

AI-POWERED
DIGITAL HUMANS



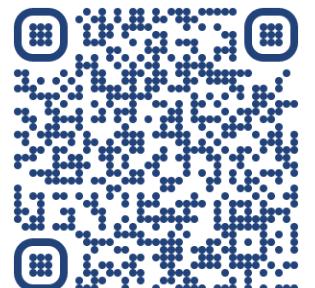
REPLY

https://www.reply.com/contents/AI-powered_Digital_Humans - English.pdf

Smart &
Social
fest

Chasing the AGI-myth

Only Digital humans
can make generative-
AI explainable.

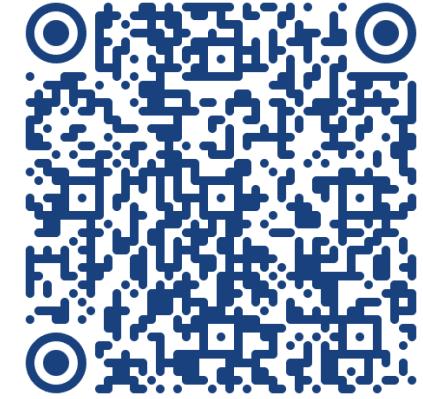


hr.nl/ai

Chasing the AGI-myth

The narrative of this talk is centred around the hypothesis that only by experimenting with Digital humans we can make generative-AI explainable to real human beings.

myths hampering your organisation from adopting AI



Myth 1:

My organization lacks the right tools and platforms to develop trustworthy AI

Myth 2:

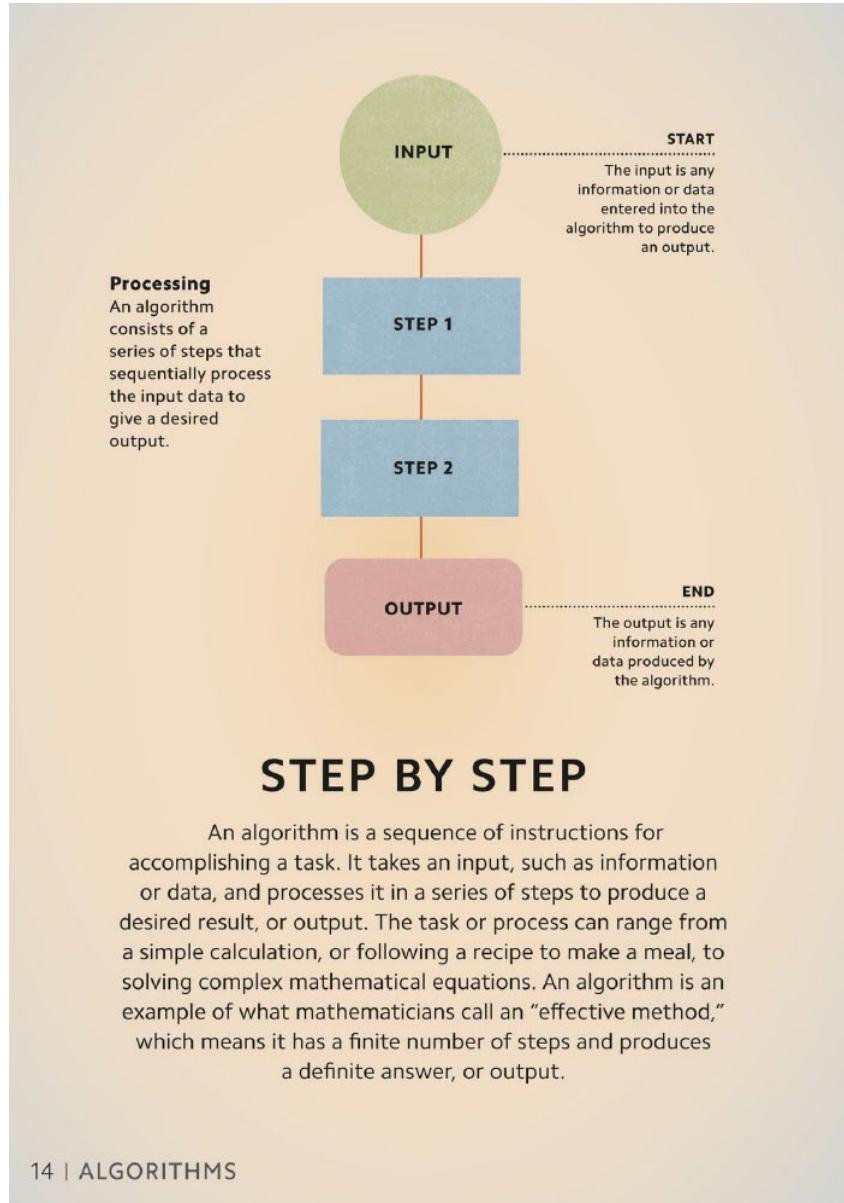
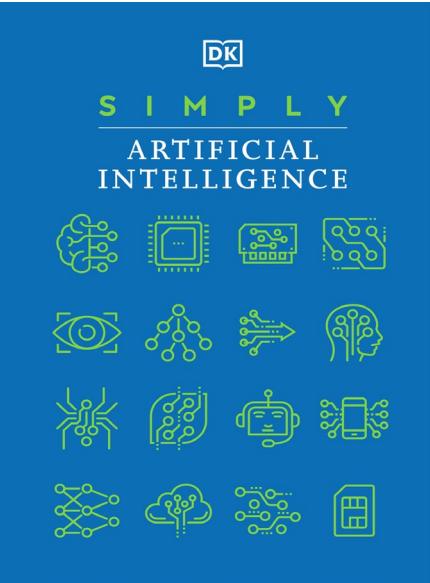
AI is too complex and expensive for my organization to build from scratch

Myth 3:

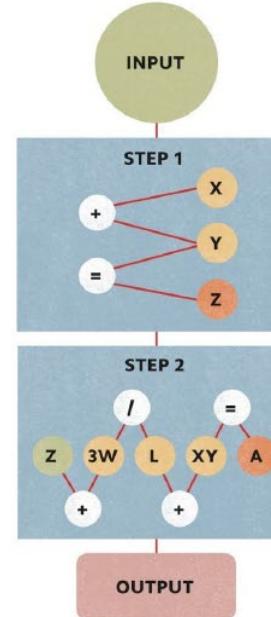
My organization lacks the right skills and expertise to develop AI



HOGESCHOOL
ROTTERDAM



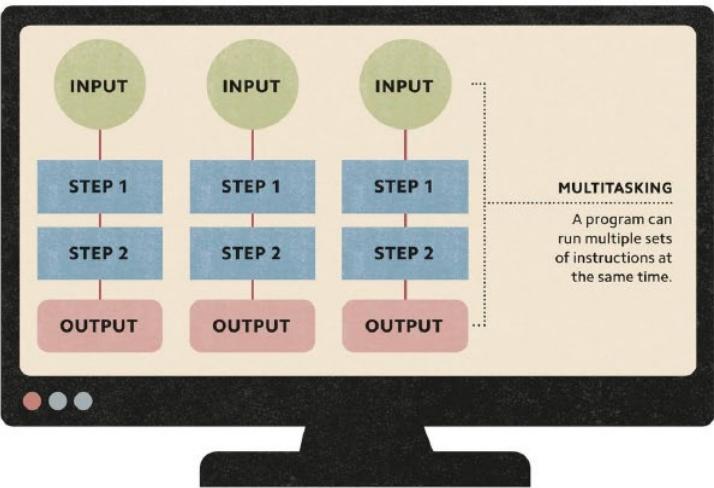
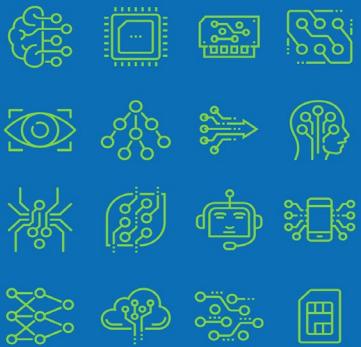
Components of calculation
Computations have an input and an output, and multiple steps. They can vary from simple sums to complex equations.



ALGORITHMS IN ACTION

A computation is a calculation that follows the steps of an algorithm (see opposite). The most straightforward example of computation is arithmetic calculation. For example, if you add together a pair of three-digit numbers in your head, you follow a series of steps, or an algorithm, to achieve this calculation. Computations use symbols to represent numbers, but symbols can represent almost anything else (see p.36). With the right symbols and the right algorithms, immensely complex computation becomes possible.

SIMPLY

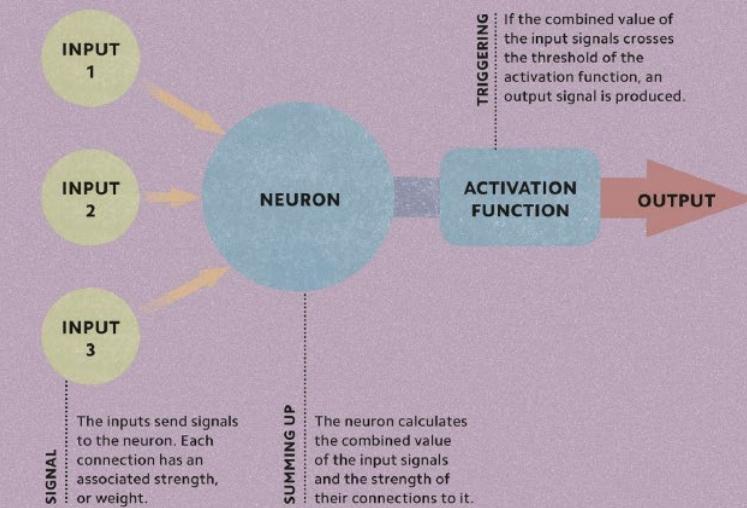
ARTIFICIAL
INTELLIGENCE

INSTRUCTING COMPUTERS

A program is a sequence of instructions written in code that enables a computer to perform one or more tasks. Charles Babbage (see opposite) imagined the first program. He was inspired by the design of a certain silk loom, which had parts that moved up or down in response to a pattern of holes punched into a card. Babbage recognized that these holes could store instructions to operate the cogs and levers of a machine he was designing: the "Analytical Engine". Modern computers work on the same principle, following sequences of instructions, which are usually written in binary code (see p.13).

ARTIFICIAL NEURONS

Each of the 86 billion neurons in the human brain is effectively a tiny processor, receiving electrical signals (inputs) from other neurons and sending out signals of its own (outputs). McCulloch and Pitts (see opposite) realized that neurons can act as logic gates—devices that can switch on and off (see p.13), depending on the input. The scientists described an imaginary neuron called a "threshold logic unit". This neuron works by first adding the values of its inputs (signals from other neurons) and then multiplying that value by a variable called a "weight" (see p.78)—this is the strength of a connection between neurons. If the input signals exceed a certain value (see p.79), the neuron is triggered to send an output signal. This triggering is called the "activation function".



Defining AI is
nonsensical

Shaping Europe's digital future

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REPORT / STUDY | Publication 18 December 2018

A definition of Artificial Intelligence: main capabilities and scientific disciplines

This document expands the definition of Artificial Intelligence (AI) as defined in the Commission Communication on AI. It clarifies certain aspects of AI as a scientific discipline and as a technology, with the aim to avoid misunderstanding, to achieve a shared common knowledge of AI that can be fruitfully used also by non - AI experts, and to provide useful details that can be used in the discussion on both the AI ethics guidelines and the AI policies recommendations.

Downloads



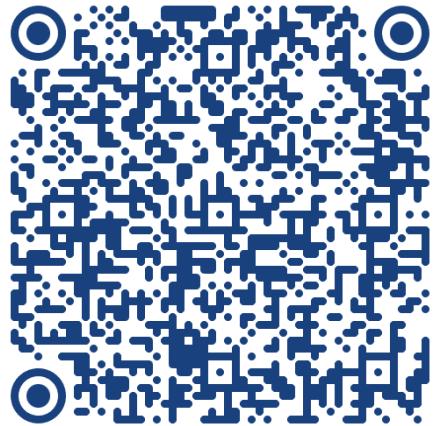
AI Definition.pdf

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European Parliament

Artificial intelligence: How does it work, why does it matter, and what can we do about it?

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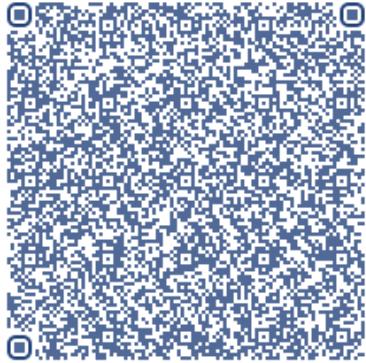
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[https://www.europarl.europa.eu/RegData/etudes/STUD/2020/641547/EPRS_STU\(2020\)641547_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2020/641547/EPRS_STU(2020)641547_EN.pdf)

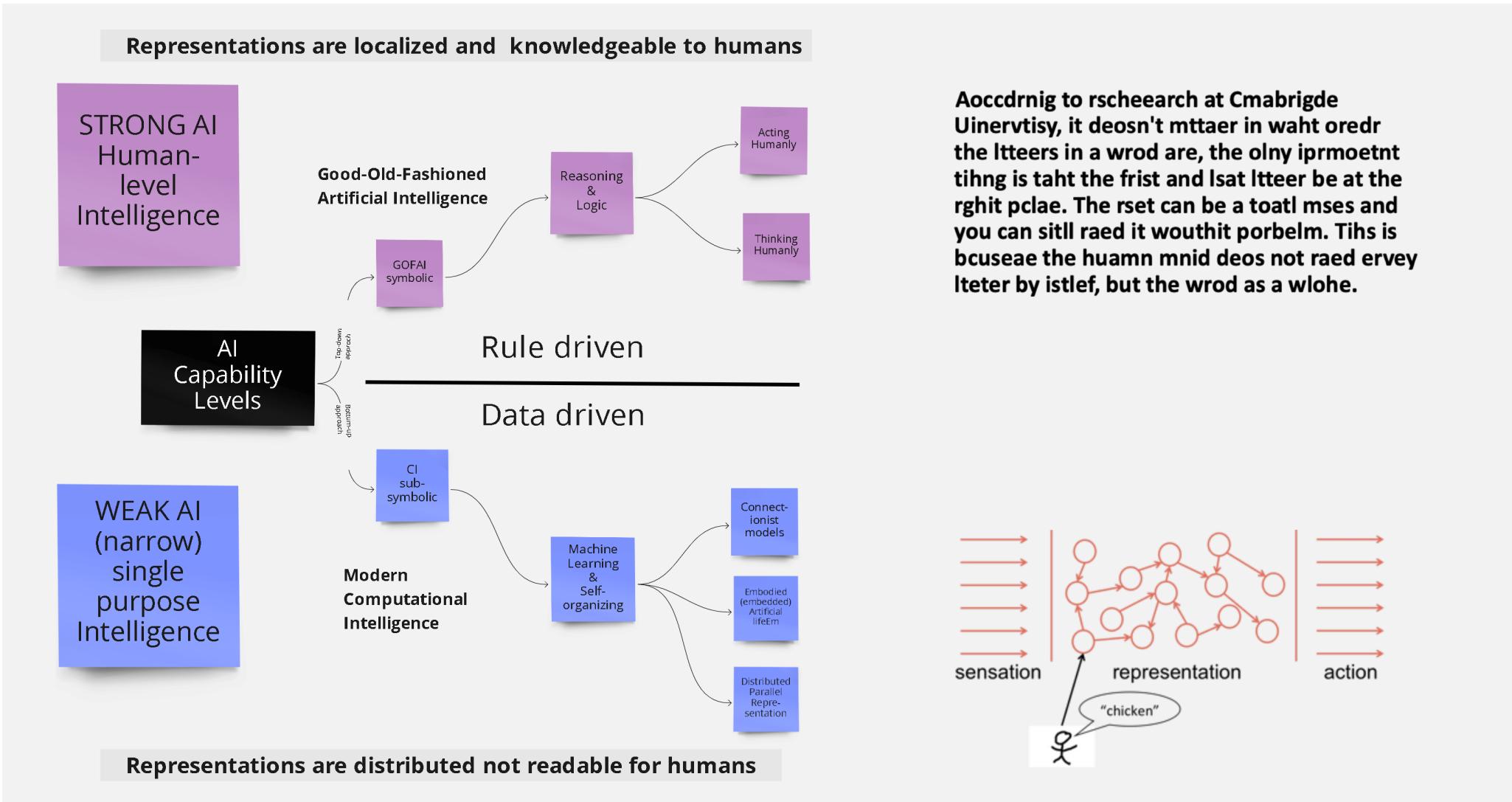


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AI-taxonomie is complex



https://www.researchgate.net/publication/359424818_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



**Defining what
characterizes AI**
gives Insight

Answer given by Gemini

***Give the five main
characteristics of AI
+ examples***



Here are five main characteristics of Artificial Intelligence (AI) along with some examples:

1. **Learning and Adaptation:** AI systems can learn from data and improve their performance over time. This is often achieved through machine learning algorithms that can identify patterns and relationships in data. For instance, a recommendation system on a shopping website can learn about your past purchases and suggest items you might be interested in buying in the future.
2. **Problem-Solving:** AI can be used to solve complex problems by analyzing data and identifying patterns. AI systems can be programmed with specific rules and logic, or they can learn to solve problems on their own through machine learning techniques. An example is a self-driving car that uses cameras and sensors to perceive its surroundings, navigate traffic, and avoid obstacles.
3. **Natural Language Processing (NLP):** AI systems can understand, interpret, and generate human language. This allows them to communicate with humans in a natural way and perform tasks such as machine translation, sentiment analysis, and chatbot interactions. For example, a virtual assistant like Siri or Alexa can understand your spoken commands and respond with helpful information.
4. **Perception:** AI systems can perceive the world around them through sensors like cameras, LiDAR, and microphones. This allows them to gather information about their environment and react accordingly. An example is a facial recognition system that can identify individuals from images or videos.
5. **Automation:** AI can automate tasks that are repetitive, tedious, or dangerous for humans. This can improve efficiency and productivity in many industries. For instance, robots in factories can perform tasks on assembly lines with greater precision and speed than humans.



Answer given by Gemini

*What about
closed-loop*

◆ In the context of AI, a closed loop system refers to **an AI system that can independently learn, make decisions, and take actions based on the results of those actions, all within a defined system**. It essentially creates a self-regulating feedback loop where the AI continuously improves its performance.

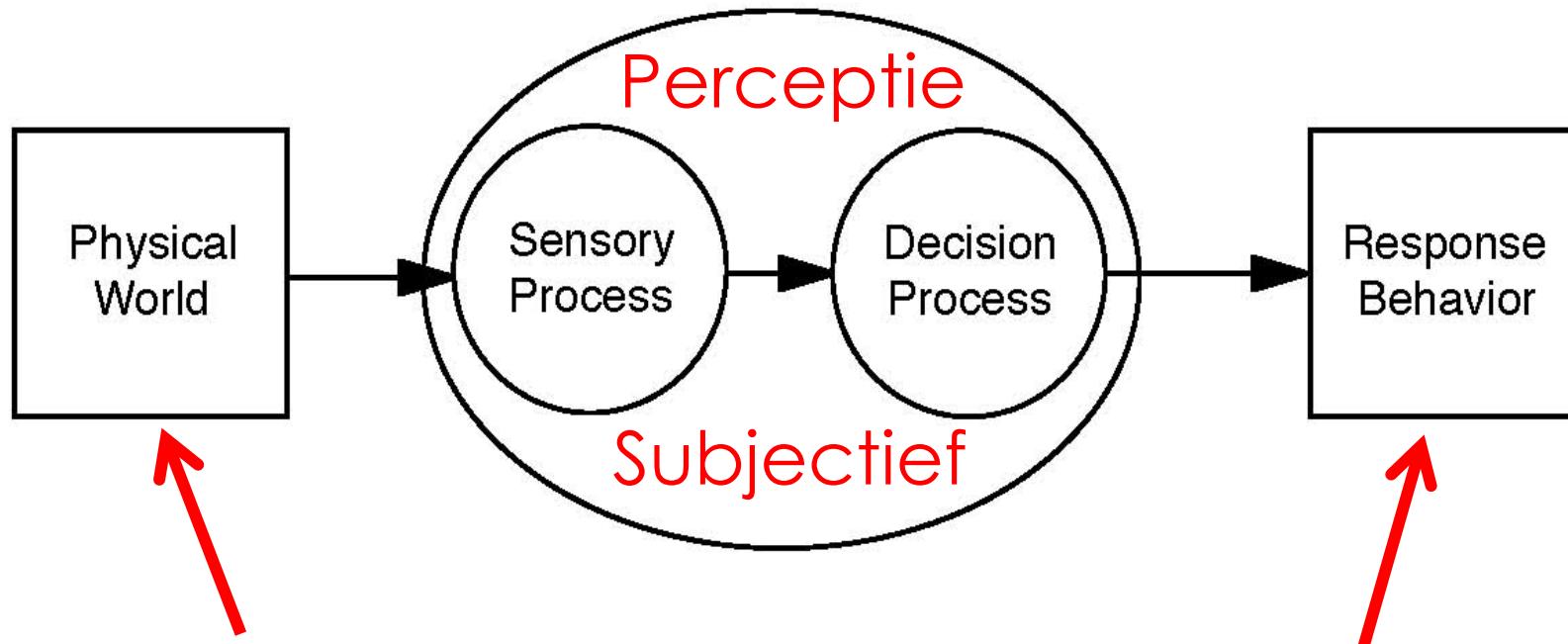
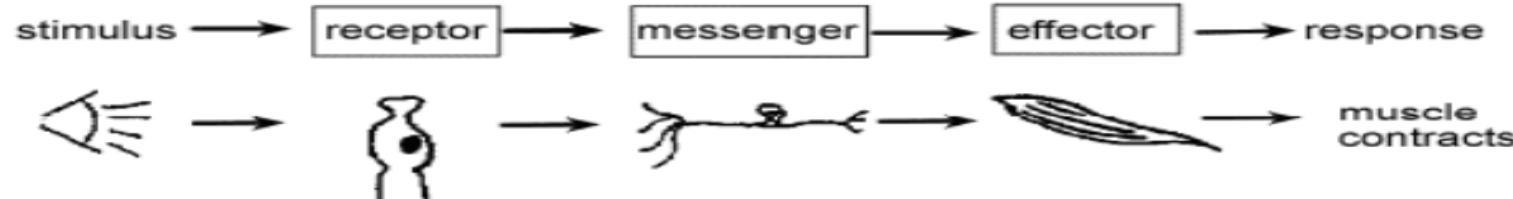
Here's a breakdown of how it works:

- 1. Data Collection:** The AI system gathers data from its environment through sensors or interacts with the world to collect information.
- 2. Learning and Decision Making:** The AI processes the collected data using its algorithms and makes decisions based on its understanding.
- 3. Action:** The AI takes action in the real world based on its decision.
- 4. Feedback:** The results of the action are fed back into the system as new data.
- 5. Continuous Improvement:** The AI analyzes the feedback and uses it to refine its learning models, leading to better decision-making in the future.

Examples of Closed-Loop AI:

- **Self-driving cars:** These cars use a closed loop. They perceive their surroundings (data collection), make decisions about navigation (learning and decision making), take actions like steering or braking (action), receive feedback from sensors about the success of the action (feedback), and use that information to improve their driving in the future (continuous improvement).
- **Industrial robots:** Robots in factories can operate in a closed loop. They receive instructions and sensor data (data collection), determine the next step in the assembly process (learning and decision making), perform an action like welding or painting (action), receive feedback on the quality of the work (feedback), and adjust their movements for better results in the next cycle (continuous improvement).
- **Trading algorithms:** Some algorithmic trading systems function in a closed loop. They analyze market data (data collection), identify trading opportunities (learning and decision making), execute trades (action), receive feedback on the profitability of the trade (feedback), and refine their trading strategies based on the results (continuous improvement).

GEWAARWORDEN & PERCEPTIE

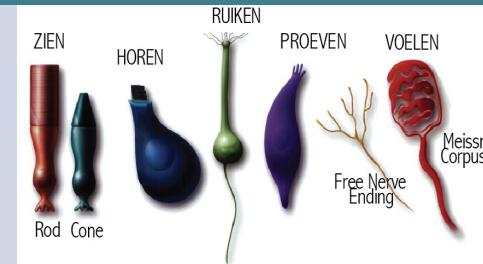


Alleen de Fysieke wereld en ons Gedrag kunnen objectief worden gemeten

Sensorische informatieverwerking

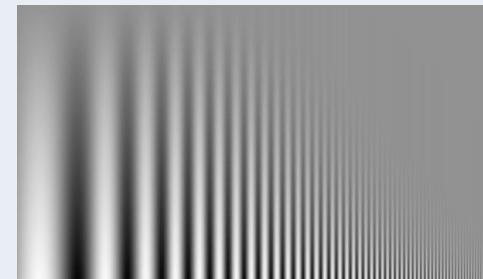
[1] Stimulus (Energie)

direct meetbaar



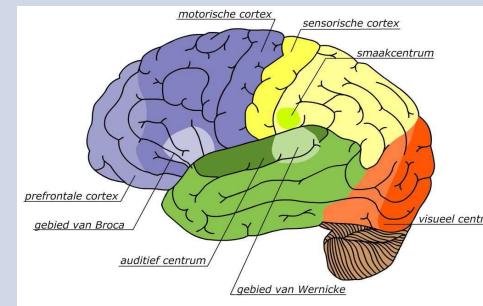
Externe prikkel

[2] Vindt gefilterd zijn weg naar het brein



Zintuigelijke waarneming

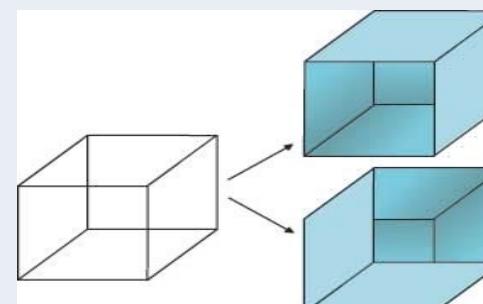
[3] Codering in het brein (corticale gebieden)



Opslag & Integratie

[4] Interpretatie, Beoordeling & besluitvorming

niet direct meetbaar



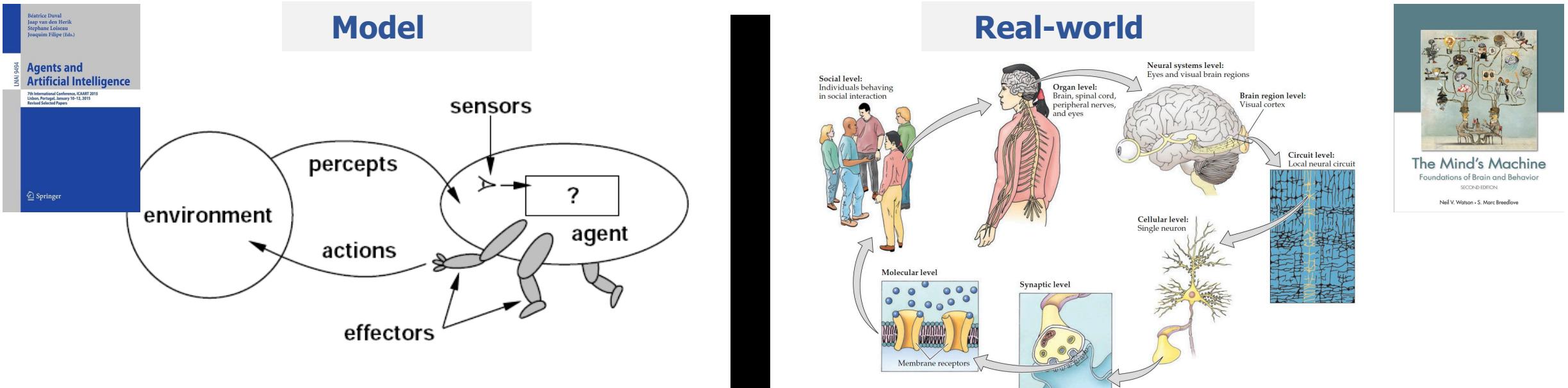
Perceptie & Cognition

{AI favors Agent-Based Models}

Agents

are abstractions of the real world **{models}** that can **perceive** their environment through sensors (input) and **act** upon that environment through effectors (output), combined with learning capabilities.

As a result, agent behaviour is desirable from an AI-viewpoint



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

Answer given by Gemini

*what are the main 5 characteristics of modern AI when taking in consideration:
perception
closed-loop
trainable
information processing
sub-symbolic
algorithm*



Here are the main 5 characteristics of modern AI you highlighted:

1. **Perception:** Modern AI can perceive and understand the world through various sensors like cameras, microphones, and LiDAR. This allows them to gather data and build representations of the environment.
2. **Closed-Loop:** Modern AI systems are not purely reactive. They can take in information from the environment, process it, and then take actions that influence the environment. This creates a closed-loop system where the AI can learn and adapt based on the results of its actions.
3. **Trainable:** A key characteristic of modern AI is their ability to learn from data. This is often achieved through machine learning algorithms that can automatically improve their performance on a task as they are exposed to more data.
4. **Information Processing:** Modern AI excels at processing large amounts of information efficiently. This allows them to identify patterns, make predictions, and solve complex problems.
5. **Sub-symbolic Algorithms:** Modern AI algorithms often don't rely on symbolic representations like logic rules. Instead, they use sub-symbolic approaches like artificial neural networks, which are inspired by the structure and function of the human brain. These algorithms can learn complex patterns from data without the need for explicit programming.



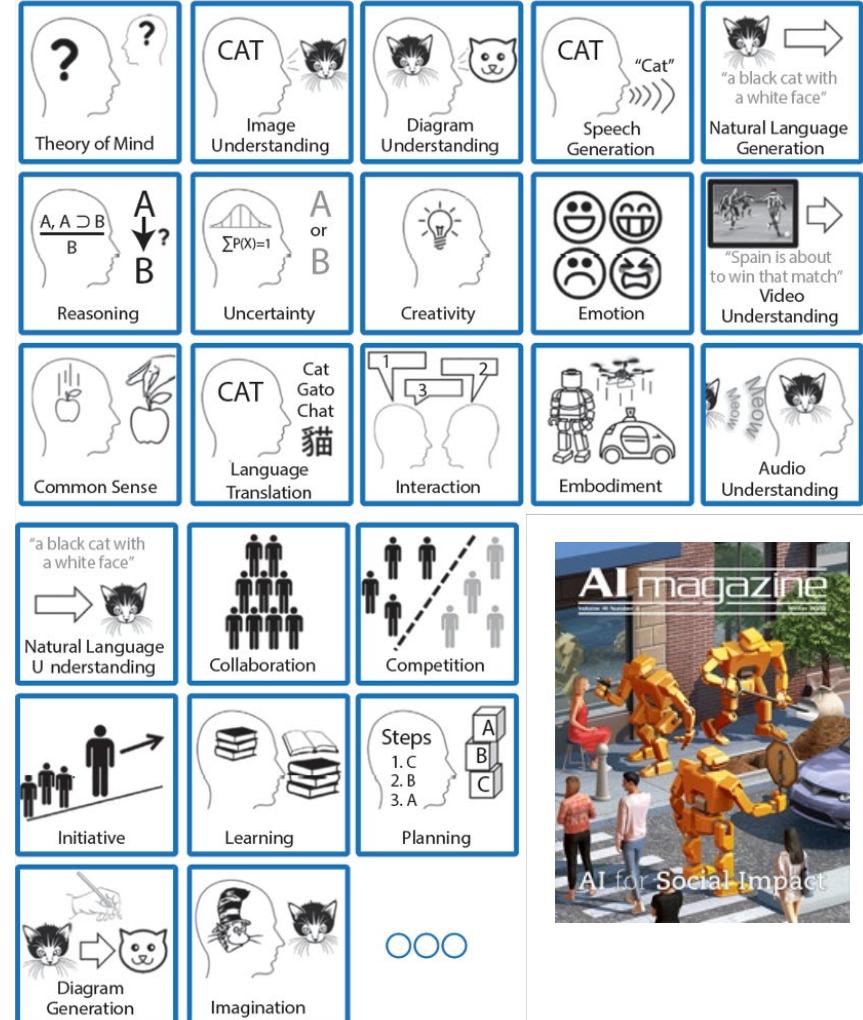
{AI=ML=DL}

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

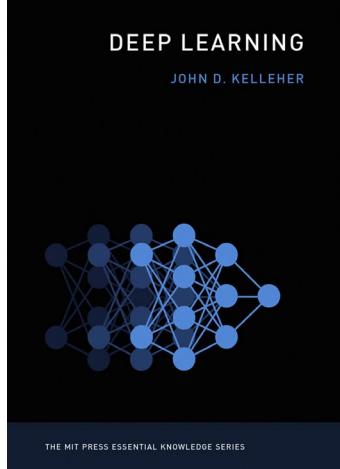
*human perception,
cognition and/or
motor skills*

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

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

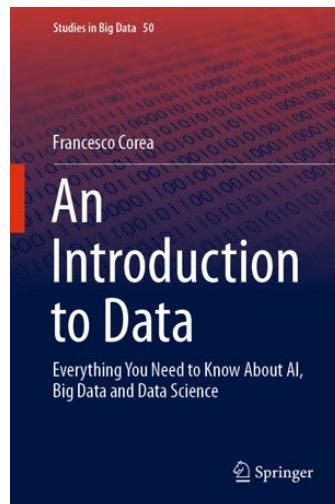


{DL + DNNs}



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.

{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" (with a "FREE" badge), "Contact Sales", "Start free trial", "Login", and a menu icon. Below the navigation bar are two main input fields: "Translate text" (26 languages) and "Translate files" (.pdf, .docx, .pptx). The left panel, set to "English", contains the following 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.

Below this text is a speaker icon. The right panel, set to "Dutch", contains the translated text:

{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 this text are icons for like, dislike, share, and copy. The URL <https://www.deepl.com/translator> is visible at the bottom right.

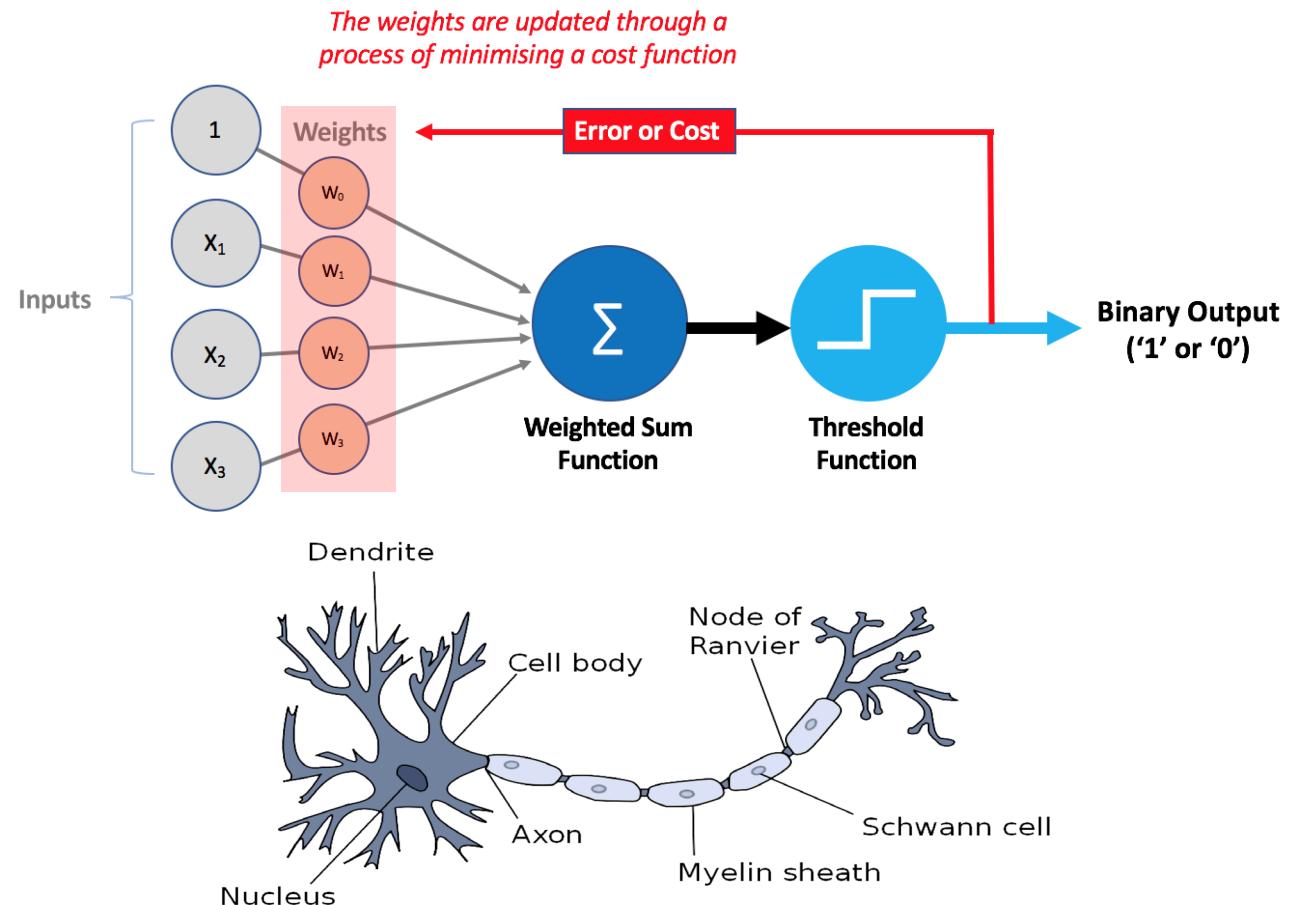
<https://www.deepl.com/translator>

{Artificial Neurons}

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

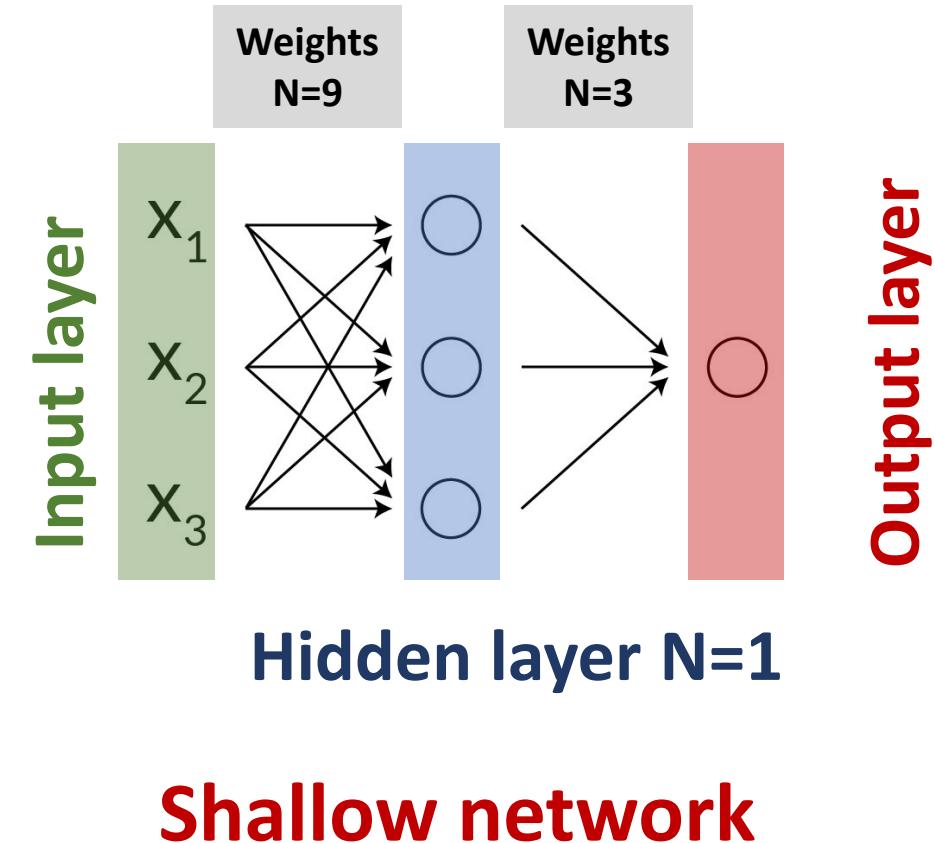
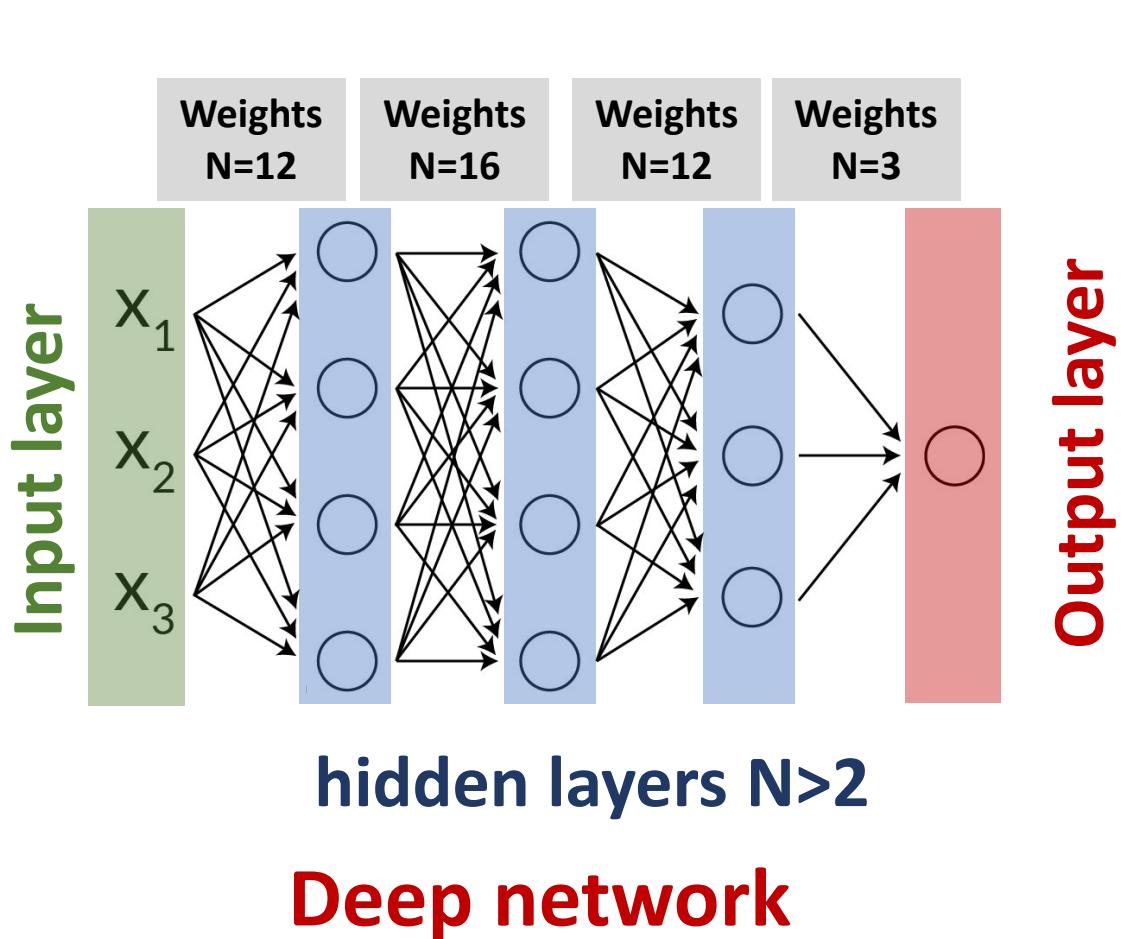
**Names for
 Artificial Neurons**

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



{NN Layers}

Neural Network {NN} Layer Architecture



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>

*Taxonomie implementatie
technologie niveau's voor
“digital Humans” bevat 3
lagen: *Talig / Fysiek / Digitaal**

Talig : Conversationele Agenten

Fysiek: Robotica / Cybernetica / “Reinforced Learning”

Digitaal: AI-gedreven Video “Dubbing” & “Motion Capture”

Game Engines [+Omniverse Connectors]

<https://www.fxguide.com/quicktakes/nvidia-ace-enables-easier-interactive-avatars/>

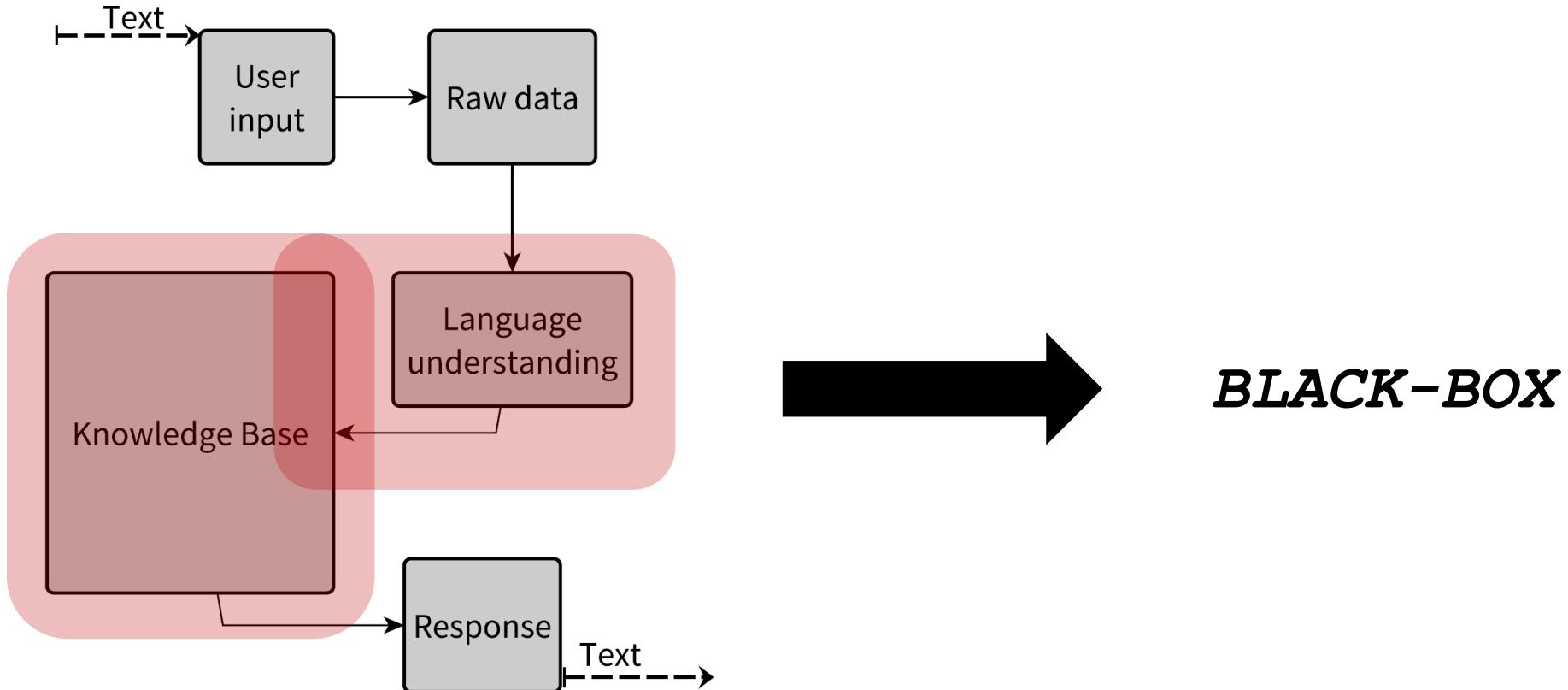
<https://blogs.nvidia.com/blog/2023/04/21/epic-benefits-omniverse-connector-unreal-engine/>



TALIGE IMPLEMENTATIE

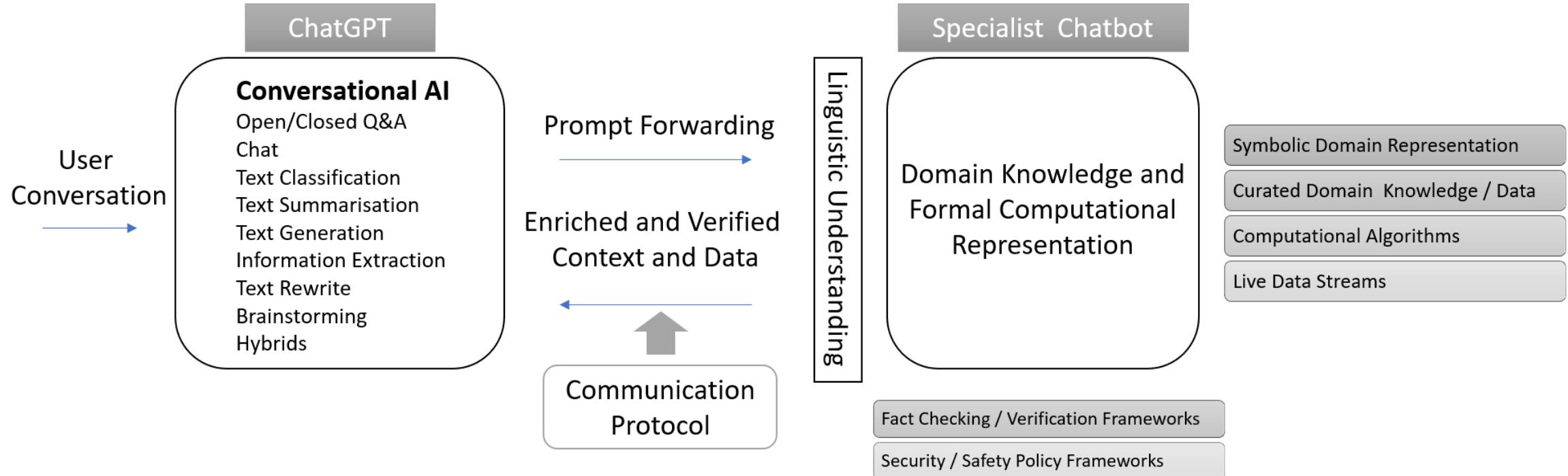
Digital human

ChatGPT is een Conversationele *tekst-in/tekst-uit* AI-agent



Sánchez-Díaz, X., Ayala-Bastidas, G., Fonseca-Ortiz, P., & Garrido, L. (2018).
A knowledge-based methodology for building a conversational chatbot as an
intelligent tutor. https://doi.org/10.1007/978-3-030-04497-8_14

Conversational Agents



Conferences > 2023 IEEE International Conference on Big Data and Cloud Computing for Smart Cities

ChatGPT and Generative AI Guidelines for Addressing Academic Integrity and Augmenting Pre-Existing Chatbots

Publisher: IEEE

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Daswin De Silva ; Nishan Mills ; Mona El-Ayoubi ; Milos Manic ; Damminda Alahakoon All Authors

635
Full
Text Views



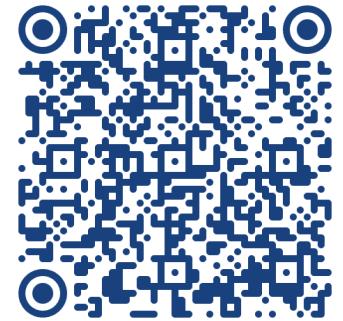
Fysiek
ROBOT IMPLEMENTATIE
Digital human

Featured Article

Boston Dynamics' Atlas humanoid robot goes electric

A day after retiring the hydraulic model, Boston Dynamics' CEO discusses the company's commercial humanoid ambitions

Brian Heater @bheater 3:07 PM GMT+2 • April 17, 2024

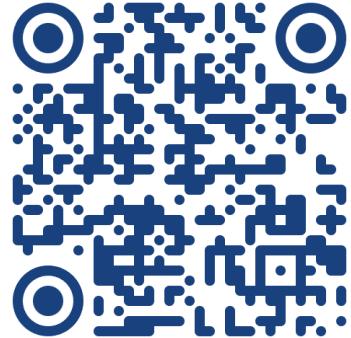
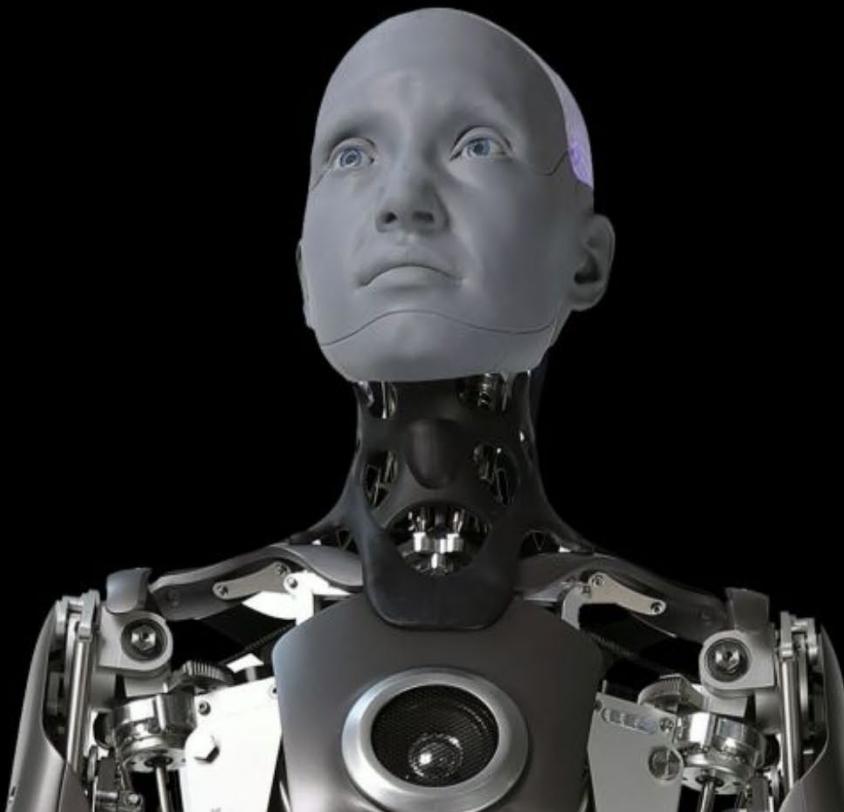


Ameca

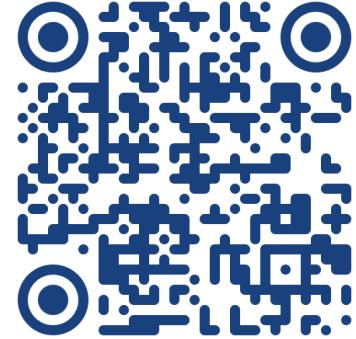
The Future Face Of Robotics

[Home](#) / Ameca

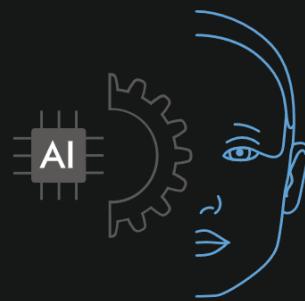
['World's most advanced' humanoid robot shows off her language skills in creepy new video | Daily Mail Online](#)



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Todays robotics for tomorrows AI



Modular by design

Both hardware and software is modular, making it easily upgradable.

All modules can run independently so you can have just a head, or even only an arm. No need for a full robot.



Head in the clouds

Built from the ground up with a cloud connected focus, all our robots can benefit from the latest and greatest the tech community have to offer.

Gain access to all the robots data, control it as your personal avatar, animate and simulate, all available from anywhere in the world.



Natural motion

Smooth, lifelike motion and advanced facial expression capabilities means Ameca can strike an instant rapport with anybody.

Ameca is the perfect platform to develop interaction between us humans and any metaverse or digital realm.



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DIGTALE IMPLEMENTATIE

Digital human



NVIDIA
OMNIVERSE

CREATING ANIMATED DIGITAL HUMANS FOR OMNIVERSE

John Martin II, Vice President, Reallusion
Elvis Huang, Head of Innovation, Reallusion



Character Creator Connector for Omniverse

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- CC CONNECTOR
- SKETCHUP CONNECTOR

REALLUSION CHARACTER CREATOR | OMNIVERSE 3.41.1-E INSTALL

About Omniverse REALLUSION CHARACTER CREATOR

Description

Character Creator Omniverse Connector is a plugin for exporting digital humans and motions from Character Creator 3 to an NVIDIA Omniverse Neudeus Server.

Developer

Reallusion

Version

3.41.1-e

Platforms

Windows

Tags

Character Creation, Character Animation, Game Character, Content Creation, Connector

Learn more

RELEASE NOTES DOCUMENTATION TUTORIALS FORUMS

<https://www.nvidia.com/en-us/on-demand/session/gtcspring21-s31882/>



MetaHuman SDK

AR VR Lab

37 37 reviews written | 145 of 148 questions answered

Automated solution for creating realistic face animation from audio file

Supported Platforms



Supported Engine Versions

5.0 - 5.2

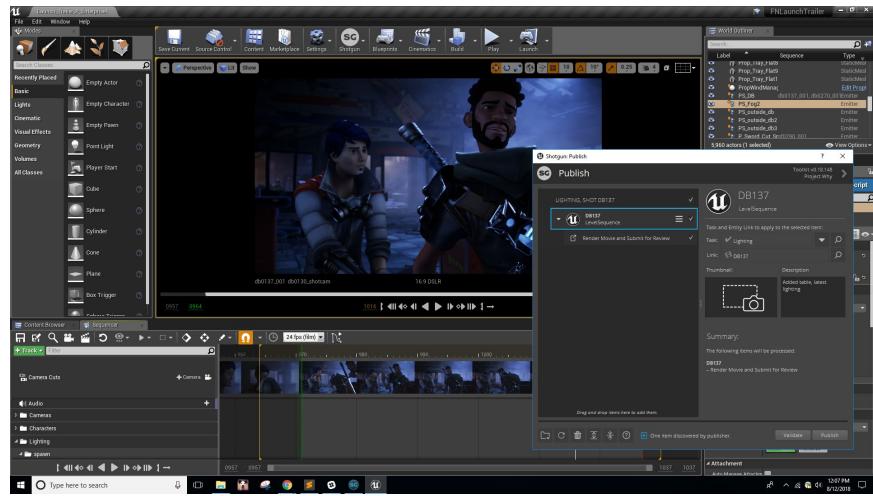
Unavailable

[Description](#)[Reviews](#)[Questions](#)

MetaHumanSDK is a set of tools for creation of an immersive interaction with a digital human. Our service creates facial animation from an audio file or text and the plugin includes connectivity modules of a synthesized voice from Google or Azure (text to speech) and offers the option of creating an interactive chat with the connection to Dialog flow (Google) with the possibility of a live dialogue with a digital human.

[VIDEO TUTORIAL](#)
[OFFICIAL TRAILER](#)To get the latest news and feedback and find friends join our [DISCORD COMMUNITY](#).

<https://www.unrealengine.com/marketplace/en-US/item/66b869fa0d3748e78d422e59716597b6>



What is it? Epic Games [describes](#) Unreal Engine as “the world’s most open and advanced real-time 3D creation tool.” Typically, creating a CGI object requires sculpting the 3D base model and then hours of rendering lighting effects to create the finished 2D image. Unreal Engine allows developers to preview the final image in real-time without waiting hours for rendering. Doing this saves time and money by allowing artists to work faster and more efficiently.

How Do Virtual Influencers Use It? Creating the virtual human is one thing, but making them move and compositing them into various settings is another ball game. Unreal Engine allows artists to place a virtual human in any environment and quickly view the final image. Even VTubers with a simplistic anime design use advanced technology like the Unreal Engine to help them animate their avatars in real-time.

<https://www.virtualhumans.org/article/the-video-game-engines-bringing-virtual-influencers-to-life>

MetaHuman Creator

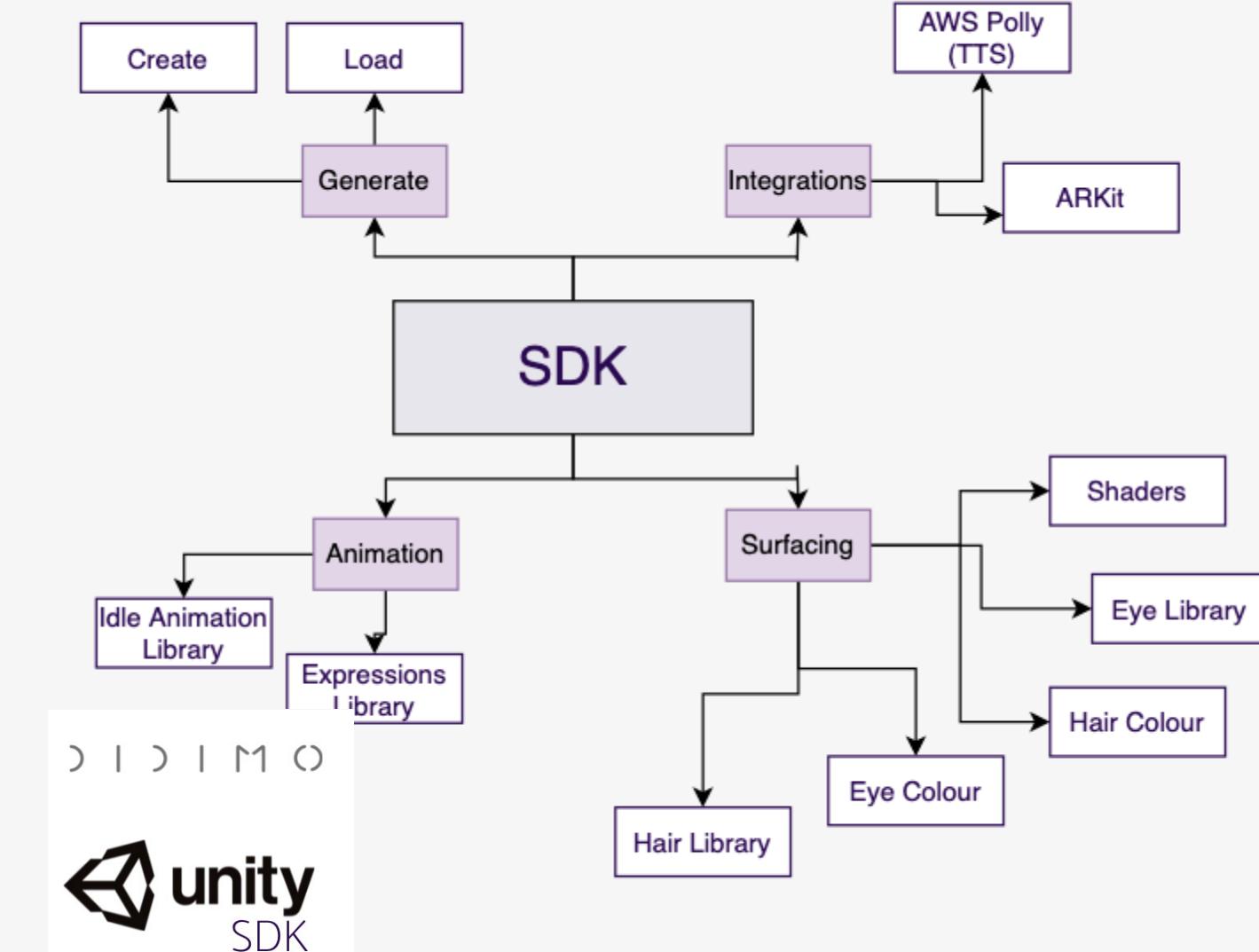


What is it? Think of [MetaHuman Creator](#) as the world's most advanced character creation tool. Typically, making an ultra-realistic virtual human would require years of experience and training as a 3D artist. With MetaHuman Creator, anyone can build photorealistic virtual humans with stunning detail. MetaHuman Creator drastically reduces the time and money it takes to create a virtual human by streamlining the process through a singular platform.

Back in March, we [interviewed](#) Vlad Mastilović, the Vice President of Digital Humans Technology at Epic Games, to discuss the future capabilities of the MetaHuman Creator. He told us that one thing is for sure: "digital humans will be one of the fundamental building blocks of many technologies in the future."



<https://developer.nvidia.com/blog/an-era-of-digital-humans-pushing-the-envelope-of-photorealistic-digital-character-creation/>



Chasing the AGI-myth

The narrative of this talk is centred around the hypothesis that only by experimenting with Digital humans we can make generative-AI explainable to real human beings.

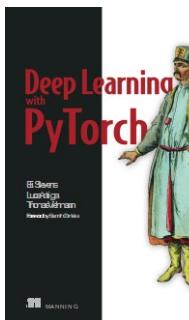
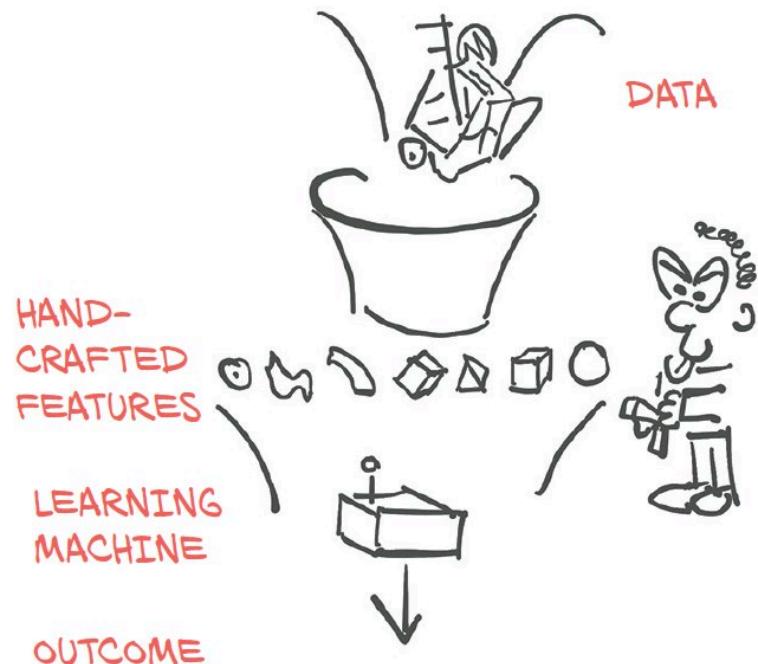
**{DL} represents an
{AI} breakthrough**

Paradigm-Shift

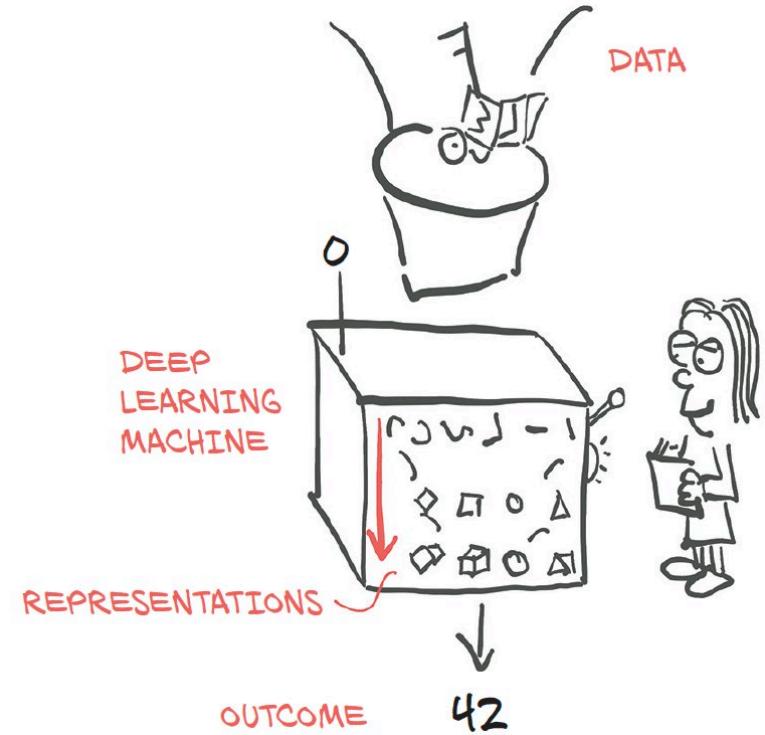
{AI Paradigm-shift}

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

Machine Learning Paradigm {ML}



Deep Learning Paradigm {DL}



{Big-data}

Big-data is needed to avoid hand-crafted feature extraction

A Unified Approach to Interpreting Model Predictions

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Abstract

Understanding why a model makes a certain prediction can be as crucial as the prediction's accuracy or efficiency. Transparency for large datasets is often achieved by complex models that even experts have trouble to interpret, such as ensemble or deep learning models, creating a tension between *accuracy* and *interpretability*. In response, various methods have recently been proposed to help users interpret the predictions of complex models, but it is often unclear how these methods are related and when one method is preferable over another. To address this problem, we present a unified framework for interpreting predictions, SHAP (SHapley Additive exPlanations). SHAP assigns each feature an importance value for a particular prediction. Its novel components include: (1) the identification of a new class of additive feature importance measures, and (2) theoretical results showing there is a unique solution in this class with a set of desirable properties. The new class unifies six existing methods, notable because several recent methods in the class lack the proposed desirable properties. Based on insights from this unification, we present new methods that show improved computational performance and/or better consistency with human intuition than previous approaches.

1 Introduction

The ability to correctly interpret a prediction model's output is extremely important. It engenders appropriate user trust, provides insight into how a model may be improved, and supports understanding of the process being modeled. In some applications, simple models (e.g., linear models) are often preferred for their ease of interpretation, even if they may be less accurate than complex ones. However, the growing availability of big data has increased the benefits of using complex models, so bringing to the forefront the trade-off between accuracy and interpretability of a model's output. A wide variety of different methods have been recently proposed to address this issue [5, 8, 9, 3, 4, 1]. But an understanding of how these methods relate and when one method is preferable to another is still lacking.

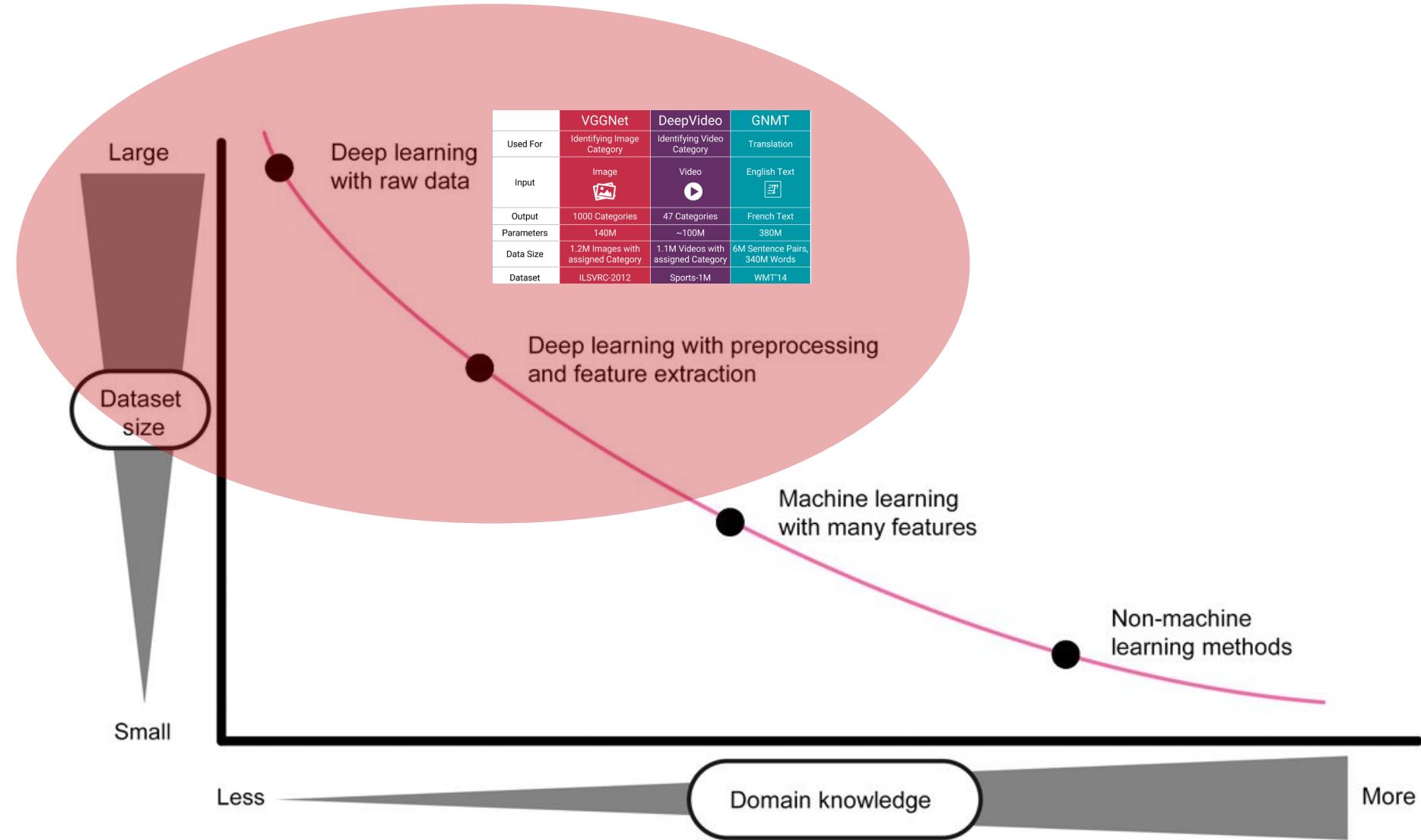
Here, we present a novel unified approach to interpreting model predictions.¹ Our approach leads to three potentially surprising results that bring clarity to the growing space of methods:

1. We introduce the perspective of viewing *any* explanation of a model's prediction as a model itself, which we term the *explanation model*. This lets us define the class of *additive feature attribution methods* (Section 2), which unifies six current methods.

¹<https://github.com/slundberg/shap>

31st Conference on Neural Information Processing Systems (NIPS 2017), Long Beach, CA, USA.

<https://proceedings.neurips.cc/paper/2017/file/8a20a8621978632d76c43dfd28b67767-Paper.pdf>



{Top-down}

Top-down Encoding Capacity increases by adding hidden layers

What are the limits of deep learning?

The much-hyped artificial intelligence approach boasts impressive feats but still falls short of human brainpower. Researchers are determined to figure out what's missing.

M. Mitchell Waldrop, Science Writer

There's no mistaking the image: It's a banana—a big, ripe, bright-yellow banana. Yet the artificial intelligence (AI) identifies it as a toaster, even though it was trained with the same powerful and oft-publicized deep-learning techniques that have produced a white-hot revolution in driverless cars, speech understanding, and a multitude of other AI applications. That means the AI was shown several thousand photos of bananas, slugs, snails, and similar-looking objects, like so many flash cards, and then drilled on the answers until it had the classification down cold. And yet this advanced system was quite easily confused—all it took was a little day-glow sticker, digitally pasted in one corner of the image.

This example of what deep-learning researchers call an "adversarial attack," discovered by the Google Brain team in Mountain View, CA (1), highlights just how far AI still has to go before it remotely approaches human capabilities. "I initially thought that adversarial examples were just an annoyance," says Geoffrey Hinton, a computer scientist at the University of Toronto and one of the pioneers of deep learning. "But I now think they're probably quite profound. They tell us that we're doing something wrong."

That's a widely shared sentiment among AI practitioners, any of whom can easily rattle off a long list of deep learning's drawbacks. In addition to its vulnerability

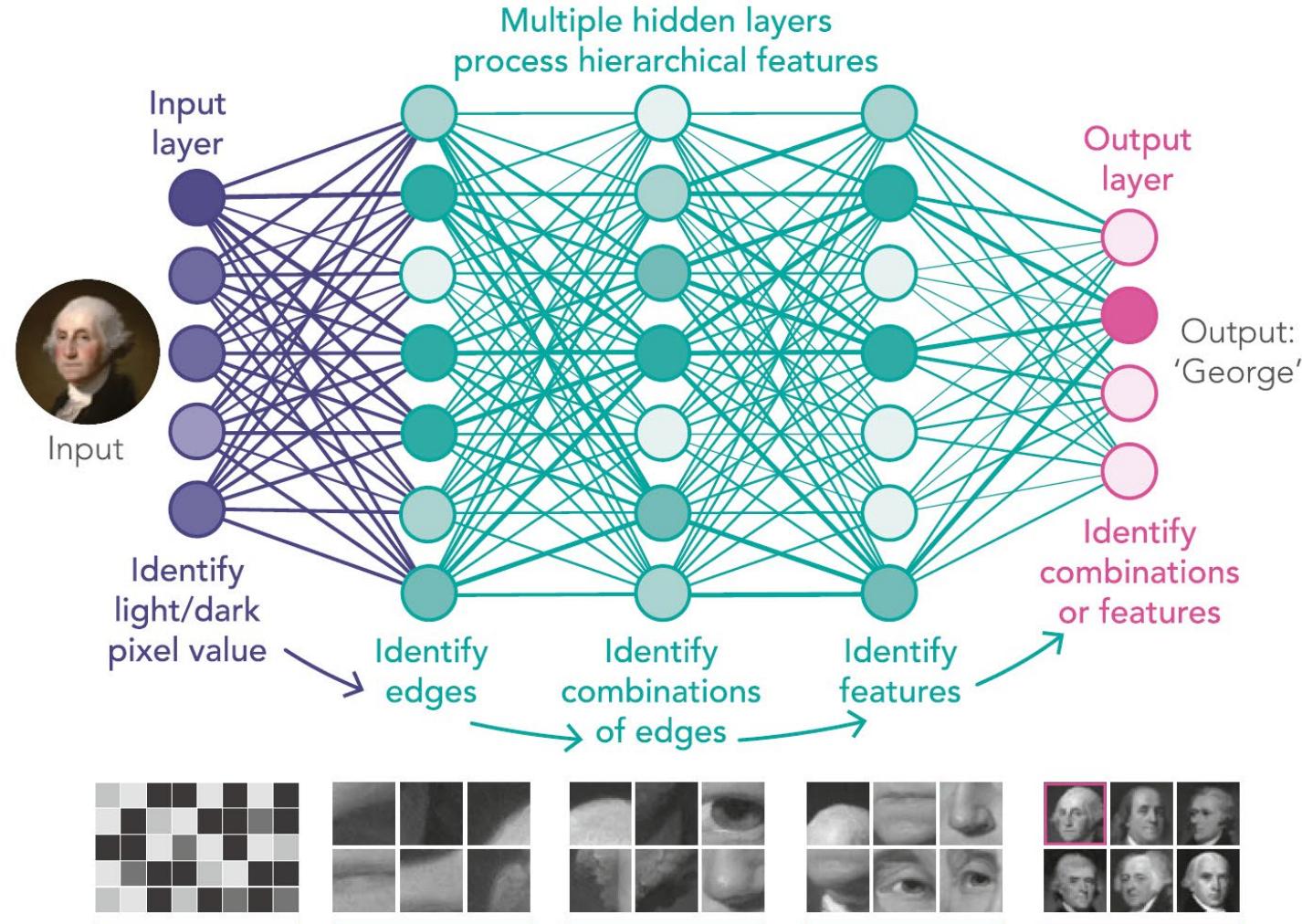


Apparent shortcomings in deep-learning approaches have raised concerns among researchers and the general public as technologies such as driverless cars, which use deep-learning techniques to navigate, get involved in well-publicized mishaps. Image credit: Shutterstock.com/MONOPOLY919.

Published under the PNAS license.

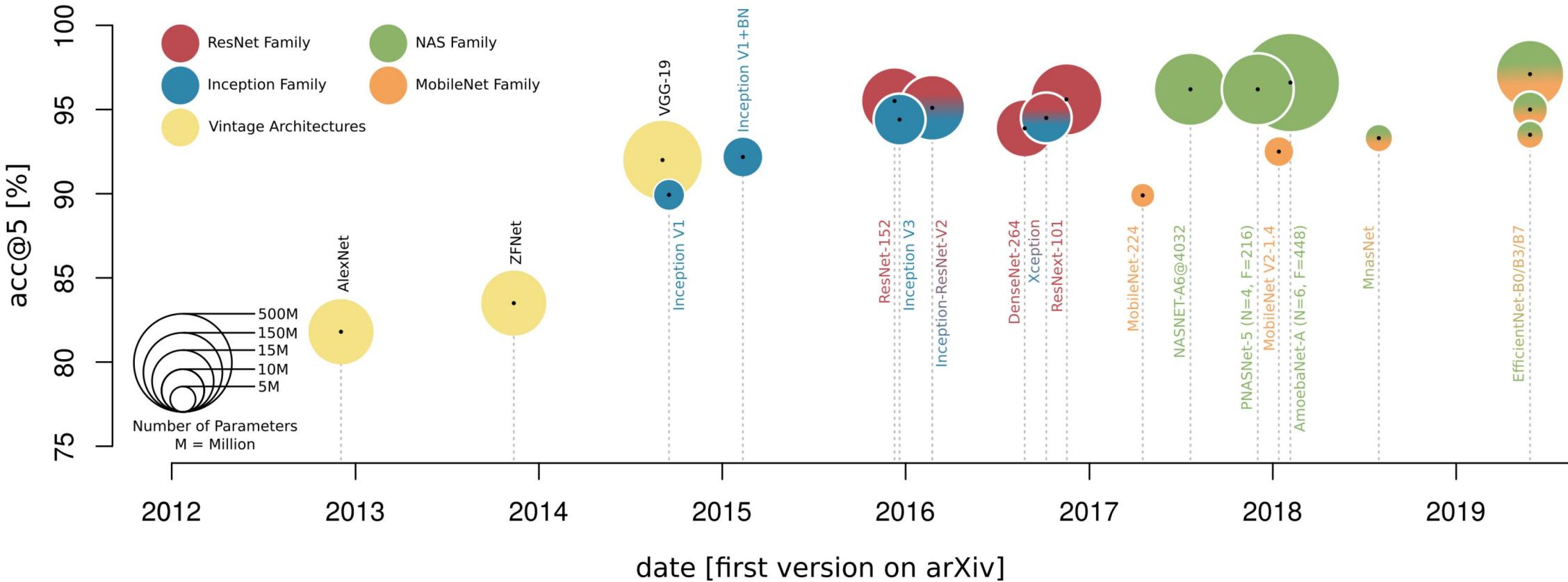
January 22, 2019 | vol. 116 | no. 4

www.pnas.org/cgi/doi/10.1073/pnas.1821594116



{Weights}

Performance increases by adding learnable parameters {weight's}



How to calculate the number of learnable parameters?

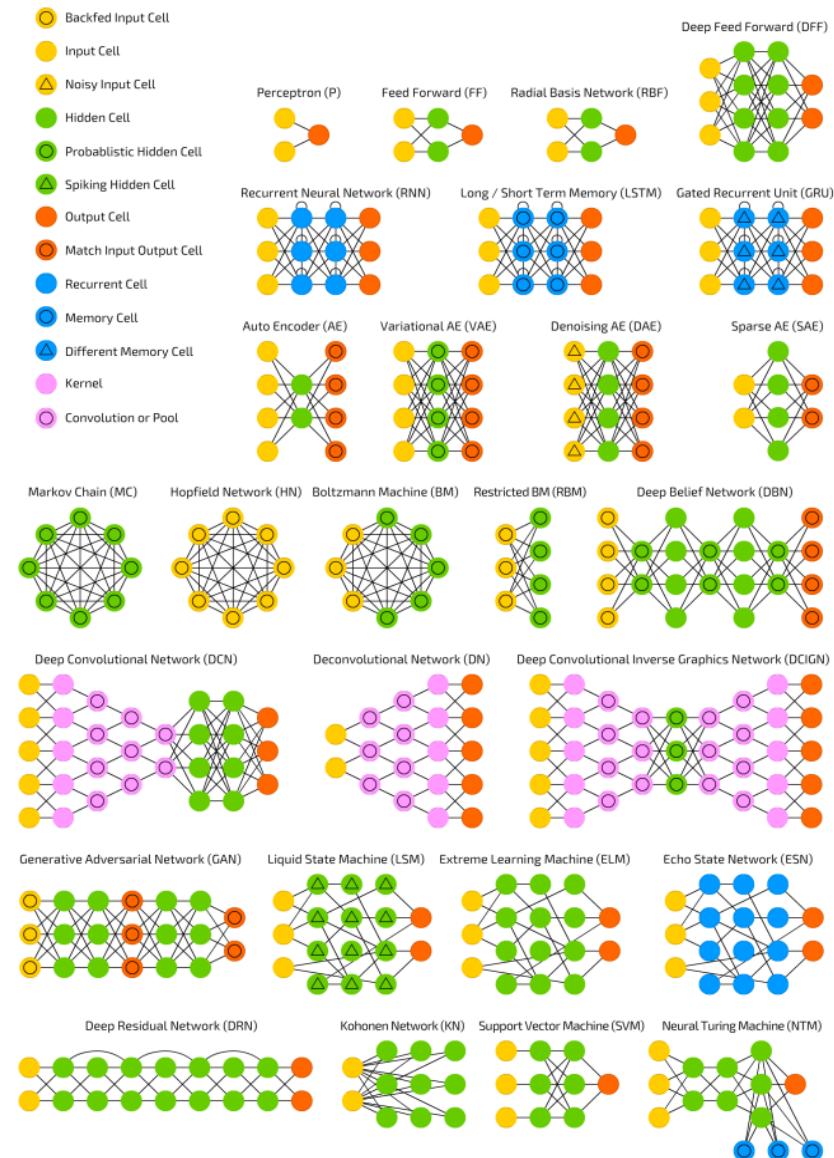
<https://doi.org/10.3390/rs121016>

{Topology}

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

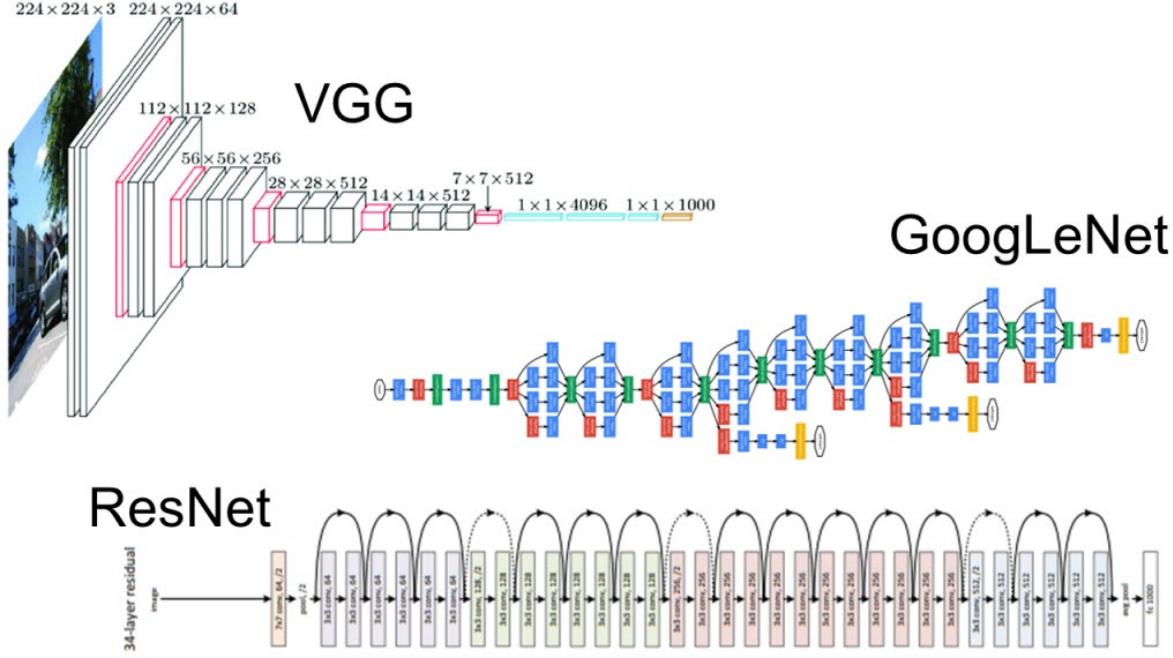
Form follows function!
The topology of a network determines the degree of perplexity of the tasks it can

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



{Perplexity}

Toplogical complex Neural Networks Perform Better: have Low Perplexity



Why the simple strategy of scaling up neural networks has been so effective?

[2105.12806] A Universal Law of Robustness via Isoperimetry
(arxiv.org)

Model	Size	Top-1 Accuracy	Top-5 Accuracy	Parameters	Depth
Xception	88 MB	0.790	0.945	22,910,480	126
VGG16	528 MB	0.713	0.901	138,357,544	23
VGG19	549 MB	0.713	0.900	143,667,240	26
ResNet50	98 MB	0.749	0.921	25,636,712	-
ResNet101	171 MB	0.764	0.928	44,707,176	-
ResNet152	232 MB	0.766	0.931	60,419,944	-
ResNet50V2	98 MB	0.760	0.930	25,613,800	-
ResNet101V2	171 MB	0.772	0.938	44,675,560	-
ResNet152V2	232 MB	0.780	0.942	60,380,648	-
InceptionV3	92 MB	0.779	0.937	23,851,784	159
InceptionResNetV2	215 MB	0.803	0.953	55,873,736	572
MobileNet	16 MB	0.704	0.895	4,253,864	88
MobileNetV2	14 MB	0.713	0.901	3,538,984	88
DenseNet121	33 MB	0.750	0.923	8,062,504	121
DenseNet169	57 MB	0.762	0.932	14,307,880	169
DenseNet201	80 MB	0.773	0.936	20,242,984	201
NASNetMobile	23 MB	0.744	0.919	5,326,716	-
NASNetLarge	343 MB	0.825	0.960	88,949,818	-
EfficientNetB0	29 MB	-	-	5,330,571	-
EfficientNetB1	31 MB	-	-	7,856,239	-
EfficientNetB2	36 MB	-	-	9,177,569	-
EfficientNetB3	48 MB	-	-	12,320,535	-
EfficientNetB4	75 MB	-	-	19,466,823	-
EfficientNetB5	118 MB	-	-	30,562,527	-
EfficientNetB6	166 MB	-	-	43,265,143	-
EfficientNetB7	256 MB	-	-	66,658,687	-

K Keras <https://keras.io/api/applications/>

{Self-attention}

Attention Is All You Need

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Abstract

The dominant sequence transduction models are based on complex recurrent or convolutional neural networks that include an encoder and a decoder. The best performing models also connect the encoder and decoder through an attention mechanism. We propose a new simple network architecture, the Transformer, based solely on attention mechanisms, dispensing with recurrence and convolutions entirely. Experiments on two machine translation tasks show these models to be superior in quality while being more parallelizable and requiring significantly less time to train. Our model achieves 28.4 BLEU on the WMT 2014 English-to-German translation task, improving over the existing best results, including ensembles, by over 2 BLEU. On the WMT 2014 English-to-French translation task, our model establishes a new single-model state-of-the-art BLEU score of 41.8 after training for 3.5 days on eight GPUs, a small fraction of the training costs of the best models from the literature. We show that the Transformer generalizes well to other tasks by applying it successfully to English constituency parsing both with large and limited training data.

1 Introduction

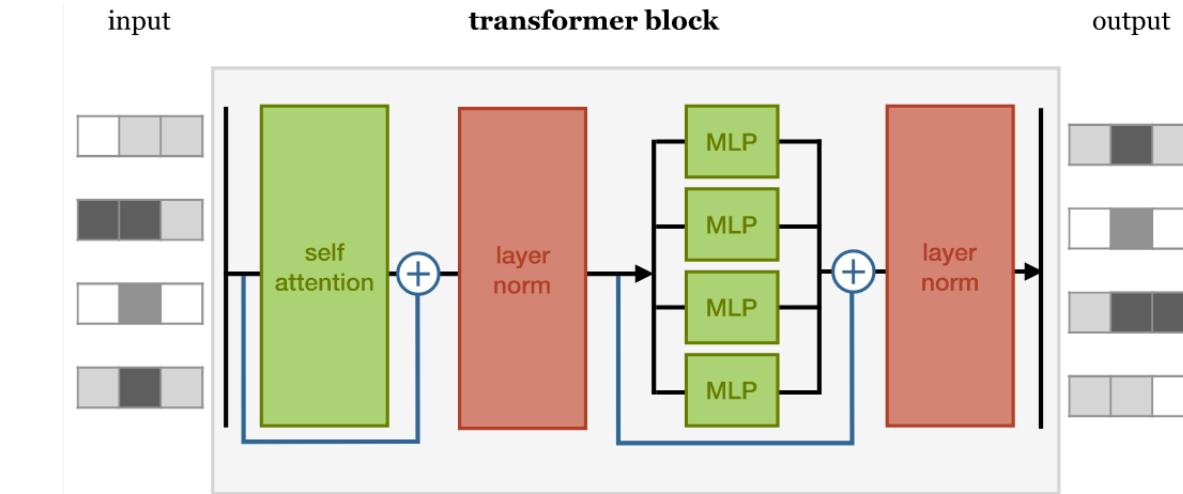
Recurrent neural networks, long short-term memory [13] and gated recurrent [7] neural networks in particular, have been firmly established as state of the art approaches in sequence modeling and

*Equal contribution. Listing order is random. Jakob proposed replacing RNNs with self-attention and started the effort to evaluate this idea. Ashish, with Ilia, designed and implemented the first Transformer models and has been crucially involved in every aspect of this work. Noam proposed scaled dot-product attention, multi-head attention and the parameter-free position representation and became the other person involved in nearly every detail. Niki designed, implemented, tuned and evaluated countless model variants in our original codebase and tensor2tensor. Llion also experimented with novel model variants, was responsible for our initial codebase, and efficient inference and visualizations. Lukasz and Aidan spent countless long days designing various parts of and implementing tensor2tensor, replacing our earlier codebase, greatly improving results and massively accelerating our research.

†Work performed while at Google Brain.

‡Work performed while at Google Research.

Transformer DNNs outperform GANs, CNN & RNNs by adding a stacked intermediate neural net topologies that attend to themselves called Transformers



[GitHub - pbloem/former: Simple transformer implementation from scratch in pytorch.](https://github.com/pbloem/former)
[Transformers from scratch | peterbloem.nl](https://peterbloem.nl)

Mukhamediev, R. I., Symagulov, A., Kuchin, Y., Yakunin, K., & Yelis, M. (2021). From Classical Machine Learning to Deep Neural Networks: A Simplified Scientometric Review. *Applied Sciences*, 11(12), 5541. MDPI AG. Retrieved from <http://dx.doi.org/10.3390/app11125541>

Data infrastructure drivers

People

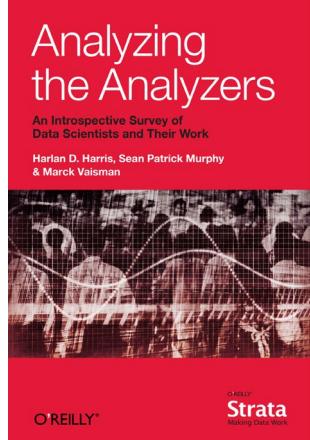
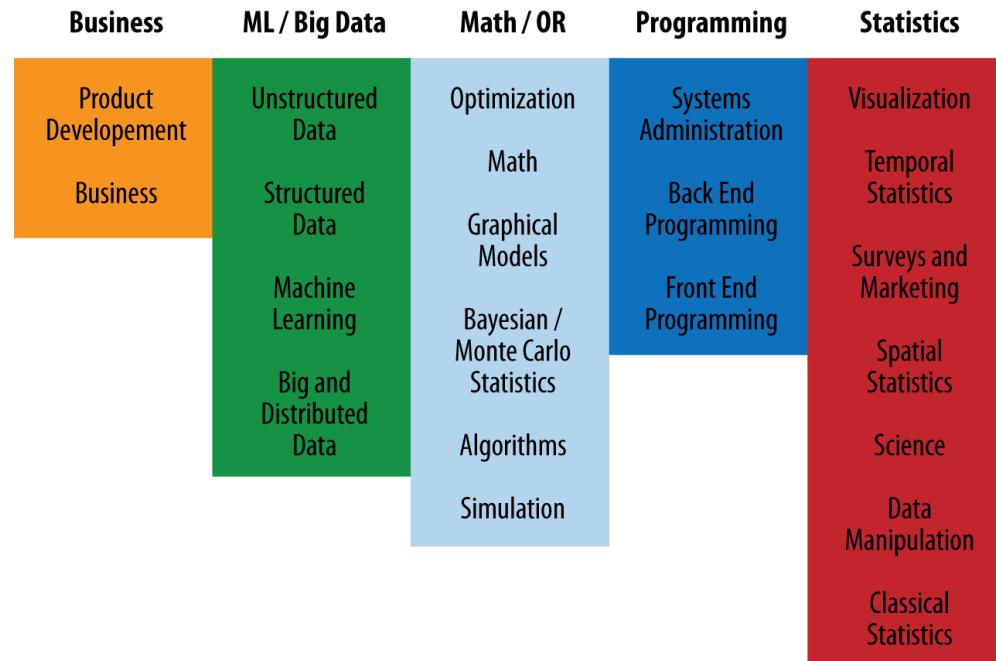
Data Access & Tooling

Knowledge Dissemination & Data Curation

Interoperability & Standards

Cloud Computing Capabilities & Accessibility

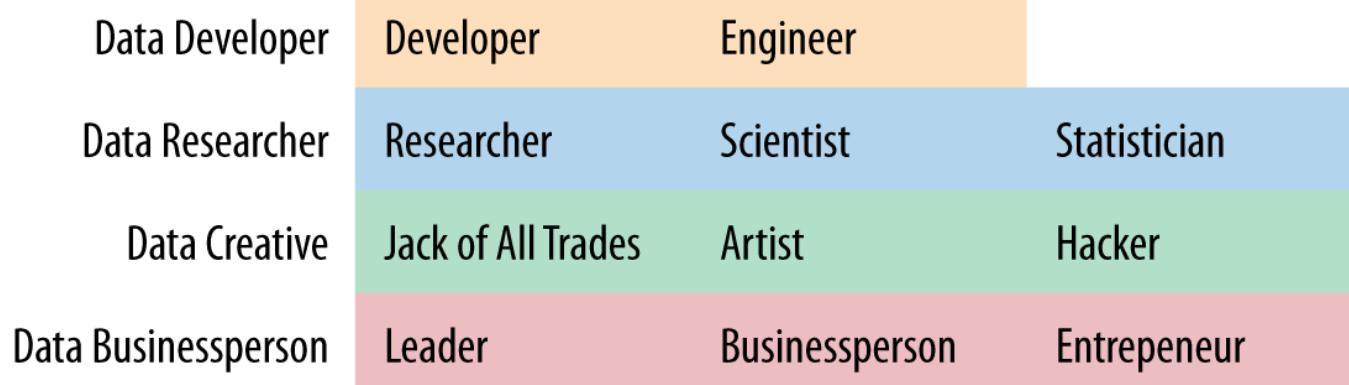
{People}



The size of your organization often determines role overlap



https://mleo.github.io/ml/GCP_day1/



{Data Access & Tooling}

Doing the right things

Discover
Research Phase

- [0] Collection
- [1] Access + Retrieval

Big Data (Acquisition/Aggregation) Gathering
Empirical (Sensor/IoT Measuring/Sampling)

Ownership (Open/Closed)
Storage (Cloud/Database)

Define
Synthesis Phase

- [2] Preparation + Wrangling (Munging)

Loading
Feature Extraction/Reduction
Normalization
Transformation
Conversion

Develop
Ideation Phase

- [3] Exploration
- [4] Analysis + Machine-Learning
- [5] Abstraction

Graphical (spatial)
Ontological (language)
Semantic (text)
Rule-based/Algorithmic
Quantitative/Qualitative
Numerical/Categorical/Symbolic

Mining (Heuristics/Statistics/Descriptive/Prescriptive)
Construct Useful Insights/Trends/Patterns/Diagnosis(Information)

Parameter Selection + Representation
Summarization
Problem Solving
Diagnostic
Prediction
Encryption

Doing things right

Deliver
Implementation Phase

- [6] Organization + Managing
- [7] Automation + Reporting

Visualization
Virtualization
Performance (Measure/Monitor)
Evaluation & Review
Decision & Advise or Prescription
(Interactive/Passive) Story Telling

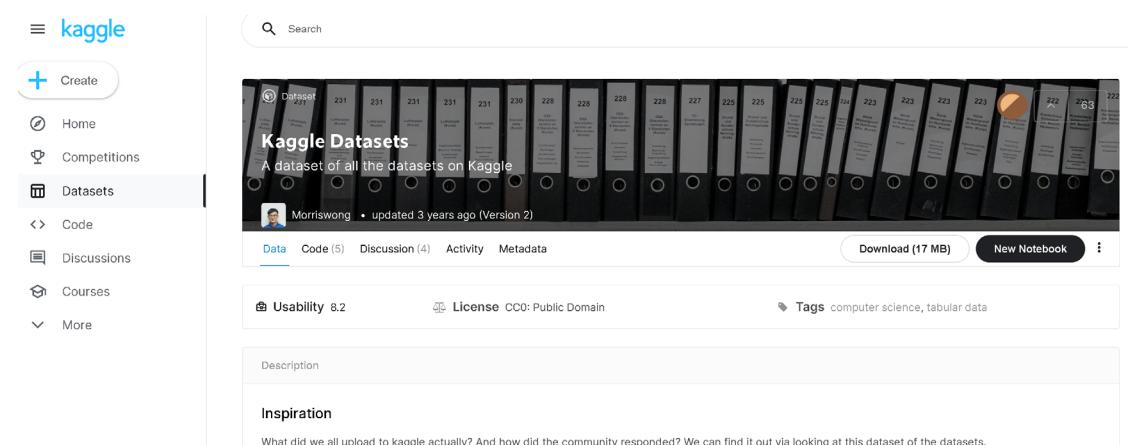
Data
Gathering & Ingesting

Data
Dissemination & Curation

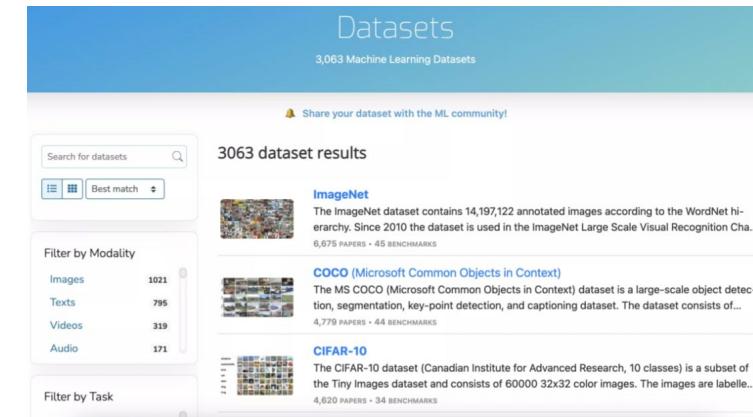
{Data Access & Tooling}



<https://dataverse.nl/>



<https://www.kaggle.com/morriswongch/kaggle-datasets>



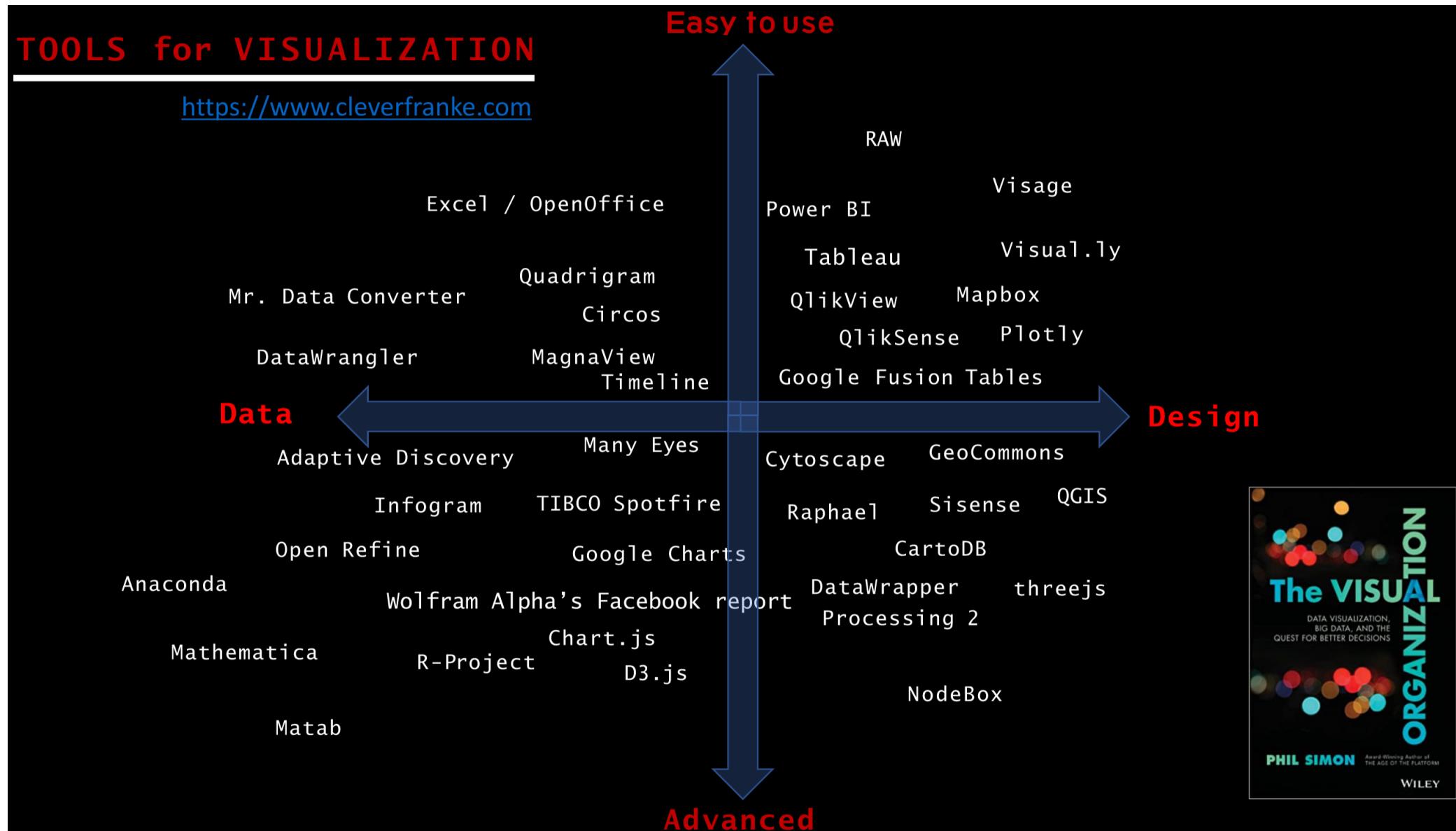
 [paperswithcode.com](#)

Papers with Code - Machine Learning Datasets

5577 datasets * 65018 papers with code.

<https://paperswithcode.com/datasets>

{Tooling}

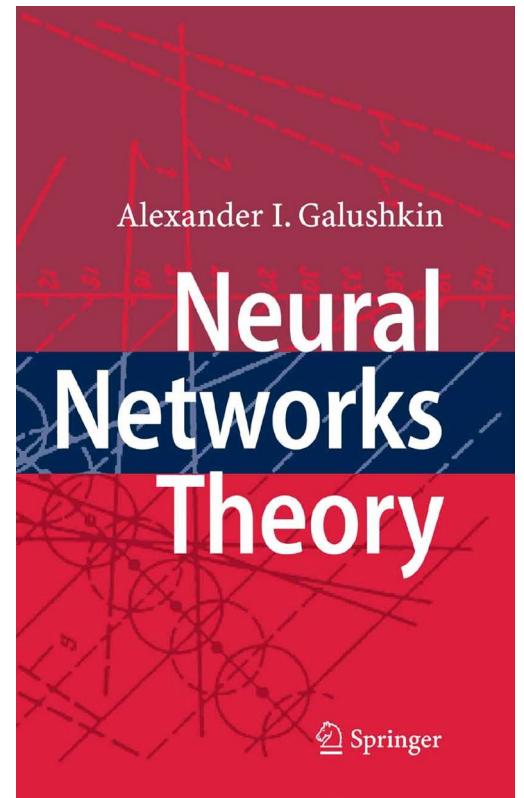
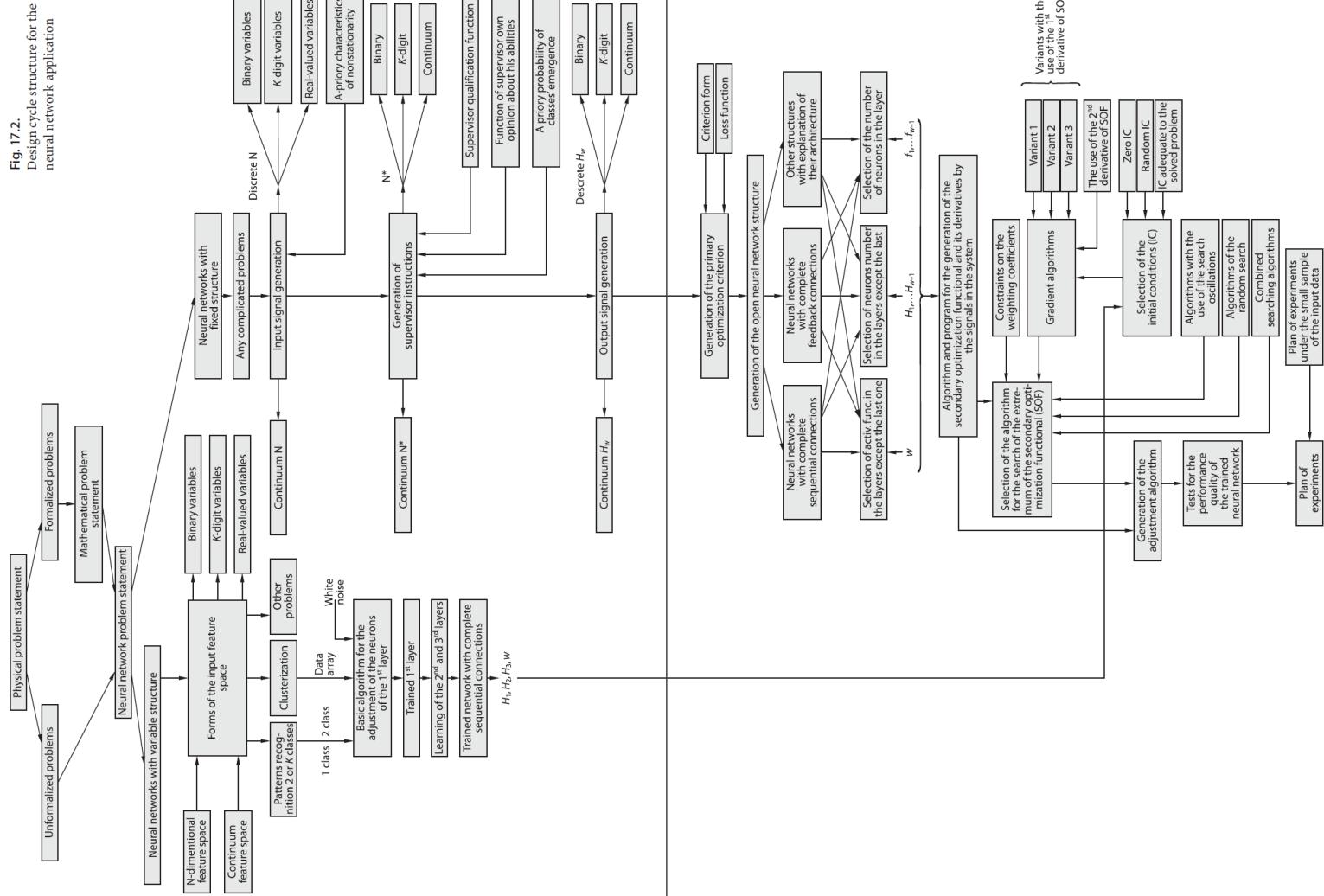


{Knowledge Dissemination & Curation}



HOGESCHOOL
ROTTERDAM

Employ decision-three flowcharts to apply (D)NNs appropriately

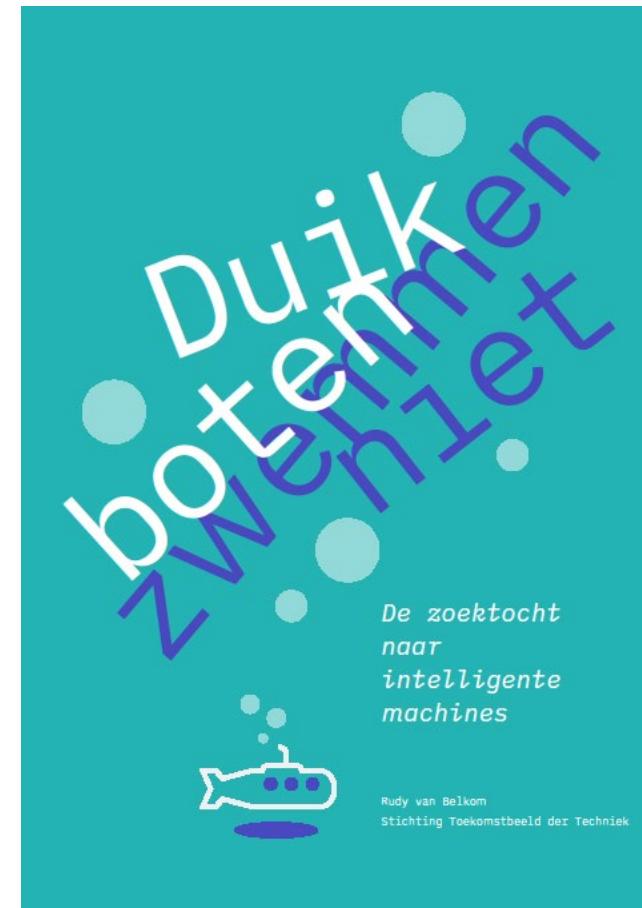


{Knowledge Dissemination & Curation}

Hight quality Dutch reviews on state-of-the-art AI



HOGESCHOOL
ROTTERDAM



De (on)mogelijkheden van kunstmatige intelligentie in het onderwijs

In opdracht van:
Ministerie van Onderwijs, Cultuur & Wetenschap

Project:
2018.068.1828 v1.0.116

Publicatienummer:
2018.068.1828 v1.0.116

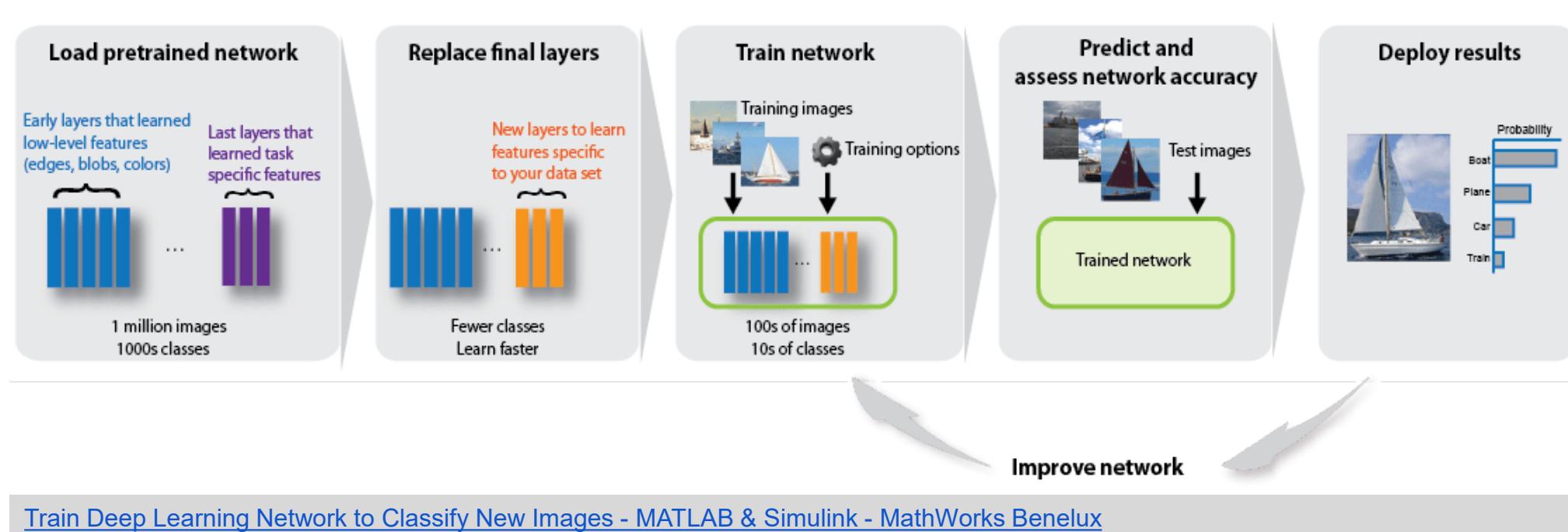
Datum:
Utrecht, 21 januari 2019

Auteurs:
ir. Tommy van der Vorst
ir. Nick Jelicic
mr. Marc de Vries
Julie Albers

{Knowledge Dissemination & Curation}



Hands-on demonstrations of how to reuse pre-trained DNNs on custom datasets by means of High-End Gaming-PCs



{Knowledge Dissemination & Curation}

Learn from prime examples

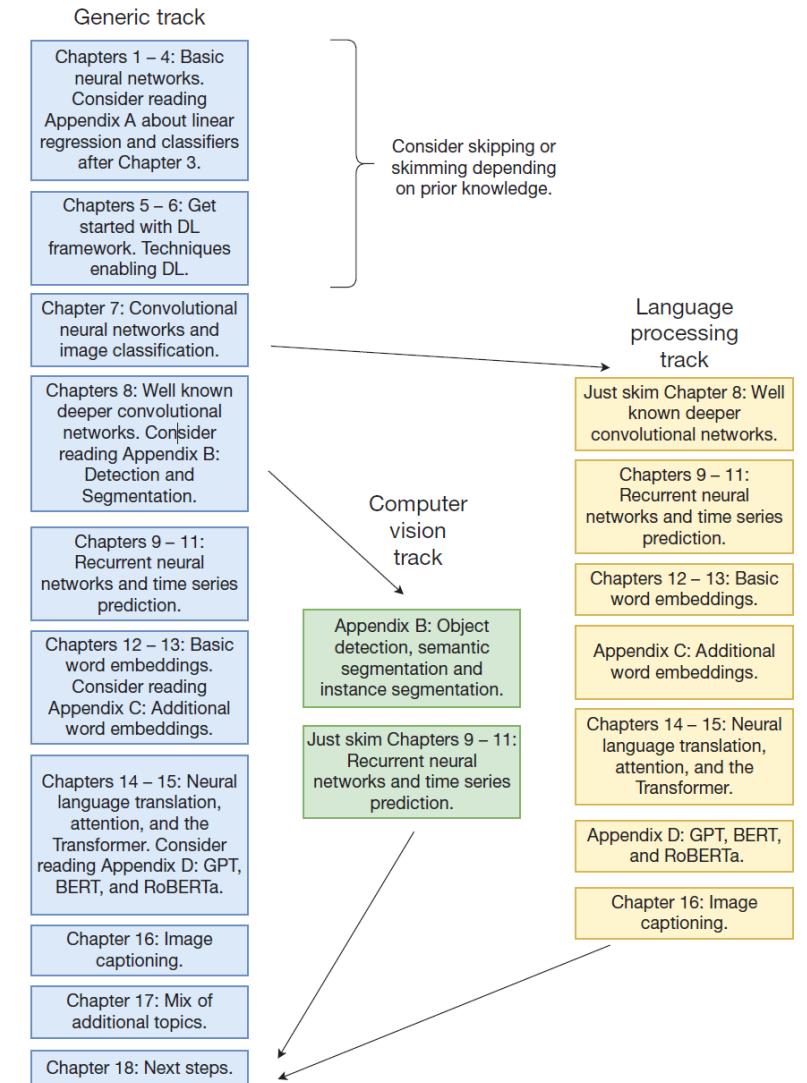
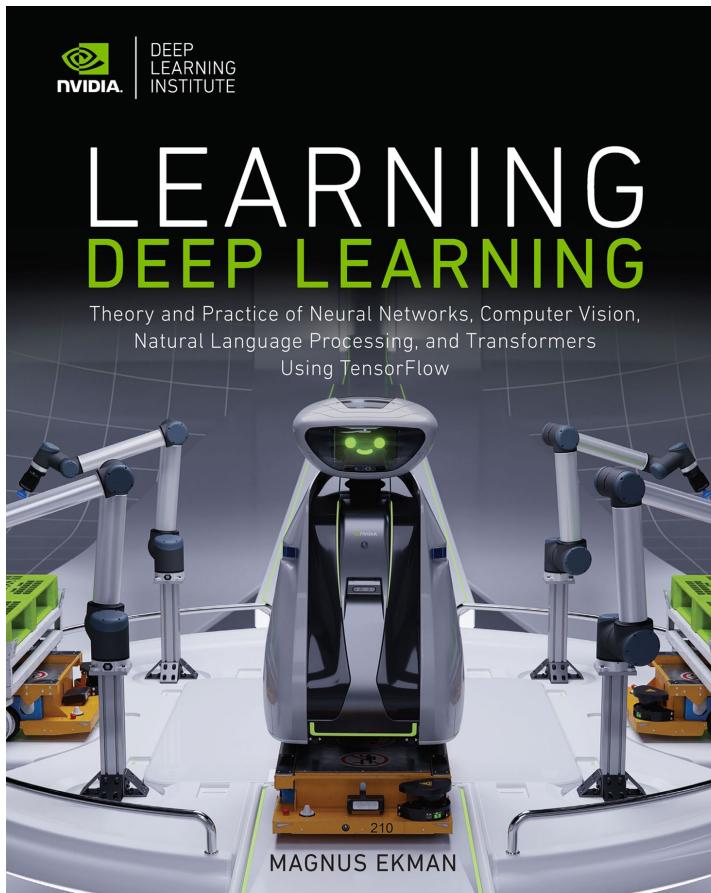


Figure P-5 Three different tracks to follow when reading this book

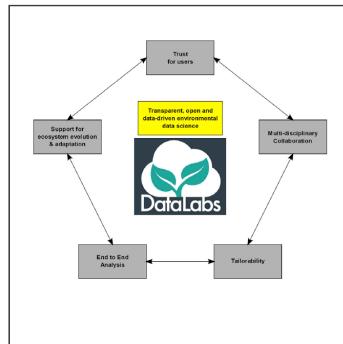
{Knowledge Dissemination & Curation}

Learn from prime examples

Patterns

Tackling the Challenges of 21st-Century Open Science and Beyond: A Data Science Lab Approach

Graphical Abstract



Authors

Michael J. Hollaway, Graham Dean, Gordon S. Blair, Mike Brown, Peter A. Henrys, John Watkins

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In Brief

We present the "data science lab" concept as a potential solution to champion cross-disciplinary and open science. Data science labs are cloud-based, collaborative, and tailorable platforms enabling users with different requirements and expertise to find data-driven solutions to a wide range of environmental challenges. We present examples of methodological and infrastructural developments using data science labs along with a detailed research roadmap to serve as a focal point for developing a more data-driven and transparent approach to environmental data science.

Highlights

- Offer a vision of data science labs as open, collaborative platforms in the cloud
- Discussion of how data science labs support open and transparent science
- Discussion of experiences around implementing data labs in practice
- The definition of a roadmap of research challenges around virtual data labs

Hollaway et al., 2020. Patterns 1, 100103
October 9, 2020 © 2020 The Author(s).
<https://doi.org/10.1016/j.patter.2020.100103>

CellPress

[Tackling the Challenges of 21st-Century Open Science and Beyond: A Data Science Lab Approach - ScienceDirect](#)

THEME ARTICLE: JUPYTER IN COMPUTATIONAL SCIENCE

Using Jupyter for Reproducible Scientific Workflows

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Thomas Kluyver European XFEL, 22869, Schenefeld, Germany

Alexander Konvalinov School of Computer Science, University of St. Andrews, KY16 9SX, St. Andrews, U.K.

Min Ragan-Kelley, Simula Research Laboratory, 1364, Fornebu, Norway

Nicolas M. Thiéry Laboratoire de Recherche en Informatique, Université Paris-Saclay, CNRS, 91405, Orsay, France

Hans Fangohr Max Planck Institute for the Structure and Dynamics of Matter, 22761, Hamburg, Germany

Literate computing has emerged as an important tool for computational studies and open science, with growing folklore of best practices. In this work, we report two case studies—one in computational magnetism and another in computational mathematics—where domain-specific software was exposed to the Jupyter environment. This enables high level control of simulations and computation, interactive exploration of computational results, batch processing on HPC resources, and reproducible workflow documentation in Jupyter notebooks. In the first study, Ubermag drives existing computational micromagnetics software through a domain-specific language embedded in Python. In the second study, a dedicated Jupyter kernel interfaces with the GAP system for computational discrete algebra and its dedicated programming language. In light of these case studies, we discuss the benefits of this approach, including progress toward more reproducible and reusable research results and outputs, notably through the use of infrastructure such as JupyterHub and Binder.

R esearch usually results in a publication that presents and shares the obtained findings and conclusions. For a publication to be scientifically valid, it must present the methodology rigorously, so that readers can follow the "recipe" and reproduce the results. If this criterion is met, the publication is considered reproducible. Reproducible publications are more easily reusable and, thus, provide a significant opportunity to make (often tax-payer funded) research more impactful. However, the reproducibility of computational work is usually hindered not only by a lack of data or metadata but also by a lack of details on the procedure and tools used.

1) The source code of the software used is not available.

2) Information on the computing environment, such as the hardware, operating system, supporting libraries, and (if required) code compilation details is not revealed.

3) The exact procedure, which led to the results reported in the publication, is not shared. This should include the set of parameters used, the simulation and data analysis procedure, and any additional data cleaning, processing, and visualization. Ideally, these are shared as open-source code and analysis scripts used to perform the simulation and to read, analyze, and visualize the resulting data. This way, the entire process can be repeated by rerunning simulation and/or analysis scripts. A human-readable document detailing the computational steps taken, despite being "better-than-

1521-9615 © 2021 IEEE
Digital Object Identifier 10.1109/MCSE.2021.3052101
Date of publication 15 January 2021; date of current version
23 March 2021.

[Using Jupyter for Reproducible Scientific Workflows | IEEE Journals & Magazine | IEEE Xplore](#)

{Knowledge Dissemination & Curation}

Learn from prime examples

RESEARCH BRIEFS | DECEMBER 17, 2020

Artificial Intelligence and the Future of Work

THOMAS MALONE, DANIELA RUS, ROBERT LAUBACHER

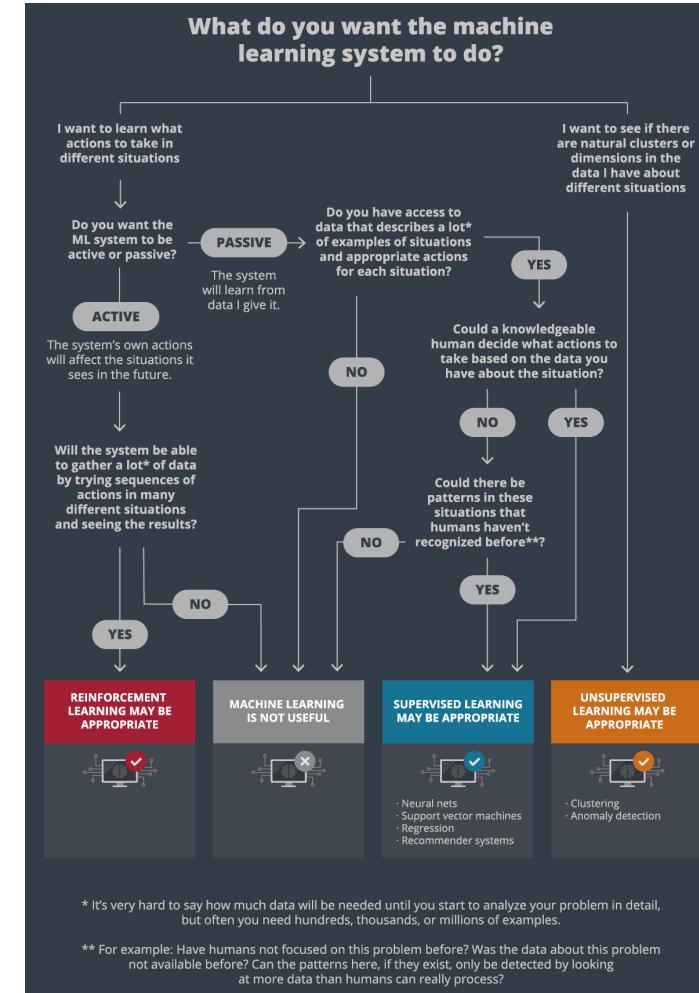
RB17-2020



SHARE @

DOWNLOAD RESEARCH BRIEF

<https://workofthefuture.mit.edu/wp-content/uploads/2020/12/2020-Research-Brief-Malone-Rus-Laubacher2.pdf>

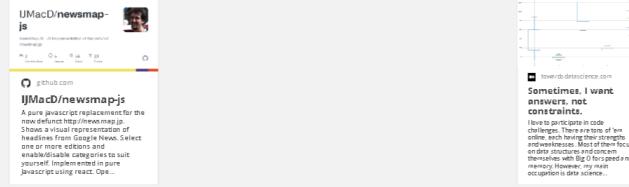


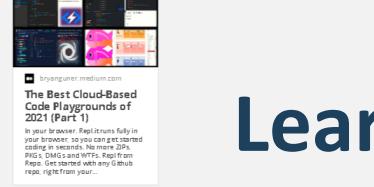
{Knowledge Dissemination & Curation}

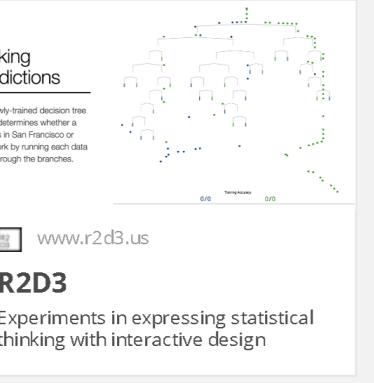


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ROTTERDAM

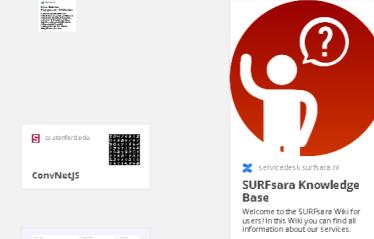

NewsMap.js
A squarified treemap visualization of Google News based on the original newsmap.js.

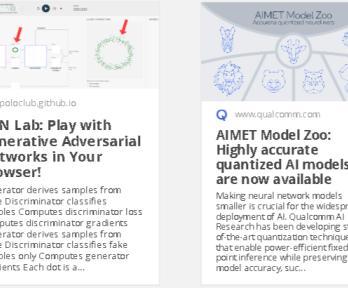

UMacD/newsmap-js
A pure javascript replacement for the now defunct <http://newsmap.js>. Shows a visual representation of the news you care about. Select one or more editions and news sources and have them yourself implemented in pure javascript using react. Ope...

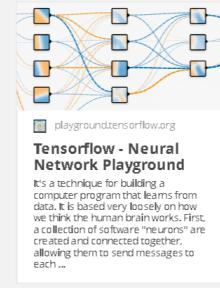

Making predictions
The newly-trained decision tree model determines whether a home is in San Francisco or New York by running each data point through the branches.

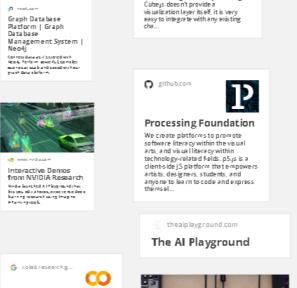

R2D3
Experiments in expressing statistical thinking with interactive design

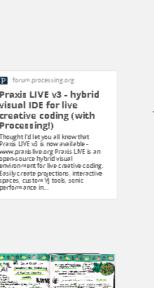

CodePen
An online code editor, learning environment, and community for front-end web development using HTML, CSS and JavaScript code snippets, projects, and web applications.

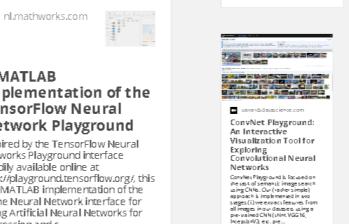

intel-analytics-zoo
Distributed Tensorflow, Keras and PyTorch on Apache Spark & Ray. Analytics Zoo is an open source Big Data AI platform, and includes the following features for scaling end-to-end AI to distributed Big Data: Orc: seamlessly scale out TensorFlow and...


GAN Lab: Play with Generative Adversarial Networks in Your Browser!
Generator derives samples from noise discriminator takes samples. Computes discriminator loss. Generator derives samples from noise discriminator classifies fake samples. Computes generator gradients. Each dot is a...


AIMET Model Zoo
Accurately quantized models


Tensorflow - Neural Network Playground
It's a technique for building a computer program that learns from data. It is based very loosely on how we think the human brain works. First, a collection of software "neurons" are created and connected together, allowing them to send messages to each other.


The AI Playground


A MATLAB implementation of the TensorFlow Neural Network Playground
Inspired by the TensorFlow Neural Networks Playground interface, readily available online at <http://playground.tensorflow.org/>, this is a MATLAB implementation of the same Neural Network interface for using Artificial Neural Networks for regression and...


playground.info - Wolfram|Alpha
Uh oh! Wolfram|Alpha doesn't run without JavaScript. Please enable JavaScript. If you don't know how, you can find instructions. Once you've done that, refresh this page to start using Wolfram|Alpha.

Learn from prime examples

DATA Science Playgrounds

https://miro.com/app/board/uXjVOCnGVbU/?invite_link_id=71693258

{Knowledge Dissemination & Curation}



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Post-Doc Voucher Milestones

HUMAN_IN_THE_LOOP
How to design deep nets that are interpretable by humans

SENSORY ECOLOGY
A Data Science Quest On the Origin of Natural Language Processing

Milestones
Post-Doc Voucher & PopUP AI-LAB Prometheus (jan 2022)

Planning

DOING THE RIGHT THINGS

DATA GATHERING & INGESTING

DATA DISSEMINATION & CURATION

HIGH IMPACT

HIGH EDUCATIONAL VALUE

LOW IMPACT

HIGH SCIENTIFIC VALUE

WHY IS IT RELEVANT in 2022?

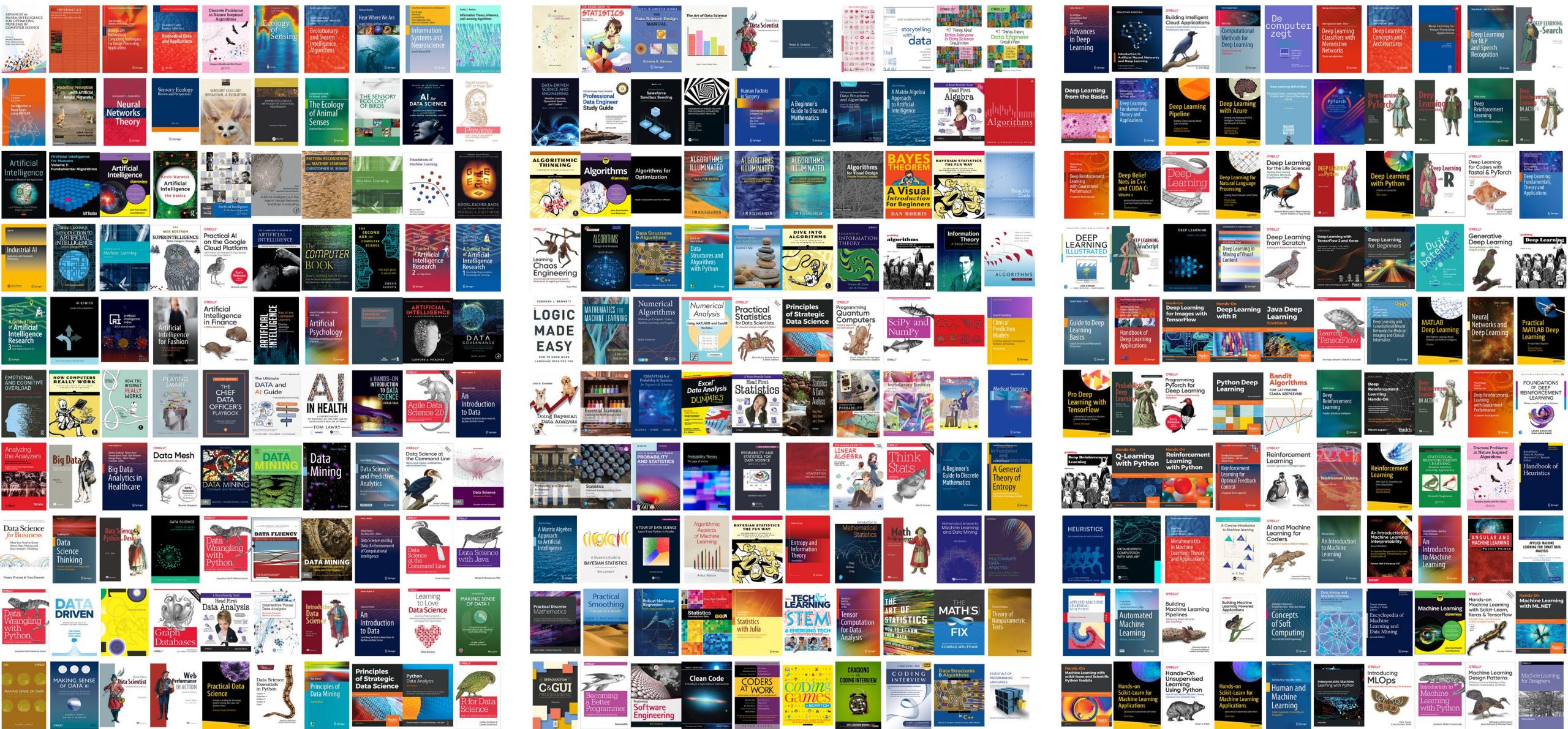
TOOLS FOR VISUALIZATION

MAN

MACHINE

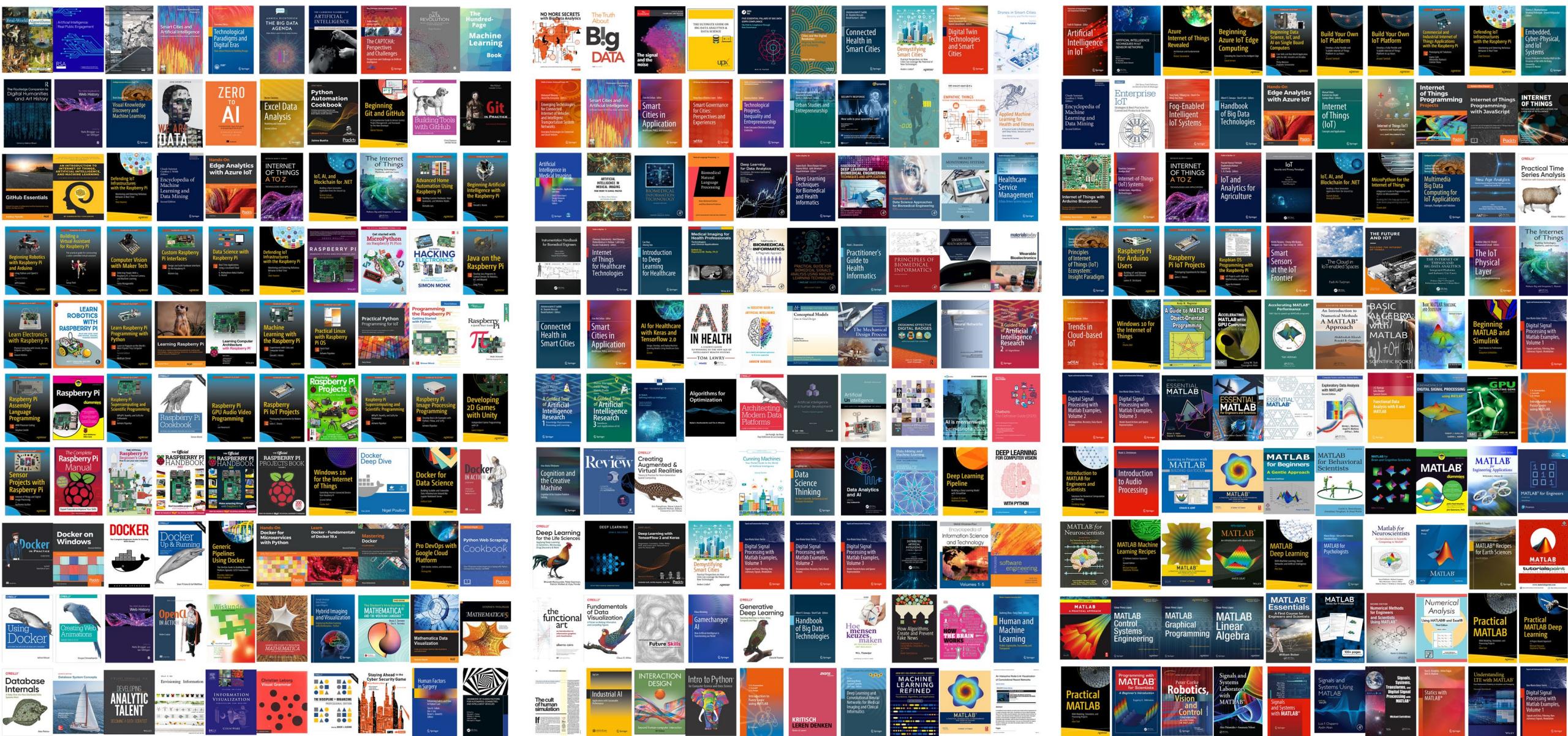
https://miro.com/app/board/o9J_I-CrLzg/?invite_link_id=427711164595

{Studied Materials: books}

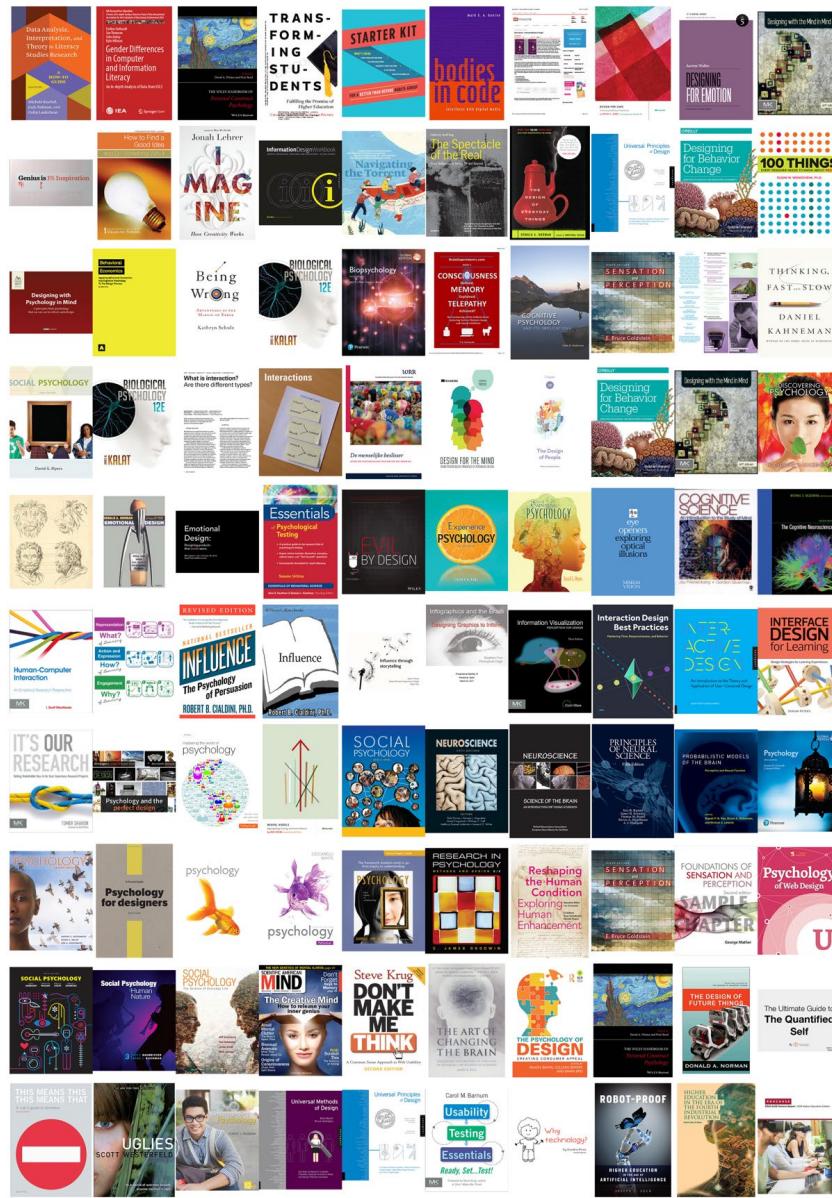


{Studied Materials: books}

{Studied Materials: books}



{Studied Materials: books}



Who AM I ?



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

Highlights

PRO

Organizations



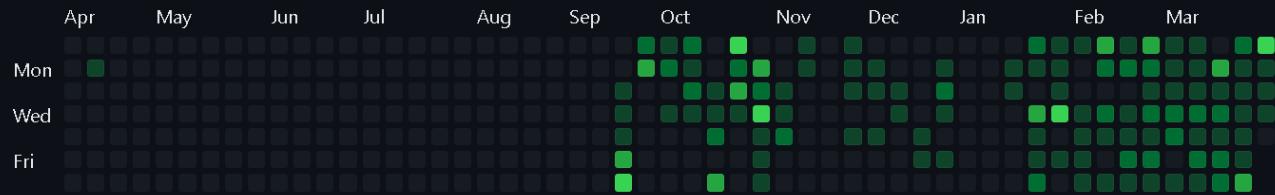
Repositories 15 Projects Packages

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

contribution settings ▾

Contribution activity

2023

March 2023

2022

2021



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

on Ma



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





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overtref jezelf