Opportunities and Threats of Artificial Intelligence

A combination of many science disciplines

Bataafs Genootschap September 2020
John Schmitz Dean EEMCS Faculty

TU Delft

About John Schmitz

- Physical chemist (KUN)
- PhD on electrochemical/ thermodynamical topic
- 35 years experience in the micro-electronic industry (research/ manufacturing/ international consortia/ intellectual property)
- Since March 2017 Dean of the faculty of Electrical Engineering, Mathematics and Computer Science

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ELECTRICAL ENGINEERING MATHEMATICS AND COMPUTER SCIENCE

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Faculty of Electrical Engineering, Mathematics & Computer Science

MICRO ELECTRONICS

QUANTUM & COMPUTER ENGINEERING

ELECTRICAL SUSTAINABLE ENERGY

APPLIED MATHEMATICS

SOFTWARE TECHNOLOGY

INTELLIGENT SYSTEMS

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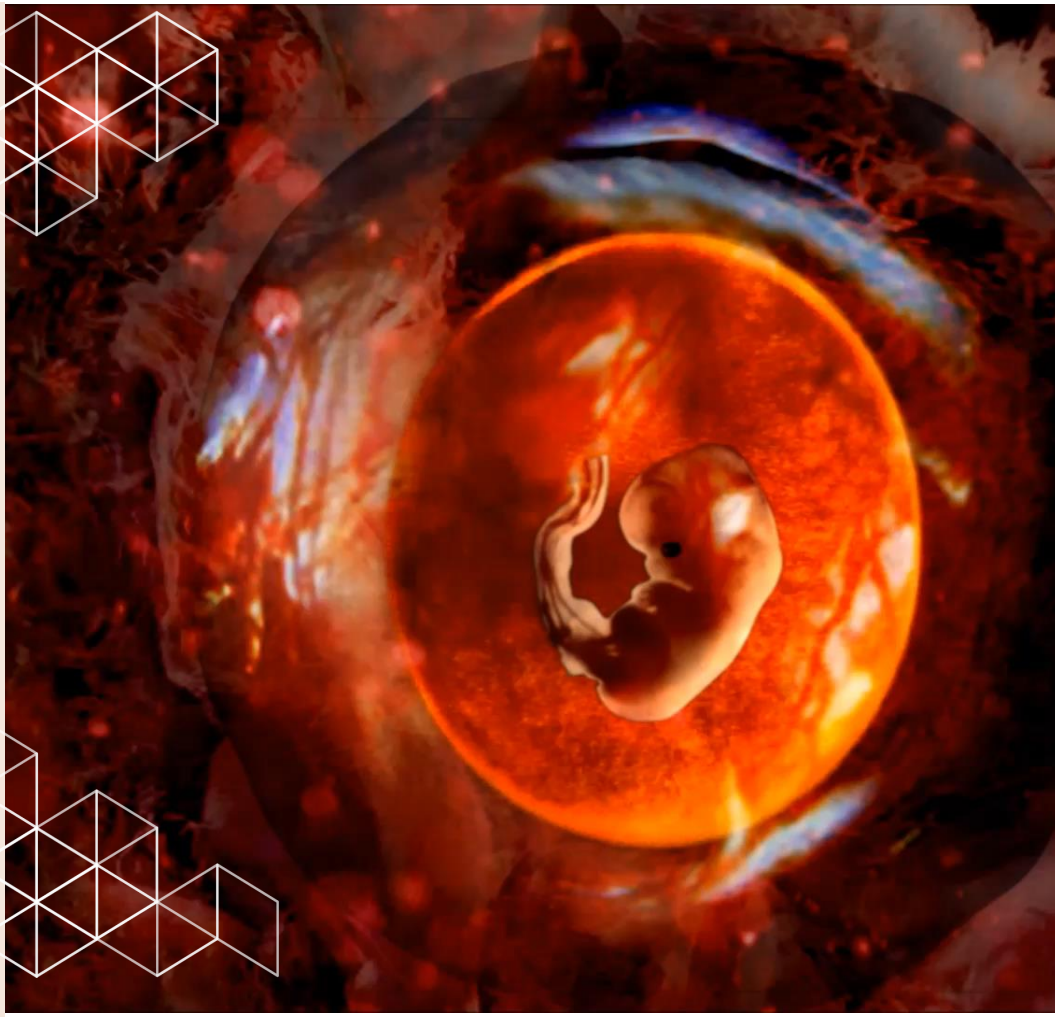
EEMCS Facts and Figures

50 full professors	**136** associate/assistant professors	**221** permanent scientific staff	**133** support staff
462 PhD students	**71** Postdocs	**1629** MSc students **2296** BSc students	**€ 65M** annual turnover

Improving quality of LIFE

- Better prevention
  - MEMS (scanner for moulds)
- Faster and more accurate diagnostics
  - Bio informatics/ Alzheimer's disease/ Niptest
  - Organ-on-a-chip
  - Medical data visualisation/ high-dimensional data
  - Digitization of data
  - MRI/ 3D Echo/ miniaturisation of ultrasound scanning
- Advanced therapy & treatment
  - Cochlear implants
  - VR mental training - e.g. support for anxiety disorder
  - Mathematical models for healing burns
  - Robotics – MEGA & PAL project



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Accelerating the ENERGY TRANSITION

Large-scale implementation of renewable energy resources

- Life test stability and monitoring high voltage transmission lines including conversion AC/DC
- Conversion to H, system stability
- Upscaling of integration PV in system

Intelligent & flexible energy infrastructure

- ICT to control, monitor and protect future power systems
- Multi commodity grid
- Power to X
- Digitizing energy system and monitoring & control
- Multi array sensors
- Switching/conversion between energy carriers
- Supply and demand market
- (Heating) sensors/ stability grid

Electric mobility

- Energy conversion, storage and distribution technologies
- Smart dynamic charging of electric vehicles
- DC Grids and storage for smart cities

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Developing responsible DIGITAL TECHNOLOGY for the good of society

Placing ethics at the heart of technology

TECHNOLOGY TO ADVANCE THE DIGITAL SOCIETY

- Robotics, AI, Internet of Things
- Quantum computer
- Autonomous Driving, XG, Wireless communication & sensing
- Blockchain, FinTech

SECURING RESPONSIBLE DEPLOYMENT OF TECHNOLOGY

- Responsible Artificial Intelligence (RAI)
- Cybersecurity (CYS)

ARTIFICIAL INTELLIGENCE

What is it?
What are the benefits?
What are the threats?
What can we expect?

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ARTIFICIAL INTELLIGENCE

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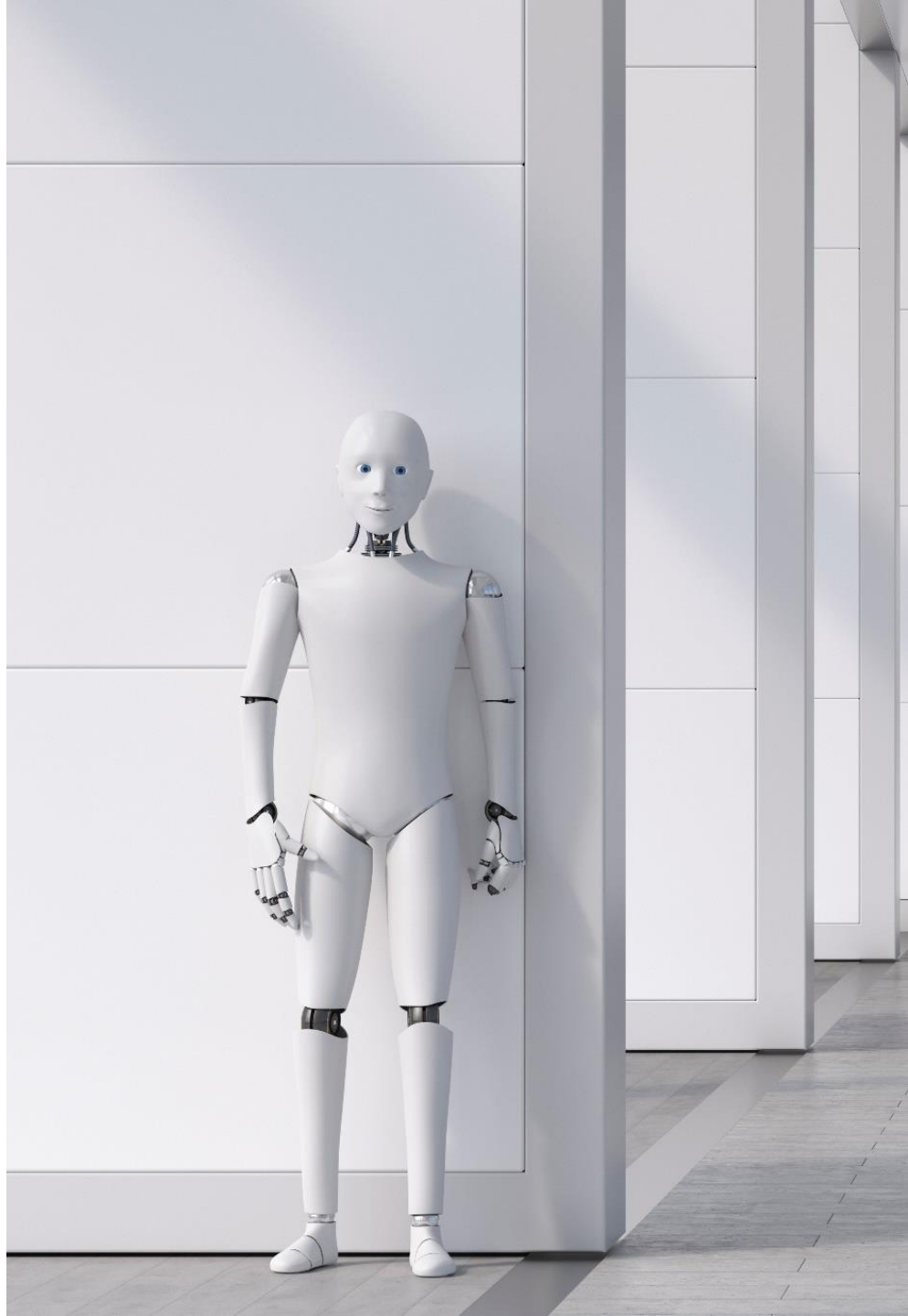
What is Artificial Intelligence?

To Start:

- **AI in development since 1950: will have more impact than internet and smartphone?**
- **Overestimation: pattern recognition well established but reasoning needs further work**
- **Much work done on narrow AI, another 50 years needed for general AI?**
- **Will computers replace humans?**



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What is Artificial Intelligence?

WIKIPEDIA: “In computer science, artificial intelligence (AI), is intelligence demonstrated by machines”

Encyclopedia Britannica: “artificial intelligence (AI), the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings.” Intelligent beings are those that can adapt to changing circumstances

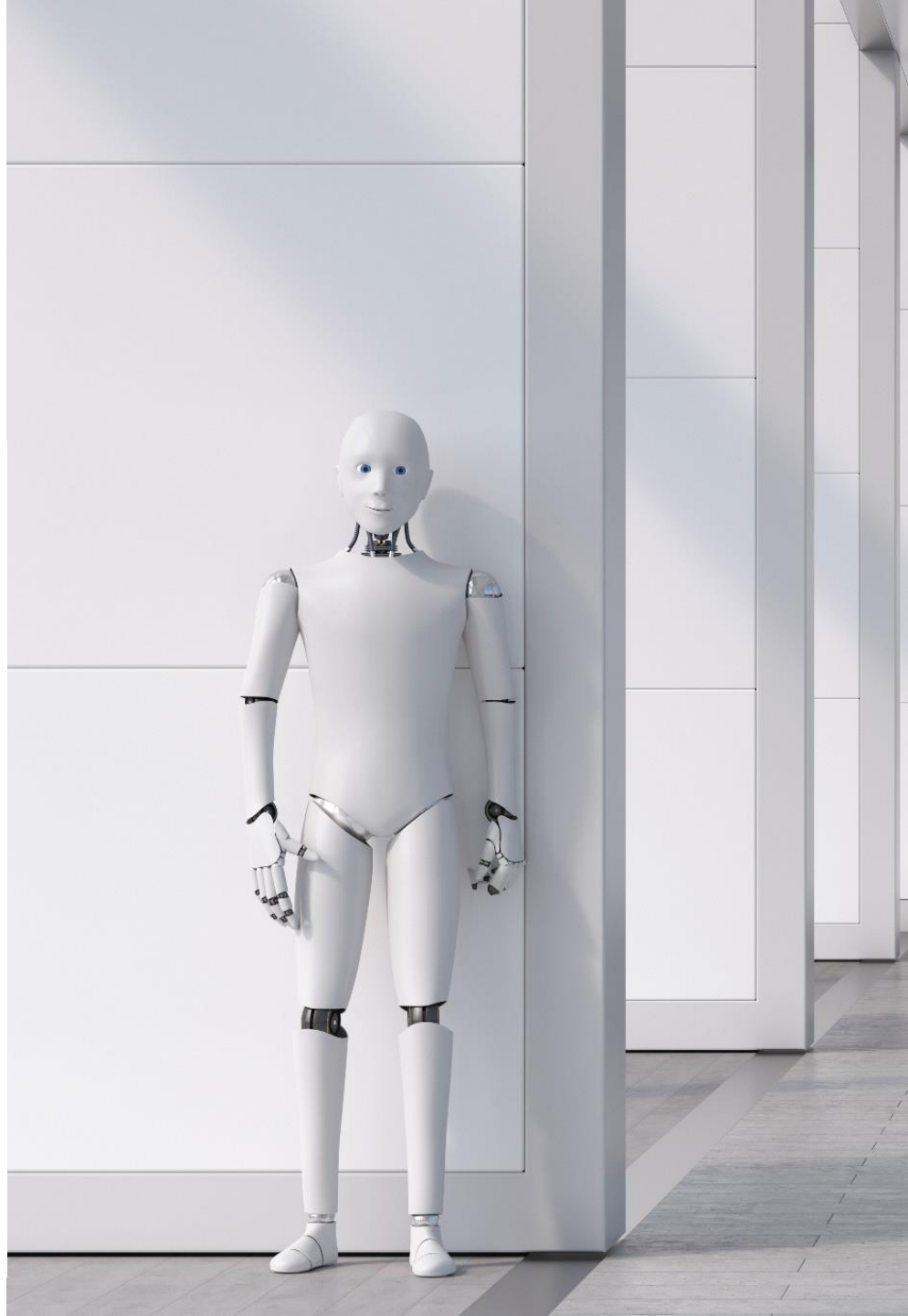
English Oxford Living Dictionary: “The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.”

Definitions difficult to give but many examples:
chess-playing machines, image recognition, GPS, self-driving cars, spam filter, recommendation algorithms of NetFlix and Amazon etc.

What is Artificial Intelligence?

Brief and concise:

- **AI is a discipline that, among other things, focuses on the development of self-learning systems**
- **So it's much more than just computers and software**
- **It is a field of science (studying and constructing AI): how can you artificially realize human intelligence?**



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AI track at EEMCS contents

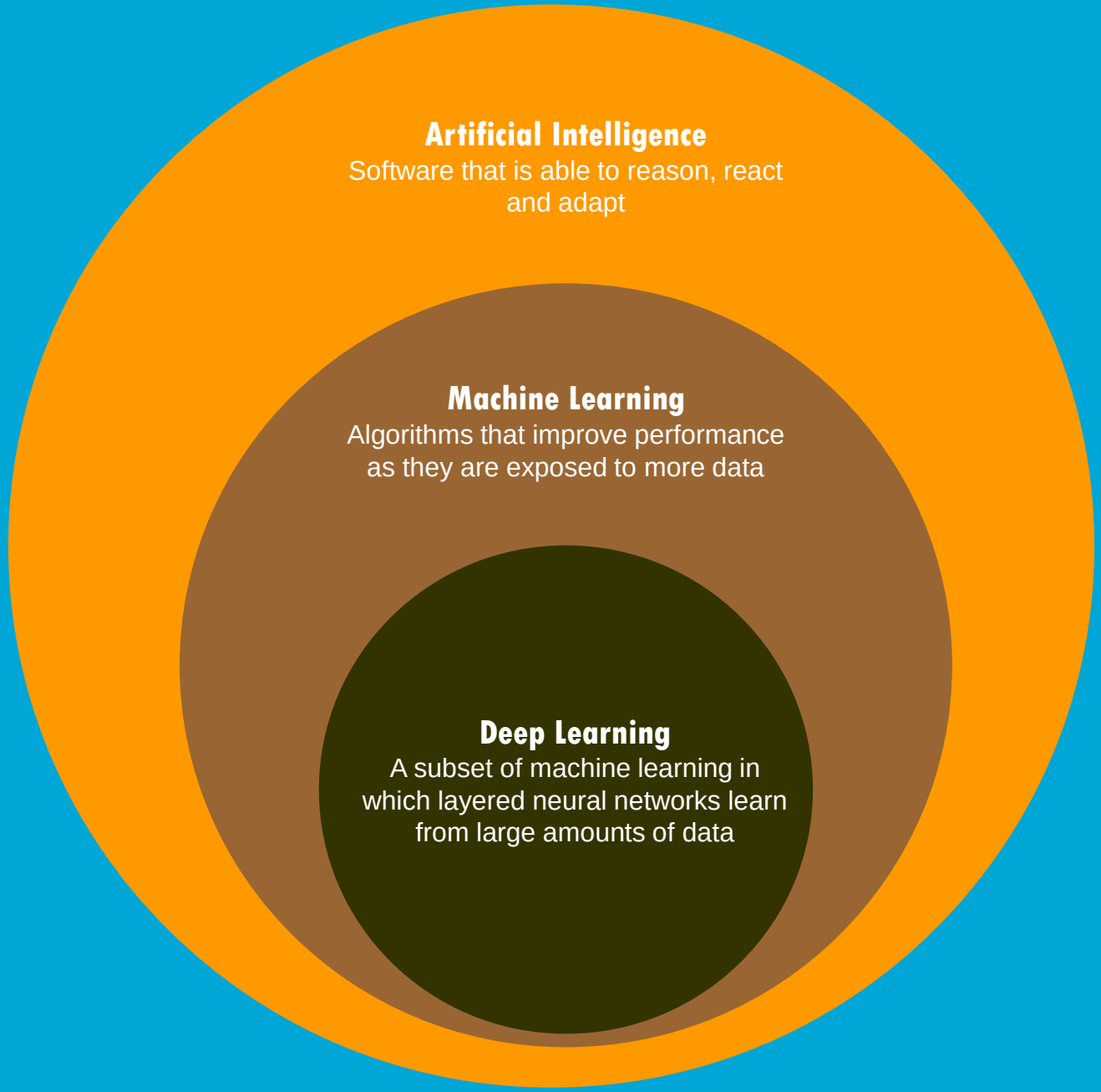
Specialisations

- Algorithmics
- Computer Graphics & Visualisation
- Cyber Security
- Distributed Systems
- Embedded & Networking Systems
- Interactive Intelligence
- Multimedia Computing
- Pattern Recognition & Bioinformatics
- Programming Languages
- Software Engineering
- Web Information Systems

Common Core courses

- Artificial Intelligence Techniques
- Algorithms for Intelligent Decision Making
- Conversational agents
- Deep Learning
- Information Retrieval
- Machine Learning 1
- Multimedia Search and Recommendation
- Evolutionary Algorithms
- Software Architecture

Artificial Intelligence
Machine Learning
and
Deep Learning



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Source: https://www.globalorange.nl/artificial-intelligence-machine-learning-en-deep-learning

What is Artificial Intelligence?

- AI uses a combination of mathematics + lots of calculation power + lots of data
- Important concepts in AI:
  - Algorithms: a set of rules that precisely defines a sequence of operations
    - Example: Start from a set of two numbers and then add the two numbers and give the addition result
  - Decision tree: is one of the predictive modelling approaches used in statistics , data mining and machine learning . Decision trees are constructed via an algorithmic approach that identifies ways to split a data set based on different conditions
  - Machine learning: computers that learn from examples and massive amounts of data
    - Machines actually learn by being given data rather than through human programming
    - Became more prevalent between the 1990s and 2000s
    - Example: Deep Blue world champion chess in 1998
  - Deep learning: is a subset of machine learning where artificial neural networks, algorithms inspired by the way the human brain works, learn from large amounts of data
    - Examples: speech recognition, Google search, facial recognition

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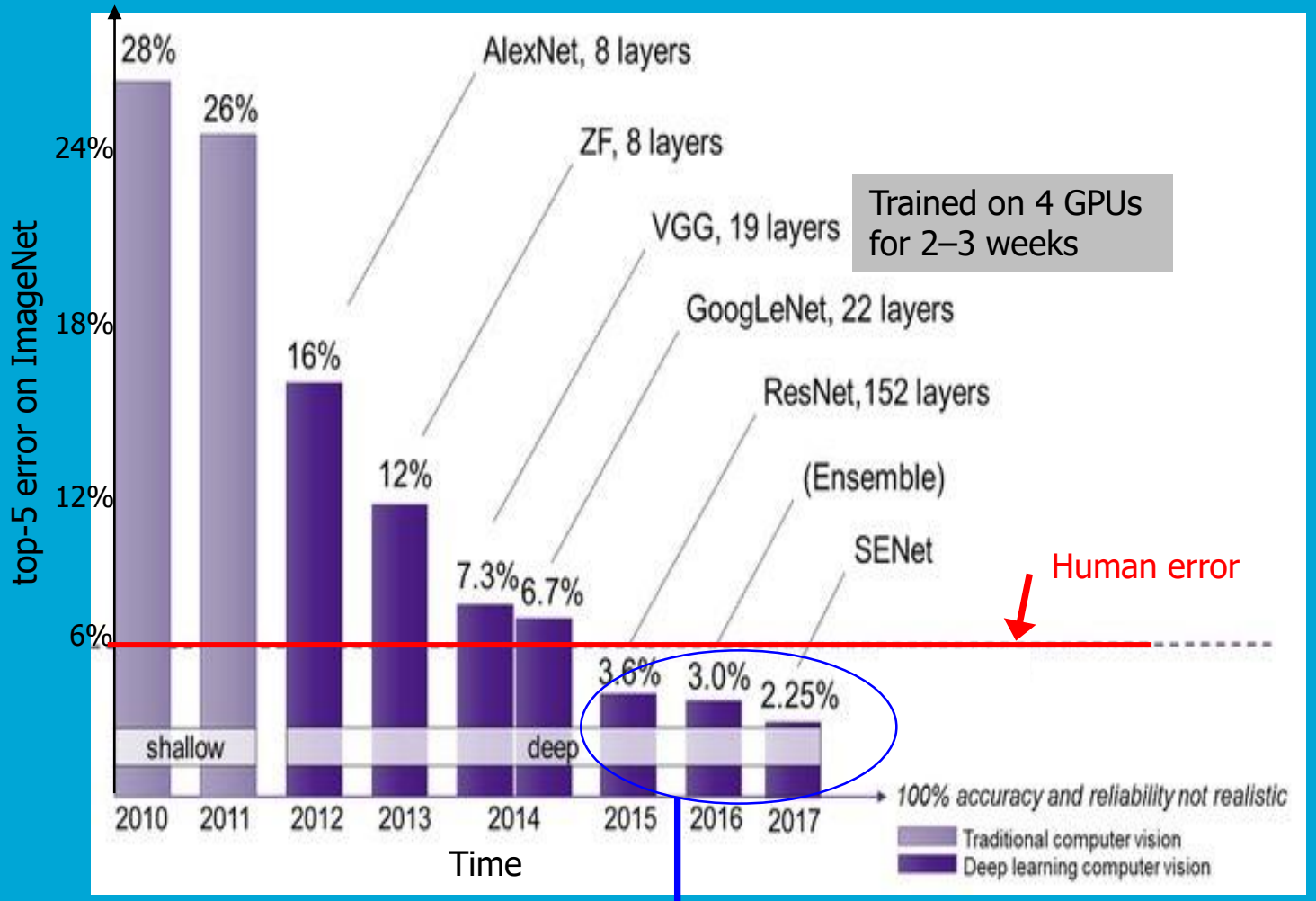
Intelligence: Are there any challenges?



Trained on 4 GPUs for 2–3 weeks

AlphaGo:
- 176 GPUs, 1202 CPUs
- 150, 000 Watts

AI **surpassed** human

AI requires **huge** resources

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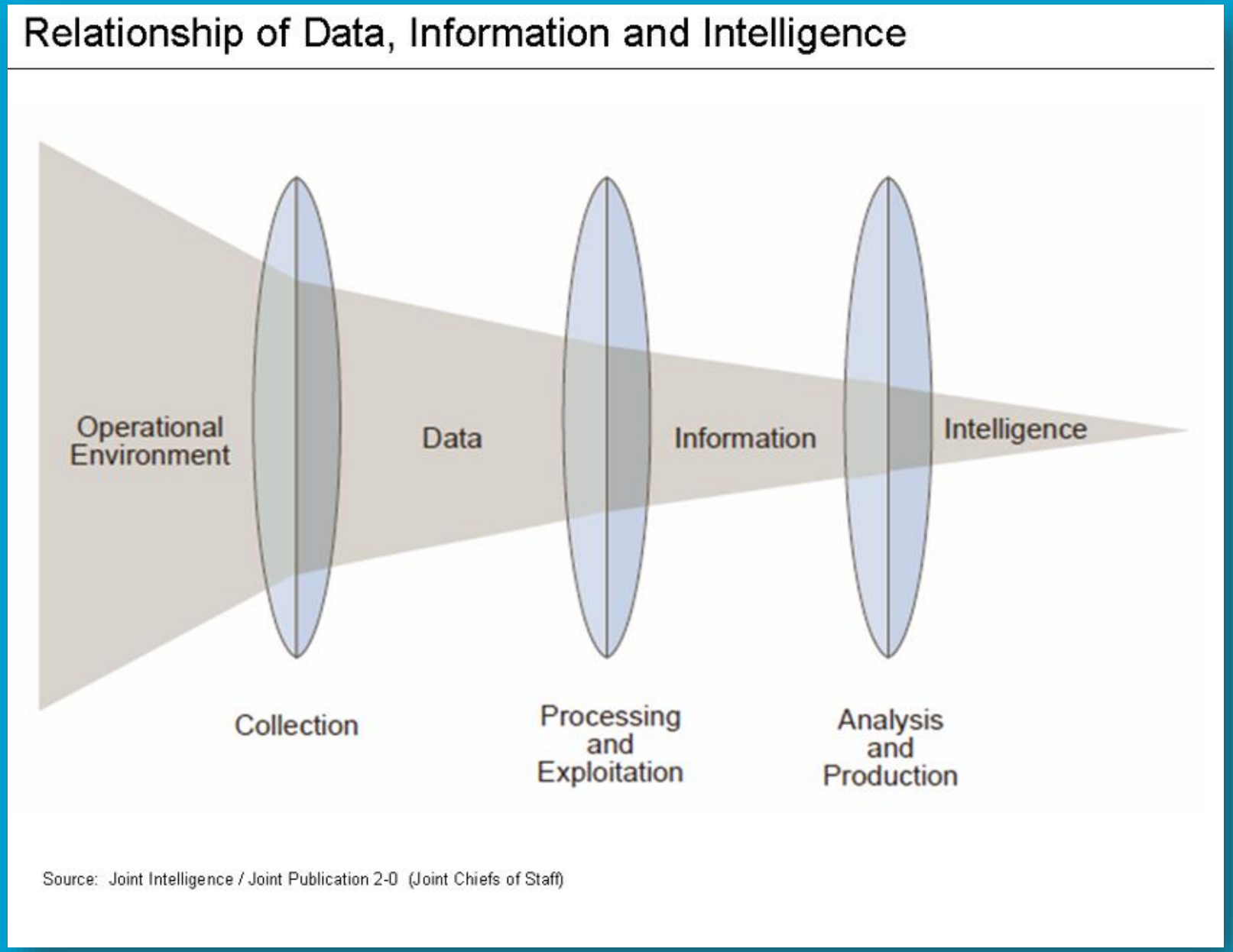
But....
it all begins with Data Science (the ambition to gain insight from data)



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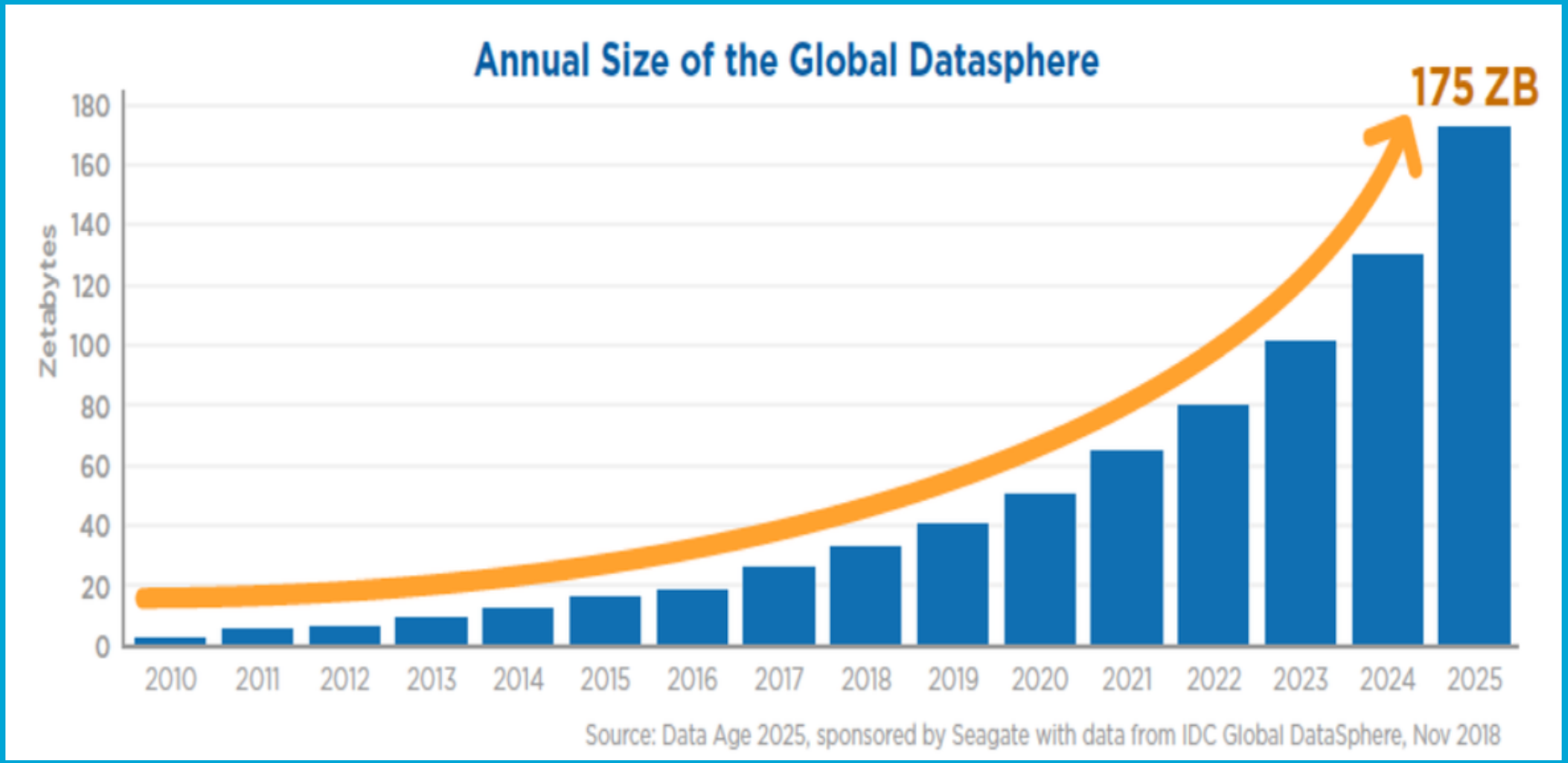
Data Becoming **BIG**



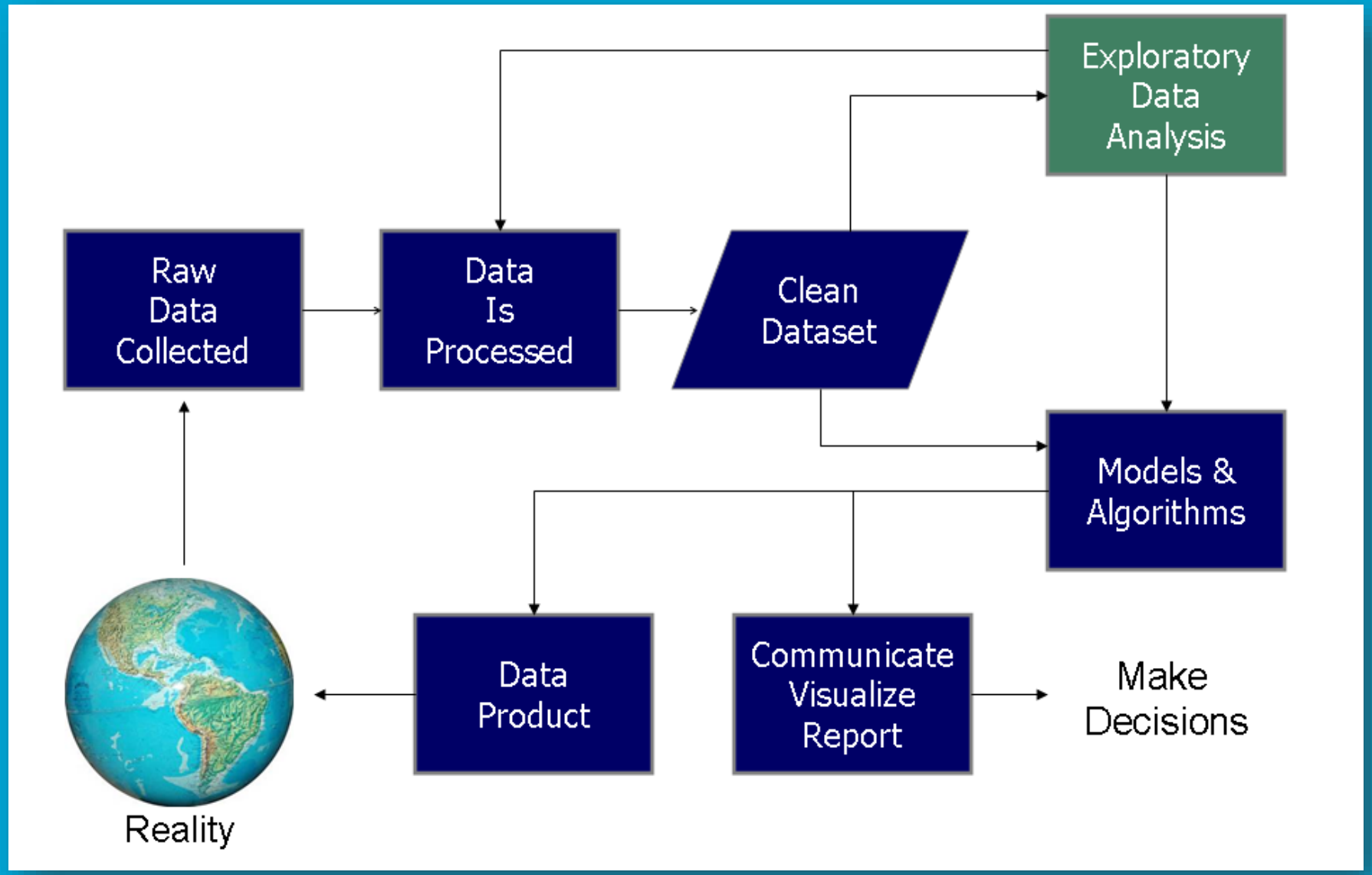
A zettabyte is 10^{21} (1,000,000,000,000,000,000,000 bytes)

But…. it all begins with Data Science (2)

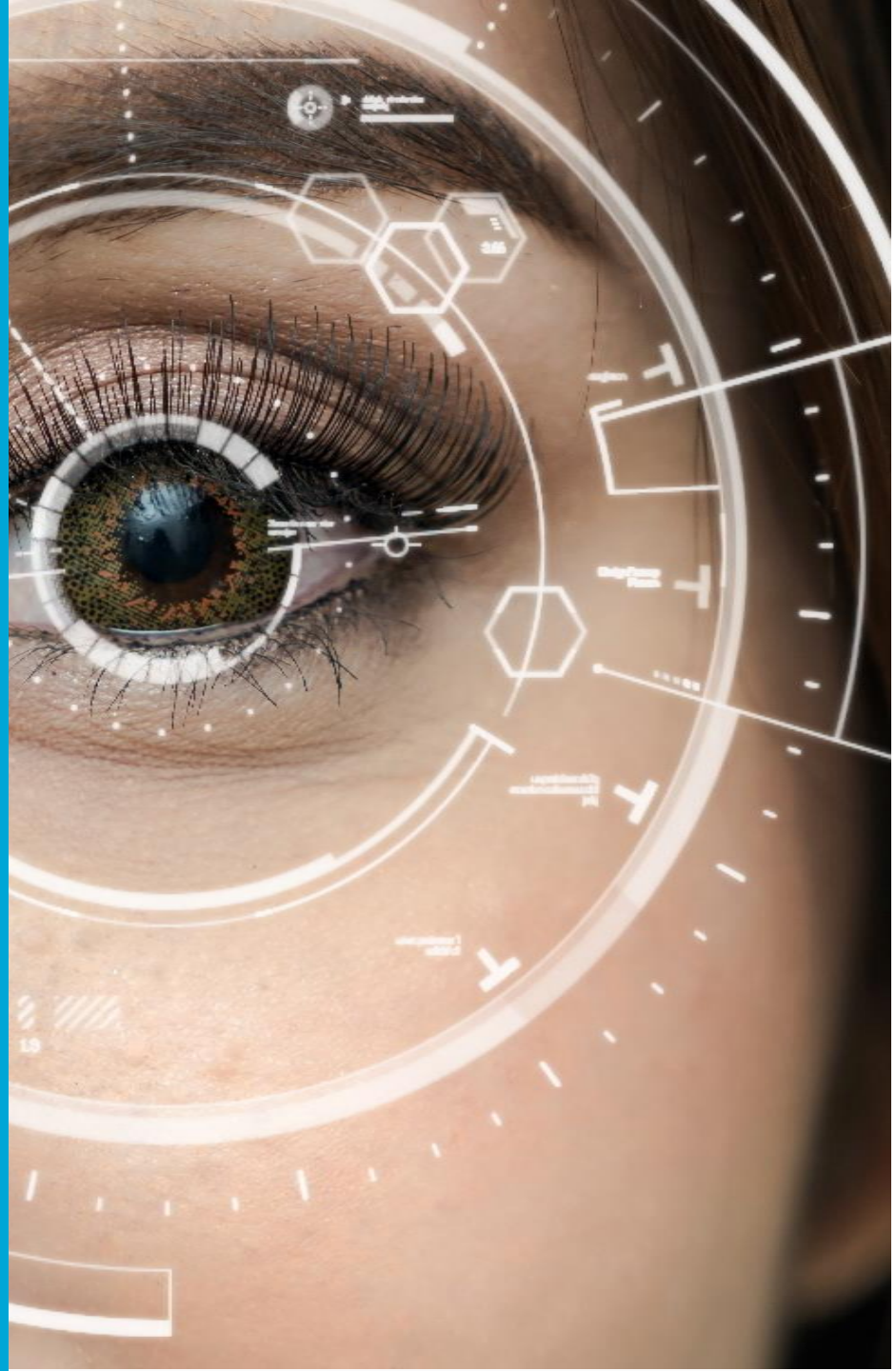
- **Data Mining (DM):**
  - Discovering patterns in large data sets involving methods from AI, machine learning, statistics, and database systems. Includes: supervised methods (classification and regression), and unsupervised methods (clustering)
- **Data Preparation and Visualization (DPV):**
  - (i)techniques for extracting and transforming data,
  - (ii) modeling data for analytic purposes and
  - (iii) data visualization techniques
- **Information Extraction and Natural Language Processing (IENLP):**
  - Most information is available in a form rather unsuitable for processing by computers, namely natural language text
- **Feature Extraction from Time Series (TS):**
  - Sensors and other measurements increasingly produce massive amounts of data with space and time dimensions
- **Semi-structured Data (SEMI):**
  - There exist several data exchange and knowledge representation standards: manipulation of data in these standards
- **Probabilistic DataBases and Data Quality (PDBDQ):**
  - Much effort in data preparation is devoted to dealing with data quality problems like uncertainty in data.
- **Process Mining (PM):**
  - Aims to improve understanding and efficiency of business processes by analysing event logs with specialized data-mining algorithms

https://research.utwente.nl/en/publications/scalable-interdisciplinary-data-science-teaching-at-the-universit

Data Science Process



https://upload.wikimedia.org/wikipedia/commons/b/ba/Data_visualization_process_v1.png



Machine Learning Methods

- **Supervised learning (classification)**
  - Give inputs and results (tell upfront which input is a cat and a dog)
  - Example is prediction of temperature or stock market
- **Re-enforcement learning**
  - Only after inputs analysis is done will system get the right answer (tell only after analysis whether it was a cat or a dog)
  - Example: a robot that is learning to walk
- **Un-supervised learning (clustering)**
  - Systems explores data w/o any other inputs and will find out that there are groups in the data (dogs and cats): clustering
  - Example: detection of fraud bank transactions

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WHAT'S THE DIFFERENCE BETWEEN MACHINE LEARNING AND DEEP LEARNING? (Image recognition)

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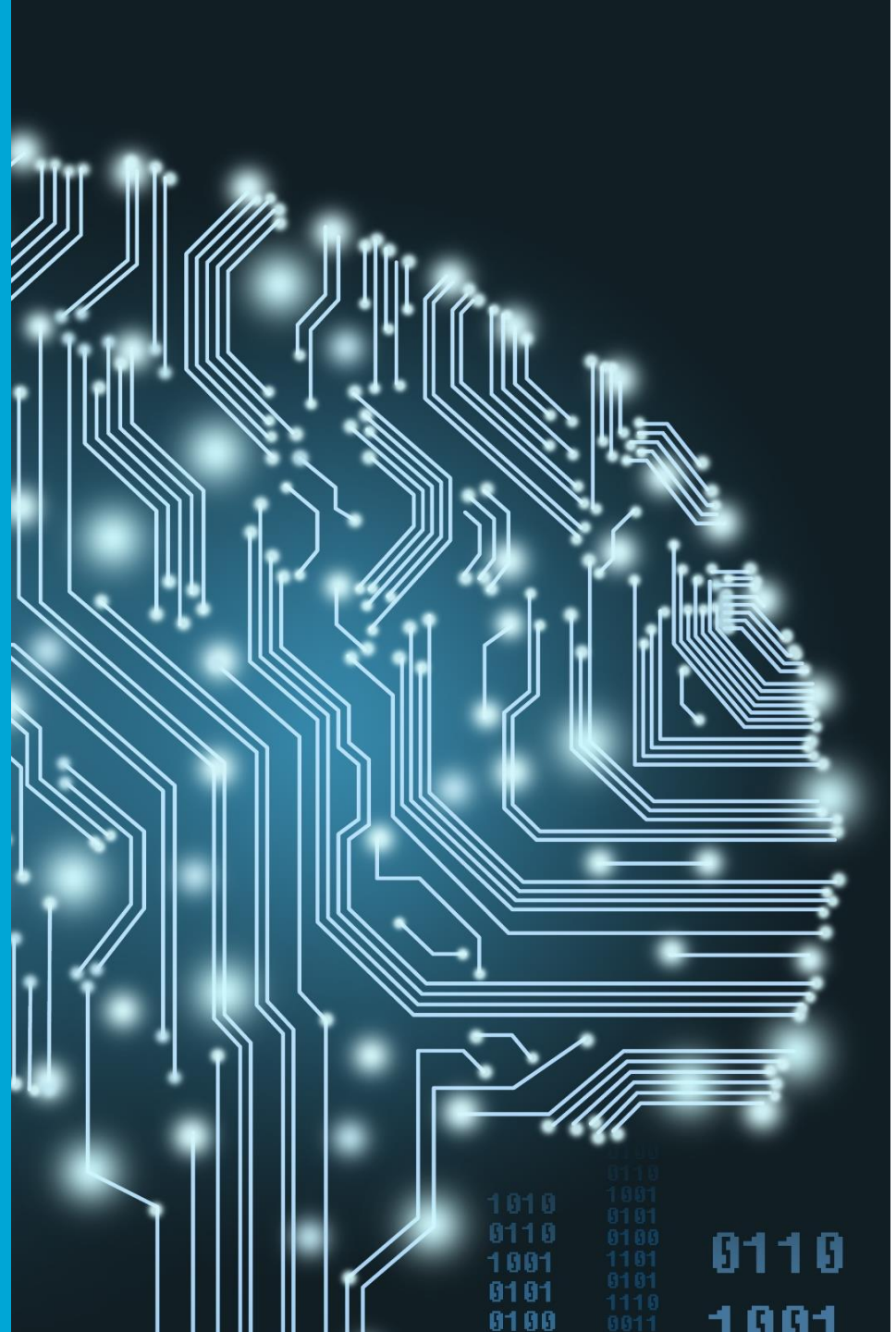
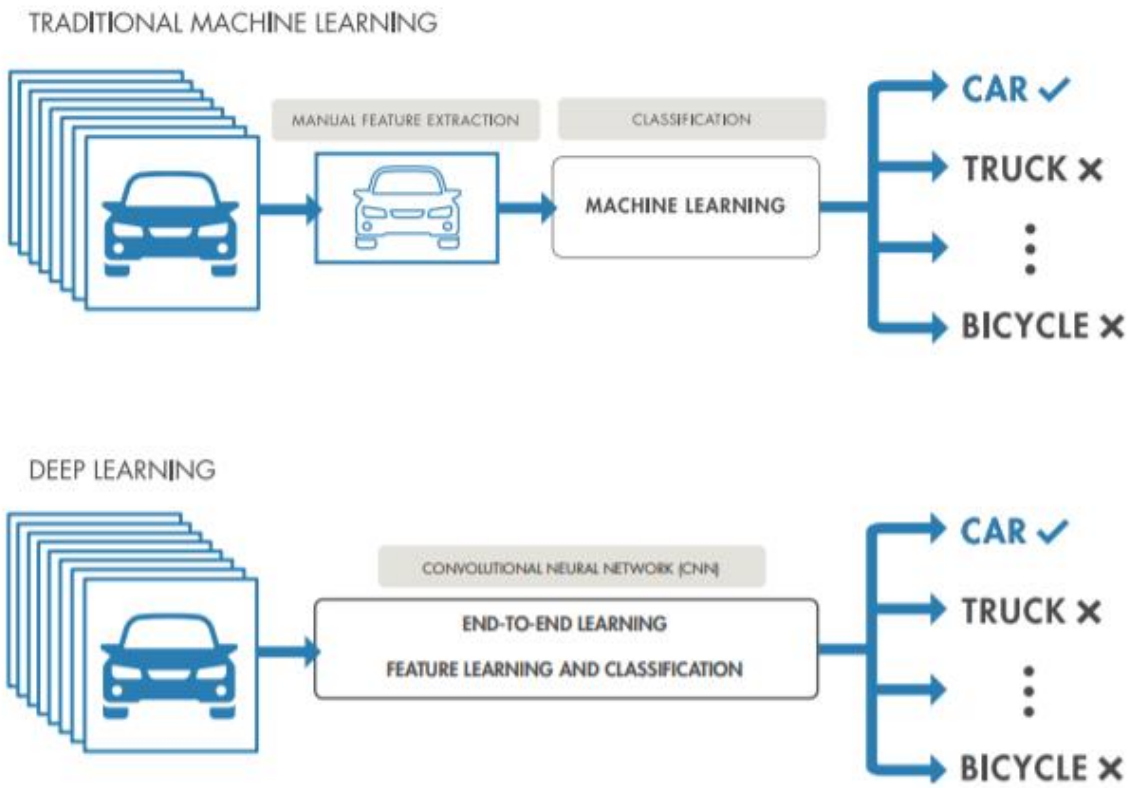


WHAT'S THE DIFFERENCE BETWEEN MACHINE LEARNING AND DEEP LEARNING?

- Deep learning is a subtype of machine learning.
  - With machine learning, you manually extract the relevant features of an image.
  - With deep learning, you feed the raw images directly into a deep neural network that learns the features automatically.
- Deep learning often requires hundreds of thousands or millions of images for the best results. It's also computationally intensive and requires a high-performance GPU.

https://nl.mathworks.com/discovery/deep-learning.html

WHAT'S THE DIFFERENCE BETWEEN MACHINE LEARNING AND DEEP LEARNING?

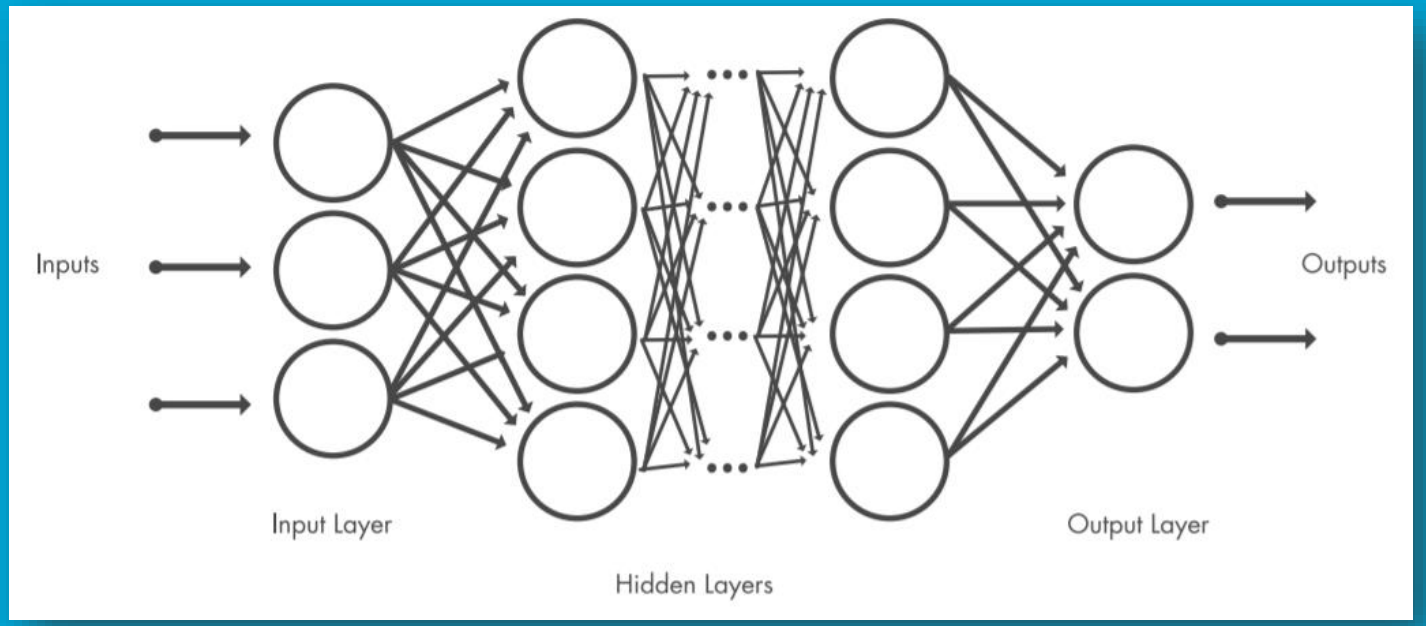


Machine Learning	Deep Learning
+ Good results with small data sets	— Requires very large data sets
+ Quick to train a model	— Computationally intensive
— Need to try different features and classifiers to achieve best results	+ Learns features and classifiers automatically
— Accuracy plateaus	+ Accuracy is unlimited

https://nl.mathworks.com/discovery/deep-learning.html
https://nl.mathworks.com/content/dam/mathworks/ebook/gated/80879v00_Deep_Learning_ebook.pdf

Deep Neural Network

A deep neural network combines multiple nonlinear processing layers, using simple elements operating in parallel and inspired by biological nervous systems. It consists of: an input layer, several hidden layers, and an output layer. The layers are interconnected via nodes, or neurons, with each hidden layer using the output of the previous layer as its input.



Multi Layer Perceptron (MLP)

https://nl.mathworks.com/discovery/deep-learning.html

Example neural network

MatLab tool

- MATLAB is a high-performance language for technical computing. It integrates computation, visualisation, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation

- Several known deep learning networks (such as GoogleNet and AlexNet) can be used in this environment:
  - **GoogleNet**
    - 22 hidden layers
  - **AlexNet**
    - Contains **eight layers**; the first **five** were convolutional layers, some of them followed by max-pooling layers, and the last three were fully connected layers.

Example with GoogleNet in MatLab

Command Window

```
     0     0     0
     0     2     0
     1     2     0
     3     2     2
     3     2     2
     3     2     2
     3     2     2
     3     2     2
     3     2     2
     3     2     2
     2     2     2
     2     2     2
     2     2     2
     2     2     2
     2     2     2
     2     2     2
     2     2     2
     2     2     2
```

Figure 3

File Edit View Insert Tools Desktop Window Help

```
>> Image = imread('C:\Users\jejschmitz\Pictures\matlab.jpg');
>> figure
>> imshow(Image)
>> [label,scores] = classify(net,Image);
>> label

label =

  categorical

     barometer

fx >>
```

Workspace

Name	Value
classNames	1000x1 cell
I	224x224x3 uint8
Image	224x224x3 uint8
inputSize	[224,224,3]
label	1x1 categorical
matlab	224x224x3 uint8
net	1x1 DAGNetwork
numClasses	1000
scores	1x1000 single

https://www.cs.ryerson.ca/~aharley/vis/conv/

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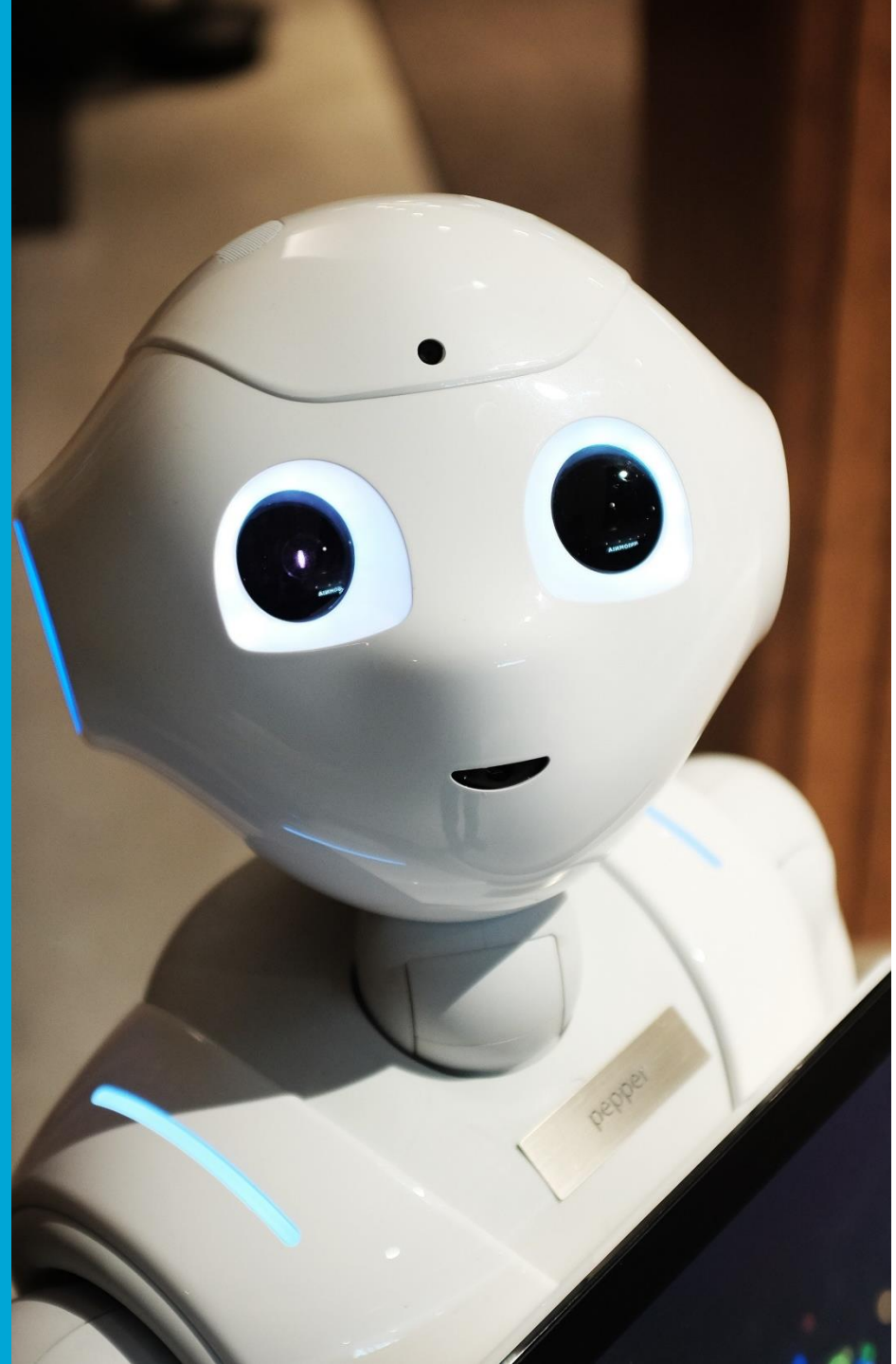

AI Examples

Robot era nears as machine conducts 100,000 experiments a year

- The dream of robot researchers is edging closer with automated laboratory producing five years of experiments in just two weeks, experts claim
- In a Science Robotics paper, fluid dynamics researchers describe how they set up an “intelligent towing tank” to test the vortex-induced vibrations created when a body is dragged through water – an important area applicable to shipping and ocean structures.
- The robot was able to observe the results and plan a follow-up experiment, which it had done so 100,000 times in its first year, “essentially completing the equivalent of all of a PhD student’s experiments every two weeks”, says the paper
- https://www.timeshighereducation.com/news/robot-era-nears-machine-conducts-100000-experiments-year

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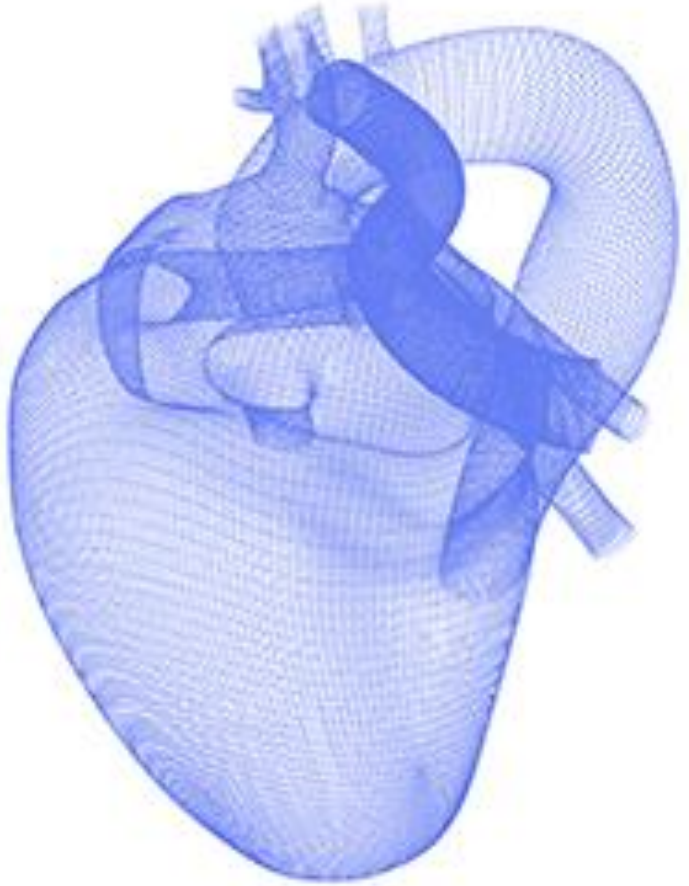
Example of Data Science Application: **Automatic detection of Atrial fibrillation episodes**

- Atrial fibrillation (AF) occurs as a complication postoperatively form cardiac surgery. AF results in stasis of the blood. In the postoperative period AF can induce delirium and neurocognitive decline, thereby pro- longing the hospital stay. On the long term serious complications like thromboembolic dis- eases, stroke and heart failure can be induced by AF. These complications result in increased morbidity and mortality and prolonged hospital stays. Precise ECG monitoring is important to detect AF as soon as possible. Then complications caused by AF can be obviated due to a fast intervention.
- The challenge was to develop an algorithm/method that can detect automatically episodes of AF (minimum of 30 seconds) from (preprocessed) ECG data



25,000 fewer delivery vans on the road due to smart delivery

Picnic is able to deliver efficiently to its customers thanks to a smart algorithm, devised by Joris van Tatenhove, the mathematics graduate from TU Delft who joined Picnic when he was 21. He has found an almost ultimate solution for a time-honoured logistical challenge, the so-called 'travelling salesman problem'. In short, it's all about how to get from place A to many other places with as few vehicles as possible and as short a distance as possible, and eventually return to place A

(https://www.ttm.nl/it/ritplanning/slim-algoritme-maakt-ritten-picnicstukken-efficienter/122344/)

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Real-time Deep Learning Algorithms for Optimal Traffic flow at Bridge openings

The province of Zuid-Holland plays an important role in the traffic flow within the region by operating and maintaining more than 100 bridges. Smart ICT solutions offer new opportunities to use sensors and algorithms to connect real-time traffic information to live shipping information. Forecasting traffic intensities around a number of important bridges in the province of Zuid-Holland. The Long Short-Term Memory neural networks can make predictions up to 21 minutes ahead with a correlation coefficient accuracy of 75-95%.

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https://upload.lingacms.nl/nv_ce0191a9/Papers/NVC-paper_Real-time_deep_learning_algoritmes_voor_optimale_verkeersdoorstroming_bij_brugopening_final.pdf

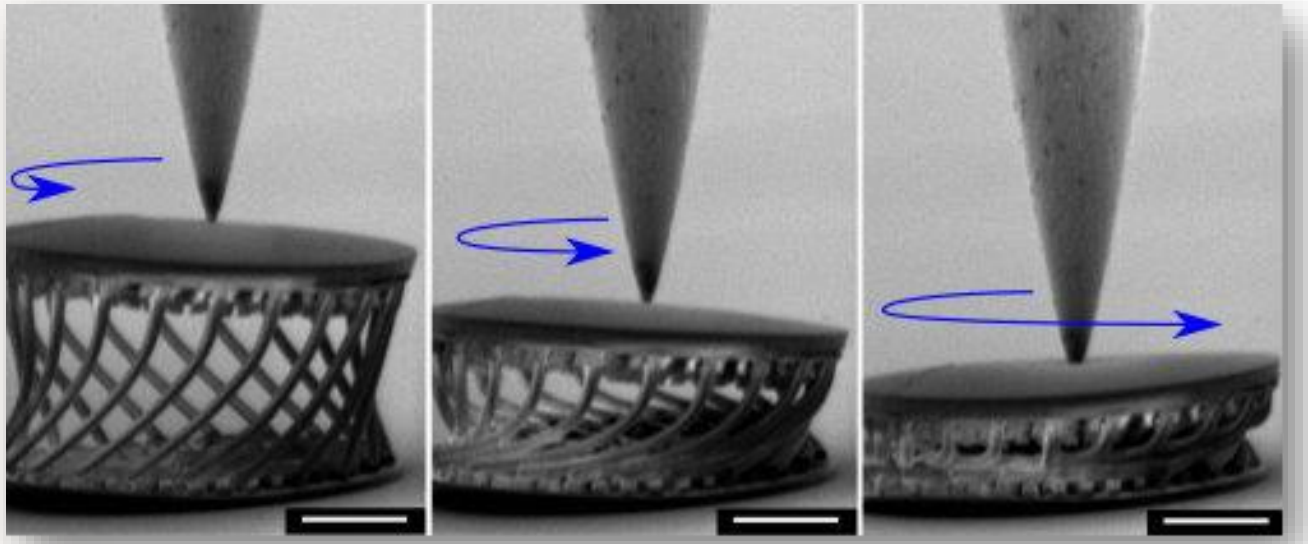
An AI system identified a potential new drug for fibrosis in 46 days

- The approach is based on two popular AI techniques: generative adversarial networks, and reinforcement learning.
- The news: A team from Insilico Medicine took 21 days to create 30,000 designs for molecules which target a protein linked with fibrosis (tissue scarring.) They synthesized six of these molecules in the lab, then tested two in cells, with the most promising one tested in mice. The researchers concluded it was potent against the protein and showed “drug-like” qualities. All in all, the process took just 46 days.
- Context: Getting a new drug to market is hugely costly and time-consuming: it can take 10 years and cost as much as $2.6 billion. No wonder then, that there’s so much work underway on using AI to expedite the process.
- A word of caution: The research looks promising, but it’s still very much a proof-of-concept. We’re a long way from AI-designed drugs being created, let alone sold to patients. We explored the issue in this article from our TR10 issue earlier this year.

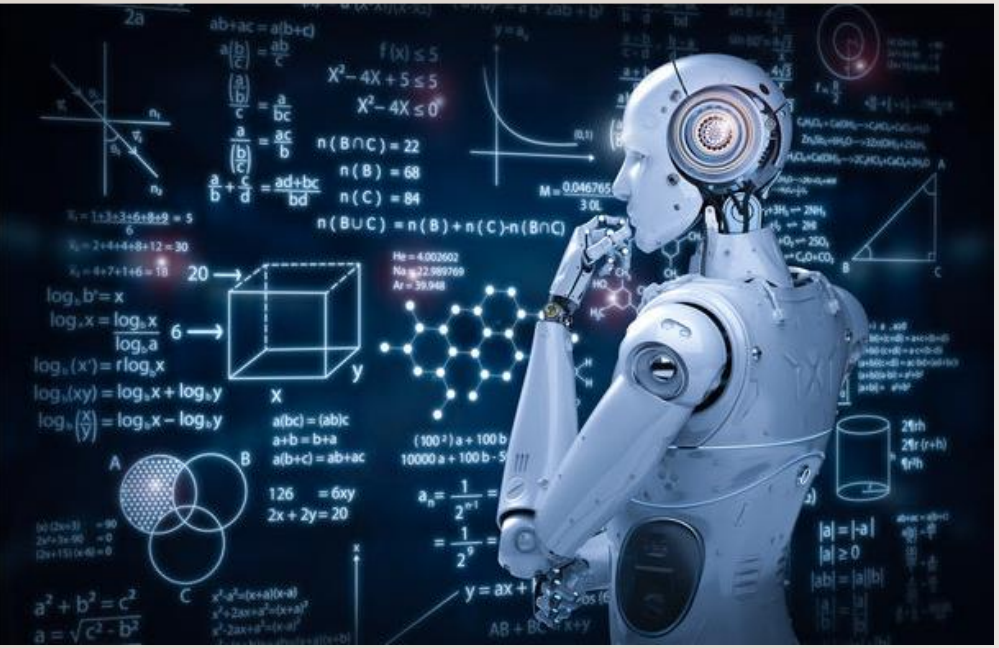
Finding material with **AI**

Miguel Bessa (3ME) finds a new, super compressible material by using artificial intelligence to search for new materials. According to Bessa, experiments can be reduced to an absolute minimum by searching in this way.

https://www.youtube.com/watch?v=cWTWHhMAu7I&amp=&feature=youtu.be



How AI trained to read scientific papers could predict future discoveries



- “In the new study, an AI learned to retrieve information from scientific literature via unsupervised learning. This has remarkable implications. So far, most of the existing automated NLP-based methods are supervised, requiring input from humans. Despite being an improvement compared to a purely manual approach, this is still a labour intensive job.”
- “Scientific progress relies on the efficient assimilation of existing knowledge in order to choose the most promising way forward and to minimize re-invention. As the amount of scientific literature grows, this is becoming increasingly difficult, if not impossible, for an individual scientist.
- We hope that this work will pave the way towards making the vast amount of information found in scientific literature accessible to individuals in ways that enable a new paradigm of machine-assisted scientific breakthroughs”

https://www.natureindex.com/news-blog/how-an-ai-trained-to-read-scientific-papers-could-predict-future-discoveries


With the help of Data Science the NIPT test reads millions of pieces of prenatal DNA for certain diseases

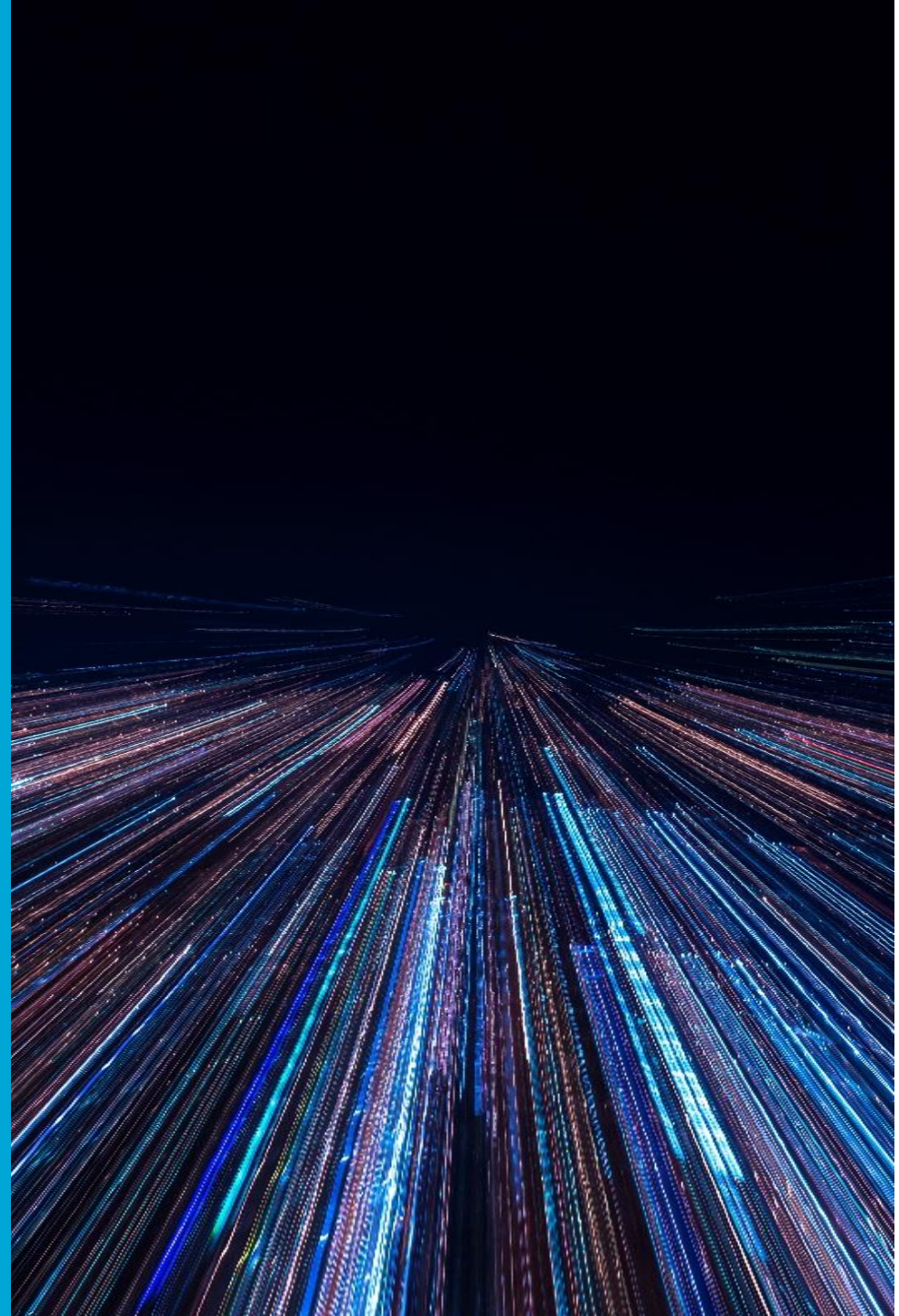
Non invasive pregnancy test

- TU Delft contribution leads to low cost test because of
  - Within sample comparison: no requirement to re-run healthy references!!
  - Affordable low coverage Next Generation Sequencing
- NIPT can detect Down syndrome and other genome deviations
- Test done on plasma from maternal blood: no risk of miscarriage
- Used in most Dutch medical centers

WISECONDOR: detection of fetal aberrations from shallow sequencing maternal plasma based on a within-sample comparison scheme

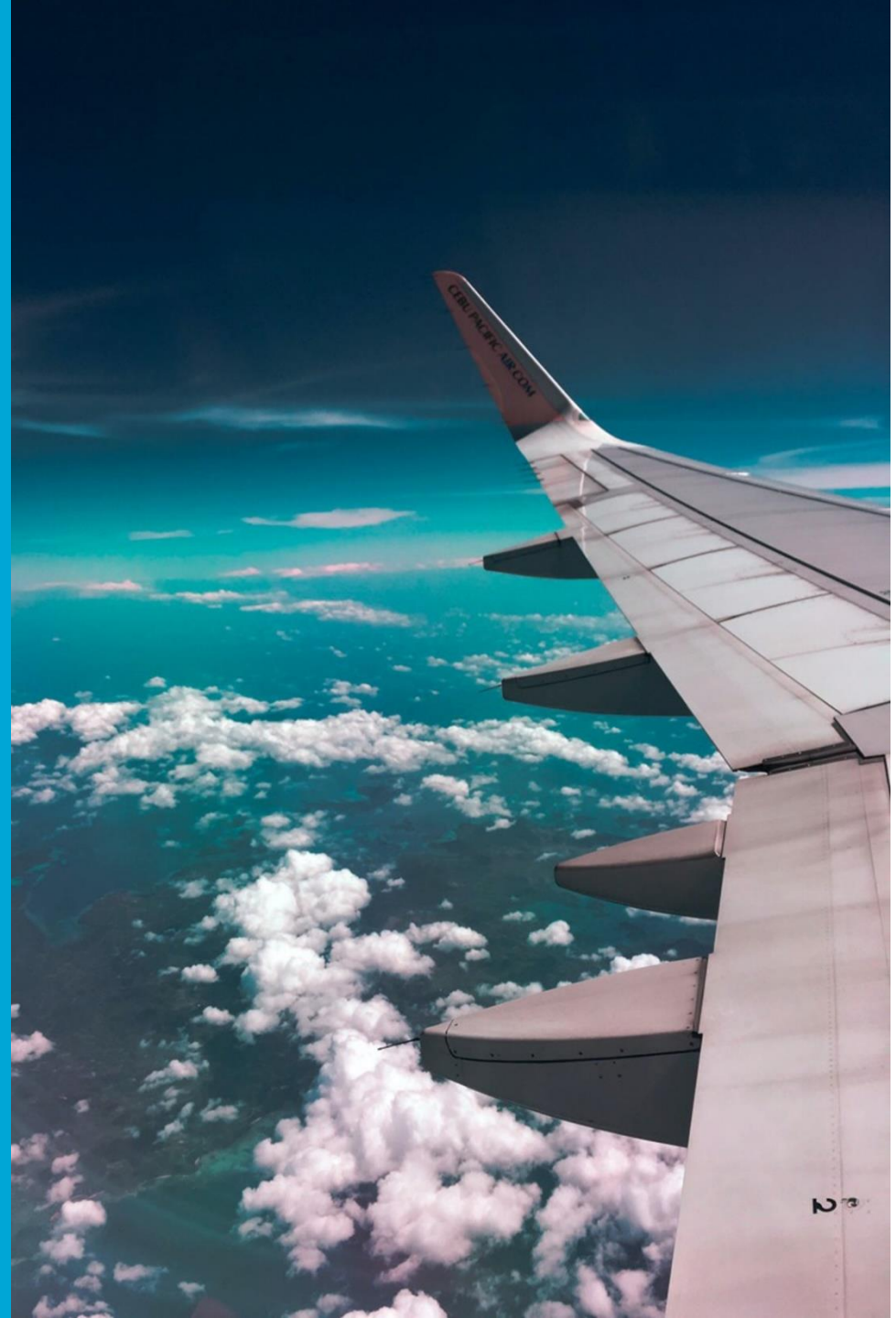
Roy Straver[1,2,*], Erik A. Sistermans[2], Henne Holstege[2], Allerdien Visser[3], Cees B. M. Oudejans[3] and Marcel J. T. Reinders[1,*]

[1]Delft Bioinformatics Lab, Delft University of Technology, Mekelweg 4, 2628 CD Delft, The Netherlands, [2]Department of Clinical Genetics, VU University Medical Center Amsterdam, van der Boechorststraat 7 (BS7/J377), 1081 BT Amsterdam, The Netherlands and [3]Department of Clinical Chemistry, VU University Medical Center Amsterdam, van der Boechorststraat 7 (BS7/J377), 1081 BT Amsterdam, The Netherlands



Digital twins

- They integrate: Internet of Things | Artificial Intelligence | Machine Learning | Software analytics with spatial network graphs
- Creating living digital simulation models that update and change as their physical counterparts change.
  - A digital twin continuously learns and updates itself from multiple sources to represent its near real-time status, working condition or position.
  - This learning system, learns from itself, using sensor data that conveys various aspects of its operating condition
- A digital twin also integrates historical data from past machine usage to factor into its digital model



Digital twins - EXAMPLE

For aircraft collecting, per engine, all data of a flight between London and Paris. The data is transferred to a data center, where it generates a real-time digital twin of each engine. In this way, General Electric is able to detect potential defects or faults already during the flight. So, if a part of the engine is causing a fault, the personnel that is responsible for maintenance can have the replacement part ready at the airport where the aircraft will land.

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Concerns about AI

- Do we understand the methods sufficiently so that we know that if we apply a method in a new situation, it will again work in the same way as in all previously considered (and perhaps trained) situations.
- This is a concern for three reasons:
  1) use of data that encodes the world but perhaps that encodes and abstracts incorrectly
  2) use of learning from examples with risks being valid for general application
  3) use of reinforcement/deep tactics that are completely a “black box” (not explainable anymore)

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Concerns about AI

Deep Fake

AI technology that uses existing images and audio fragments to create convincingly fake videos of existing people

Huh? – Nixon maakt noodlottig ongeval bekend van Apollo 11

George van Hal
Amsterdam

Tijdens een ingelaste persconferentie, kort nadat astronauten Neil Armstrong en Buzz Aldrin aan de afdaling naar het maanoppervlak waren begonnen, maakte president Richard Nixon bekend dat de poging om als eerste een mens op de maan te zetten, noodlottig is verlopen.

'Het lot heeft bepaald dat de mannen die de maan in vrede gingen verkennen, nu op de maan in vrede zullen rusten', zei hij tijdens zijn wereldwijd live uitgezonden toespraak. 'Deze dappere mannen (...) weten dat er geen hoop is dat ze terug kunnen komen. Maar ze weten ook dat in hun opoffering hoop rust voor de gehele mensheid. Deze twee mannen geven hun leven voor het nobelste doel dat we kennen: de zoektocht naar waarheid en begrip.'

Wie het Nixon ziet voorlezen op het authentiek ogend, tikje gruizige archiefbeeld in de film *In Event of Moon Disaster* begint bijna te twijfelen aan zichzelf. Die '*one small step*' van Neil Armstrong, waarmee hij de eerste man op de maan werd. Het hupsje waarmee hij de ladder van maanlander Eagle afstapte. Die foto van een voetafdruk in het grijze maangruis... is dat dan allemaal nooit gebeurd?

Natuurlijk wel. In werkelijkheid is de film, die sinds maandag op YouTube staat, een mengelmoes van kunstproject en techdemo. De makers willen er de kracht mee demonstreren van zogenoemde deepfakes, waarbij een kunstmatig intelligent programma op basis van bestaande beelden en audiofragmenten overtuigende nepvideo's maakt van echte personen. Van beroemdheden die in pornofilms worden gemonteerd, tot politici die uitspraken doen waar ze in werkelijkheid nooit achter zouden staan: sinds de introductie van de deepfake-technologie kun je zelfs je eigen ogen niet meer geloven. De beelden van Nixon gingen vorig jaar al in première op het Idfa DocLab in Amsterdam, deden daarna de ronde binnen het festivalcircuit, en wonnen een aantal festivalprijzen.

Richard Nixon
Foto ANP

Om de nepgeschiedenis in *In Event of Moon Disaster* zo echt mogelijk te maken, gingen ingenieurs verbonden aan de Amerikaanse universiteit MIT aan de haal met historische beelden van Nixon. Ze lieten hem bovendien de toespraak voorlezen die daadwerkelijk geschreven was voor het geval Armstrong en collega's niet meer zouden kunnen terugkeren van de maan, of als ze zouden overlijden tijdens de missie.

In de nooit uitgesproken woorden van Nixon klinkt dat zo: 'In de oudheid keken mensen omhoog naar de sterren en zagen daar, in sterrenbeelden aan de hemel, hun helden. Nu, in de moderne tijd, doen we hetzelfde – maar onze helden zijn epische mannen van vlees en bloed.

'Anderen zullen heus volgen, en hun weg terugvinden naar huis. Onze zoektocht kan niet worden gestopt. Maar deze mannen waren het eerst, en zullen altijd in onze harten blijven.'

TU Delft

Autonomous Intellectual Technology: AITech

https://www.tudelft.nl/en/aitech/

AI Tech culminates research activities of 4 of the 8 faculties of TU Delft active in the domain of AI:

- The focus of the Industrial Design Engineering Faculty is on developing design methodologies for humans and non-human partners such as forms of artificial intelligence that interact and do business with humans
- The faculty of Mechanical, Maritime and Materials Science Engineering centres around the issue of meaningful human control
- The faculty of Electrical Engineering, Mathematics and Computer Science is devoted to research on reliable and responsible use of data and algorithms.
- The faculty of Technology, Policy and Management conducts a rich portfolio of research covering ethical, social and institutional aspects of the rapidly emerging digitalisation of society in all of its complexities.

TU Delft

AI TECH

Autonomous Intellectual Technology: AITech

Why meaningful human control?

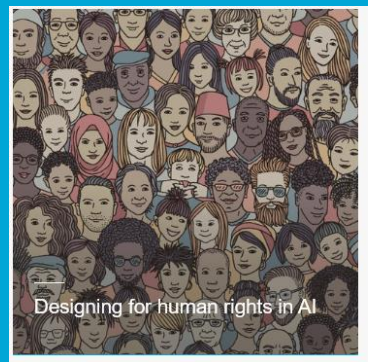
Today's engineers create systems that are ever more equipped with artificial intelligent technologies. Autonomous behavior of cars, robots, and decision support algorithms is becoming a reality. Our vision is that scientists should not only research the technology that makes intelligent autonomy possible, but also act upon the responsibility to ensure that design, engineering, and use of such systems embrace human values and meaningful human control.

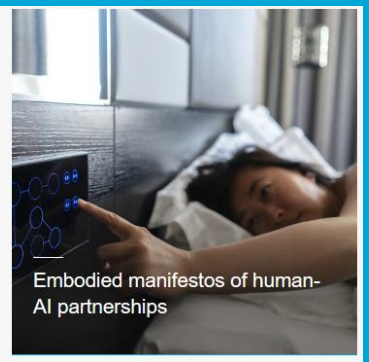
Our 'how to' approach

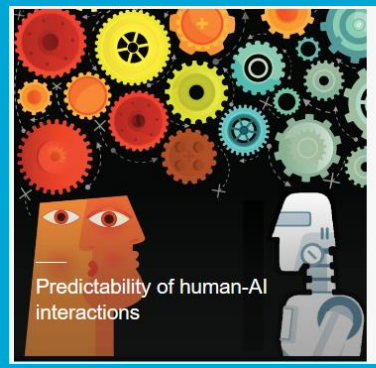
Meaningful human control is particularly important in cases of failures or conflicts with the normative foundations of society, social conventions, and human acceptability. We believe these challenges demand a multidisciplinary effort, bringing together researchers across a wide range of fields. Our aim is to provide answers to 'how to' build autonomous intelligent systems that collaborate with humans towards societal and economic prosperity and the sustainable development of our planet.

AiTech's objectives

- Understand the implications of meaningful human control for the science, design, and engineering of autonomous intelligent systems
- Build, test, break, and learn from systems under meaningful human control in practice
- Develop educational programs on the use of meaningful human control in autonomous intelligent systems







TU Delft

AITECH

ARTIFICIAL INTELLIGENCE

What is it?
What are the benefits?
What are the threats?
What can we expect?

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ARTIFICIAL INTELLIGENCE

What is it?
What are the benefits?
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What can we expect?

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Er Komt Geen Zelfrijdende Auto

- Lekker de krant lezen of een uurtje extra werken, de voordelen van een zelfrijdende auto lijken groot, toch komt er in de praktijk nog niet veel van terecht. Niet alleen, omdat het technologisch nog steeds een uitdaging is, maar ook omdat mensen niet snel voldoende vertrouwen hebben in een robot.
- “De revolutie van de chauffeurloze auto gebeurt niet,” is dan ook de stellige overtuiging van Carlo van de Weijer, expert slimme mobiliteit aan de TU Eindhoven. “De robotauto is een oplossing voor een niet bestaand probleem,” zegt hij in de Volkskrant. En hij is niet de enige. Steeds meer wetenschappers denken dat het nog lang gaat duren voordat auto’s echt zelfstandig kunnen rijden. Het is namelijk veel complexer dan een aantal jaar geleden werd gedacht
- Experimenten van Audi en Volvo laten zien dat de zelfrijdende auto nog ver weg is. Zo kon de Audi A8 alleen in de file autonoom rijden en niet harder dan 60. Dat is behoorlijk beperkt. Bovendien: die auto is er nog steeds niet. “De techniek kan het misschien al voor 99,9 procent zelf af”, aldus Bert van Wee, hoogleraar mobiliteitsbeleid aan de TU Delft . “Maar er zijn veel meer negens achter de komma nodig, omdat het aantal ongevallen anders onacceptabel hoog is.”

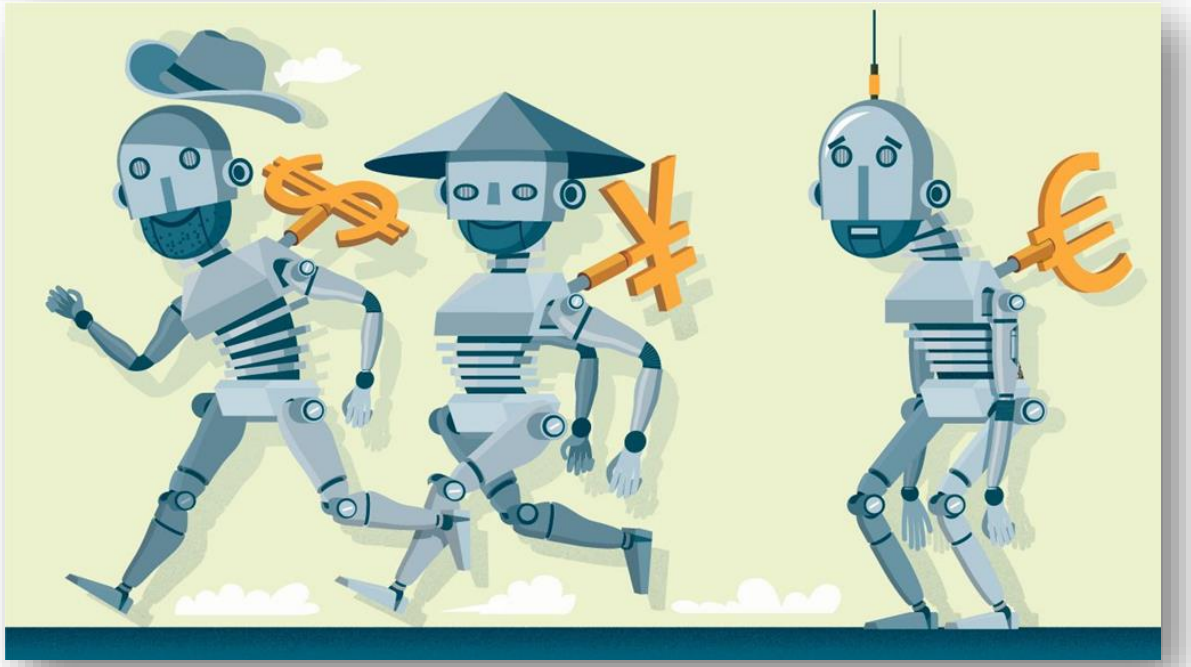
- https://www.welingelichtekringen.nl/tech/1389026/er-komt-geen-zelfrijdende-auto.html

EU dreigt digitale kolonie te worden

Kunstmatige intelligentie China en de VS werken al jaren aan werelddominantie. ‘Het gaat om de volgende industriële revolutie, er staat veel op het spel.’

Source: Wouter van Noort

Patent filing breakdown:
50% Chinese
30% USA
15% EU
5% ROW



Hybrid Intelligence: The computer as fellow human being

(Frank van Harmelen, Professor Knowledge Representation & Reasoning)

- Increasingly, AI research shows that AI is very different from human intelligence. In some cases, computers are much stronger than humans: computers have a perfect memory, they can see patterns that are invisible to the human eye and they can follow reasoning that is much longer than is possible for the human brain.
- But on the other hand, people are subtly aware of the context in which they find themselves, they are aware of what actions in such a context are or are not socially or even morally ethical, and unlike computers, people are the best collaborators.

TU Delft

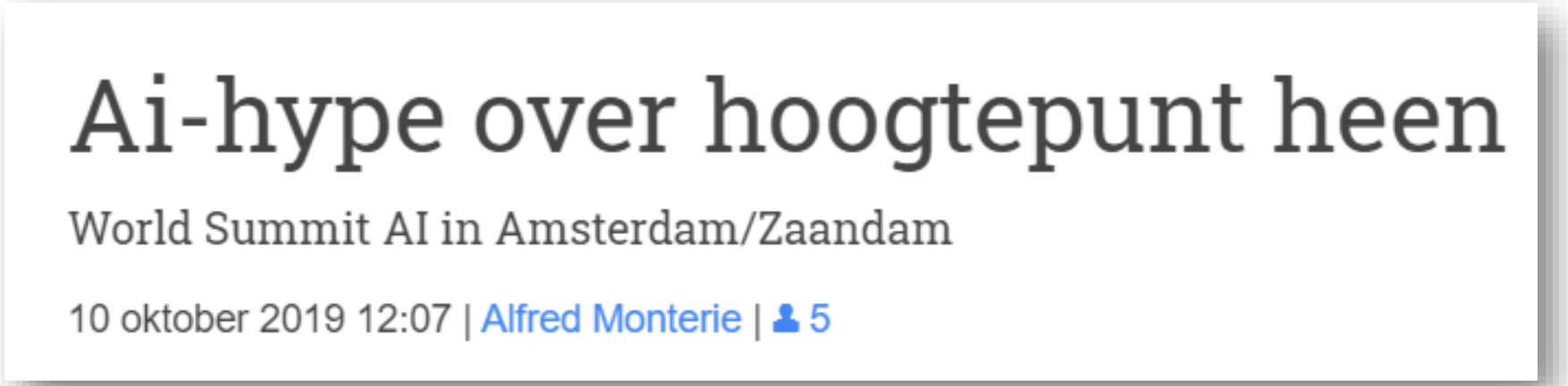
Interview Johan Pouwelse

Onderzoekers van de TU Delft willen het internet openbreken: 'Het kapitalisme faalt op internet'

The internet was supposed to become a sanctuary for the individual, but superpowers like Google or Facebook make up the service. Researchers from Delft are trying to give the net back to the public.

TU Delft

Is AI a Hype and will it go away?



Ai-hype over hoogtepunt heen

World Summit AI in Amsterdam/Zaandam

10 oktober 2019 12:07 | Alfred Monterie | 5

Conclusions

- AI will bring us mind boggling results in the years to come
- AI will bring us many problems in the years to come, but the academic world is aware of this and working on solutions
- What now…….?
  - AI may have currently a certain hype content but it will not go away
  - The focus and themes of AI may change over time

Links

- Nationale AI cursus: https://app.ai-cursus.nl/home
- TUD AI website van EEMCS: https://www.tudelft.nl/ai/
- AI Rapport NWO: https://www.nwo.nl/documents/enw/rapport-ai-voor-nederland-vergroten-versnellen-en-verbinden
- AiTech initiative of the TUD: https://www.tudelft.nl/en/aitech/
- Indeling informatica onderwijsprogramma https://www.acm.org/binaries/content/assets/education/cs2013_web_final.pdf

TU Delft

AIDU (AI for Delft University) en DAI-Labs (Delft AI Labs)

Luuk Mur / Roos ter Elst

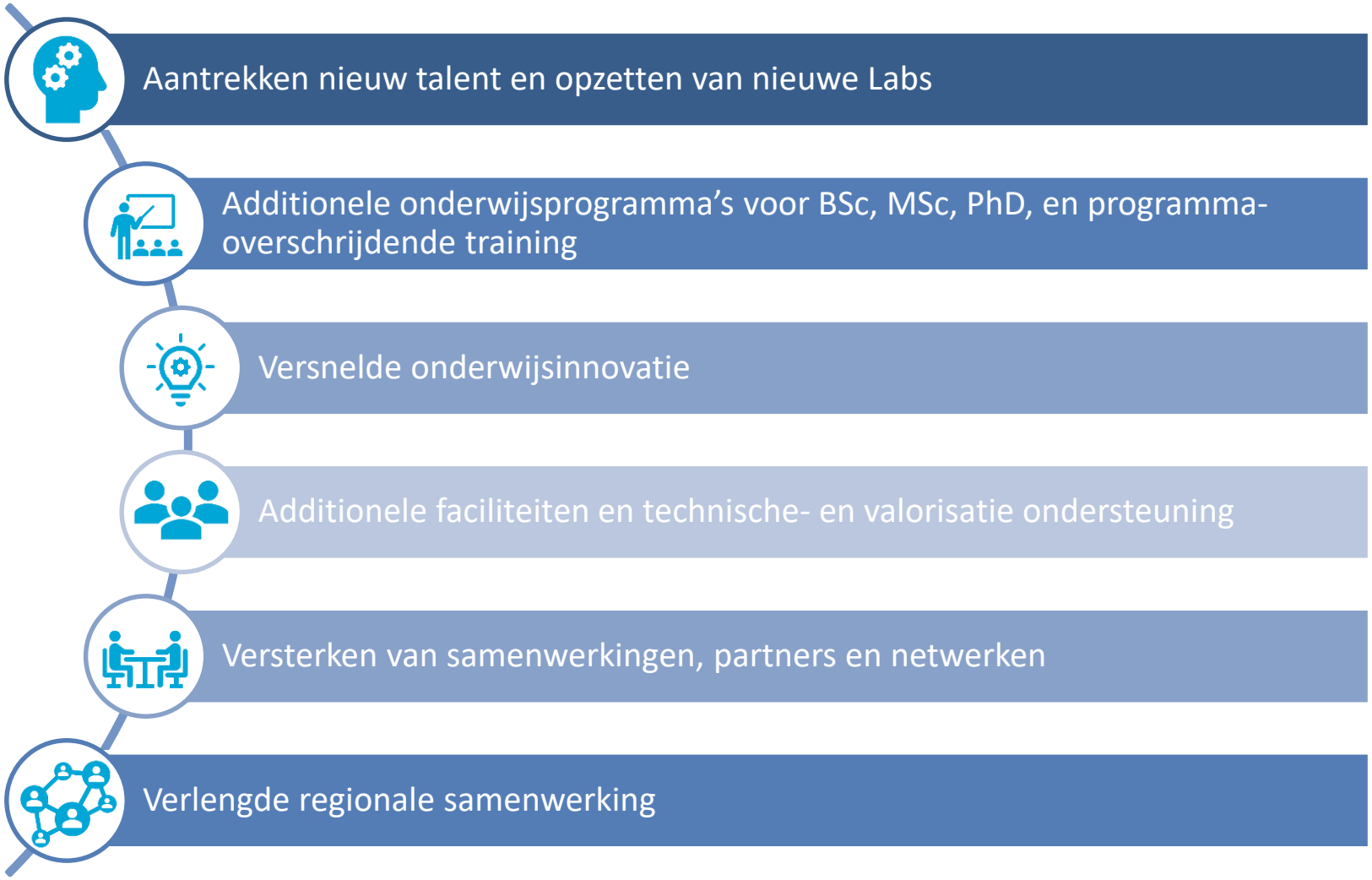
2. Missie AIDU

De TU Delft zal het huidige budget voor onderzoeks- en onderwijsactiviteiten rondom AI, Data en Digitalisatie bijna verdubbelen, tot 70 miljoen euro per jaar.

Verhoog zichtbaarheid en impact

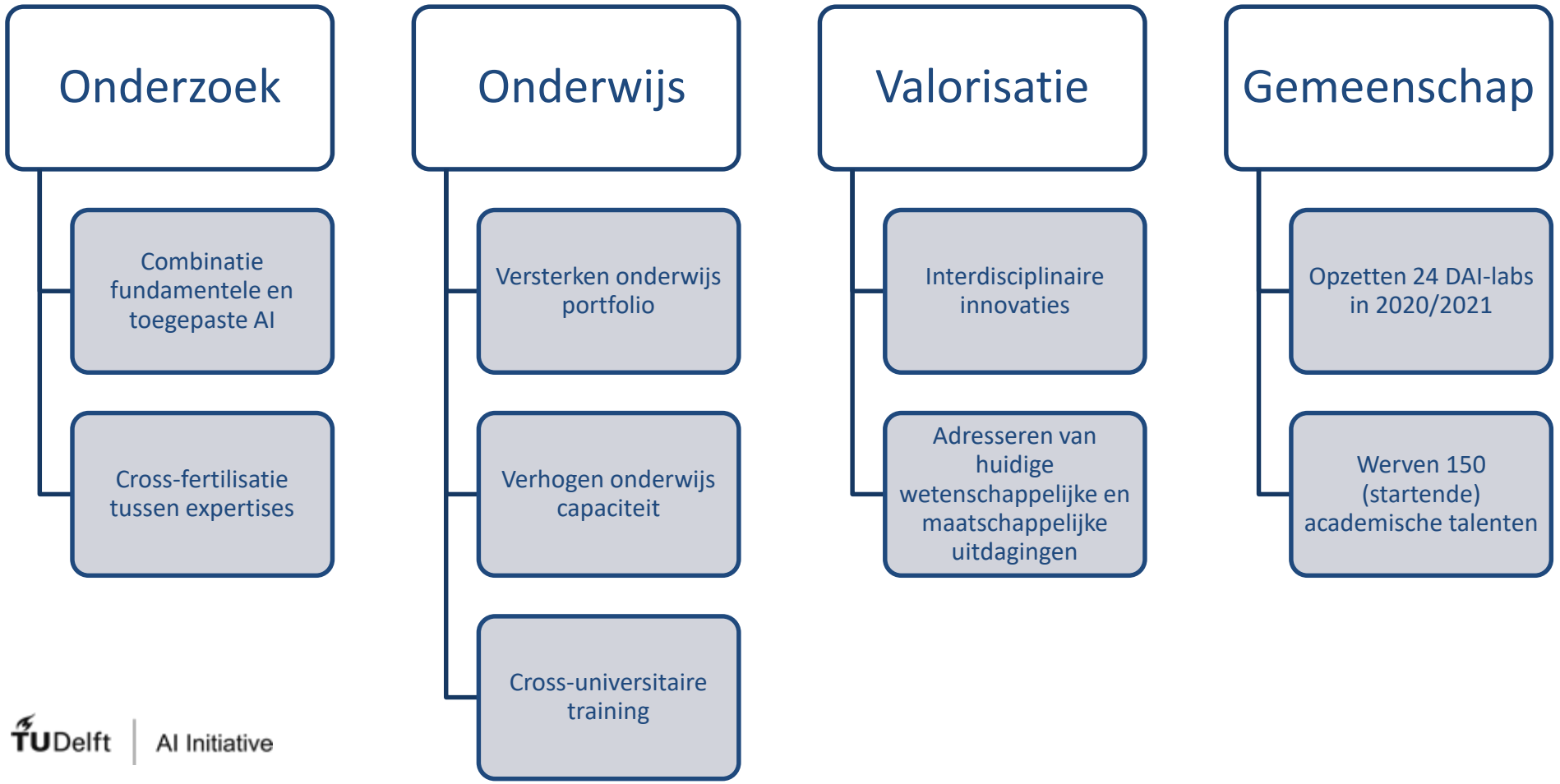
AI, Data en Digitalisation voor onderzoek/ onderwijs/ onderwijs-innovatie aan de TU Delft

2. Ambities AIDU



2. Het DAI-Lab concept

Een DAI-Lab belichaamt de brug tussen expertise **in** AI-grondslagen en expertise van gebieden die **met** behulp van AI werken aan maatschappelijke en wetenschappelijke uitdagingen.



2.Doelen DAI-Labs

Door het bouwen van bruggen tussen onderzoek ***in*** en ***met*** AI, Data en Digitalisatie, versterken/verhogen we ons

in deze en andere gerelateerde velden.

2. DAI-Labs

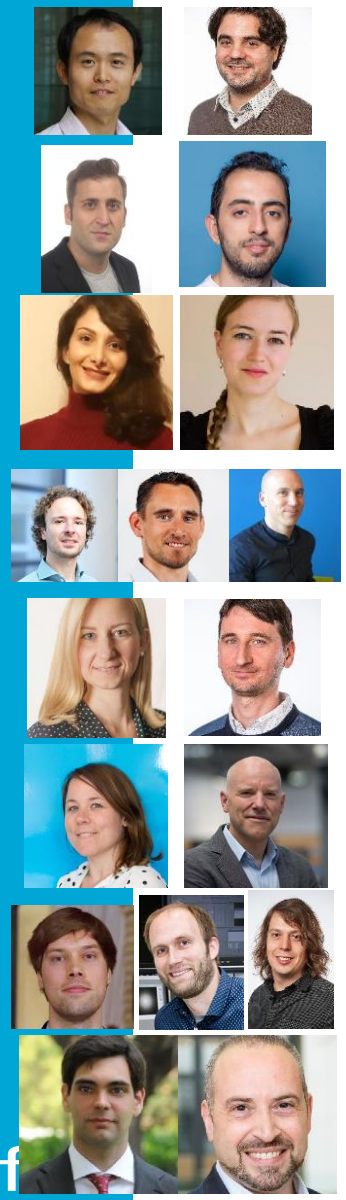
Aantal DAI-labs – 24 in totaal in 3 calls

1. 8 interdisciplinaire DAI-labs gelanceerd (juni 2020)
2. 8 interdisciplinaire DAI-labs te lanceren in **2020**
3. 8 interdisciplinaire DAI-labs te lanceren in **2021**

De kern van elk DAI-lab bestaat uit:

- 2 Tenure Trackers (1 IN AI en 1 MET AI)
- 4 Gezamenlijke PhD's (2 bij elke betrokken faculteit)

2. DAI labs – de eerste 8



3DUU **ABE | 3ME**	3D Urban Understanding	Liangliang Nan / Julian Kooij
AidroLab **CEG | EEMCS**	Artificial intelligence research in water management	Riccardo Taormina / Elvin Isufi
AI*MAN **AE | EEMCS**	Developing optimal and transparent decision making in human-AI teams	Anahita Jamshidnejad / Myrthe Tielman
CTAI-Lab **TPM | CEG**	CiTy AI Lab	Sander van Cranenburgh / Simeon Calvert / Oded Cats
DeTAIL **EEMCS | 3ME**	Delft Tensor AI Lab	Borbála Hunyadi / Kim Batselier
DI_Lab **IDE | EEMCS**	Designing Intelligence Lab	Catharine Oertel / Peter Lloyd
IRIS **AS | 3ME**	Intelligent & Reliable Imaging Systems	David Maresca / Arjen Jakobi / Carlas Smith
MACHINA **3ME | EEMCS**	Machine Intelligence Advances for Materials	Miguel Bessa / Angelo Accardo

DAI-labs: 2020 Call