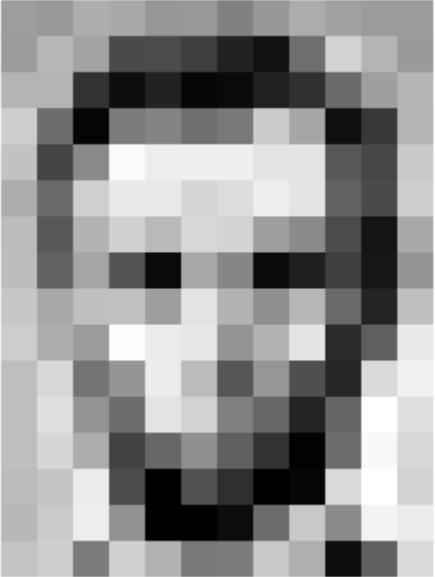
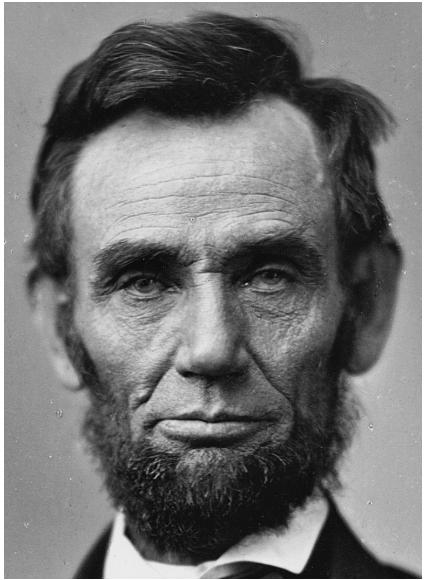


Demystifying AI in the classroom

“Leer hoe
AI te herherken op
het Internet”





157	153	174	168	150	152	129	151	172	161	155	156
155	182	163	74	75	62	33	17	110	210	180	154
180	180	50	14	84	6	10	33	48	106	159	181
206	109	5	124	131	111	120	204	166	15	56	180
194	68	137	251	257	239	239	228	227	87	71	201
172	105	207	233	233	214	220	239	228	98	74	206
188	88	179	209	185	215	211	158	139	75	20	169
189	97	165	84	10	168	134	11	31	62	22	148
199	168	191	193	158	227	178	143	182	105	36	190
205	174	155	252	236	231	149	178	228	43	95	234
190	216	116	149	236	187	85	150	79	38	218	241
190	224	147	108	227	210	127	102	36	101	255	224
190	214	173	66	103	143	95	50	2	109	249	215
187	196	235	75	1	81	47	0	6	217	255	211
183	202	237	145	0	0	12	108	200	138	243	236
195	206	123	207	177	121	123	200	175	13	96	218

157	153	174	168	150	152	129	151	172	161	155	156
155	182	163	74	75	62	33	17	110	210	180	154
180	180	50	14	84	6	10	33	48	106	159	181
206	109	5	124	131	111	120	204	166	15	56	180
194	68	137	251	237	239	239	228	227	87	71	201
172	105	207	233	233	214	220	239	228	98	74	206
188	88	179	209	185	215	211	158	139	75	20	169
189	97	165	84	10	168	134	11	31	62	22	148
199	168	191	193	158	227	178	143	182	106	36	190
205	174	155	252	236	231	149	178	228	43	95	234
190	216	116	149	236	187	85	150	79	38	218	241
190	224	147	108	227	210	127	102	36	101	255	224
190	214	173	66	103	143	95	50	2	109	249	215
187	196	235	75	1	81	47	0	6	217	255	211
183	202	237	145	0	0	12	108	200	138	243	236
195	206	123	207	177	121	123	200	175	13	96	218

[https://openframeworks.cc/ofBook/chapters/
image_processing_computer_vision.html](https://openframeworks.cc/ofBook/chapters/image_processing_computer_vision.html)

How the pixels look:

H	E	L	L	O
O	P	E	N	F
R	A	M	E	W
O	R	K	S	!

How the pixels are numbered:

0	1	2	3	4
5	6	7	8	9
10	11	12	13	14
15	16	17	18	19

How the pixels are stored in computer memory:

H	E	L	L	O	O	P	E	N	F	R	A	M	E	W	O	R	K	S	!
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

0 1 2 3...

WHY DESMISTIFYING AI?

To make sense of the world

“ Sense-making is the way that humans choose between multiple possible explanations of sensory input. ”

– Dave Snowden

<http://kwork.org/Stars/Snowden/snowden3.html#Simplicity>

**“The inescapable resurgence of {AI}
on the world wide web {WWW}
— along with the arrival of Internet-of-Things {IoT} —
has expanded the scope of the
digital world into the realm of cybernetics”**

Cybernetics studies communication & control of information in living beings +
the machines built by humans

=====> Feedback & Reinforcement <=====

The cybernetic foundation of {AI} explains its insatiable hunger for Big data, with the promise to solve societal challenges ranging from:

Health - Climate Change - Safety up to Cyber Physical Systems {CPSs}: Robotics & Driverless Cars

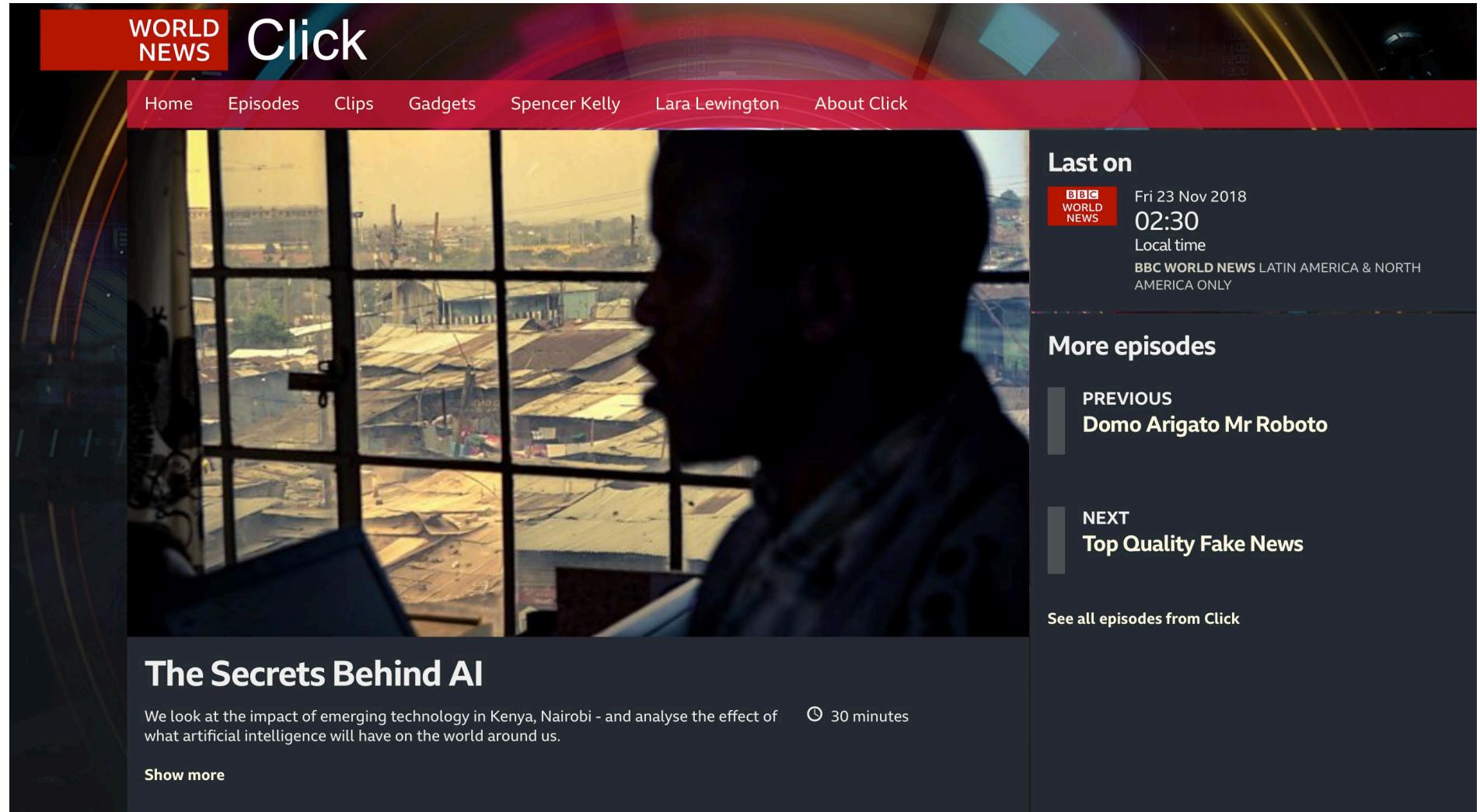
**Today it seems we only
receive ambiguous promises
and paradoxical stories**

**{AI} has revealed itself to us
as a double-edged sword:**

**Dangerous yet Supportive
All-Consuming yet Liberating**

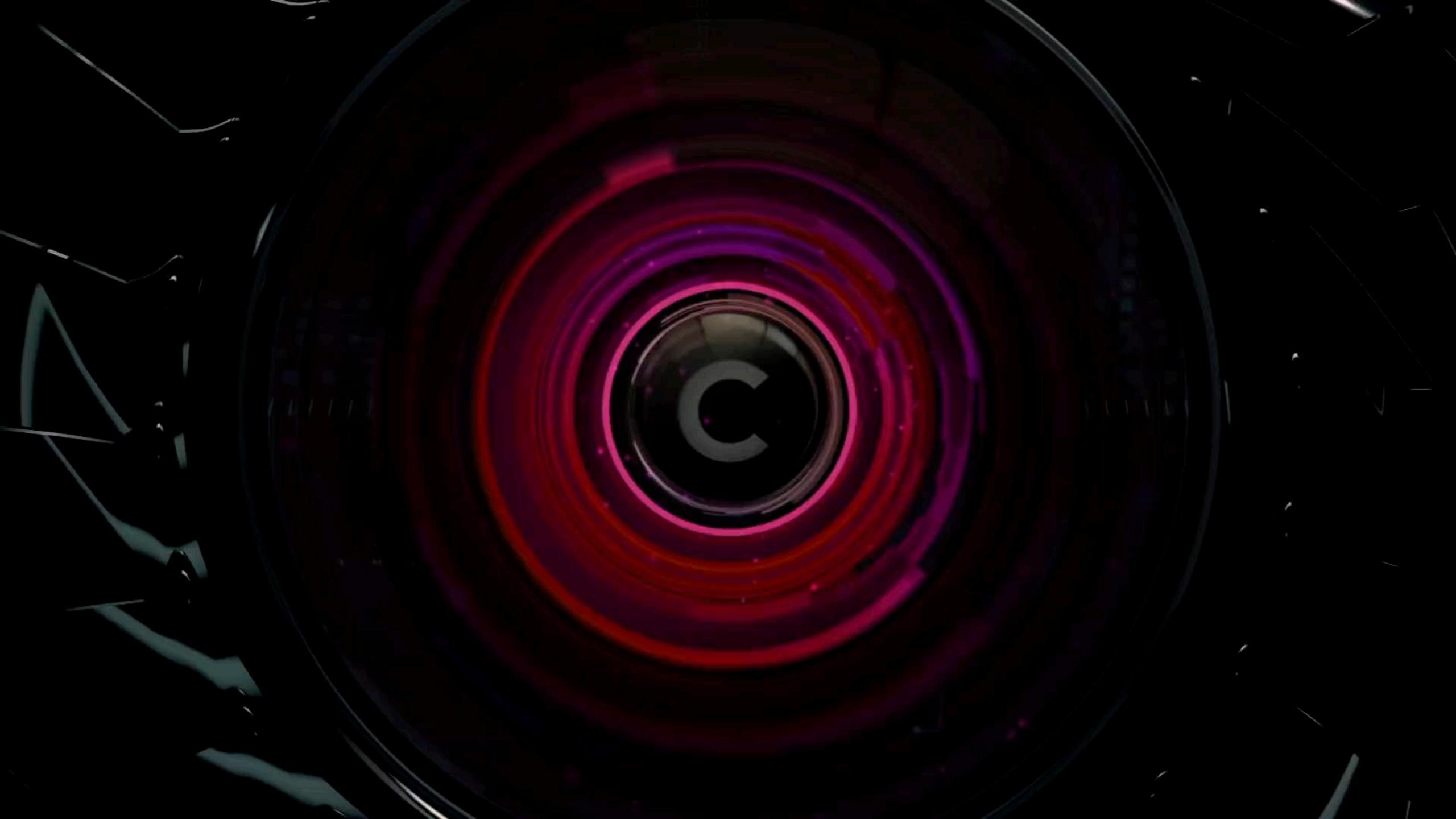
**{AI} is dominated by
labour intensive,
wasteful & costly
Brute-Force practices
using neural networks**

{The Secrets Behind AI}



The screenshot shows the BBC Click website interface. At the top left is a red 'WORLD NEWS' button. To its right, the word 'Click' is displayed in large white letters. Below this is a navigation bar with links: Home, Episodes, Clips, Gadgets, Spencer Kelly, Lara Lewington, and About Click. The main content area features a large image of a person looking out of a window at a cityscape. Below the image, the title 'The Secrets Behind AI' is shown in bold white text. A subtitle reads: 'We look at the impact of emerging technology in Kenya, Nairobi - and analyse the effect of what artificial intelligence will have on the world around us.' A 'Show more' link is visible. To the right of the main content, there's a sidebar titled 'Last on' which provides broadcast details: 'Fri 23 Nov 2018 02:30 Local time BBC WORLD NEWS LATIN AMERICA & NORTH AMERICA ONLY'. Below this are sections for 'More episodes' with links to 'PREVIOUS Domo Arigato Mr Roboto' and 'NEXT Top Quality Fake News'. A link 'See all episodes from Click' is also present.

C



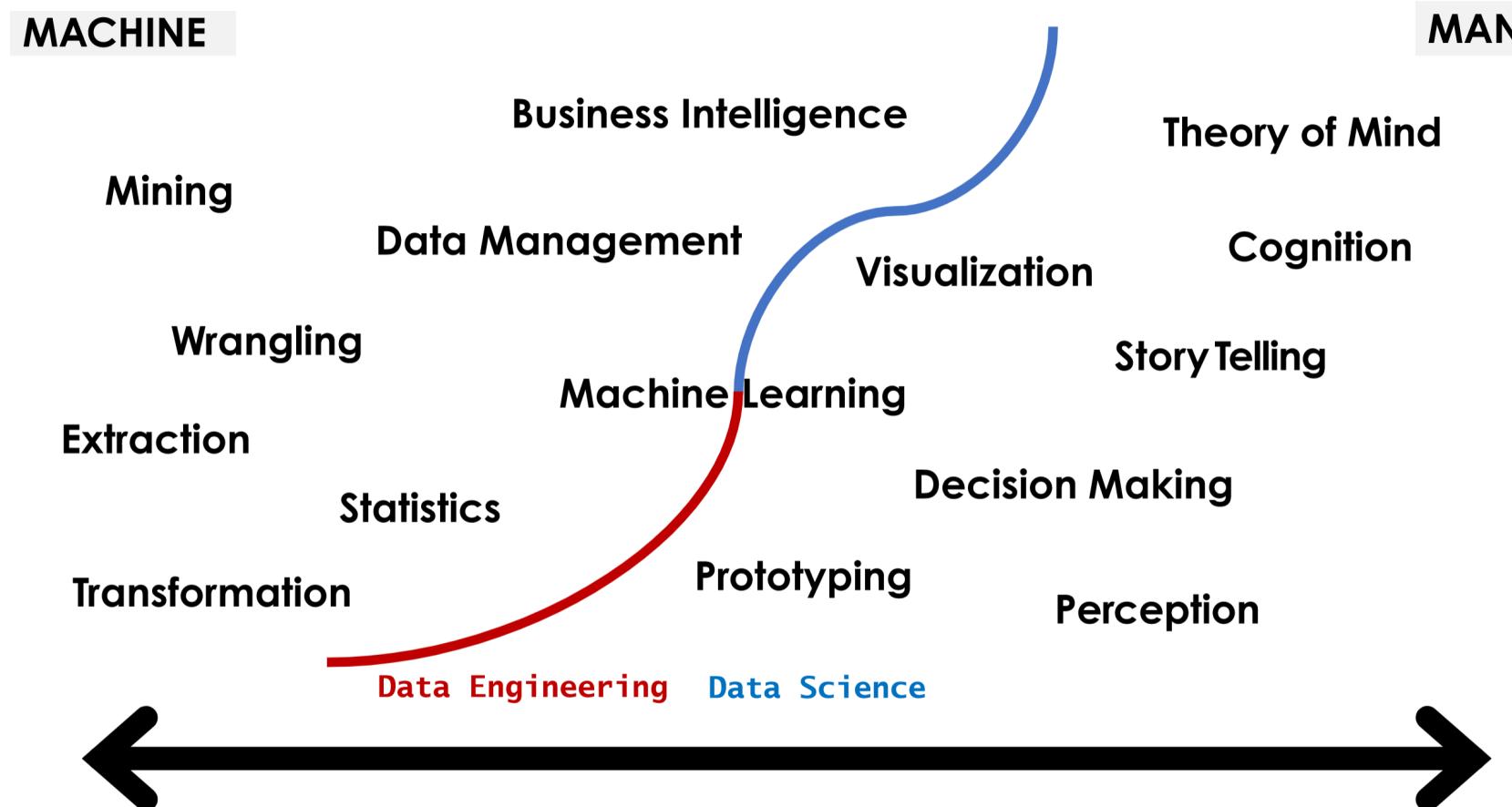
Artificial intelligence {AI}

“Kunstmatige Intelligentie”
Wat is dat eigenlijk?

"Kunstmatige intelligentie" {AI}

is een multidisciplinair vakgebied gericht op onderzoek naar en het ontwikkelen van technologie dat menselijke cognitieve, perceptuele en/of motorische vermogens kan nabootsen en/of automatiseren.

{AI integrates two Scientific Disciplines}



Inspired by Daniel Keim, "Visual Analytics: Definition, Process, and Challenges"

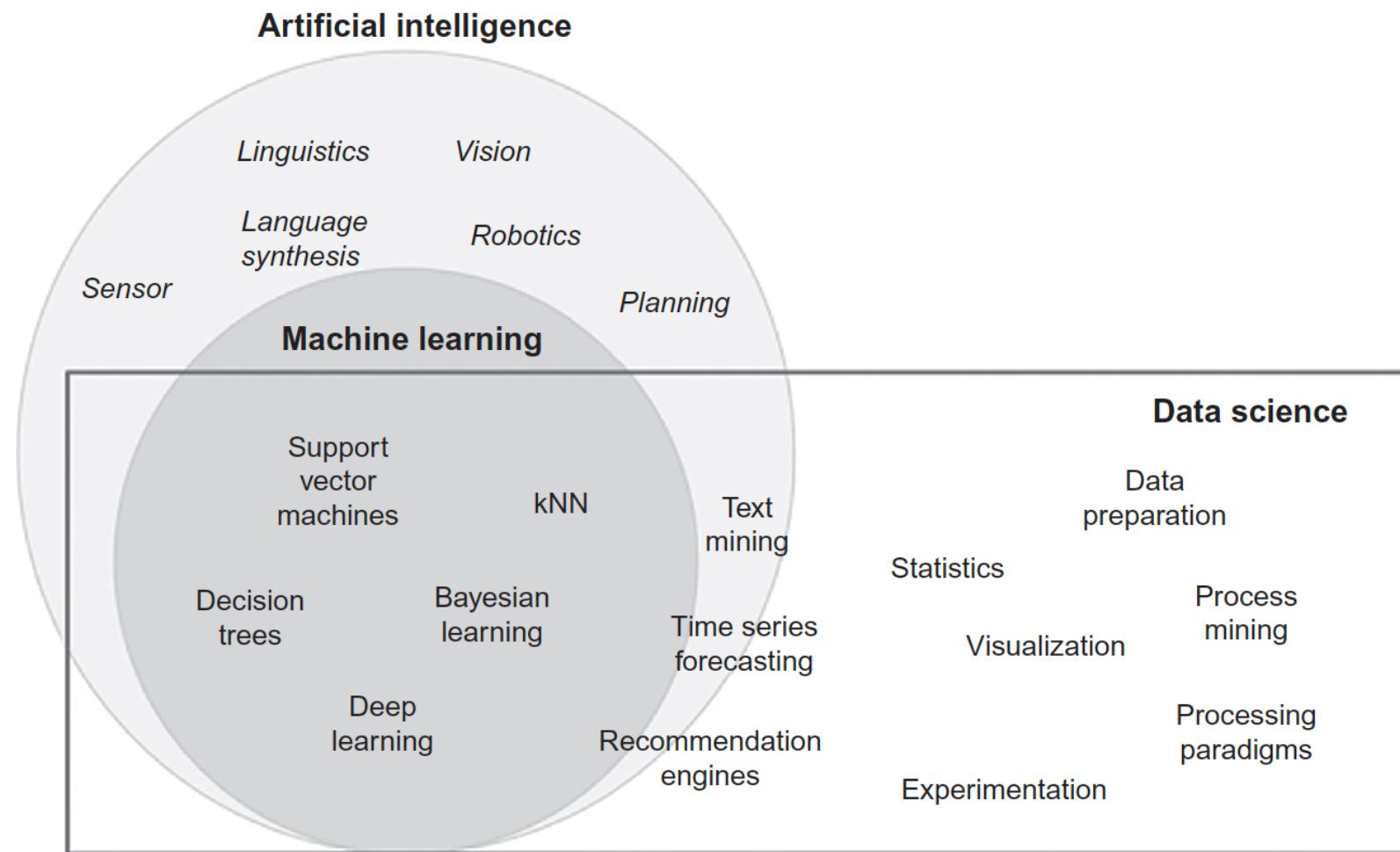
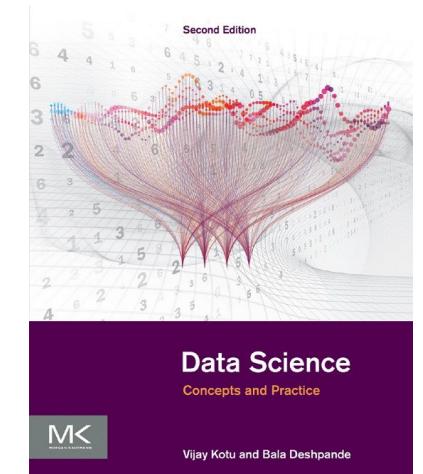
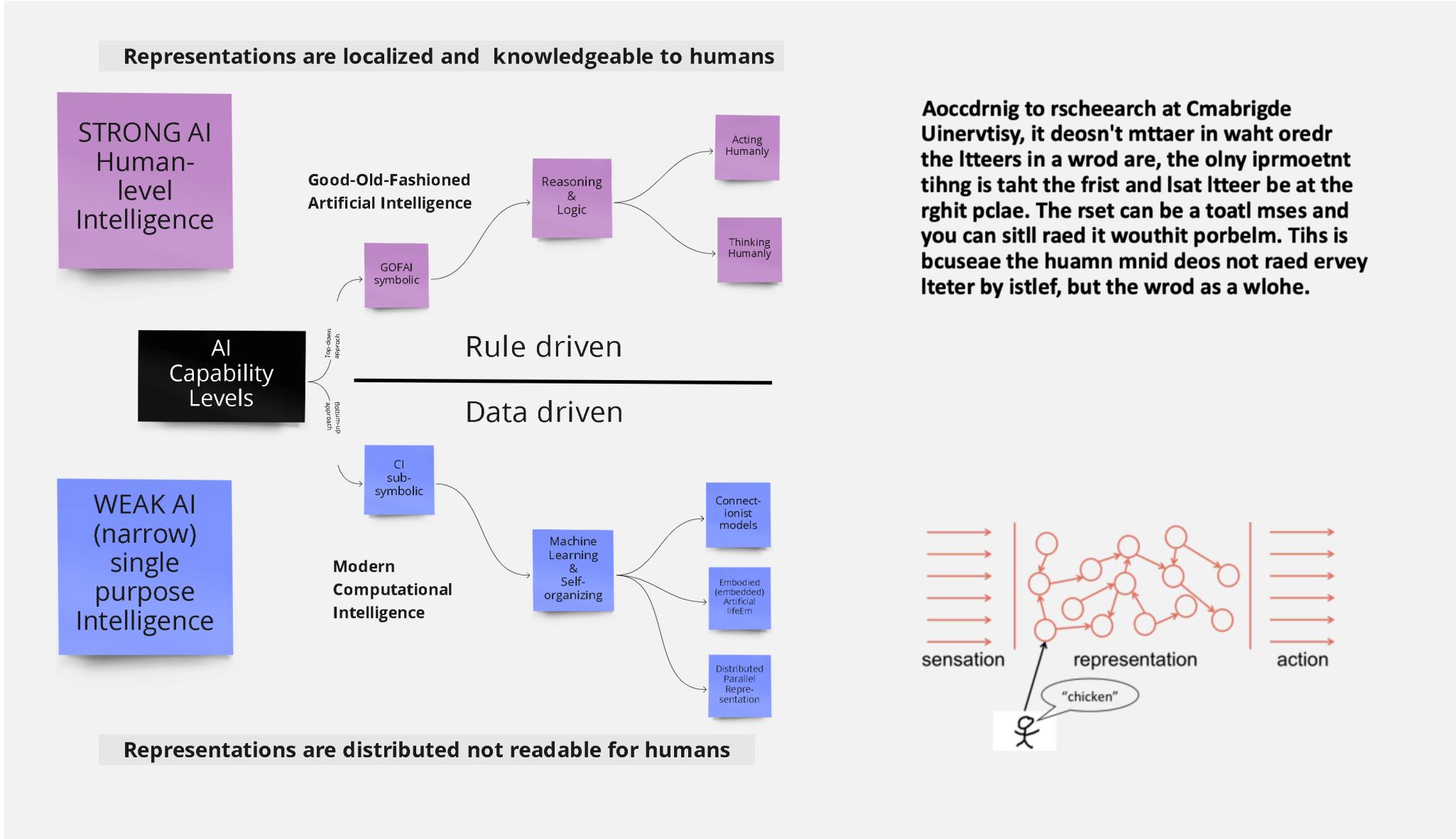


FIGURE 1.1

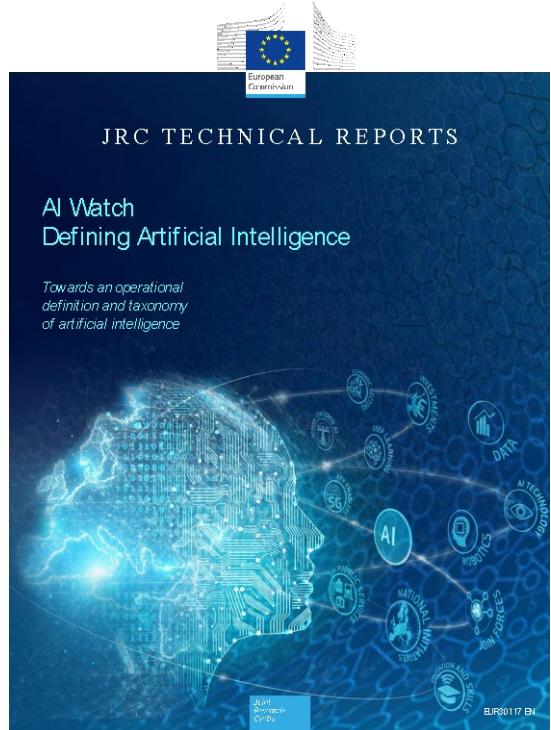
Artificial intelligence, machine learning, and data science.



{The taxonomy of AI is complex}



{The taxonomy of AI is complex}



<https://publications.jrc.ec.europa.eu/repository/handle/JRC118163>

AI taxonomy		
	AI domain	AI subdomain
Core	Reasoning	Knowledge representation
		Automated reasoning
		Common sense reasoning
Core	Planning	Planning and Scheduling
		Searching
		Optimisation
Core	Learning	Machine learning
		Natural language processing
		Computer vision
Core	Perception	Audio processing
		Multi-agent systems
		Robotics and Automation
Transversal	Integration and Interaction	Connected and Automated vehicles
		AI Services
		AI Ethics
Transversal	Ethics and Philosophy	Philosophy of AI

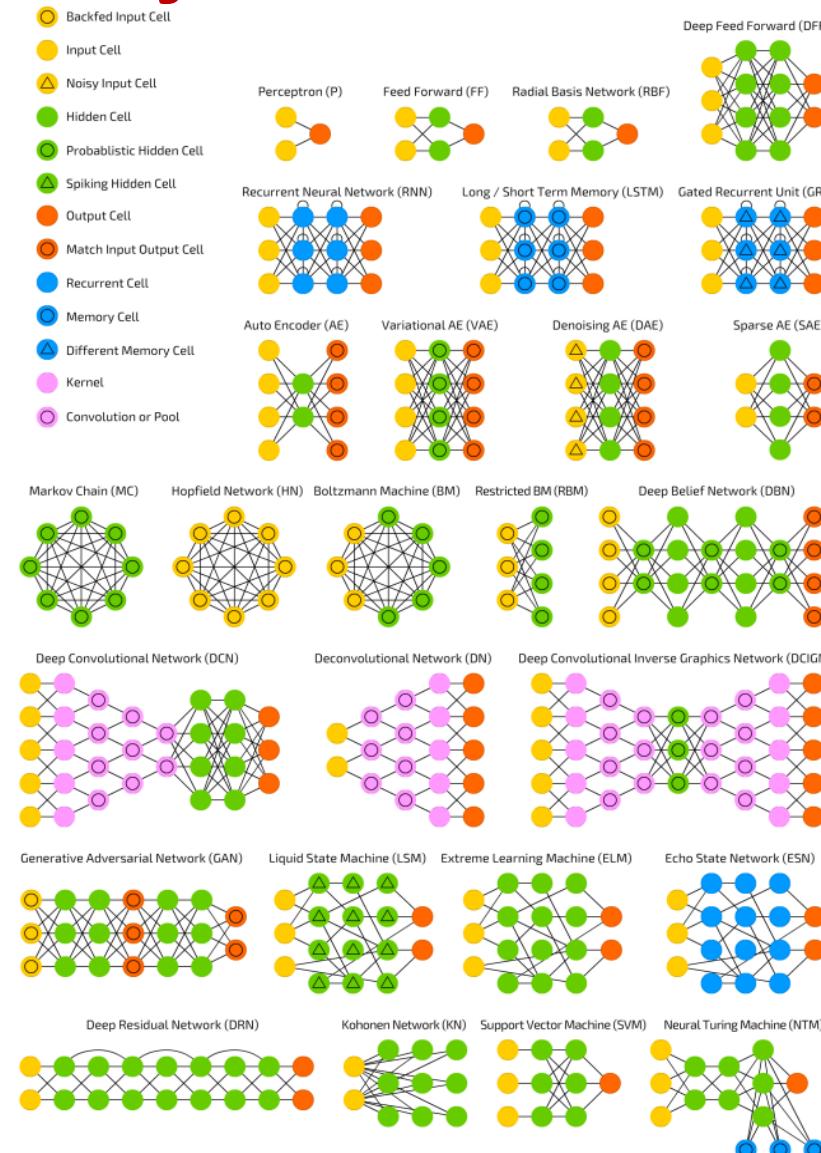
<http://dx.doi.org/10.2760/382730%20>

{AI requires Architecture}

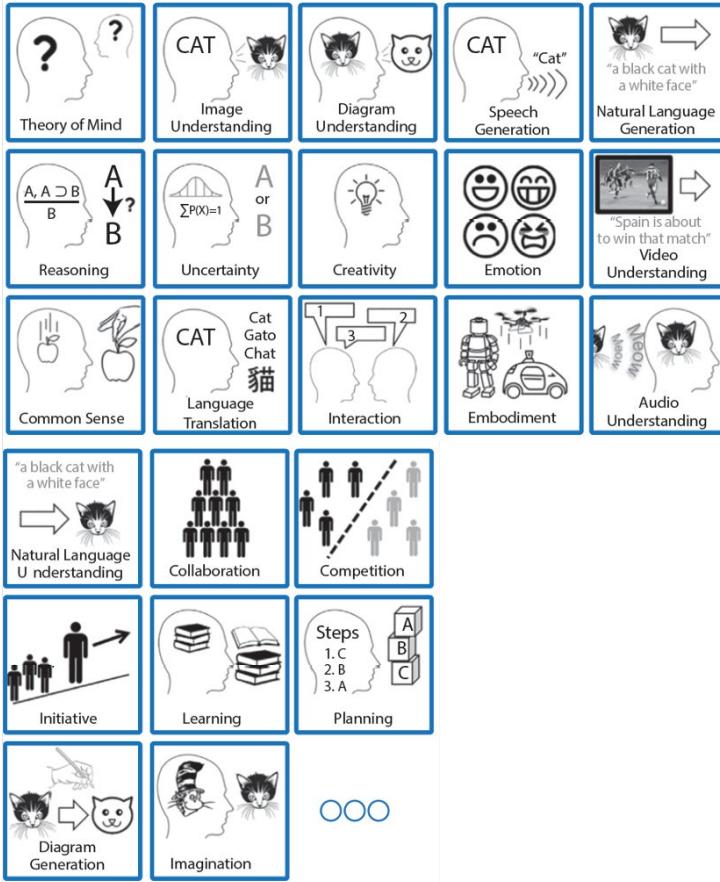
Topology of a neural network refers to the way artificial neurons are connected to form a network.

Form follows function!
The topology of a network determines the degree of perplexity of the tasks it can perform.

<https://pub.towardsai.net/main-types-of-neural-networks-and-its-applications-tutorial-734480d7ec8e>



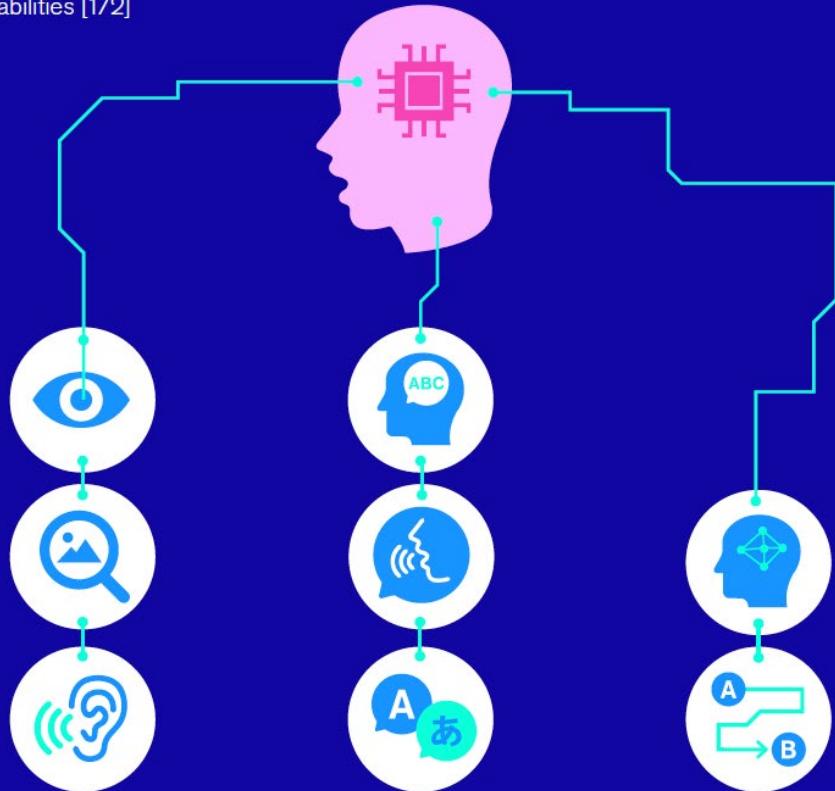
<https://doi.org/10.1609/aimag.v37i1.2643>



	Menselijk Vermogen	Toepassing
Cognitie	Verwerken, Begrijpen en Onthouden van informatie via het Brein.	Spraak, Natuurlijke Taalverwerking , Logisch Redeneren, Problemen Oplossen, Theory of Mind [ToM] .
Perceptie (invoer)	Verzamelen van Ongestructureerde Informatie via Sensoren : Ogen, Oren, Neus, Huid, Tong	Beeldherkenning, Sprakherkenning, Object Lokalisatie.
Motorische vermogens (uitvoer)	Uitvoeren van fysieke acties via Effectoren : Armen, Handen, Benen, Voeten, Mond, Lippen	Zelfrijdende auto's, Drones, Humanoïde Robots, Tekst-naar-spraak synthese

<https://robfvdw.medium.com/the-world-wide-web-ai-safari-b2e4f7f90647>

AI Capabilities [1/2]



1. Perception

- Object recognition: being able to identify objects from visual information (including facial recognition)
- Scene analysis: understanding what's going on in a visual scene (eg not just being able to identify that there's a car and a human in a scene, but being able to understand that the car is about to run over the human).
- Speech recognition: being able to pick out speech from a soundscape

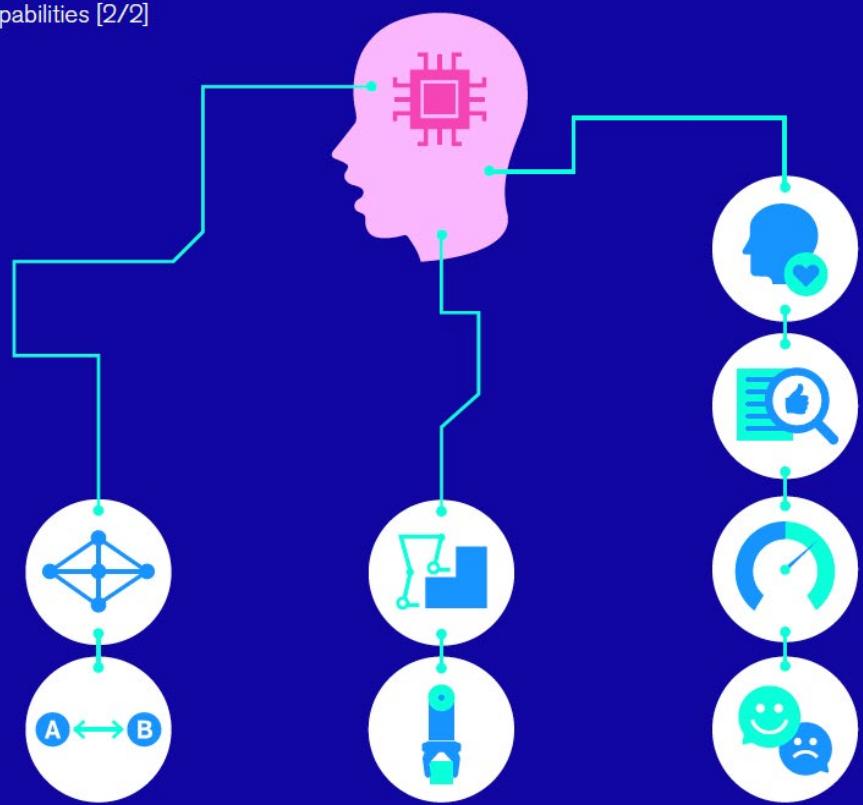
2. Natural Language Processing

- Understanding language (text and speech)
- Generating language (text and speech)
- Translating from one language to another

3. Reasoning and Planning

- Making logical deductions (eg understanding that if "Socrates is a man" and "All men are mortal", that therefore "Socrates is mortal".)
- Working out the optimal route to reach a specified goal (eg how to solve a multi-step puzzle in the fewest number of moves; how to drive from London to Manchester in the quickest possible time)

AI Capabilities [2/2]



4. Knowledge Representation

- Understanding the semantic relationships between concepts (eg that a chicken is a type of bird)
- Verbal reasoning (eg understanding that "man" is to "woman" as "boy" is to "girl")

5. Locomotion and Manipulation

- Being able to move about in a physical environment, and across different physical environments (eg walking on sand and up mountains and up and down stairs)
- Being able to pick up and manipulate physical objects (eg using a pen, tying shoe-laces, shaving)

6. Affective / Emotional Capacities

- Recognising emotions expressed through facial expressions, body language and tone of voice
- Sentiment analysis: understanding the sentiment expressed in speech or text (eg understanding if a tweet contains a pro or anti Brexit message)
- Being able to predict someone's emotional reaction to a given event / action
- Being able to display emotions, (eg generate facial expressions or speech that displays appropriate emotions)



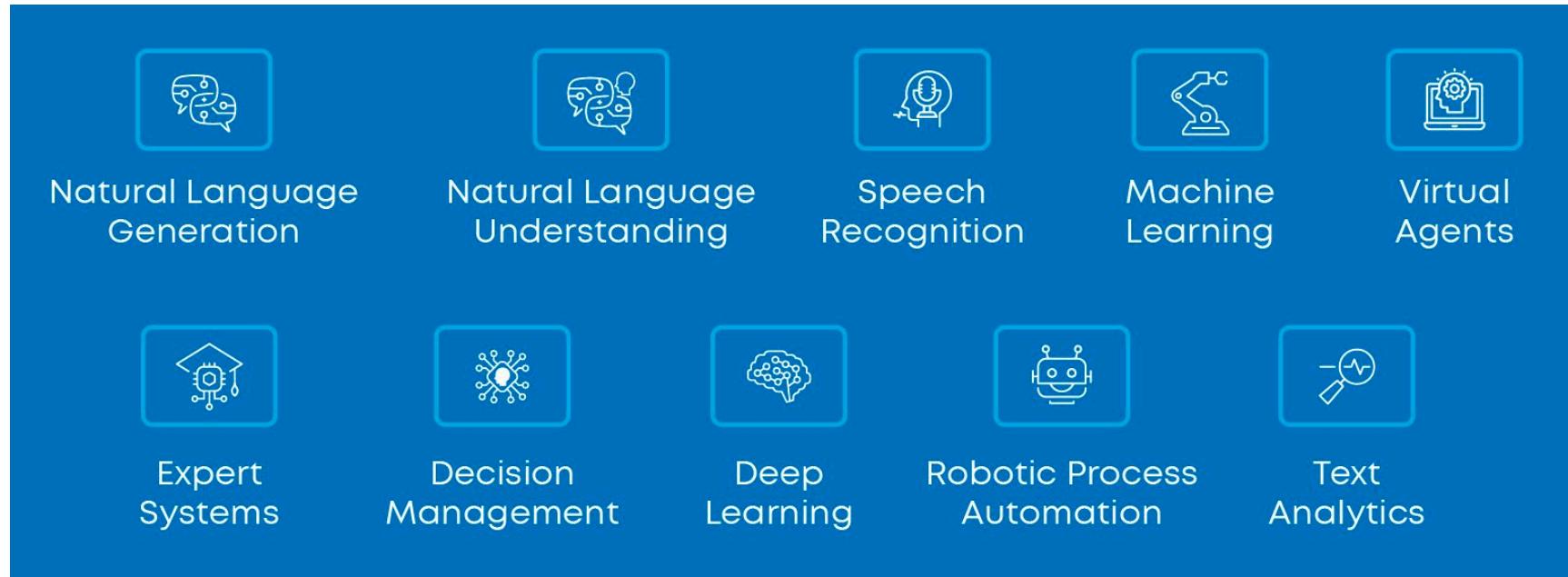


Figure 1

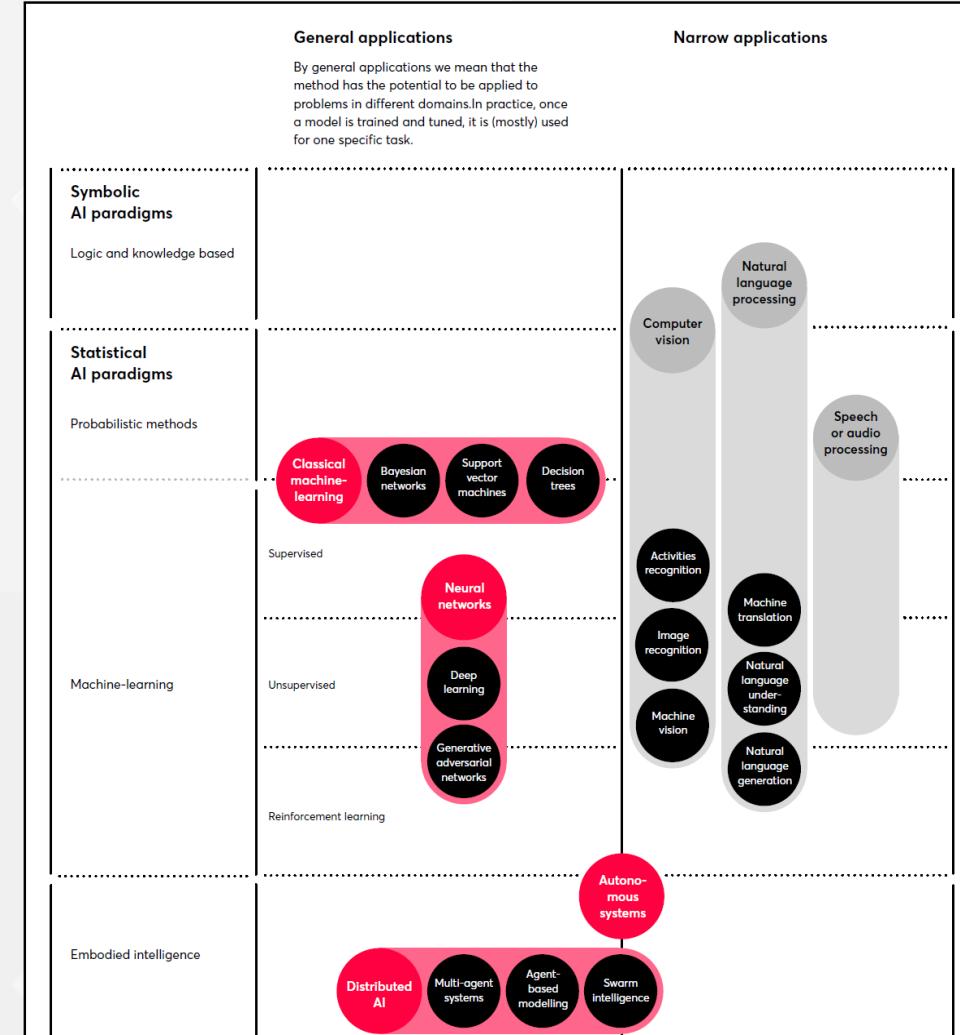


Figure 1 has been adapted from the AI Knowledge Map by Francesco Corea.

Artificial intelligence {AI}

*“Waarom maakt AI gebruik
van Modellen & Agenten?*

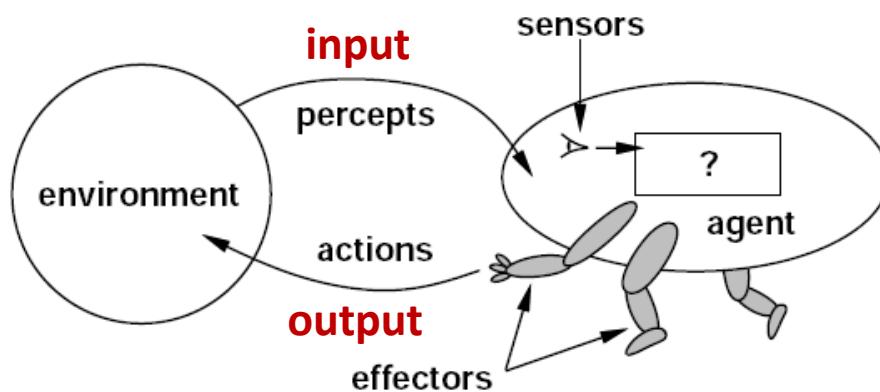
AI-model versus Agent

Agent == taak specifiek + doelgericht

Een versimpelde versie van de echte wereld **{invoer-uitvoer model}** dat de directe omgeving kan waarnemen via sensoren (**input**) en deze omgeving kan beïnvloeden via effectoren (**output**), gecombineerd met **zelflerend vermogen via feedback**.



AI (input-output) Model + agent



Realiteit

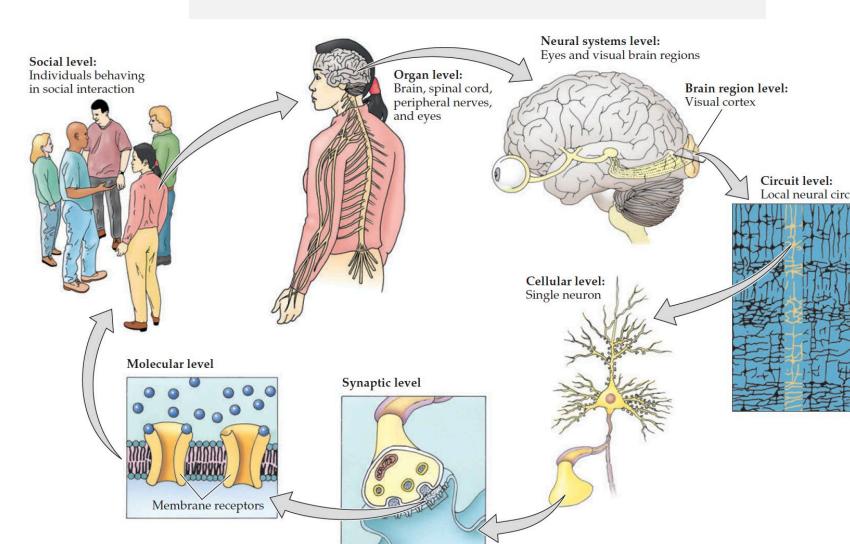
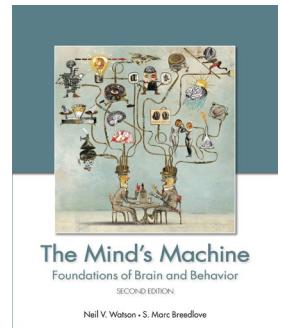


FIGURE 1.10 Levels of Analysis in Biological Psychology

Animal research is an essential part of life sciences research, including biological psychology



{AI requires MODELING to be able to learn}

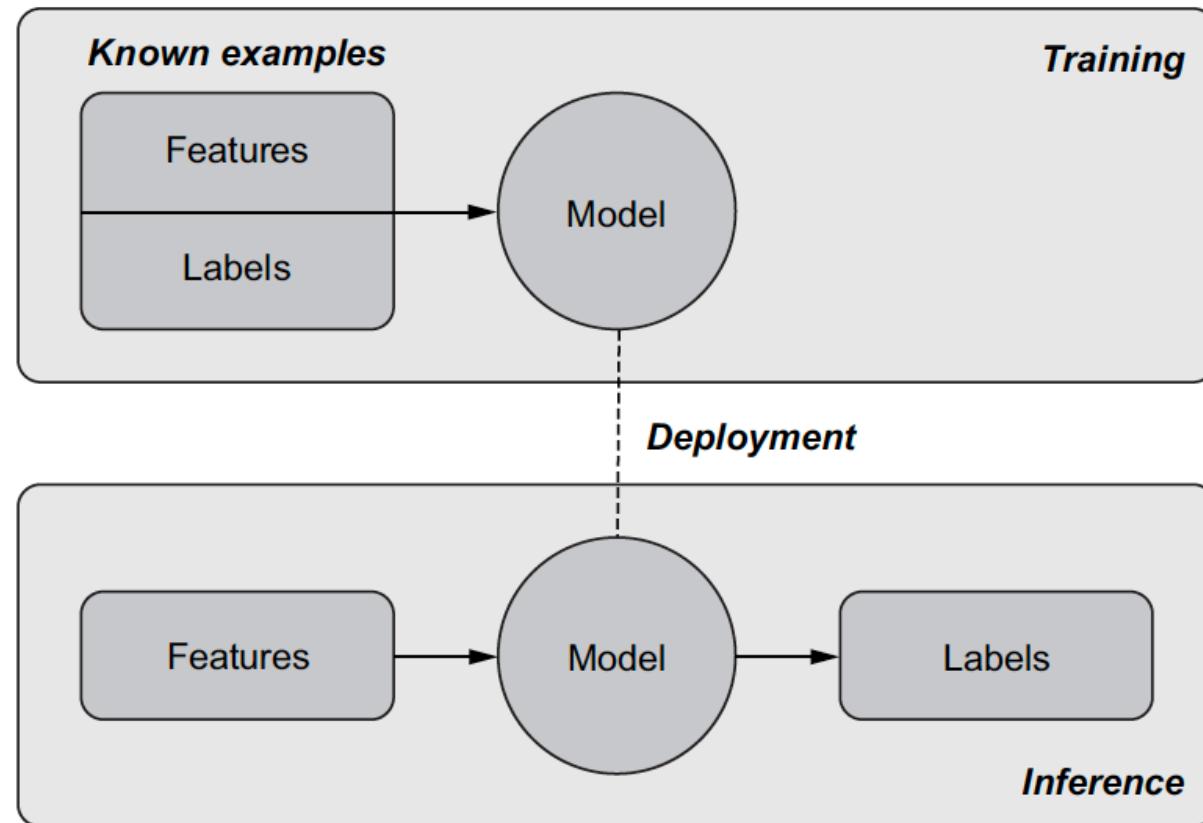
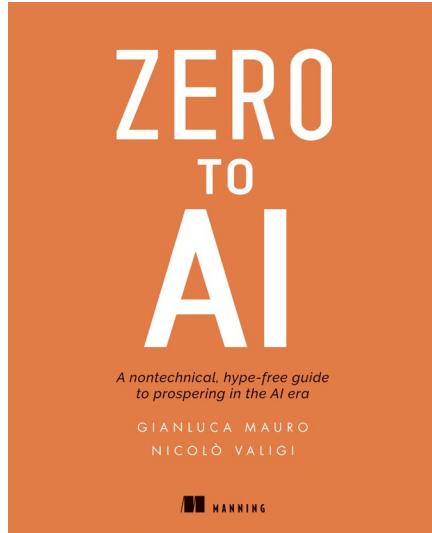


Figure 2.3 The two phases of machine learning: training and inference

{Modeling}

Classification



CAT

No spatial extent

Semantic Segmentation



**GRASS, CAT,
TREE, SKY**

No objects, just pixels

Object Detection



DOG, DOG, CAT

Multiple Object

Instance Segmentation



DOG, DOG, CAT

This image is CC0 public domain

{Human-in-the-Loop}

$$AI = ML + TD + HITL$$

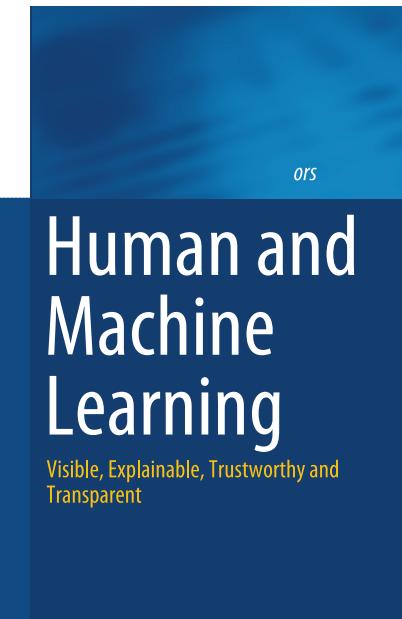


Artificial Intelligence:
in contrast to natural intelligence, it is *the ability of computer systems to perform tasks or actions that would normally require a human*

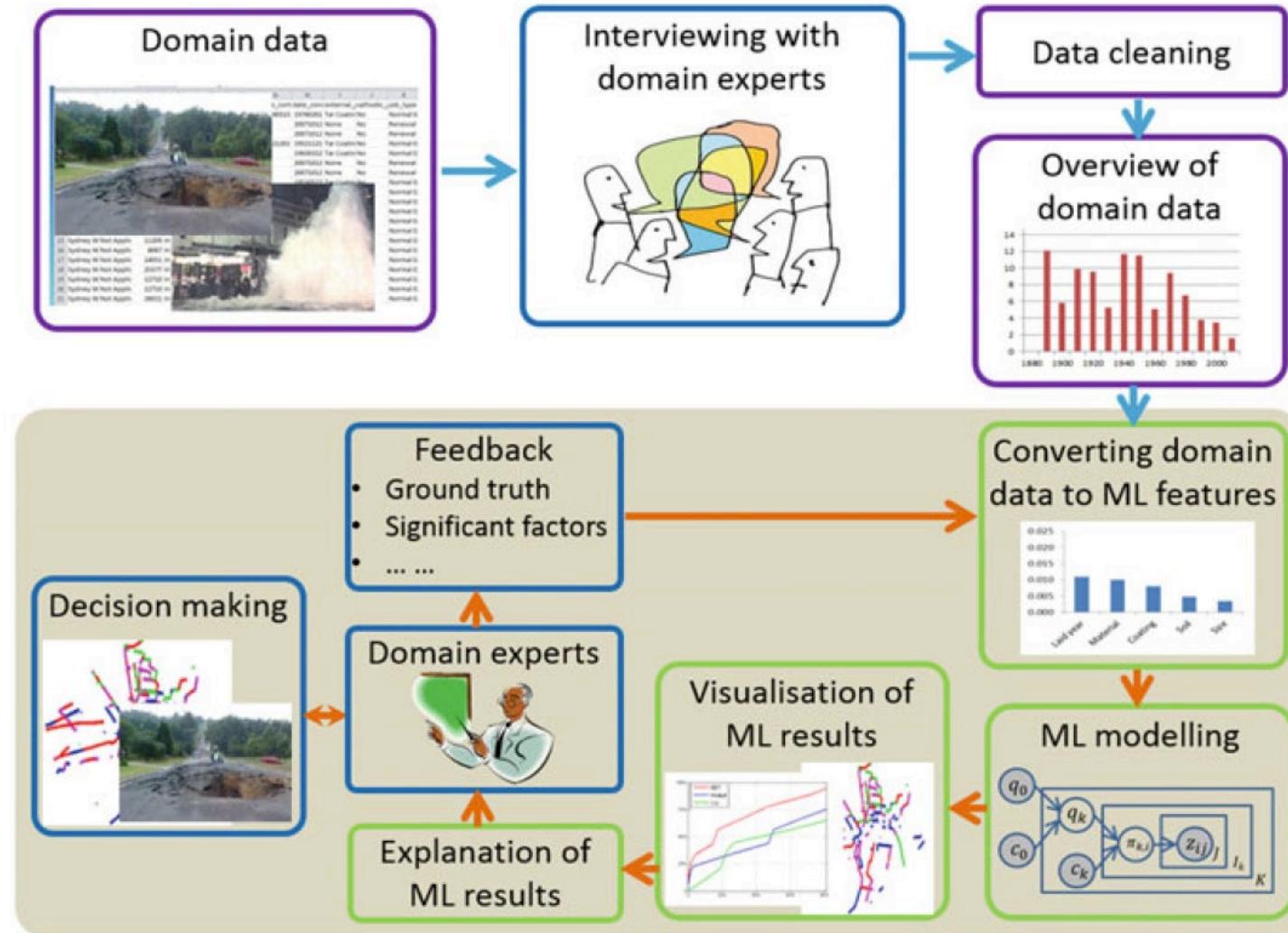
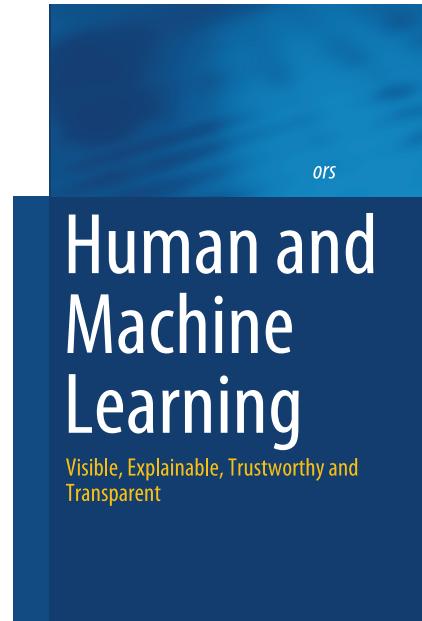
Machine Learning:
the ability of computer systems to use algorithms and statistical models to perform tasks without explicit instruction, through patterns and inferences

Training Data:
the data used to train a machine learning algorithm to perform a task in supervised machine learning

Human in the Loop:
the involvement of a human in training a machine learning algorithm



{Modeling}



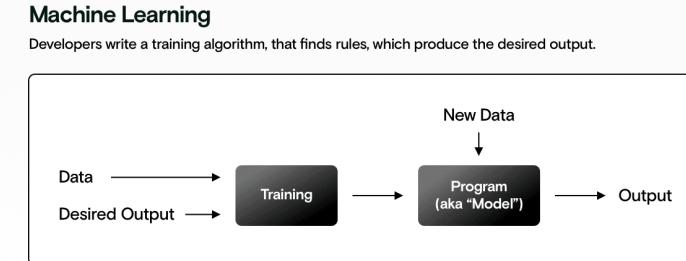
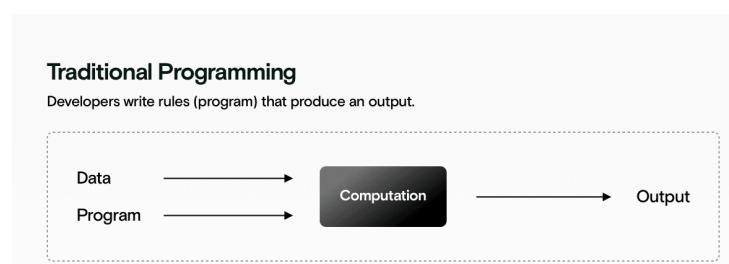
Artificial intelligence {AI}

*“Hoe zorg je ervoor dat een
computer kan leren?*

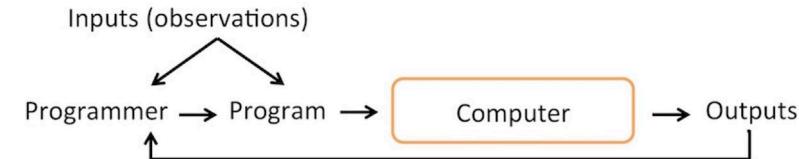
{AI requires MODELING to be able to learn}

“Machine Learning” [ML] is het vakgebied dat computers het vermogen geeft om te leren zonder expliciet geprogrammeerd te zijn door een mens

- Arthur Samuel {1959}



A The Traditional Programming Paradigm



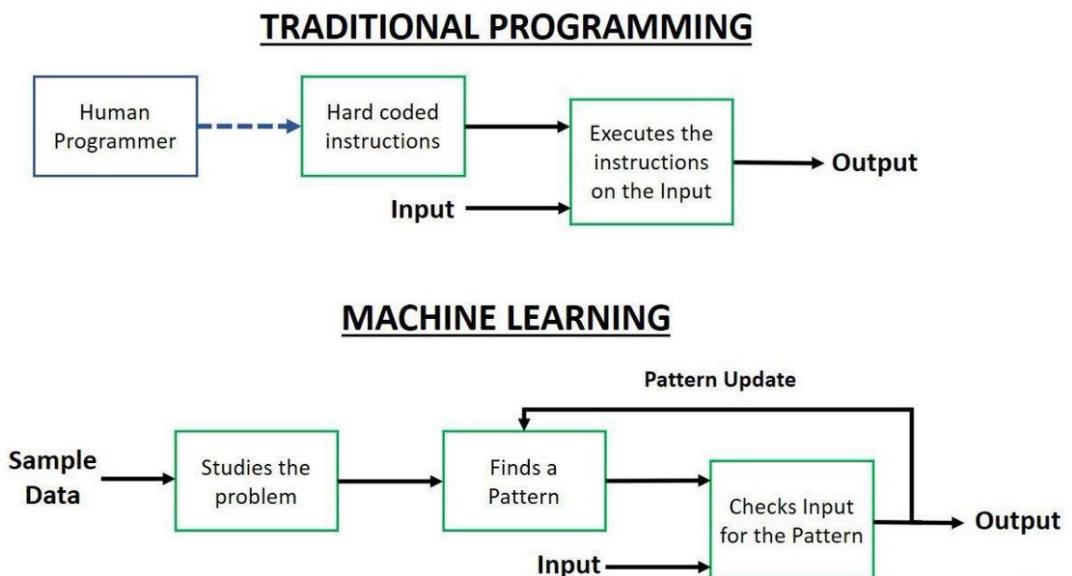
B Machine Learning



{AI requires MODELING to be able to learn}

“Machine Learning” [ML] is het vakgebied dat computers het vermogen geeft om te leren zonder expliciet geprogrammeerd te zijn door een mens

- Arthur Samuel {1959}



{AI must be able to LEARN}

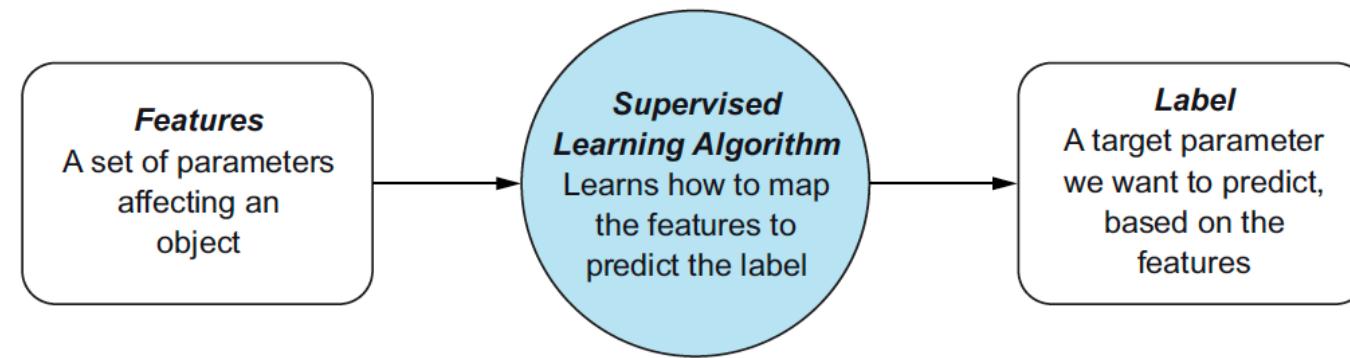
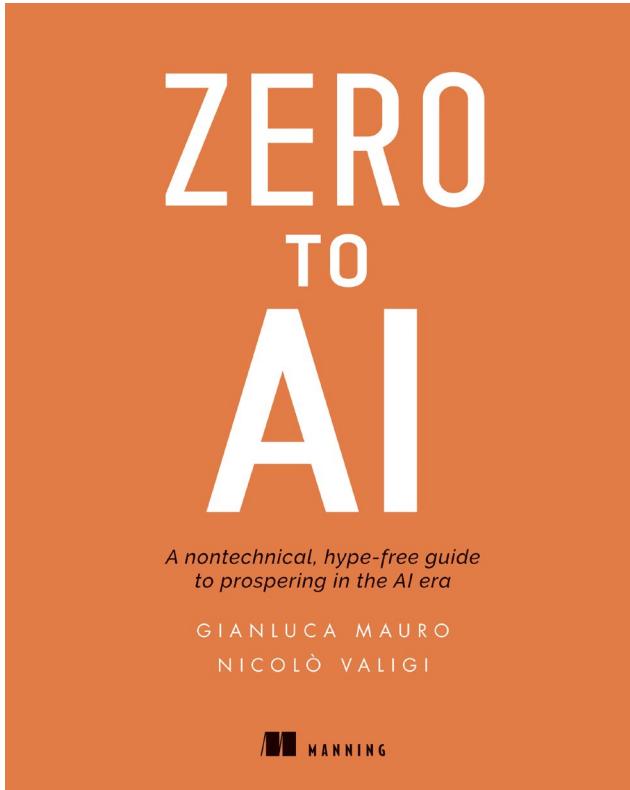
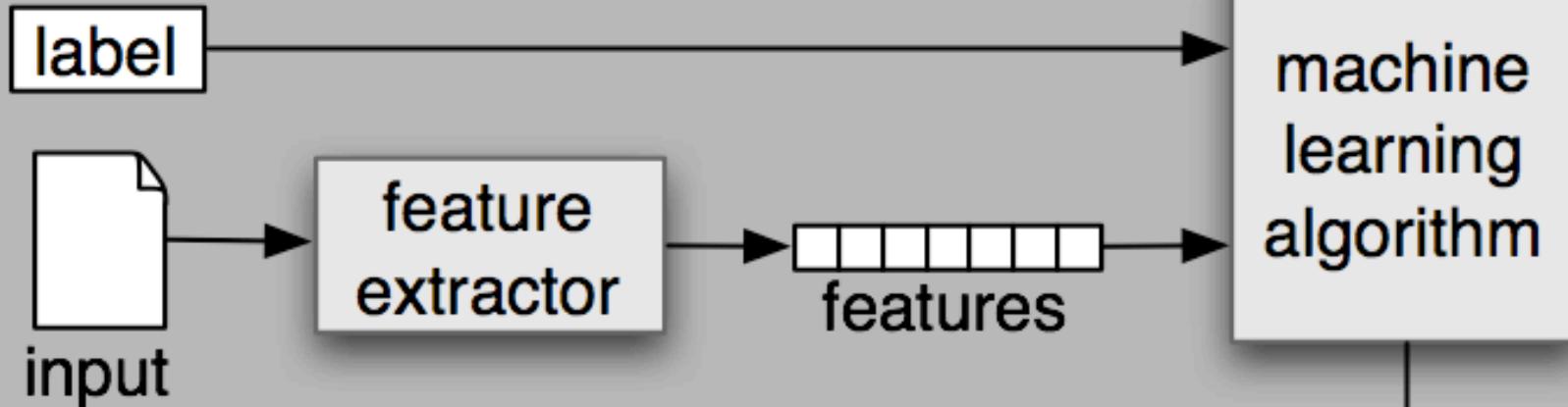


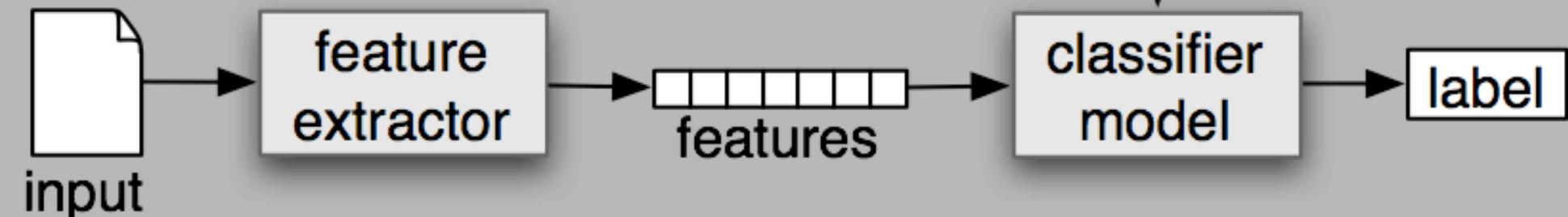
Figure 2.4 The core concept of supervised learning: finding a mapping between a set of features and a label

{AI requires Training}

(a) Training

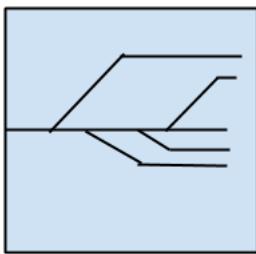


(b) Prediction

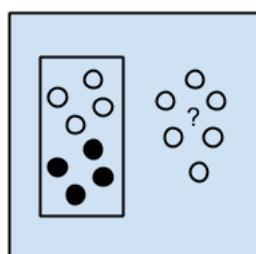


{Learning Algorithms}

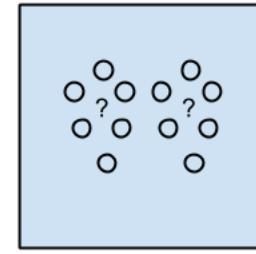
Algorithms Grouped by Learning Style



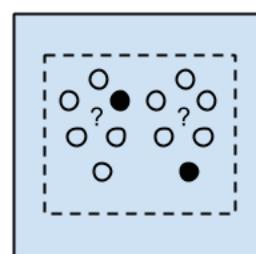
Regularization
Algorithms



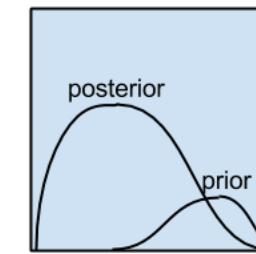
Supervised Learning
Algorithms



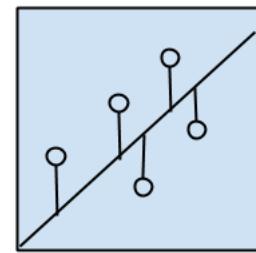
Unsupervised Learning
Algorithms



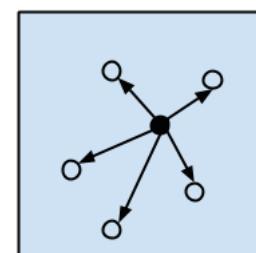
Semi-supervised
Learning Algorithms



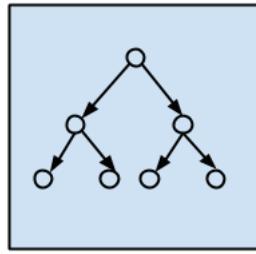
Bayesian Algorithms



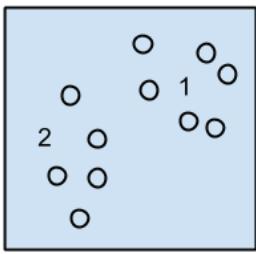
Regression Algorithms



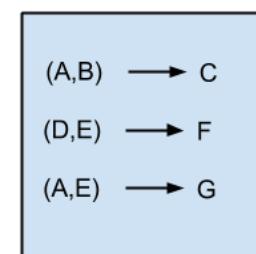
Instance-based
Algorithms



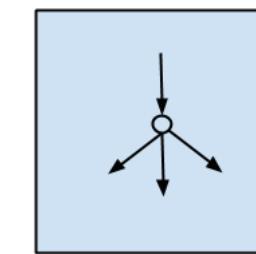
Decision Tree
Algorithms



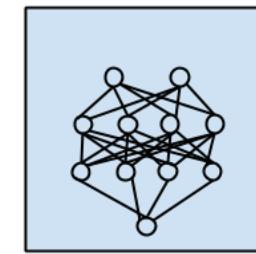
Clustering Algorithms



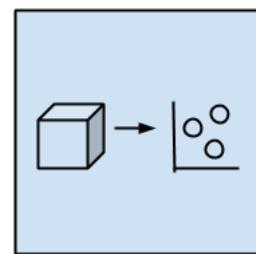
Association Rule
Learning Algorithms



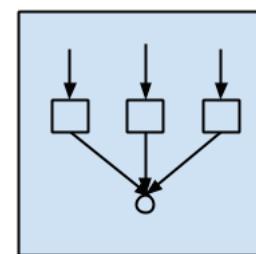
Artificial Neural Network
Algorithms



Deep Learning
Algorithms



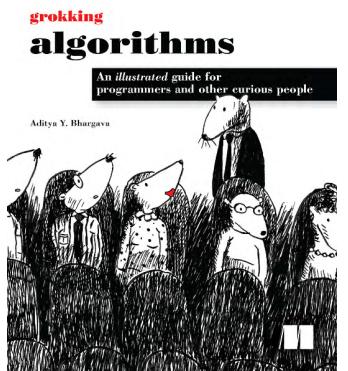
Dimensional Reduction
Algorithms



Ensemble Algorithms

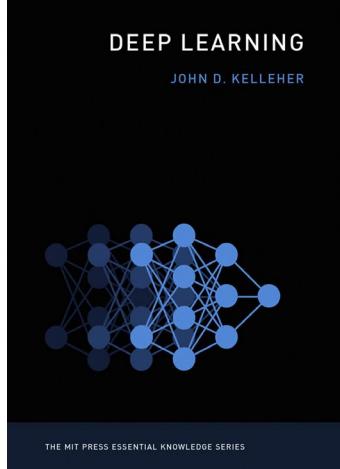
{Algorithm}

**Step by step process or recipe
describing
how to solve a problem and/or
complete a task,
which will always give
identical end results**



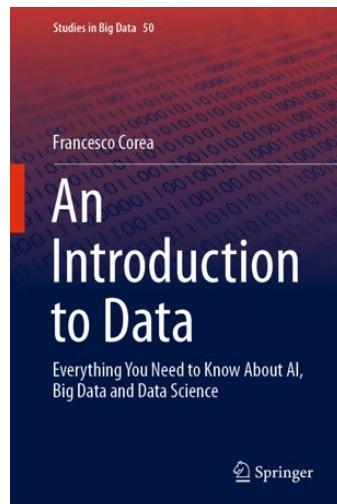
What constitutes a
{Deep} Neural Net?

{DL + DNNs}



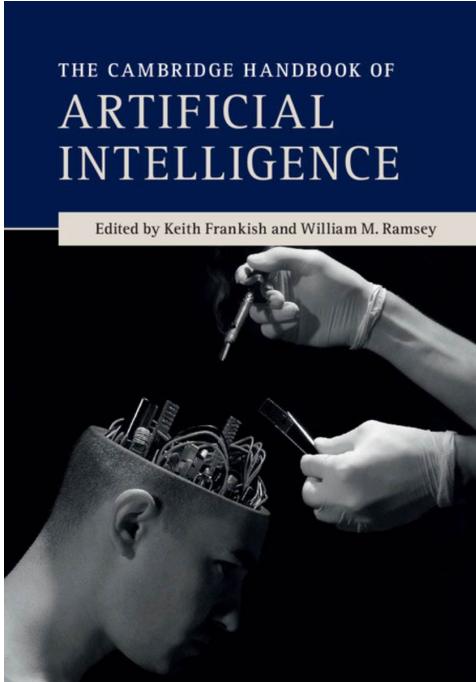
Deep learning {DL} must be understood as a major Machine Learning {ML} subdomain:

Crafting Deep Neural Networks {DNNs} that can attain human-level performances on challenging cognitive tasks.



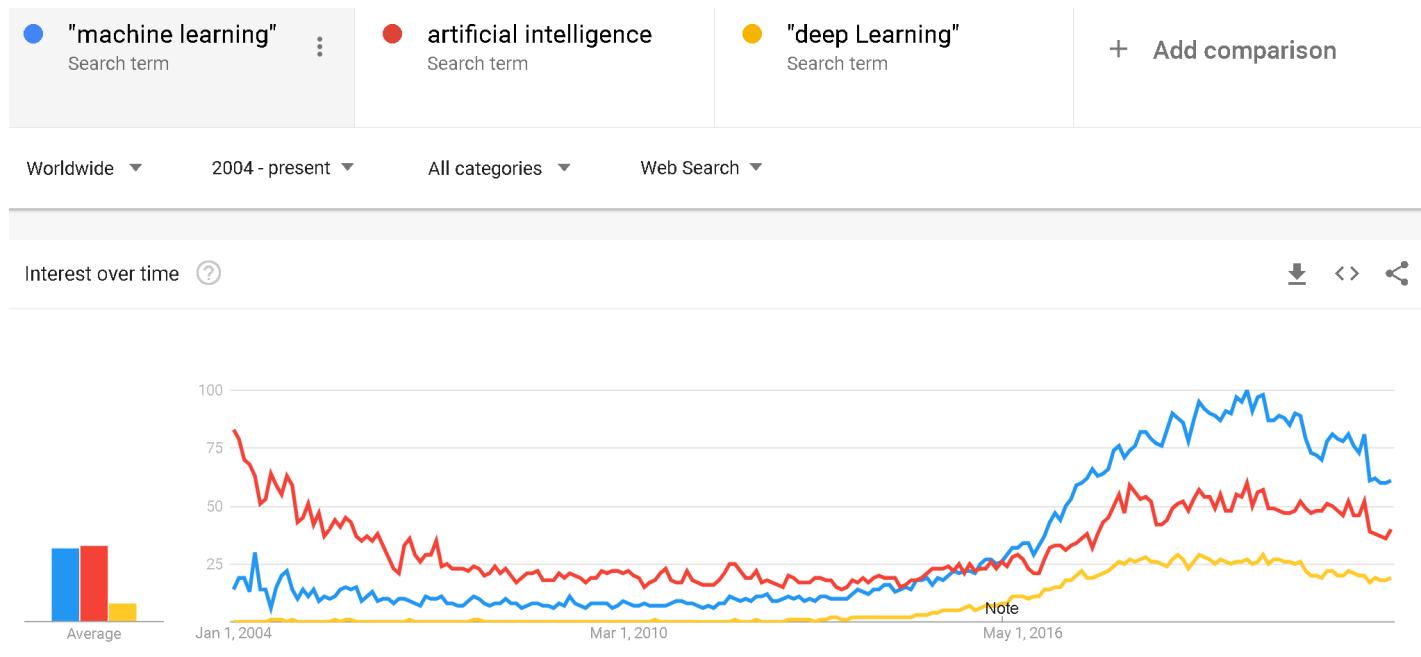
{DNNs} can Recognize Speech or Human Poses & Faces; Translate Text in real time at High Levels of Performance.

{DL}



(Pre-trained) Deep Learning {DL}

Neural Networks {NNs} are the most advanced, successful & fastest growing Artificial Intelligence {AI} technology

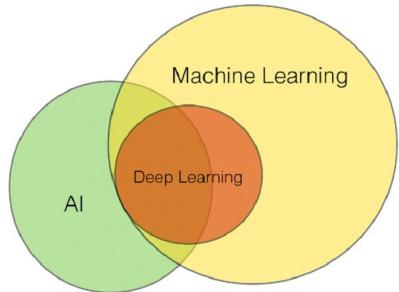


<https://trends.google.com/trends/explore?date=all&q=%22machine%20learning%22,artificial%20intelligence,%22deep%20Learning%22>

{AI=ML=DL}

AI enabled through {DL} must be understood as any form of Machine Learning {ML} technology mimicking & automatizing tasks which otherwise require

*human perception,
cognition and/or
motor skills*

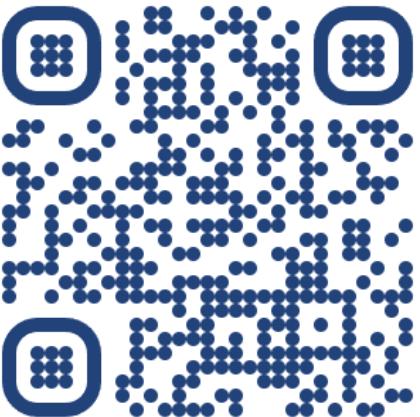


<https://robfvdw.medium.com/the-world-wide-web-ai-safari-b2e4f7f90647>

<https://doi.org/10.1609/aimag.v37i1.2643>



{Human-level performance}

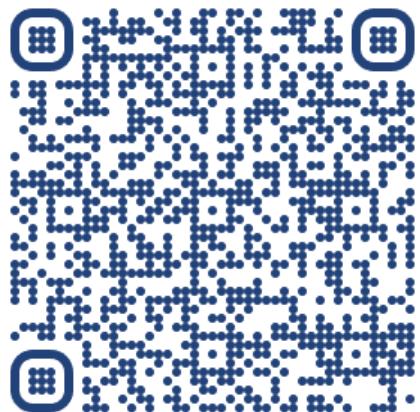


The screenshot shows the DeepL Translator interface. At the top, there's a navigation bar with the DeepL logo, "DeepL Translator", "DeepL Pro", "API", "Plans and pricing", "Apps FREE", "Contact Sales", "Start free trial", "Login", and a menu icon. Below the navigation, there are two main translation options: "Translate text" (26 languages) and "Translate files" (.pdf, .docx, .pptx). The "Translate text" option is selected and highlighted with a blue border. The main content area has two language dropdowns: "English" on the left and "Dutch" on the right. Between them is a central translation box containing the text: "{DL} must be understood as a major {ML} subdomain: Crafting Deep Neural Networks {DNNs} that can attain human-level performances on challenging cognitive tasks. {DNNs} can Recognize Speech or Human Poses & Faces; Translate Text between Languages at High Levels of Performance." To the right of this text, the Dutch translation is shown: "{DL} moet worden opgevat als een belangrijk {ML} subdomein: Het creëren van Diepe Neurale Netwerken {DNNs} die menselijke prestaties kunnen bereiken op uitdagende cognitieve taken. {DNNs} kunnen spraak of menselijke houdingen en gezichten herkennen; tekst vertalen tussen talen op hoog prestatieniveau." Below the text boxes are several interactive icons: a speaker icon, a thumbs up icon, a thumbs down icon, a share icon, and a copy icon. The entire interface is set against a light gray background.

<https://www.deepl.com/translator>

{Human-level performance}

Probeer Speech to Text uit met deze demo-app, ontwikkeld op basis van onze JavaScript-SDK



Taal

Dutch (Netherlands)

Automatische interpunctie

Spreken

Bestand uploaden

Uw spraakgegevens worden niet opgeslagen

[Ontdek hoe u Speech to Text in uw apps en producten gebruikt >](#)

[Verken meer aspecten van uw Speech to Text-uitvoer met het programma zonder code in Speech Studio >](#)

Kies de knop Spreken aan de linkerkant en begin met spreken. De spraakservice retourneert herkenningsresultaten terwijl u spreekt. Als u verschillende talen spreekt, kunt u elke taal uitproberen die door de spraakservice wordt ondersteund. U kunt ook bestanden uploaden om de spraakservice voor uw specifieke gebruiksscenario's te testen. Raadpleeg onze documentatie en ontdek hoe u de spraak-naar-tekstfunctie in uw oplossingen inbouwt.

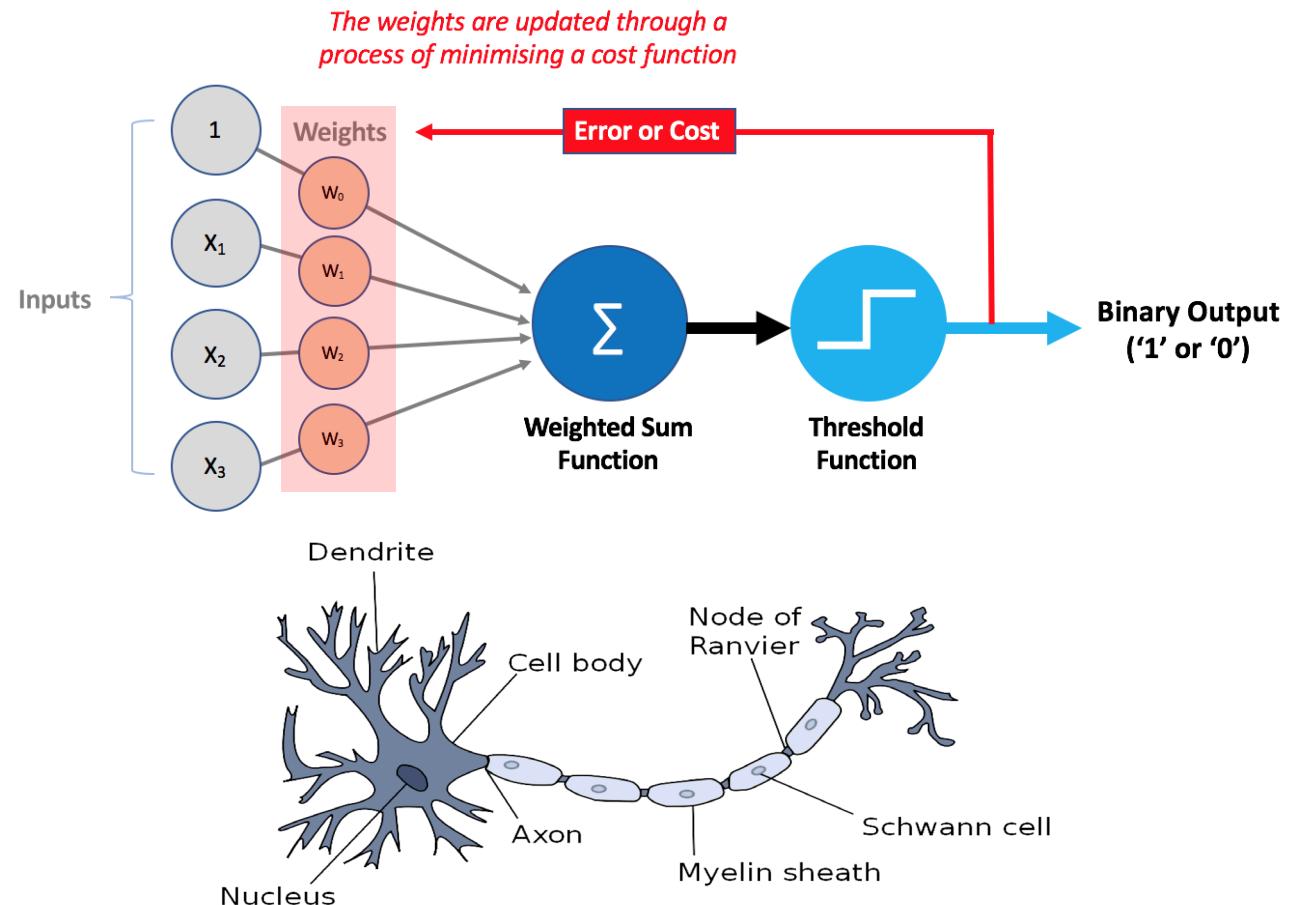
<https://azure.microsoft.com/nl-nl/services/cognitive-services/speech-to-text/#features>

{Artificial Neurons}

Deep Neural Nets {DNNs} harbor vast amounts of
“artificial neurons” →smallest computational unit←

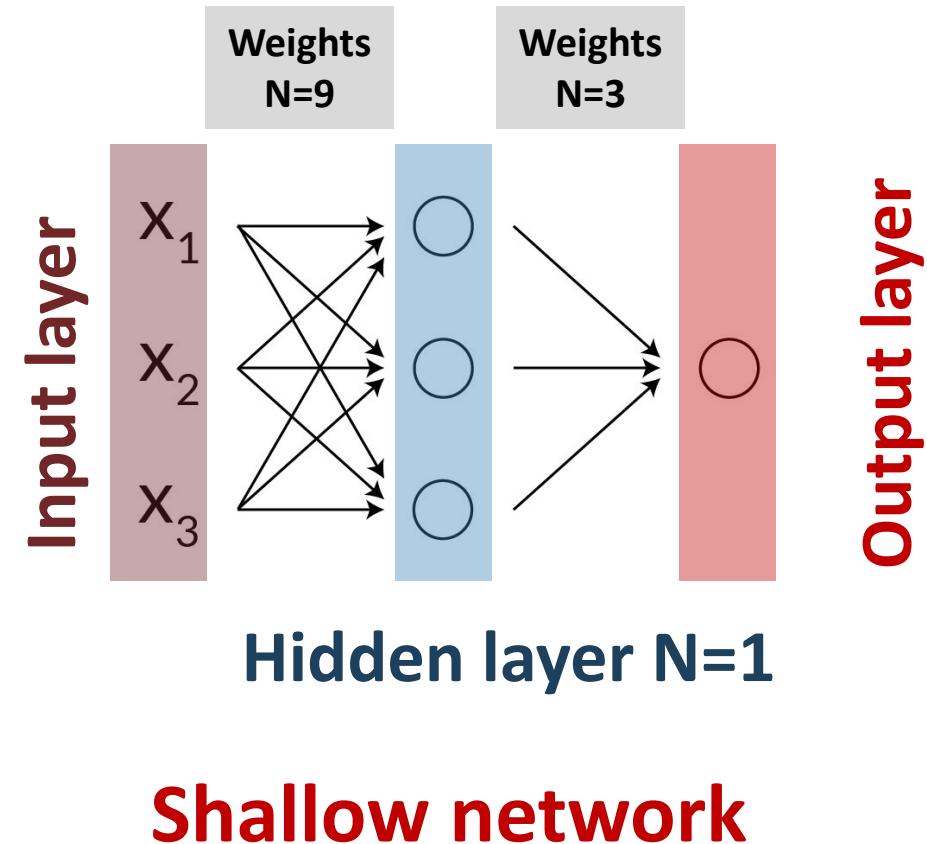
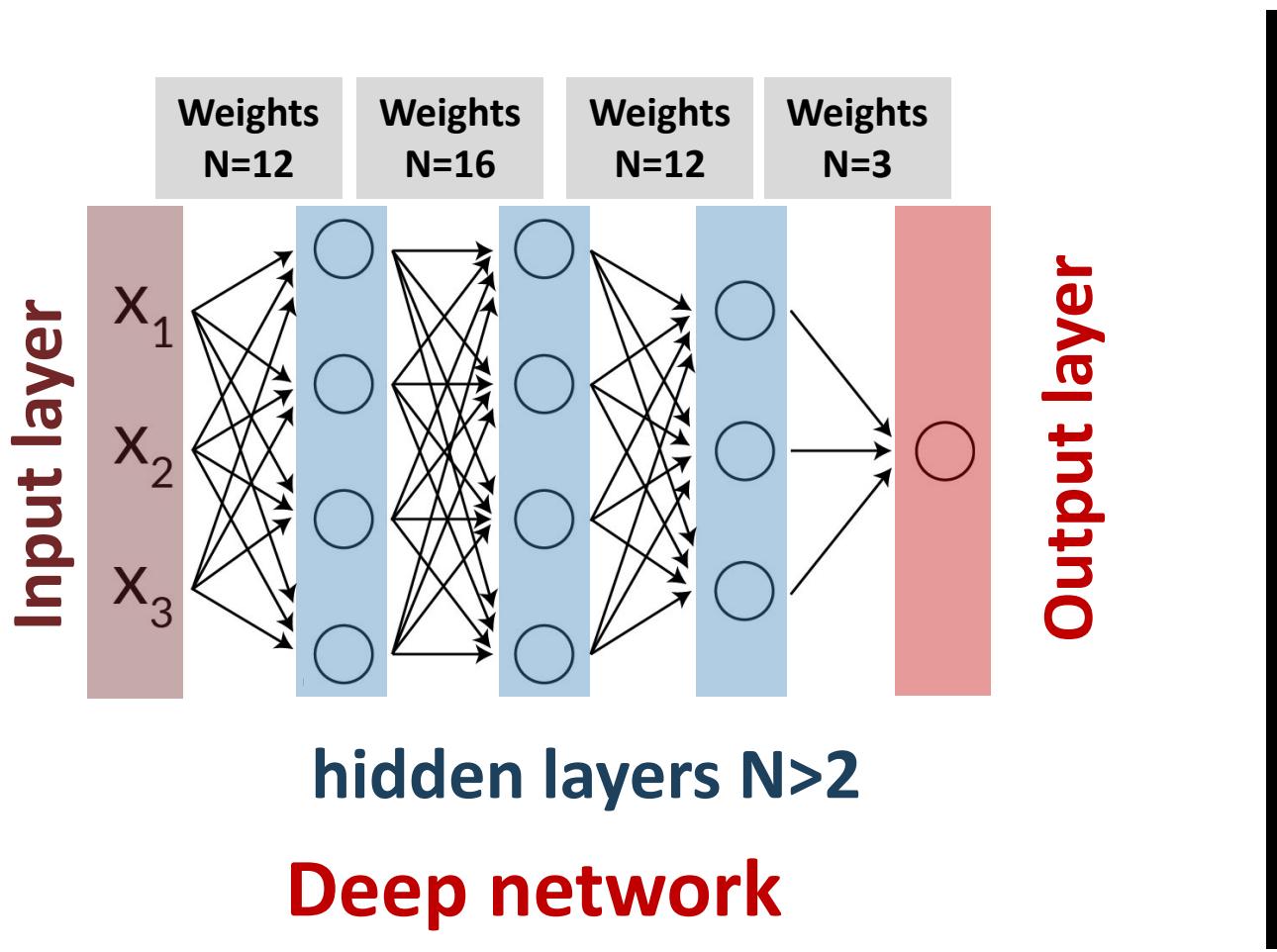
**Names for
 Artificial Neurons**

{unit}
{cell}
{node}
{perceptron}



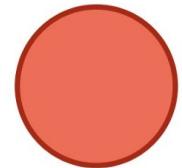
{NN Layers}

Neural Network {NN} Layer Architecture

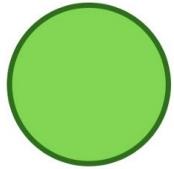


{NN Layers}

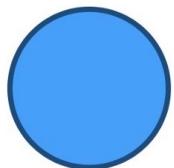
Neural Network {NN} Layer Architecture



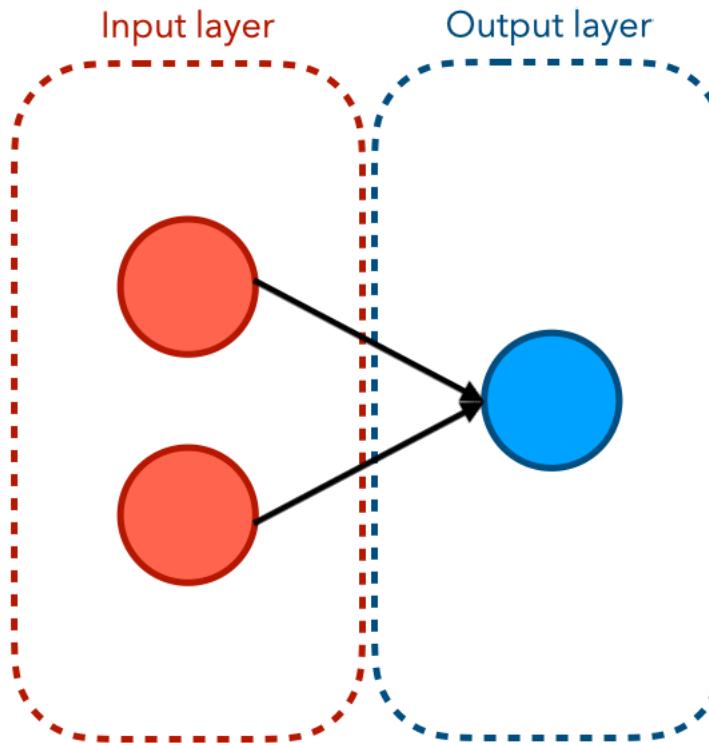
Input neuron



Hidden neuron



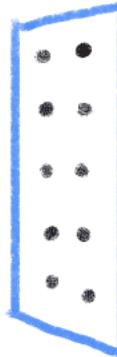
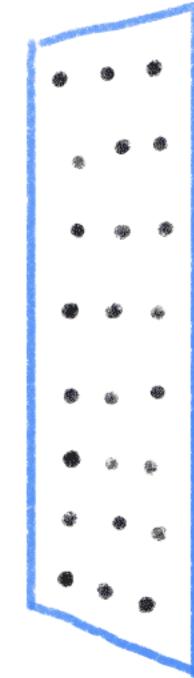
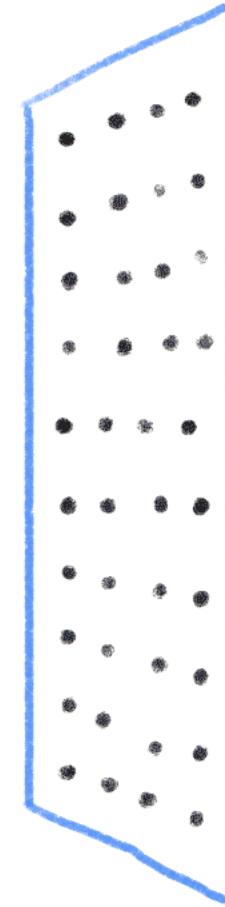
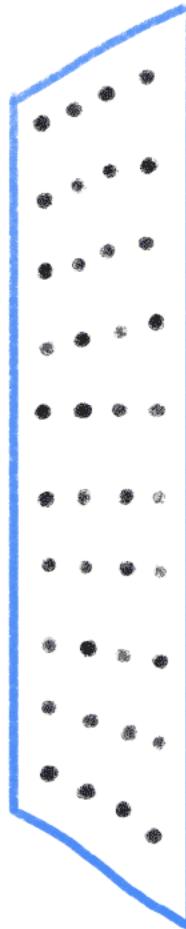
Output neuron



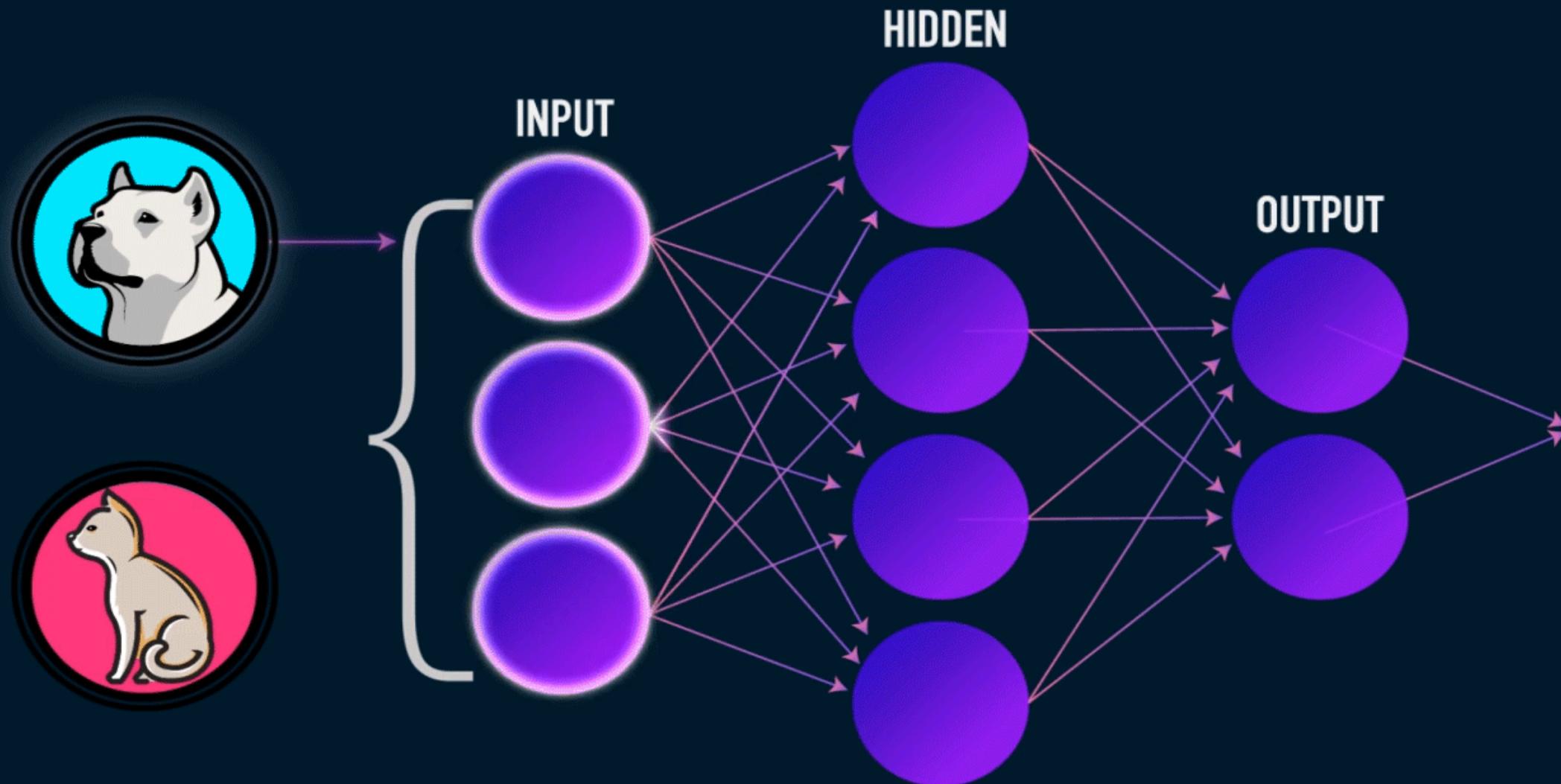
CAT

(LABELED)
PHOTOS

DOG



OUTPUT



Labels

Bird



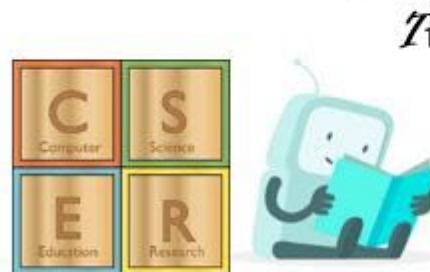
Cat



Features

Two legs, Feathers, Beak

Four legs, Tail, Fur, Whiskers



DEEP LEARNING

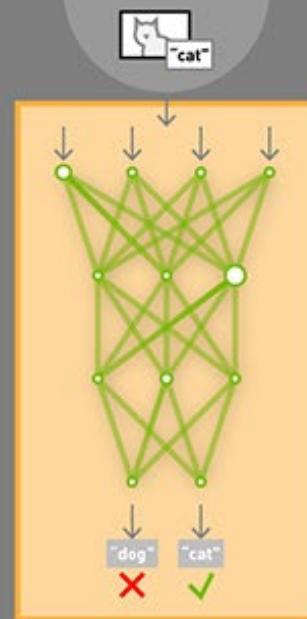
TRAINING

Learning a new capability
from existing data

Untrained
Neural Network
Model

Deep Learning
Framework

TRAINING
DATASET



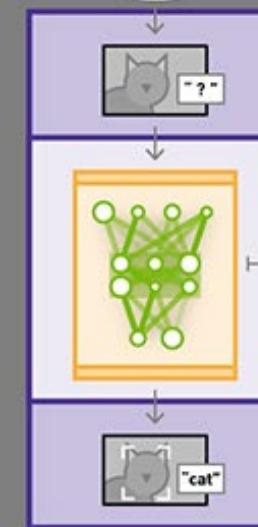
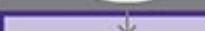
Trained Model
New Capability

INFERENCE

Applying this capability
to new data

App or Service
Featuring Capability

NEW DATA



Trained Model
Optimized for
Performance

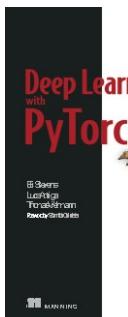
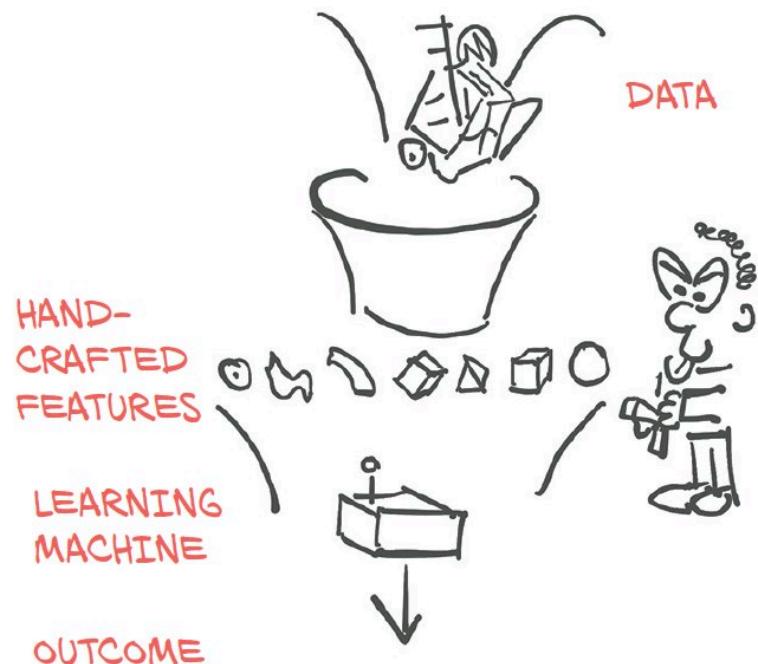
**{DL} represents an
{AI} breakthrough**

Paradigm-Shift

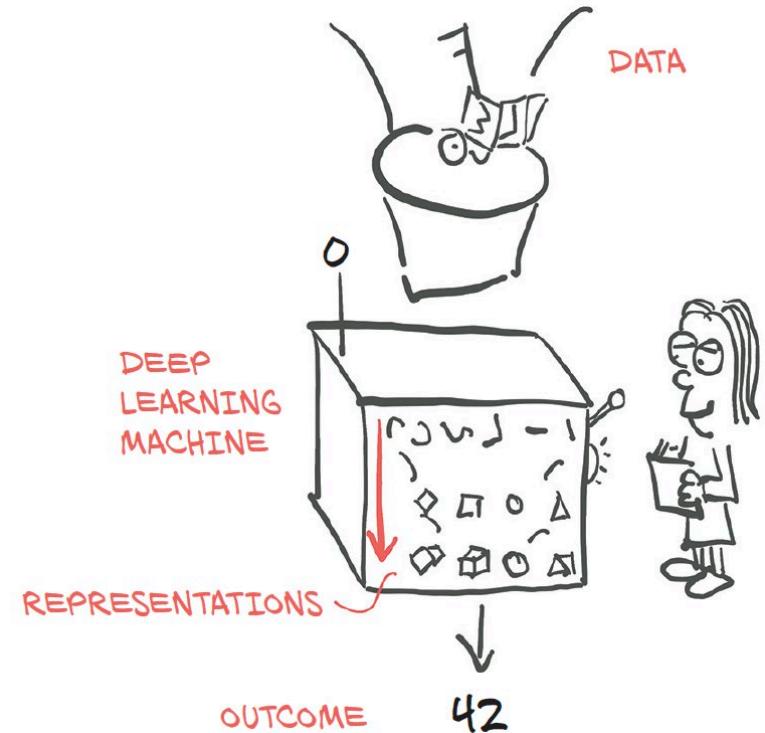
{AI Paradigm-shift}

More data, parameters & computing power | Less human-in-the-loop

Machine Learning Paradigm {ML}



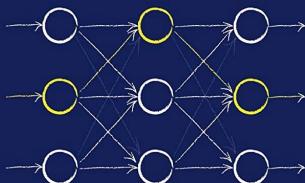
Deep Learning Paradigm {DL}



{04}

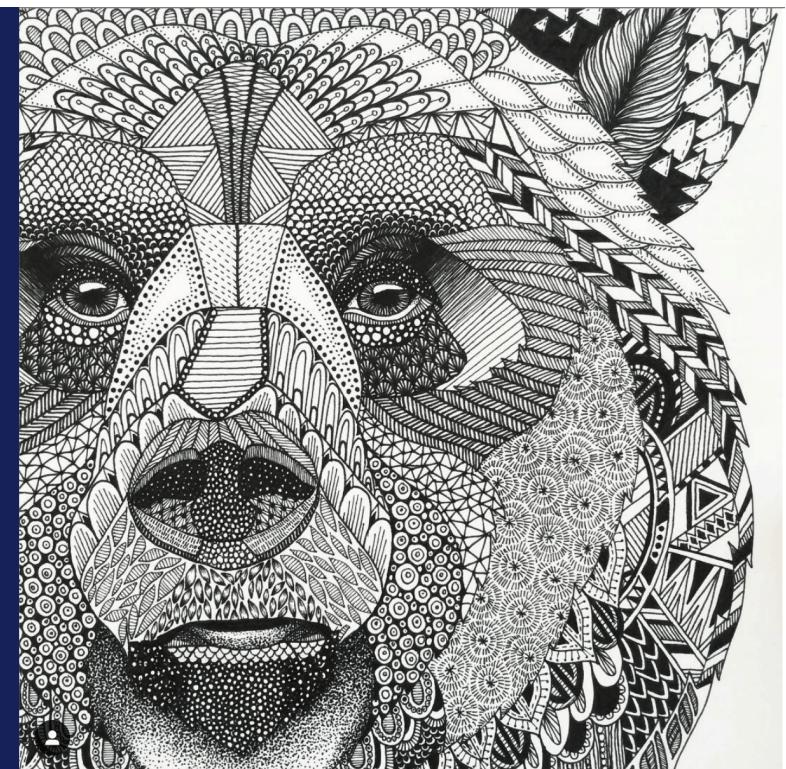
Do it Yourself

MAKE YOUR OWN NEURAL NETWORK



A gentle journey through the mathematics of neural networks, and making your own using the Python computer language.

TARIQ RASHID





TEACHABLE MACHINE

Teach a machine using your camera,
live in the browser. No coding required.

 Let's Go!

or [skip the tutorial](#)

This is an
**A.I.
Experiment**

Made with
some friends from
Google

<https://teachablemachine.withgoogle.com/v1/>

How do I use it?

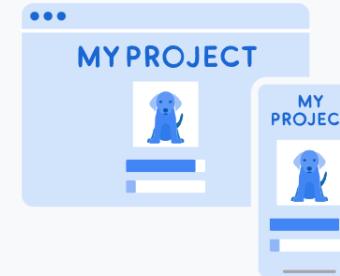
Class 1



Class 2



TRAIN MODEL



1 Gather

Gather and group your examples into classes, or categories, that you want the computer to learn.

2 Train

Train your model, then instantly test it out to see whether it can correctly classify new examples.

3 Export

Export your model for your projects: sites, apps, and more. You can download your model or host it online.



Labradoodle or fried chicken



Puppy or bagel



Sheepdog or mop



Chihuahua or muffin



@teenybiscuit

Barn owl or apple



@teenybiscuit

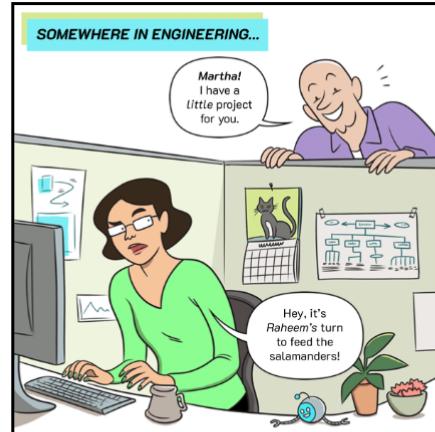
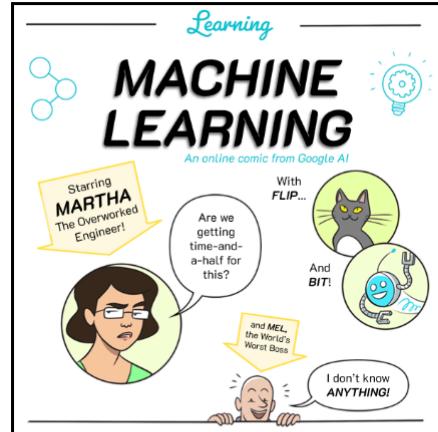
Parrot or guacamole



@teenybiscuit

Raw chicken or Donald Trump





<https://cloud.google.com/products/ai/ml-comic-1>





HOGESCHOOL ROTTERDAM

overtref jezelf

Who AM I ?



Serengeti Plains. By [Kristin Moger](#)



RobFvdW

4 Followers

My research anc
biological & psyc
to smart informa

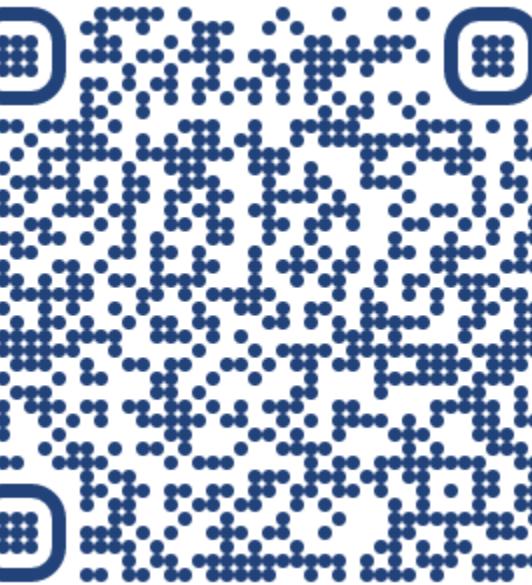
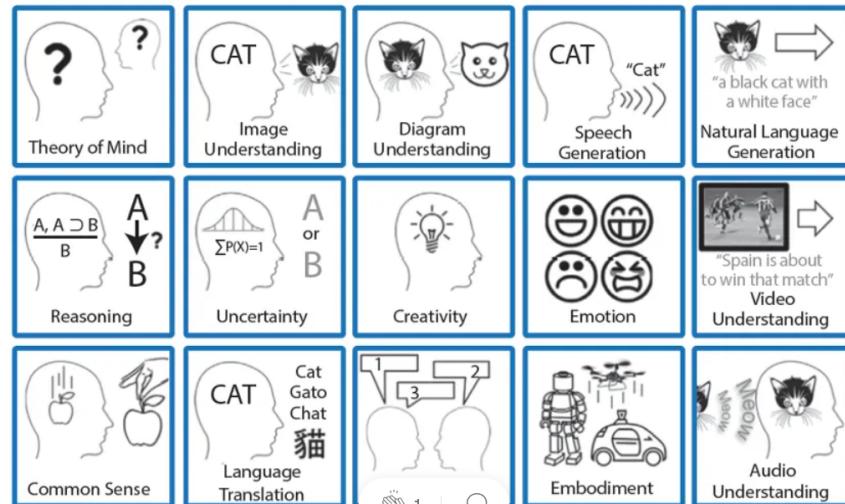
Follow



The World-Wide-Web AI-Safari

Artificial Intelligence: a Human Centred View

AI aims to **mimic & automatise** tasks which otherwise require human perception, cognition and/or motor skills – e.g. pattern recognition, learning, logical reasoning & planning, decision making, problem solving, designing, creativity, likelihood estimation, language acquisition, multi-sensory interfacing, actuated body movement control, locomotion & manipulation, sentiment analysis, and generalisation (see refs [1]...[3]).



Help Status Writer
About Text to spee



Who AM I ?



Hogeschool Rotterdam | HR · Instituut voor Communicatie, Media en Informatietechnologie (CMI)
PhD

About

Publications (48)

Network

Projects (8)

Contact

About

48

Publications

83,070

Reads ⓘ

685

Citations

Introduction

Binnen het Creating-010 onderzoeksthema Design in the 21st Century onderzoeken we de valorisatie van Machinaal Lerende (ML) Neurale-Netwerk (NN) algoritmen. De uitkomsten ervan moeten het ontwerp van Human-Centred (HC) data-producten mogelijk maken binnen toepassingsdomeinen zoals Smart & Social City, Zorg-Tech, Smart Logistics & Maritime Innovation. <https://robfvdw.medium.com>

Skills and Expertise

- (Brain)
- (Animal Behavior)
- (Neural Networks)
- (Ethology)
- (Biophysics)
- (Data Science)
- (Data Visualization)
- (Behavioral Analysis)
- (Behavioral Neuroscience)
- (Machine Learning)

Publications

Publications (48)

Designing Neural Networks Through Sensory Ecology "Biology to the rescue of AI"
Produced by Living-Lab: AiRA, Hub voor Data & Responsible AI, Hogeschool Rotterdam
Lunch-Lezing Creating-010 FEB 2022

atietechnologie (CMI) > Robert Frans van der Willigen

Current institution

Hogeschool Rotterdam

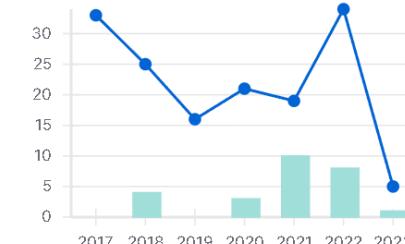


Instituut voor Communicatie, ...

Current position
Data Scientist

Citations since 2017

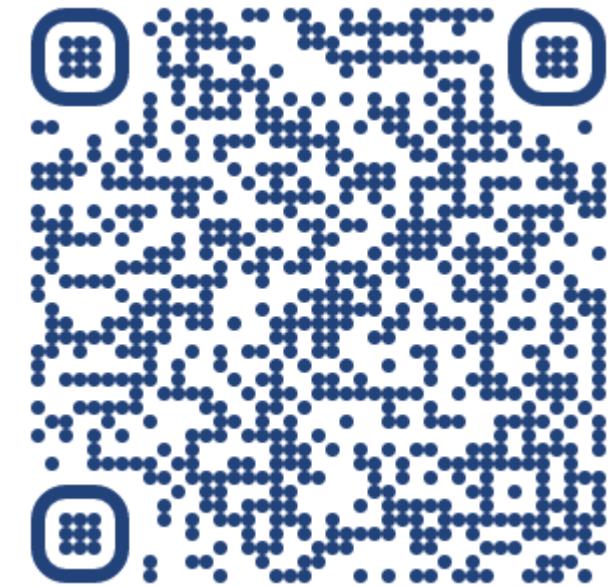
26 Research Items 153 Citations



[Learn about citations on ResearchGate](#)

Co-authors

Top co-authors



Who AM I ?



Rob

robvdw

Edit profile

8 followers · 0 following

Hogeschool Rotterdam

Netherlands

https://www.researchgate.net/profile/Roberto_Van_Der_Willigen

Highlights

PRO

Organizations



Repositories 15 Projects Packages

Psignifit-MEX Public

Mex files for Matlab 2010b on Win64 / Mac OS X 10.6.7

1 star

1,619 contributions in the last year



Learn how we count contributions

2023

2022

2021

Contribution activity

March 2023

Created 391 commits in 3 repositories

HR-ChatGPT/ChatGPT-UITGELEGD 381 commits

HR-ChatGPT/chatgpt.uitgelegd 8 commits

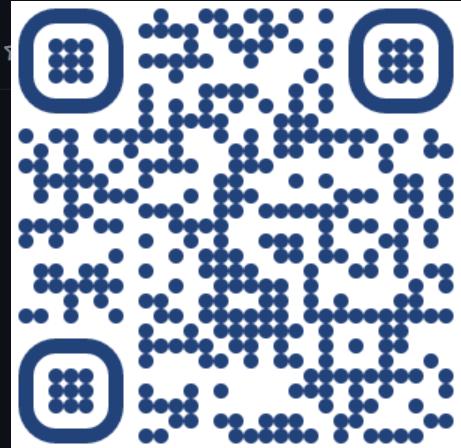
HR-Data-Supported-Healthcare/Corpora-that-Support-Clinical-Reasoning 2 commits

Joined the Hogeschool Rotterdam organization



Hogeschool Rotterdam

De wildgroei aan gezondheidsdossiers heeft een overvloed aan klinisch tekst opgeleverd die vaak onbenut blijft. AI in de vorm van NLP kan uitkomst bieden.



Customize your pins

Contribution settings ▾

