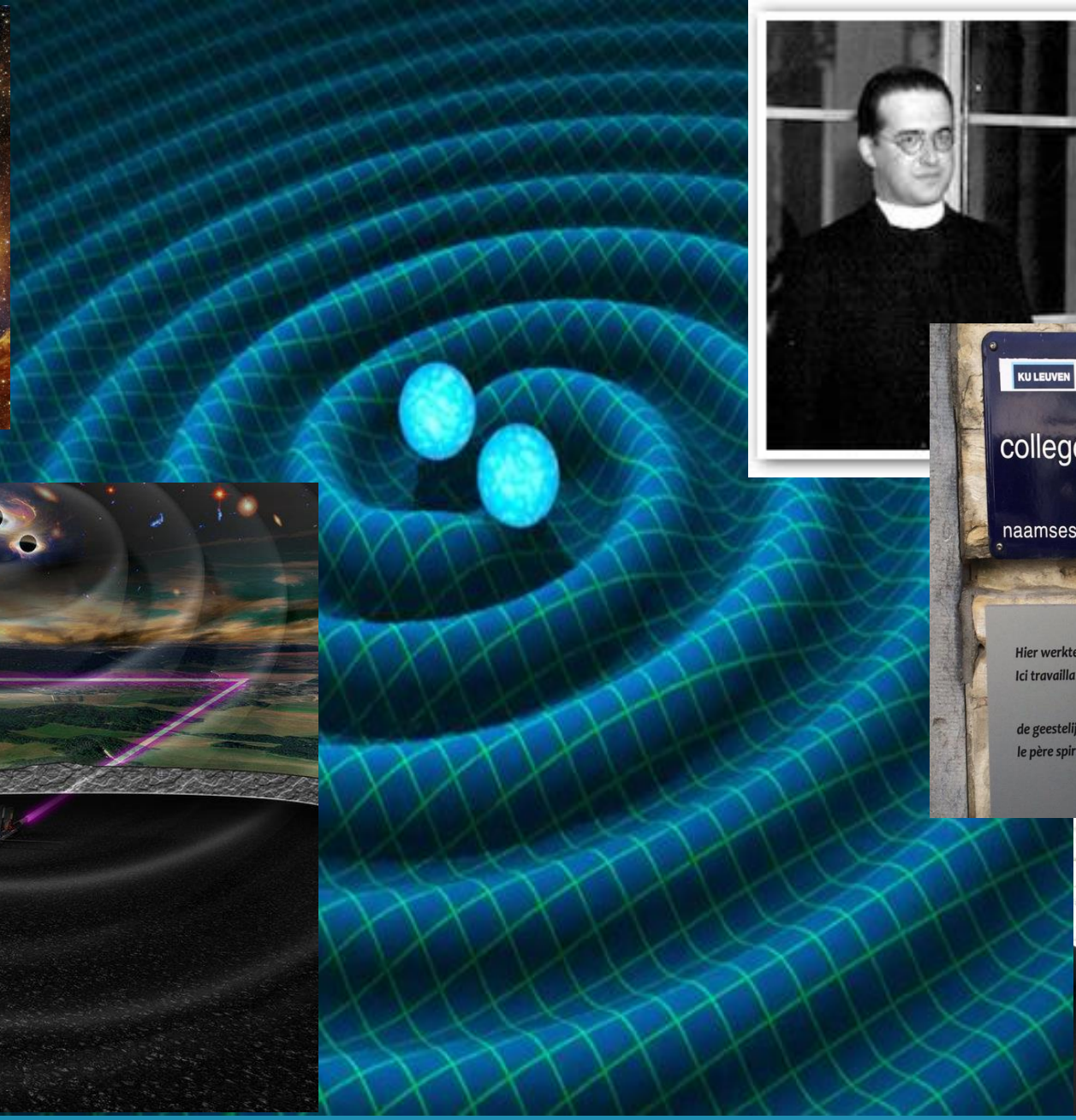



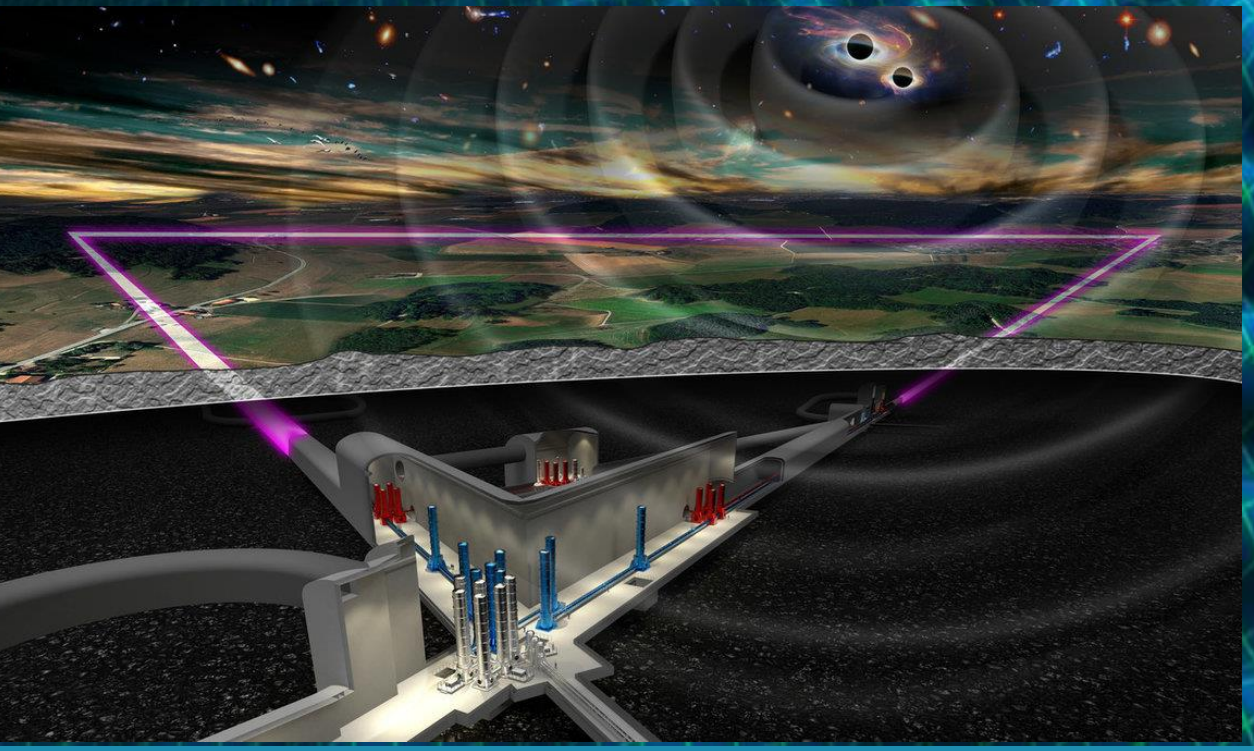


KU LEUVEN
college van premonstreit
naamsestraat 61
116.01
1425
Hier werkte
Ici travailla
Here worked
Hier wirkte
Georges Lemaître
de geestelijke vader van de
le père spirituel du
father of the
der geistige Vater des
Big Bang



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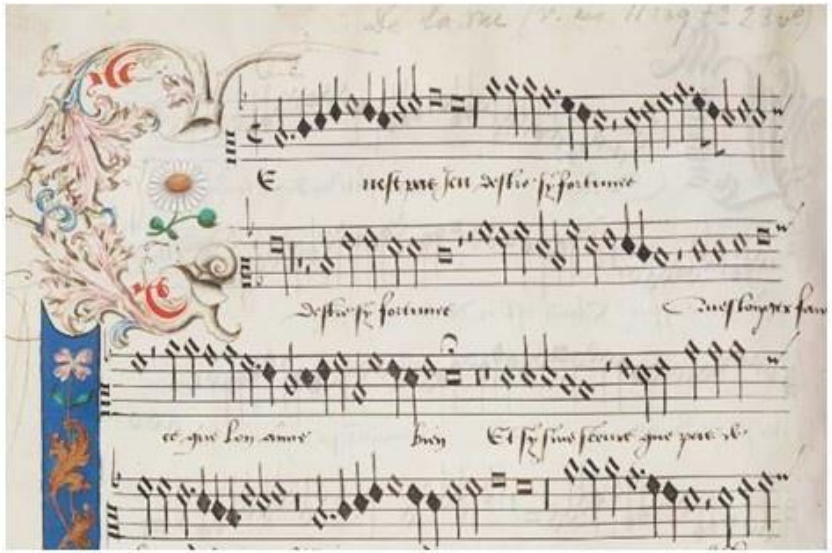

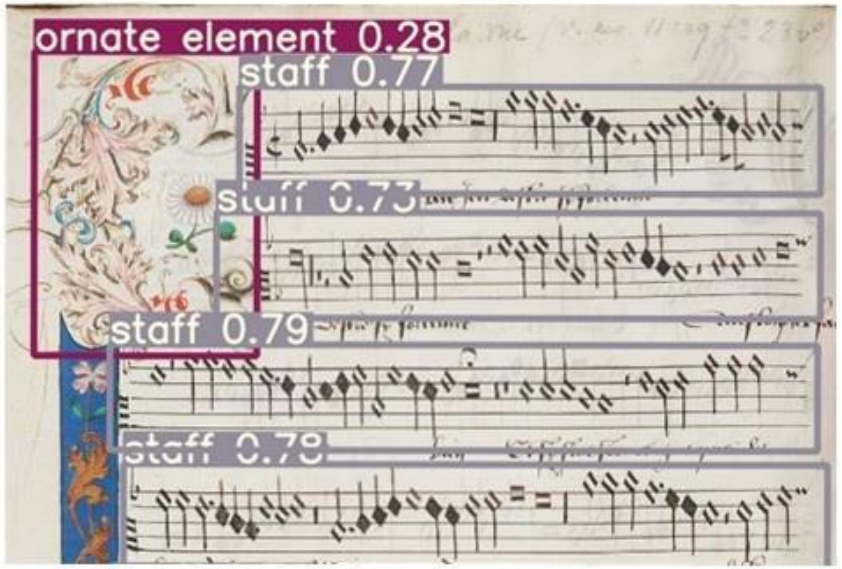



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- Systeemtechnologieën

- De vele moeders en vaders van AI

- Wat is AI ?

- AI in Vlaanderen

- Niet-technologische en politieke dimensies

- athumi (Flanders Data Utility Company)



Foto:
KU Leuven

AI in support of living a healthier life for longer



AI in support of a human-centered prosperous digital future for society

Responsible AI



Foto: Flanders Make

AI in support of Industry 5.0: sustainable, resilient, and human-centered



Foto: VUB

AI for sustainability, AI taking care of our planet and supporting the energy transition

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Garbage in, garbage out: mitigating risks and maximizing benefits of AI in research

Six principles to help build trust

Following these best practices will help to avert harm when using AI in research.

Researchers

1. Transparency. Clearly document and report participants, data sets, models, bias and uncertainties.
2. Intentionality. Ensure that the AI model and its implementations are explained, replicable and reusable.
3. Risk. Consider and manage the possible risks and biases that data sets and algorithms are susceptible to, and how they might affect the outcomes or have unintended consequences.
4. Participatory methods. Ensure inclusive research design, engage with communities at risk and include domain expertise.

Scholarly organizations (including research institutions, publishers, societies and funders)

5. Outreach, training, and leading practices. Provide for all roles and career stages.
6. Sustained effort. Implement, review and advance these guidelines.

Can AI systems learn/ be taught to make ethical choices ?

Can AI systems be taught to deal with differing opinons ?

Einstein Foundation Award 2023 — The Einstein Foundation Berlin awards €500,000 prize to enhance quality in research
The Einstein Foundation Berlin is to honor Belgian bioinformatician Yves Moreau, the Berkeley Initiative for Transparency in the Social Sciences, and the Responsible Research Assessment Initiative with this year's Einstein Foundation Award for Promoting Quality in Research 2023.

The recipient of the **Individual Award** is Yves Moreau from the Katholieke Universiteit Leuven. Moreau ranks among the most ardent advocates for ethical standards in the utilization of human DNA data in the age of artificial intelligence and big data. He designs algorithms that protect personal privacy during the analysis of genetic data.



AI & Science Policy

In June OECD published a report on applying AI to accelerate productivity in research, in which it says, “While AI is penetrating all domains and stages of science, its full potential is far from realised. Policy makers and actors across research systems can do much to accelerate and deepen the uptake of AI in science, magnifying its positive contributions to research.”

National Institutes of Health (NIH) in the US has placed limits on generative AI in its peer review processes

US national Science Foundation has put together an internal working group to find out if there are ways to integrate AI tools in the production of science

A recent workshop at the National Academies explored the present and future of artificial intelligence In advancing discovery across a range of scientific fields, from physics to neurology to meteorology.

While the EU is in the process of finalising its first regulation on artificial intelligence, the scientific community is yet to come up with a unified response on how generative AI could be used higher education and research

European Commision (new unit E4: Industry 5.0 and AI in Science): To develop new policy on how to use AI improve scientific productivity and avoid misuse copyright and academic dishonesty (“CHATGPT detector catches AI-generated papers with unprecedented accuracy”).

EU Commission (policy brief preview)

1. **Introduction**

2. **Context**

(History of AI, European approach to AI)

3. **Why the EU needs a policy for AI in Science**
   - 3.1 Global competition is under way to harness AI's potential in science
   - 3.2 The EU needs a competitive advantate in the global AI race
   - 3.3 AI-boosted science can deliver growth and solutions to societal challenges
   - 3.4 AI in science comes with new challenges, risks and ethical considerations

4. **What AI can do for Science**
   - 4.1. AI in Science: a tool for accelerated discovery
   - 4. 2. AI helping science solve global challenges
   - 4. 3. AI-driven collaboration: unlocking innovation

5. **A Glimpse into the Future: AI from toolbox to "brainbox**

6. **What new challenges from AI in Science**
   - 6.1 AI amplifies ethical issues in science
   - 6.2 The problem of public trust in AI-driven research
   - 6.3. Talent and education system challenges
   - 6.4 Challenges related to data, resources and infrastructures
   - 6.5. Regional disparities and the integration of AI in Science

7. **Solutions to enable uptake of AI in Science**
   - 7.1 Vision and governance for AI in Science
   - 7.2. Anticipate impact and preserve trust in the scientific practice
   - 7.3 Ramping up access to data, assets and compute infrastructures
   - 7.4 EU R&I funding for AI-driven science
   - 7.5 Enhancing capacities for AI-driven interdisciplinary research
   - 7.6 Education and skills, access to talent

8. **Conclusions**

Annex I: EU initiatives supporting AI in Science

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President Biden Issues Executive Order on Safe, Secure, and Trustworthy AI

- Require that developers of the most powerful AI systems share their safety test results and other critical information with the U.S. government.
- Develop standards, tools, and tests to help ensure that AI systems are safe, secure, and trustworthy.
- Protect against the risks of using AI to engineer dangerous biological materials
- Protect Americans from AI-enabled fraud and deception by establishing standards and best practices for detecting AI-generated content and authenticating official content.
- Establish an advanced cybersecurity program to develop AI tools to find and fix vulnerabilities in critical software,
- Order the development of a National Security Memorandum that directs further actions on AI and security.
- Protect Americans' privacy by prioritizing support for accelerating the development and use of privacy-preserving techniques
- Strengthen privacy-preserving research and technologies,
- Evaluate how agencies collect and use commercially available information
- Develop guidelines for federal agencies to evaluate the effectiveness of privacy-preserving techniques,
- Provide clear guidance to landlords, Federal benefits programs, and federal contractors
- Address algorithmic discrimination
- Ensure fairness throughout the criminal justice system
- Advance the responsible use of AI in healthcare and the development of affordable and life-saving drugs.
- Shape AI's potential to transform education
- Develop principles and best practices to mitigate the harms and maximize the benefits of AI for workers
- Produce a report on AI's potential labor-market impacts,

President Biden Issues Executive Order on Safe, Secure, and Trustworthy AI

- Catalyze AI research across the United States
- Promote a fair, open, and competitive AI ecosystem
- Use existing authorities to expand the ability of highly skilled immigrants and nonimmigrants with expertise in critical areas to study, stay, and work in the United States
- Expand bilateral, multilateral, and multistakeholder engagements to collaborate on AI.
- Accelerate development and implementation of vital AI standards
- Promote the safe, responsible, and rights-affirming development and deployment of AI abroad to solve global challenges
- Issue guidance for agencies' use of AI
- Help agencies acquire specified AI products and services
- Accelerate the rapid hiring of AI professionals

The US innovates
China imitates
Europe regulates

True ???

Europe deals with values
US deals with value creation

True ???



To open or not to open the sources of AI ?

AI risk assessment related to technology security and technology leakage

Guidelines and questionnaire for reporting on findings

The Commission **Recommendation C(2023) 6689 of 3 October 2023** on critical technology areas for the EU's economic security for further risk assessment with Member States (hereafter 'the Recommendation') proposes that Member States, together with the Commission, perform **a risk assessment**, by the end of 2023, related to technology security and technology leakage risks on the artificial intelligence, high-performance computing, cloud and edge computing technology areas.

Dual use ??

- Systeemtechnologieën

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- athumi (Flanders Data Utility Company)

Bottlenecks

Technological cost

Lack of standardisation

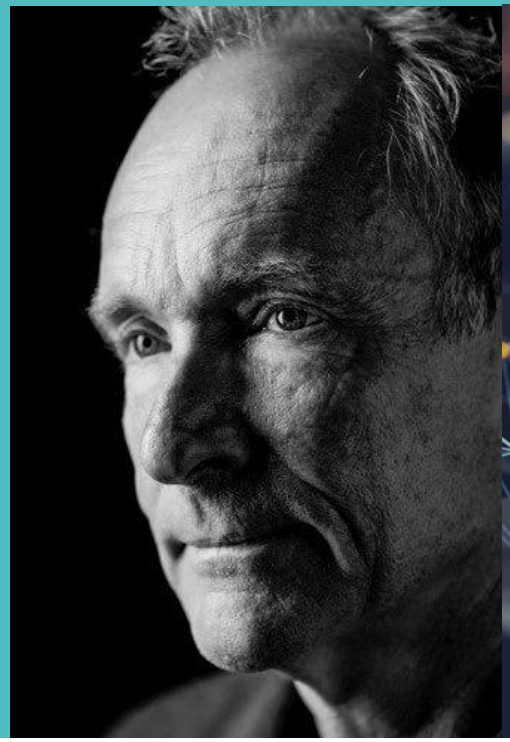
Lack of confidence



citizens
do not trust
companies
with their data

Source:
SolidLab Digimeter

"We need a midway **course correction** for the Web."
Sir Tim Berners-Lee

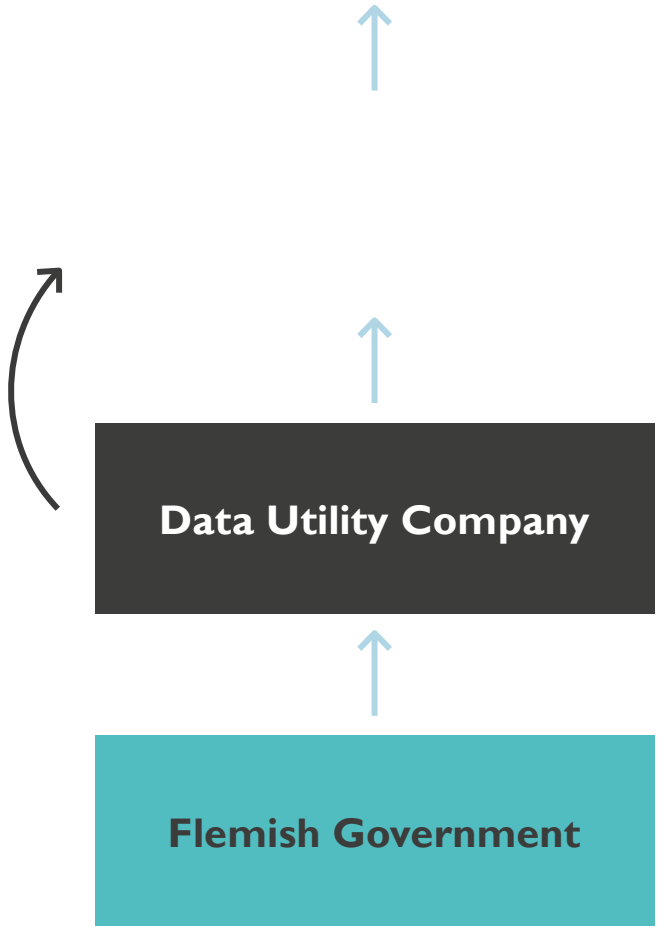




Why the Data Utility Company?

Creating the **Data Utility company** allows companies to make **more data more usable**. This process includes traditional corporate data, as well as confidential data and personal data.

The Data Utility Company thus opens up new opportunities for sectors and companies to collaborate **B2B** and develop innovative B2C services wherein citizens can securely participate without **relinquishing** control of their data.



Power of Data Collaboration Platforms (some examples)

Cables and Pipelines



Avoiding excavation damage through intensive data exchange between utility and construction sectors

Smarter mobility



Less disruption for professional and private road users

Real estate information



Enabling faster property transactions through smart data sharing

USP's Data Utility company

We ensure data collaboration

- The Data Utility company is a trusted partner to enable data collaboration
- We have no business interest in the data itself

We relieve you of the hassle of data

- Privacy and trust "by design"
- High-value data sets + personal data spaces
- Interoperability, standards, availability and scalability, ...

We are a public company

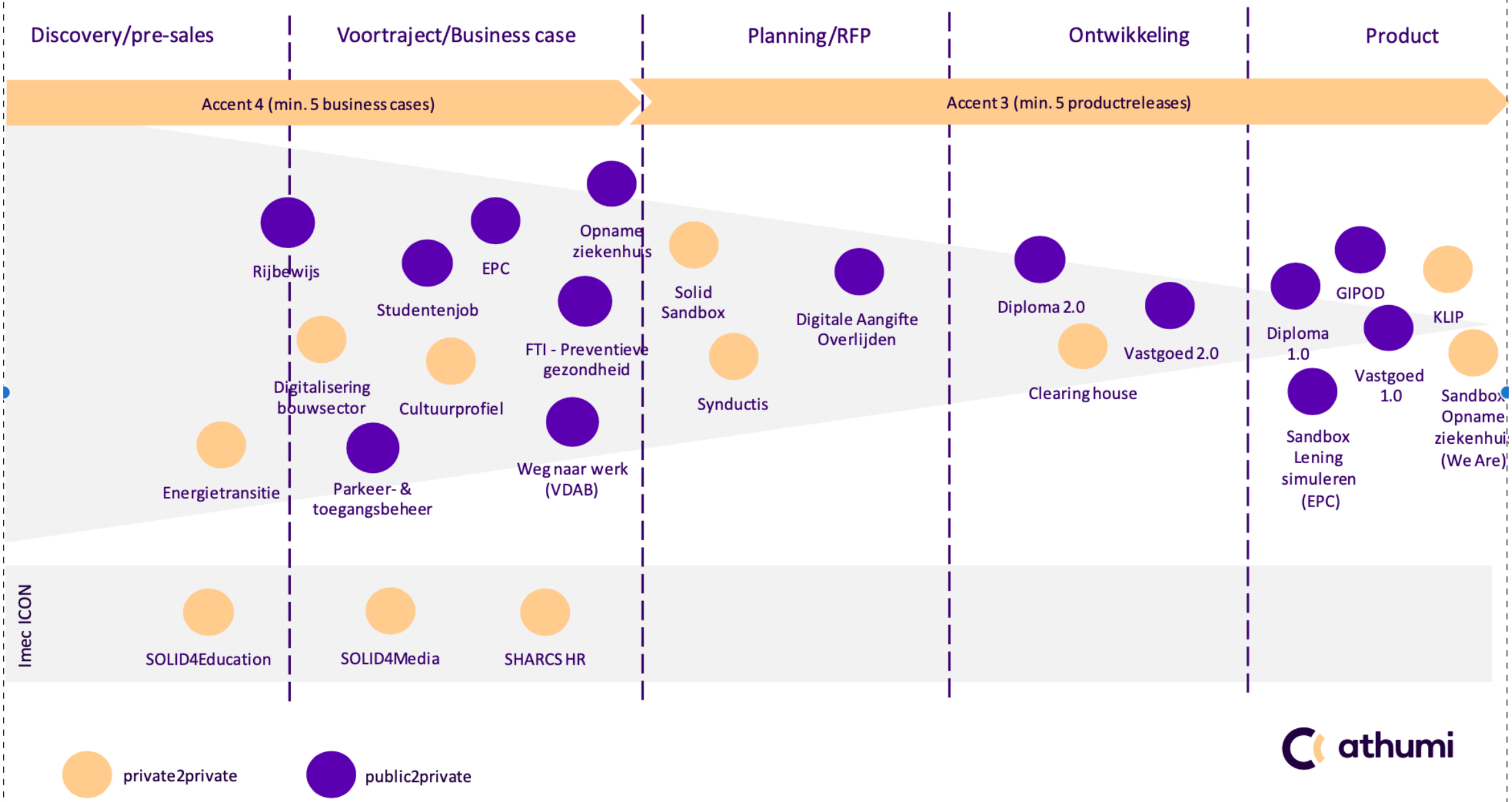
- Neutral to the private market
- Protective towards persons
- We know the way within government to be able to take legislative intiatives as well

We are strong in managing ecosystems of data

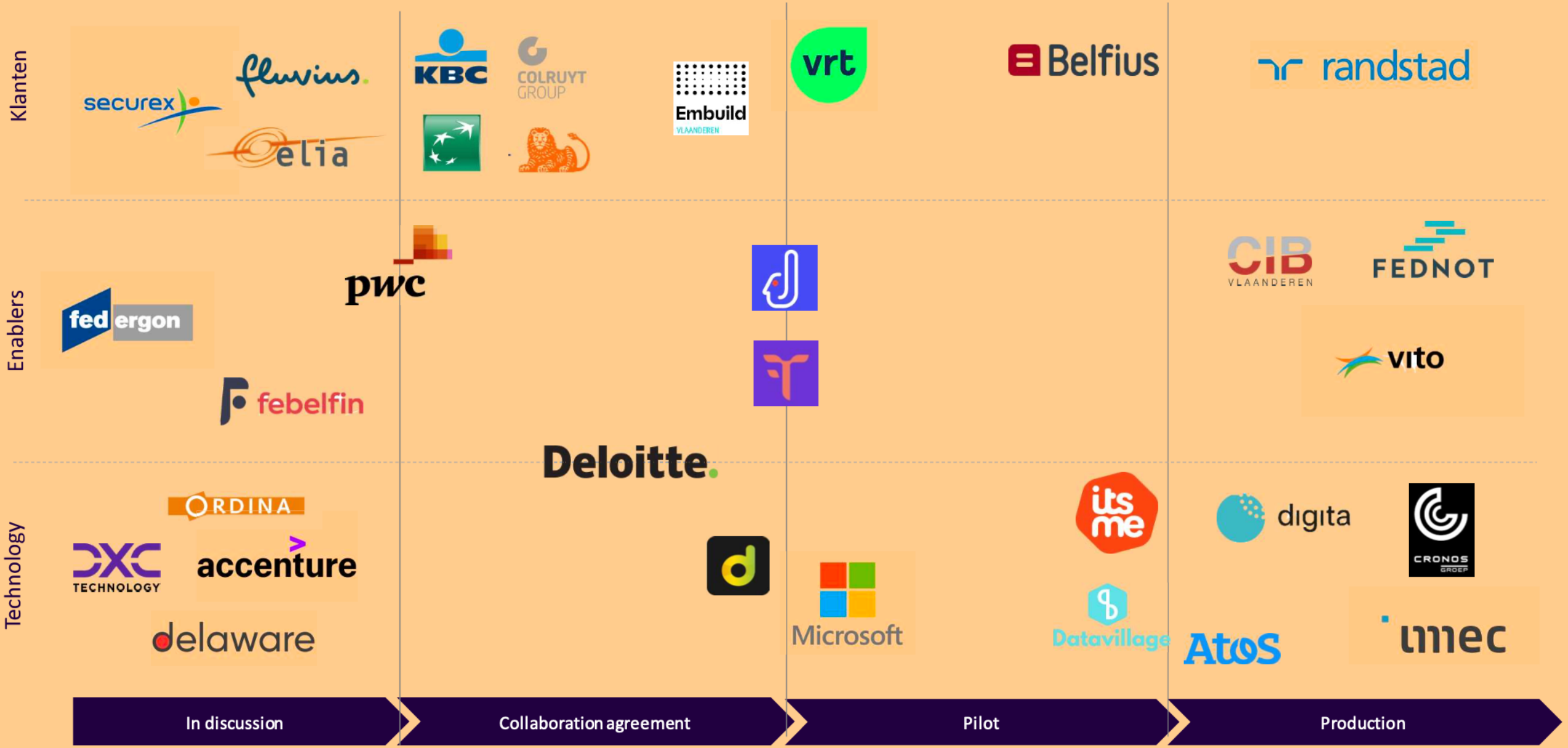
We are generic, making us better placed to facilitate cross-sectoral innovation

Strong link with European Commission and MyData, making our initiatives scalable

Overzicht use cases & releases



Partnerships



- Systeemtechnologieën

- De vele moeders en vaders van AI

- Wat is AI ?

- AI in Vlaanderen

- Niet-technologische en politieke dimensies

- athumi (Flanders Data Utility Company)

