

chatGPT & Co. in Project Management?

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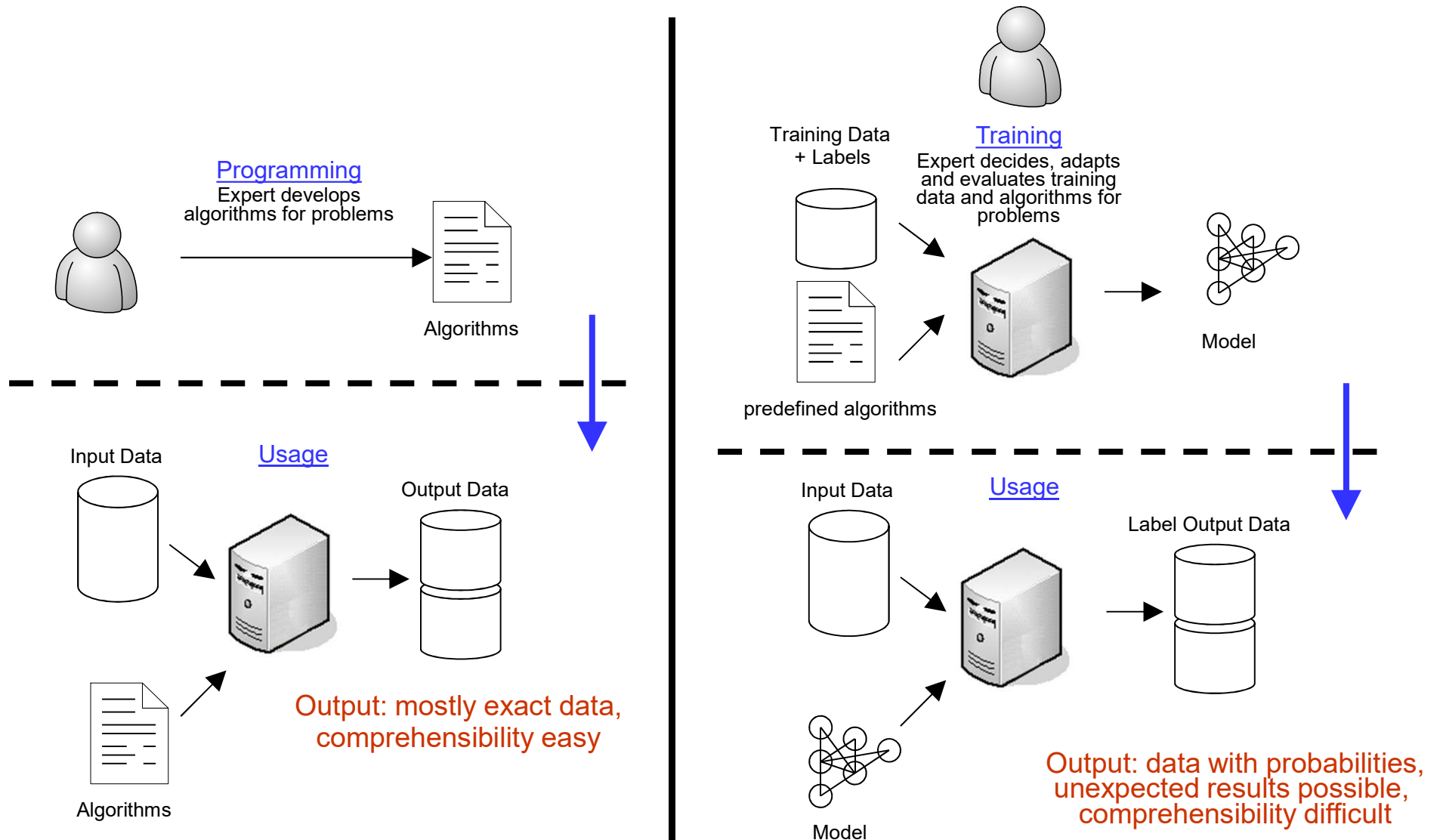
A Discussion in Practice

Stuttgarter PMCamp 2023

ARD Tagesschau Bericht vom 16.04.2023

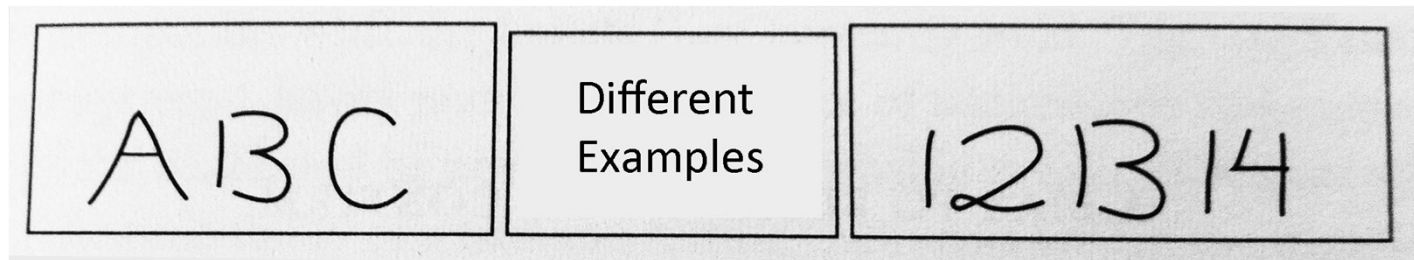
chatGPT & Co.

Classical Algorithm Process vs. Machine Learning Process



Are our decisions always safe?

- Read first left side, then right side. What do you notice?



- Read the following text very fast – What did you recognize?

Afugrnud enier Sduite an enier elingshcen Unvirestiät ist es eagl, in wlehcer Rienhnelfoge die Bcuhtsbaen in eniem Wort sethen, das enizg wcihitge dbaei ist, dsas der estre und lzete Bcuhtsbae am rcihgiten Paltz snid. Der Rset knan ttolaer Bölsdinn sien, und man knan es torztedm onhe Porbelme lseen. Das ghet dseahlb, wiel wir nchit Bcuhtsbae für Bcuhtsbae enizlen lseen, snodren Wröetr.

Imagesources: Wenger R.: AlphaSkills, Campus-Verlag, 2005 / Kahneman D.: Thinking, Fast and Slow, Penguin , 2012

What is chatGPT?

- chatGPT is an user interface and a little bit more to the language model (GPT3.5, GPT4 ...) until 2021 (in Bing browser also other years)
- The language model is trained by Deep Learning mechanism and other techniques like Reinforcement Learning from Human Feedback, data augmentations of text a.s.o. AND extremely many data (look at former models at <https://en.m.wikipedia.org/wiki/GPT-3>)
- Let's ask chatGPT what it is – **EXAMPLE**
- Let's show an **EXAMPLE** in context to project management
- There is a comfortable API interface available – **EXAMPLE**
 - <https://platform.openai.com/docs/introduction>
- There is also a plugin structure
 - <https://platform.openai.com/docs/plugins/introduction>

What can do and what can not do chatGPT?

■ What it can?

- Query knowledge
- Provide explanations in different complexities
- Generate texts based on keywords
- Summarize text
- Rephrase text
- Complementing text
- Making analogies
- Programming and debugging
- Writing poetry
- Analyzing and inferring text
- Collecting ideas
- Generating songs
- Translate
- Text classification
- Make personal recommendations, e.g. for travel
- Learning based on input
- ...

■ What it can not (yet)?

- Always answer correctly
- Always formulate accurate answers
- Calculate
- ...

Toolset of chatGPT

- Q&A**
Answer questions based on existing knowledge.
- Summarize for a 2nd grader**
Translates difficult text into simpler concepts.
- Text to command**
Translate text into programmatic commands.
- Natural language to Stripe API**
Create code to call the Stripe API using natural language.
- Parse unstructured data**
Create tables from long form text.
- Python to natural language**
Explain a piece of Python code in human understandable language.
- Calculate Time Complexity**
Find the time complexity of a function.
- Advanced tweet classifier**
Advanced sentiment detection for a piece of text.
- Keywords**
Extract keywords from a block of text.
- Ad from product description**
Turn a product description into ad copy.
- TL;DR summarization**
Summarize text by adding a 'tl;dr:' to the end of a text passage.
- Spreadsheet creator**
Create spreadsheets of various kinds of data.
- Grammar correction**
Corrects sentences into standard English.
- Natural language to OpenAI API**
Create code to call to the OpenAI API using a natural language instruction.
- English to other languages**
Translates English text into French, Spanish and Japanese.
- SQL translate**
Translate natural language to SQL queries.
- Classification**
Classify items into categories via example.
- Movie to Emoji**
Convert movie titles into emoji.
- Translate programming languages**
Translate from one programming language to another.
- Explain code**
Explain a complicated piece of code.
- Factual answering**
Direct the model to provide factual answers and address knowledge gaps.
- Product name generator**
Create product names from examples words.
- Python bug fixer**
Find and fix bugs in source code.
- JavaScript helper chatbot**
Message-style bot that answers JavaScript questions.
- ML/AI language model tutor.**
Bot that answers questions about language models
- Tweet classifier**
Basic sentiment detection for a piece of text.
- SQL request**
Create simple SQL queries.
- JavaScript to Python**
Convert simple JavaScript expressions into Python.
- Mood to color**
Turn a text description into a color.
- Analogy maker**
Create analogies.
- Micro horror story creator**
Creates two to three sentence short horror stories from a topic input.
- Notes to summary**
Turn meeting notes into a summary.
- Essay outline**
Generate an outline for a research topic.
- Chat**
Open ended conversation with an AI assistant.
- Turn by turn directions**
Convert natural language to turn-by-turn directions.
- Create study notes**
Provide a topic and get study notes.
- Science fiction book list maker**
Create a list of items for a given topic.
- Airport code extractor**
Extract airport codes from text.
- Extract contact information**
Extract contact information from a block of text.
- Friend chat**
Emulate a text message conversation.
- Write a Python docstring**
Write a docstring for a Python function.
- JavaScript one line function**
Turn a JavaScript function into a one liner.
- Third-person converter**
Converts first-person POV to the third-person.
- VR fitness idea generator**
Create ideas for fitness and virtual reality games.
- Recipe creator (eat at your own risk)**
Create a recipe from a list of ingredients.
- Marv the sarcastic chat bot**
Marv is a factual chatbot that is also sarcastic.
- Restaurant review creator**
Turn a few words into a restaurant review.
- Interview questions**
Create interview questions.

Source: <https://platform.openai.com/examples/>

Adapt (Train) the GPT model with your own data

- You can customize the LLM (i.e. GPT) with your own data, i.e. your own project management experience
- Keep in mind the topic data security (i.e. DSGVO) – look at <https://openai.com/policies/api-data-usage-policies>
- Let's show an **EXAMPLE** in context to project management

This context is trained by my own fake document This comes from the original trained context

Custom-trained AI Chatbot

Enter your text

What is the relationship between OKSDOR and a project manager ?

Löschen Absenden

output

This is the answer to my question (Keep in mind: the term "project manager" is not included in my fake document)

The relationship between OKSDOR and a project manager is that the project manager is responsible for ensuring that the criteria outlined in the OKSDOR agreement are met before a Product Backlog Item is ready for selection and implementation in a Sprint. The project manager must ensure that the Product Backlog Item is achievable, testable, has a design or mockup, has specified functional requirements, has a value, has resolved dependencies, and has identified risks.

Flag

The image shows a chatbot interface with two panels. The left panel is the input area, containing a text box with the question 'What is the relationship between OKSDOR and a project manager?' and two buttons: 'Löschen' (Delete) and 'Absenden' (Send). The right panel is the output area, containing a text box with a detailed answer and a 'Flag' button. Red arrows point from explanatory text to specific parts of the interface: 'This context is trained by my own fake document' points to the input text, 'This comes from the original trained context' points to the question, and 'This is the answer to my question (Keep in mind: the term "project manager" is not included in my fake document)' points to the output text.

What is AutoGPT?

- AutoGPT is an experimental open-source application using the capabilities of the GPT-4 language model (or GPT3.5) to automate and execute commands.
- What the main differences to chatGPT?
 - Local installation
 - Learn from their mistakes
 - Can use Internet services like web searches etc.
 - File storage and later analysis, i.e. summarization etc. (Attention!)
- Not perfect, in progressing and it is not cheap (be sure to limit monthly expenses)
- Other tools available, i.e. BabyAGI, Godmode.space (for browser) etc.
- Let's show an **EXAMPLE** in context to project management

Using chatGPT for Software Coding and Checking in Projects

- Let's show an **EXAMPLE**

- Request to chatGPT:

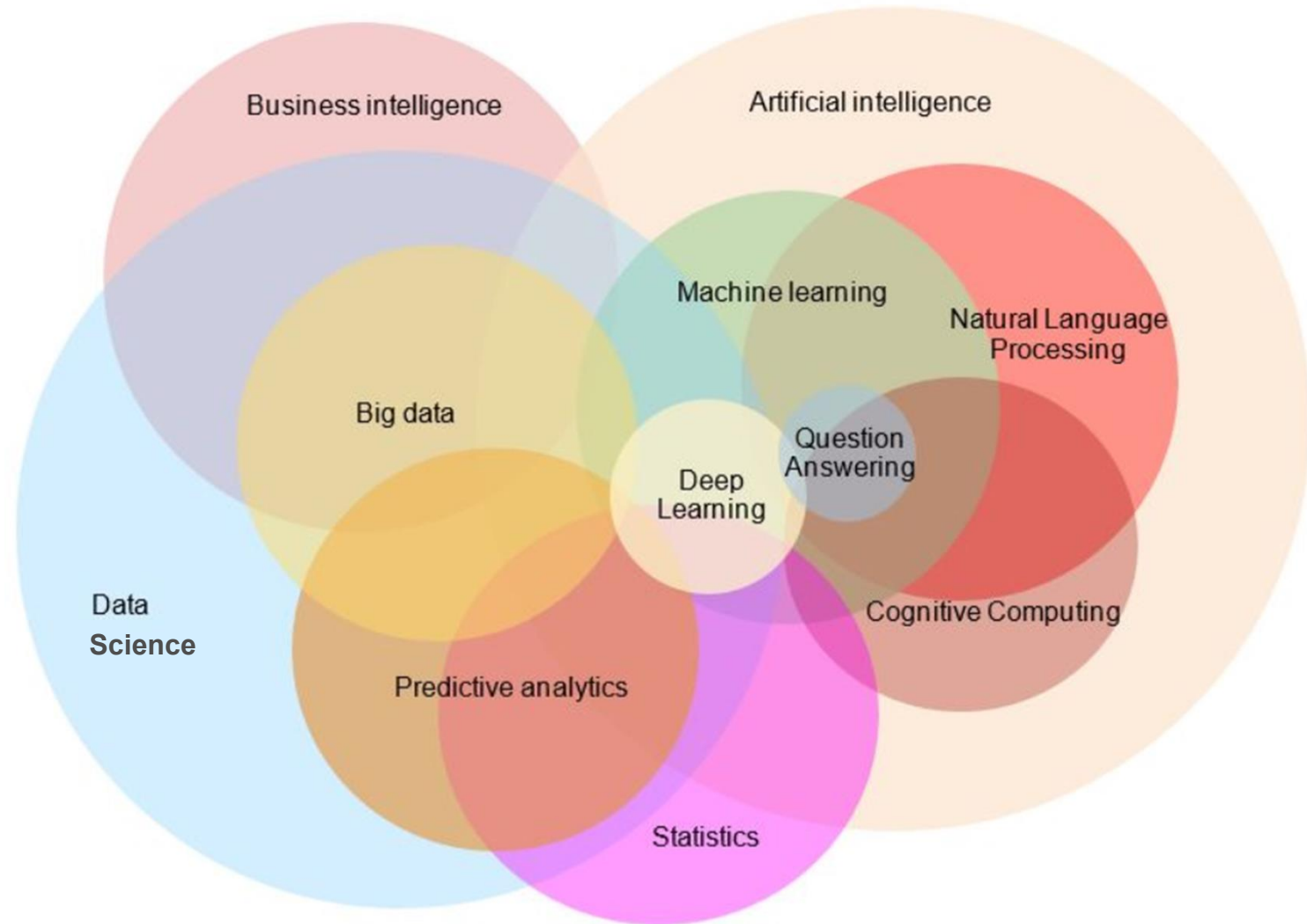
- "Write me a Python program that loads image files in JPEG format and outputs the number of animals seen in the image."

- Asking chatGPT for troubleshooting:

- „I got an error from the program above: cv2.error: OpenCV(4.6.0) D:\a\opencv-python\opencv-python\opencv\modules\dnn\src\darknet\darknet_io.cpp:660: error: (-215:Assertion failed) separator_index < line.size() in function 'cv::dnn::darknet::ReadDarknetFromCfgStream' “

Technical Background

Family Overview



Imagesource: <https://sastat.org.za/sasa2017/big-data-dictionary>, download 04/2019

Machine Learning Definition

Well-posed Learning Problem: A computer is said to learn from experience E with respect to some task T and some performance measure P , if its performance on T , as measured by P , improves with experience E .

At the very beginning of each ML-related project one should specify:

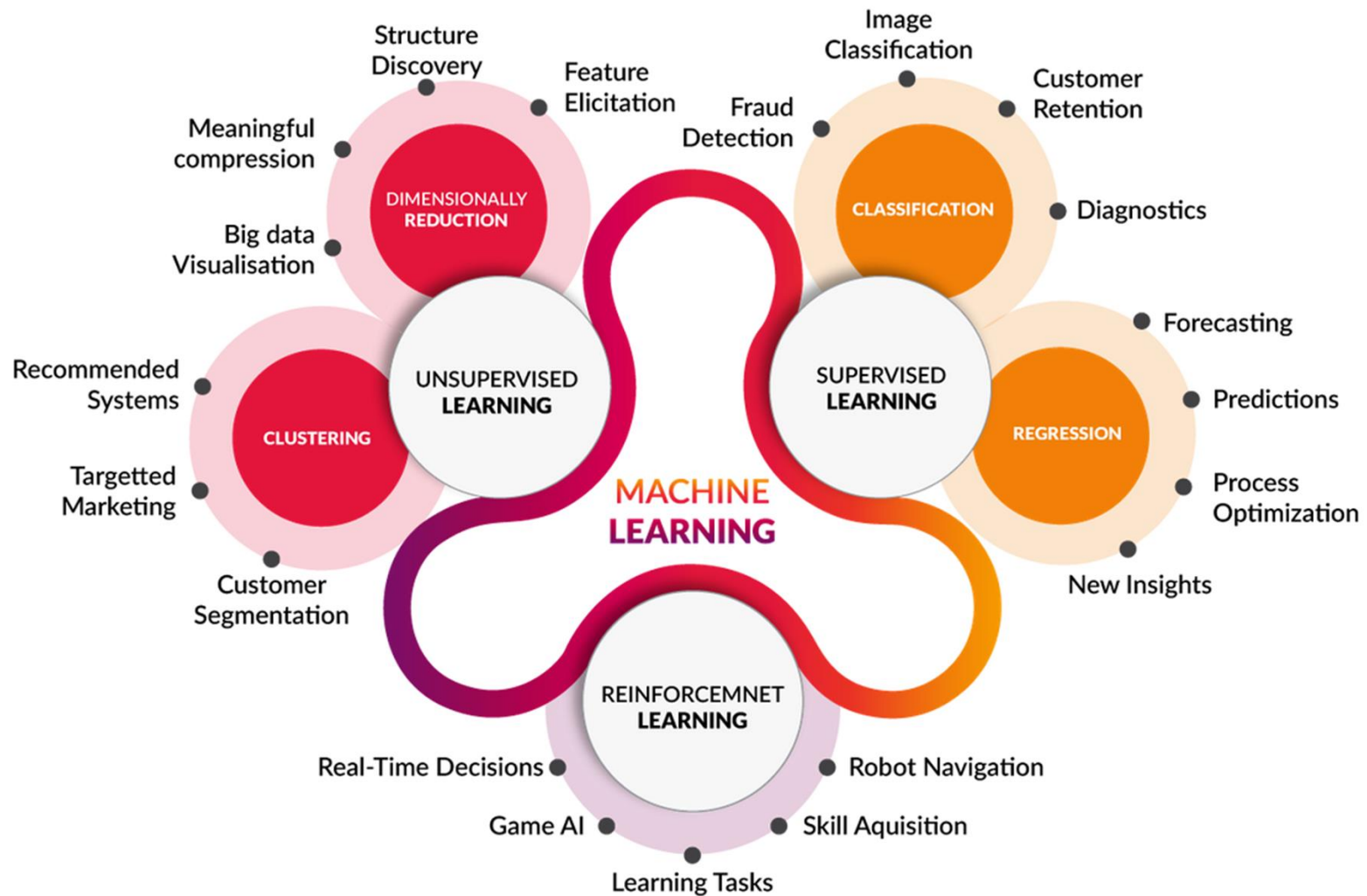
- Task T
- Experience E
- Performance Measure P

Pay attention on 2 important issues:

- 1. The Truth has to be inside the Data*
- 2. Correlation is not Causality*

Source: Mitchell, T.M.: Machine learning, International Edition. McGraw-Hill Series in Computer Science. McGraw-Hill, 1997

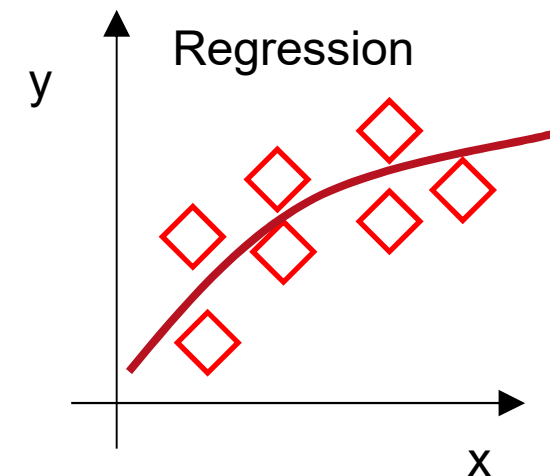
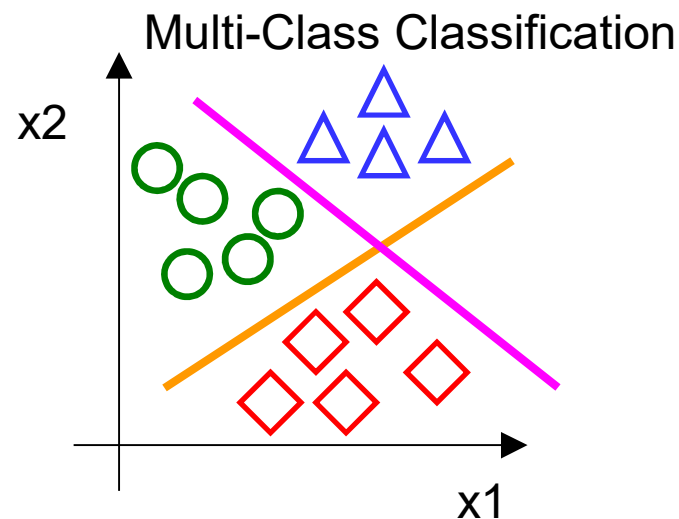
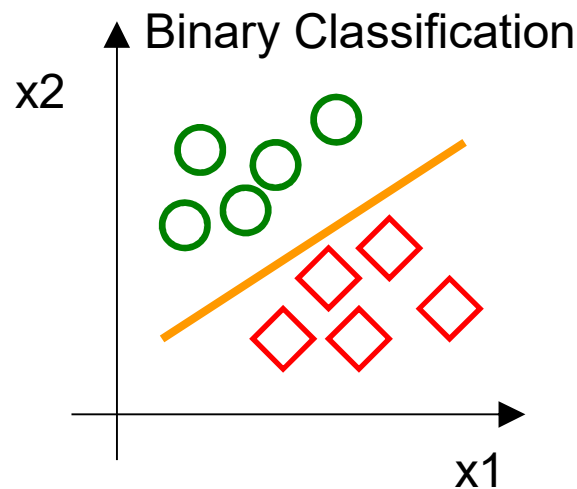
Machine Learning Areas



Imagesource: <http://www.cognub.com/index.php/cognitive-platform>, download 04/2019

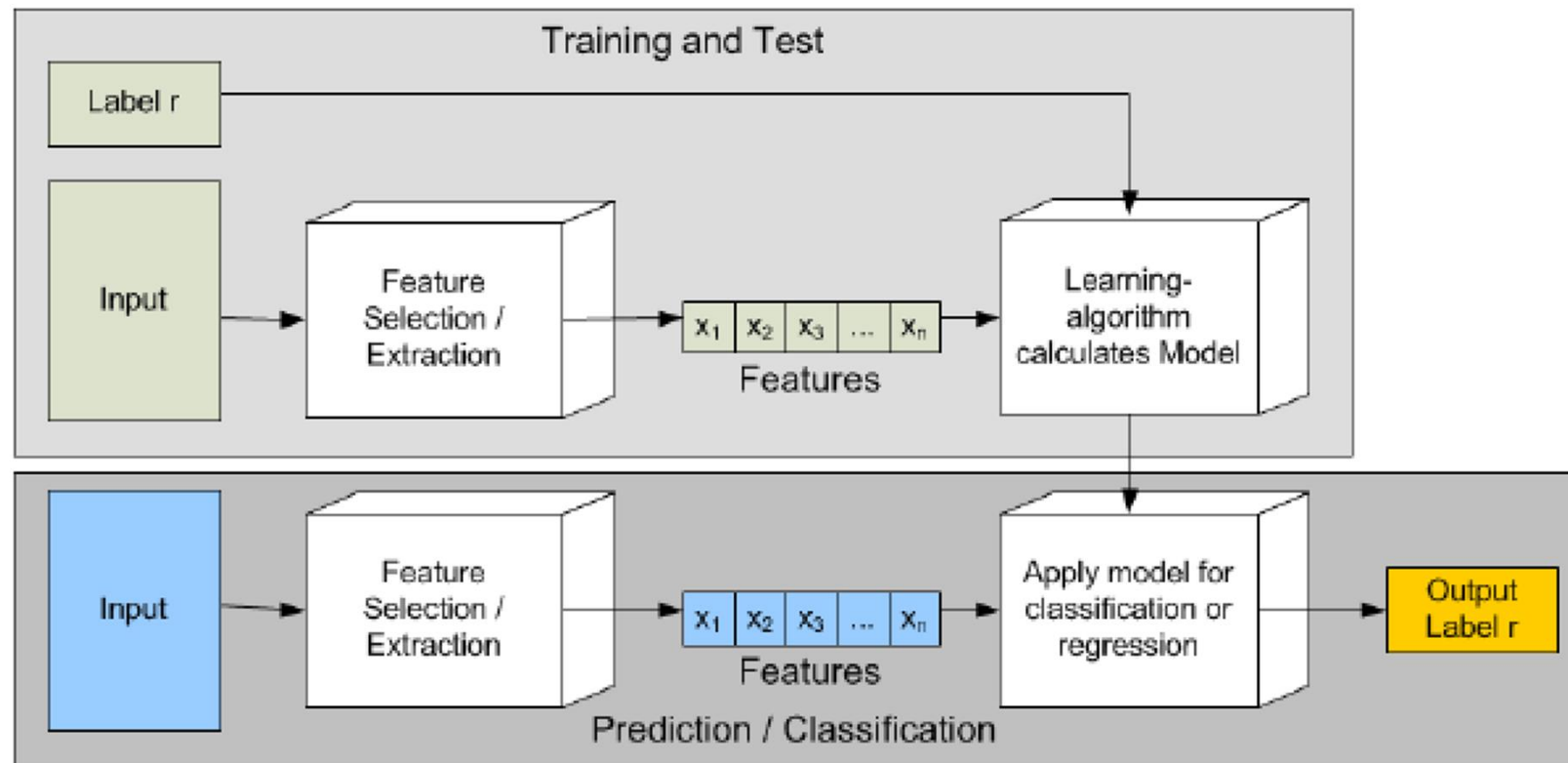
Supervised Learning

- Formerly: Multivariate Analysis methods
- Serious improvements through Deep Learning Technologies
- Typical scenarios: Regression, Binary and Multi-Class classification and more – with regarding the levels of measurement:



(simplified) Concept of Supervised Learning

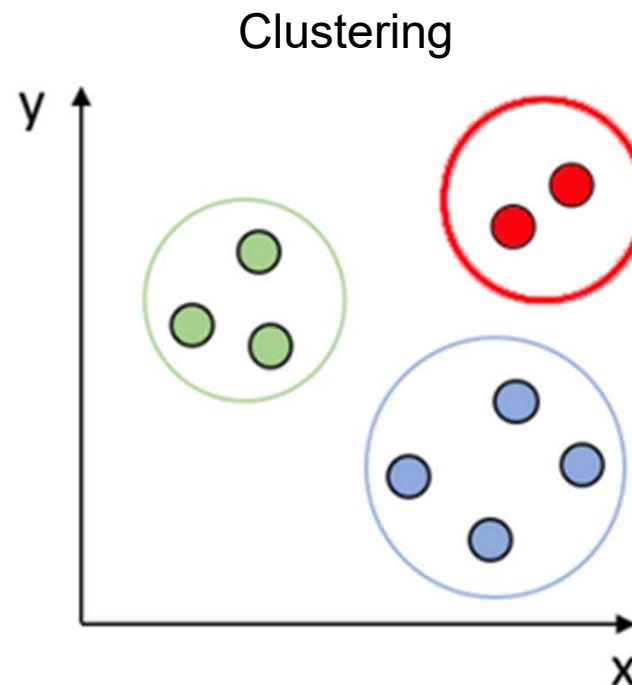
In supervised learning for each training sample a corresponding label, that explains the input, is provided. In unsupervised learning training data is not labeled.



Source: Maucher, J.: Introduction to Artificial Intelligence, Machine Learning and Deep Learning, IHK Workshop, 2018

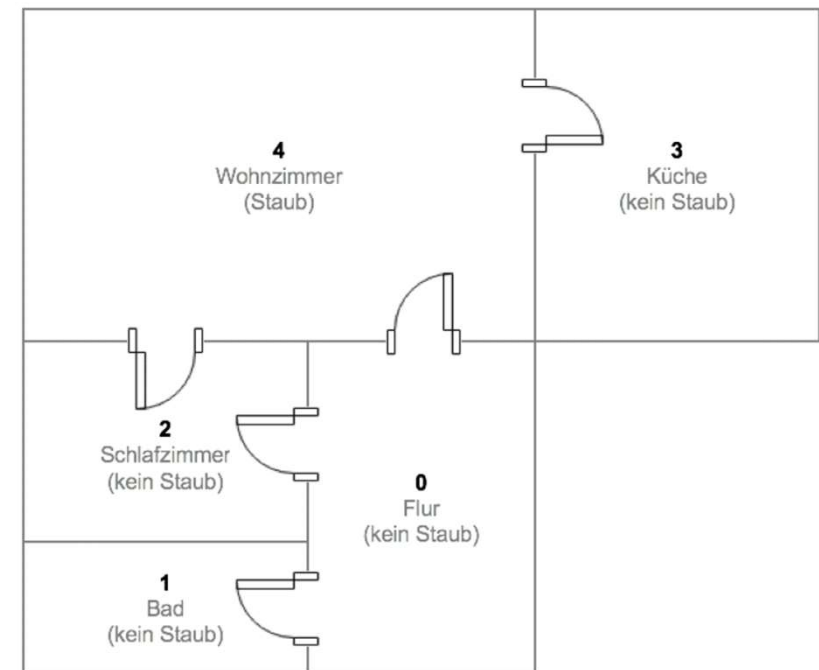
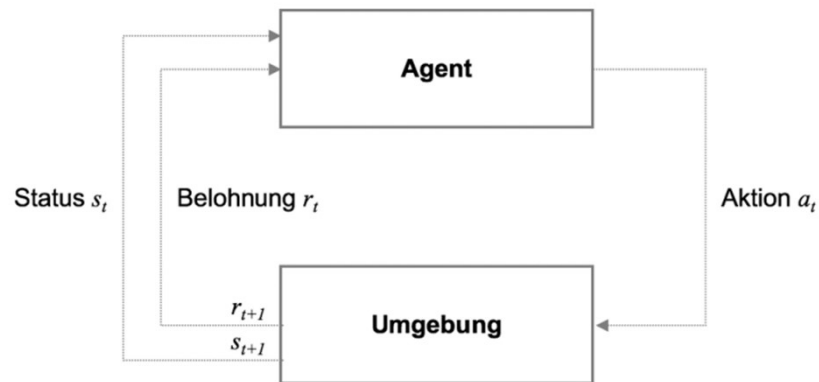
Unsupervised Learning

- Classification of unknown data based on their data, e.g. automatic classification of project risks into 'n' clusters



Reinforcement Learning

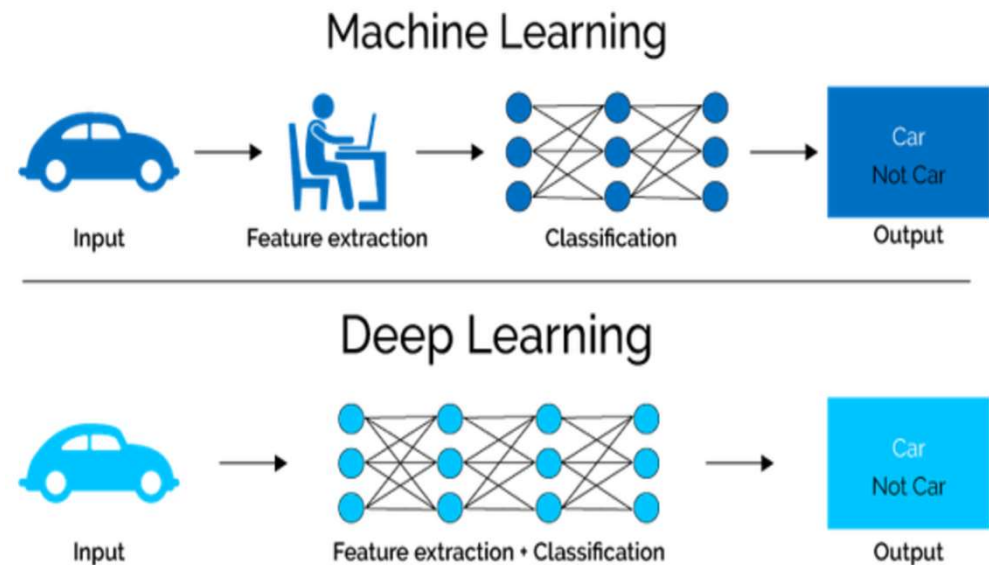
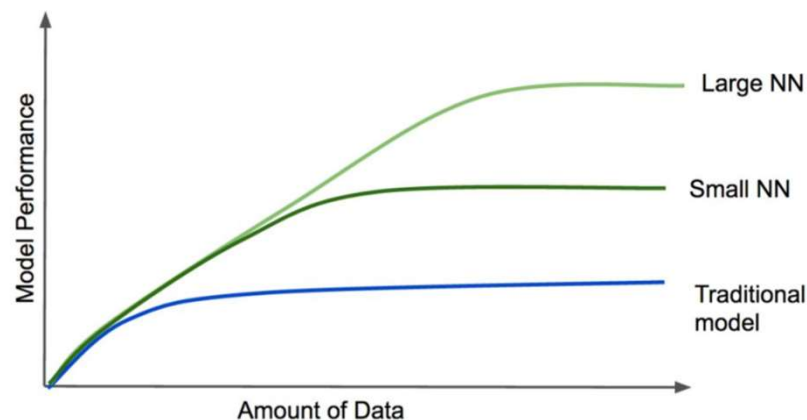
- Learning of optimizations based on continuous interactions with an environment: via "trial and error" the effects of different actions on our environment are observed and evaluated. In response to our actions, our agent receives feedback from our environment, e.g. a reward (left side). Example: A dust robot should find the optimal way to the room with dust starting from room 0 (right side)



Imagesource: <https://www.statworx.com/content-hub/blog/einfuehrung-in-reinforcement-learning-wenn-maschinen-wie-menschen-lernen/>, download 06/2022

Why does everybody talk about Deep Learning?

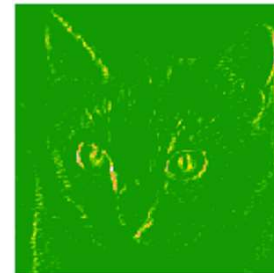
- Works similar to the human brain
- Supported by special hardware, like GPU's NVIDIA a.o.
- Many data available
- Results becomes more better the more data you have
- No Feature Engineering is mostly needed, but you need a lot of data



Imagesources: <http://bytes.schibsted.com/deep-learning-changing-data-science-paradigms>, download 04/2019
<https://codeutsava.in/blog/40>, download 10/2018

What was learned in this Deep Learning Sequential Model?

- Better explanation in a CNN for image classification problem:

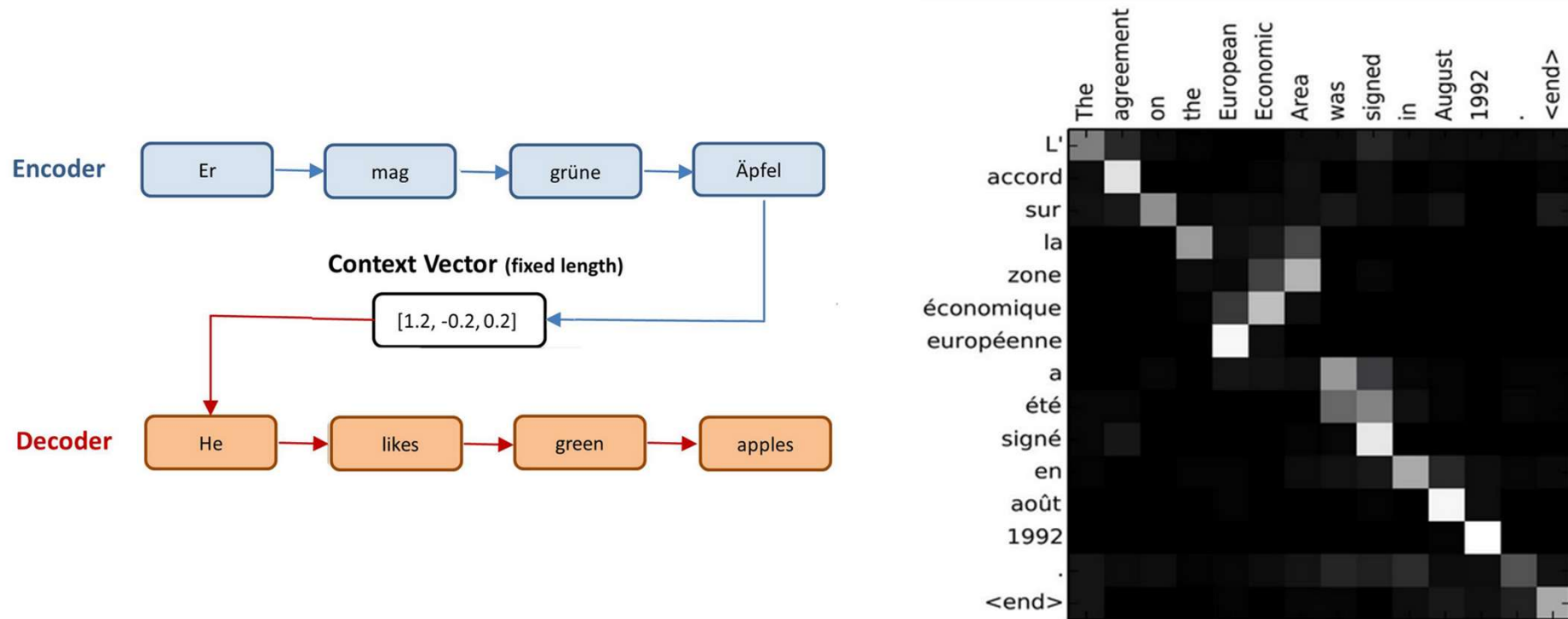


etc.

Imagesource: Allaire J., Chollet F.:
Deep Learning with R, Manning, 2018

How does it work? (1)

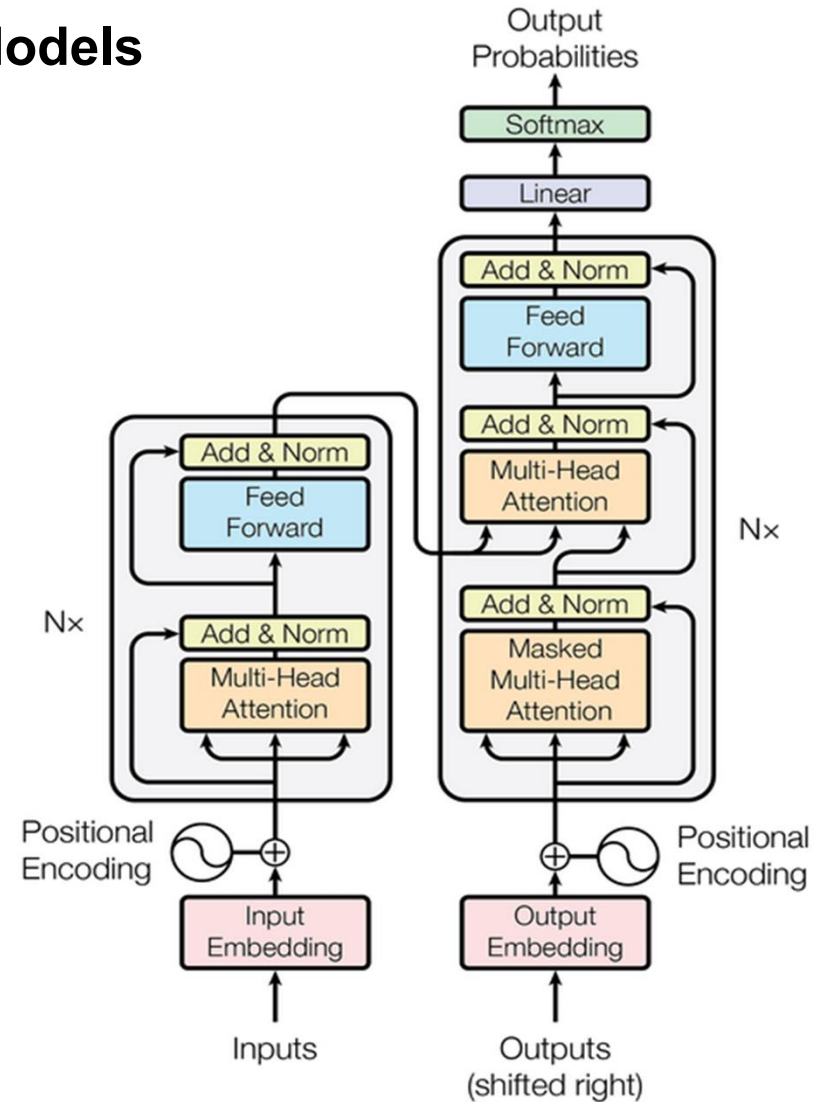
Encoder-Decoder Network (Seq2Seq) with Attention Mechanism



Imagesources: own, <https://lilianweng.github.io/lil-log/2018/06/24/attention-attention.html#whats-wrong-with-seq2seq-model>, download 05/2020

How does it work? (2)

Transformer Models



Imagesource: <https://arxiv.org/abs/1706.03762>, download 09/2019

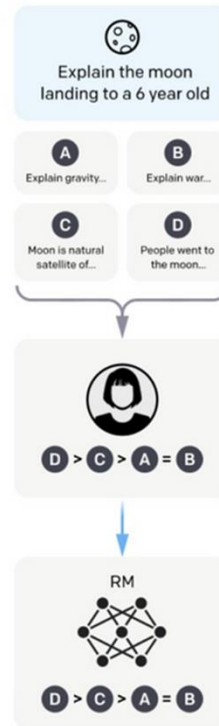
How does it work? (3)

Reinforcement Learning from Human Feedback

Step 1

Collect comparison data, and train a reward model.

A prompt and several model outputs are sampled.



Step 2

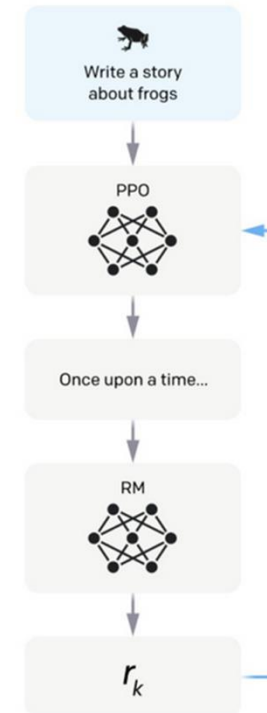
Optimize a policy against the reward model using reinforcement learning.

A new prompt is sampled from the dataset.

The policy generates an output.

The reward model calculates a reward for the output.

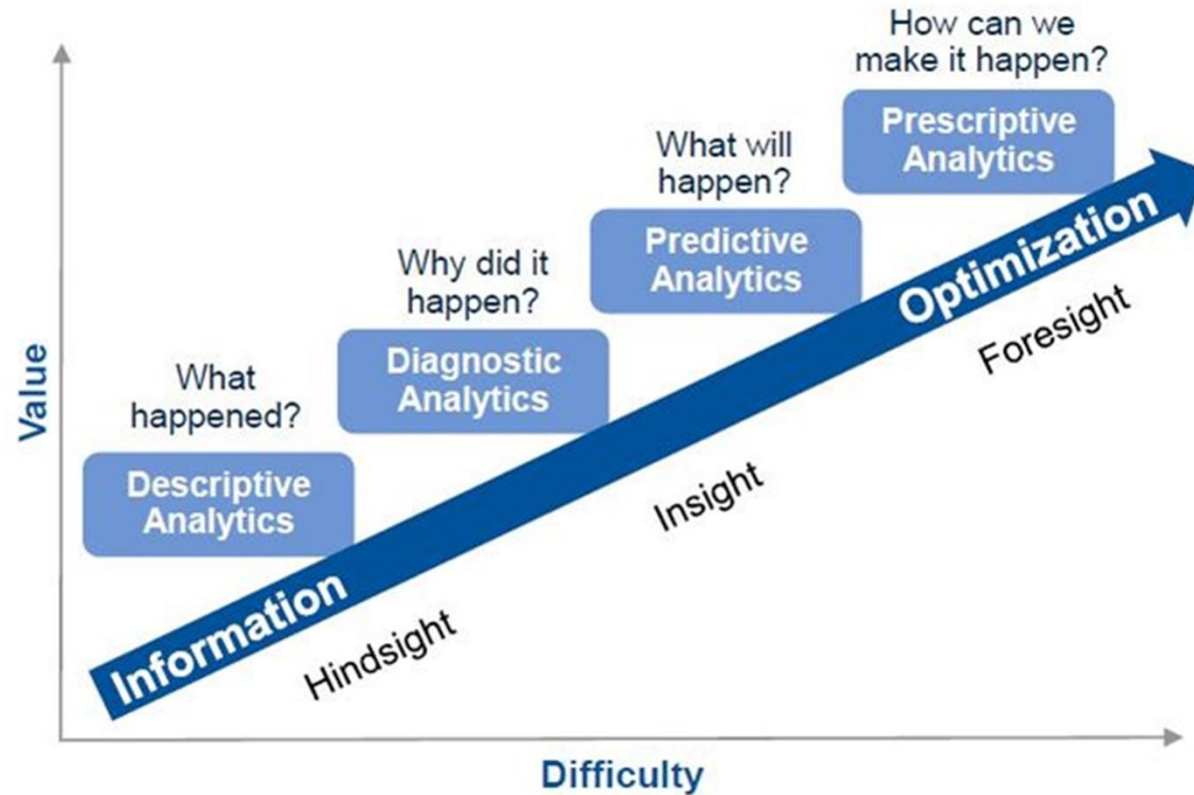
The reward is used to update the policy using PPO.



Imagesources: <https://twitter.com/humanloop/status/1582895654551945216>, download 04/2023

Some AI (i.e. chatGPT) Scenarios in Project Management

Analytics Maturity Model from Gartner



AI will take 80 percent project management tasks in future, says Gartner

Source: <https://www.zdnet.com/article/whither-project-managers-ai-will-take-80-percent-project-management-tasks-says-gartner>, download 04/2019

Image: <http://www.gartner.com/it-glossary/predictive-analytics>, download 12/2016

Regression for Estimation

- To estimate effort, an algorithm could compare a project's planned work packages with those from previous projects to determine the expected effort for the current project. In addition, trends from past projects could be identified and possible delays from previous projects could be included to improve the effort estimate.

Reinforcement Learning for Timetabling

- Based on the existing work packages and their dependencies, a preliminary schedule is created. In each optimization step, the algorithm attempts to reduce the project duration and will be rewarded. This process is continued until either no additional improvement can be achieved or a termination criterion is met. Of course, the algorithm takes into account given system constraints, such as work package dependencies, work times, milestones to be achieved, available resources and material resources, etc.

Classification for Recruiting and HR

Examples

- It is expected that third-party providers will offer innovative products and services based on chatGPT technology via API and PlugIn.
- Besides chatGPT other tools exists: i.e. Precire-Bot (<https://precire.com>) talks to applicant and determines personality metrics. Trained with 5400 interviews with persons, whose personality has been determined in psychological surveys. The algorithm only evaluates the language, my choice of words, voice and emphasis.
- Applied by many big companies like Talanx, Unilever, ...
- Other competitor products analyzed also the facial mimic.



Imagesource: „Die Zeit“ article: „Wenn der Roboter die Fragen stellt“, Edition 35, 2018

Source: u.a. Maucher, J.: Introduction to Artificial Intelligence, Machine Learning and Deep Learning, IHK Workshop, 2018

Team-Building with AI

Examples

- It is expected that third-party providers will also offer innovative products and services based on chatGPT technology via API and PlugIn.
- Besides chatGPT other tools exists: Startup Cloverleaf (<https://cloverleaf.me/>) develops software for the compilation of project teams on the basis of employee data which, in addition to characteristics such as experience and qualification, also takes into account the ability to fit the desired working model or the conformity with cultural values a.s.o.
- Program HireVue (<https://www.hirevue.com>) is a detector
- A lot of tools for Sentimental Analysis of different sources like blog entries and comments in Corporate Wiki a.s.o.
- Personality-Classification (f.ex. OCEAN of the Big Five) by different approaches, f.ex. training with Facebook-Likes and personality-profile (2013 Study by Michal Kosinski and others)



Image: https://en.wikipedia.org/wiki/Big_Five_personality_traits, download 02/2019

Risk-Management

- Forecasting future risks requires the capability of processing large amounts of historical data, f.ex. project data from risk-assessment documents, risk issue logs a.o. and the labels from the classification of the risk.
- Calculate the prediction of a risk as time series and changing risk status.
- i.e. Aptage (<https://get.aptage.com>) is Risk Management PlugIn for JIRA, MS Project a.s.o

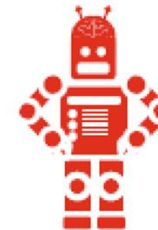
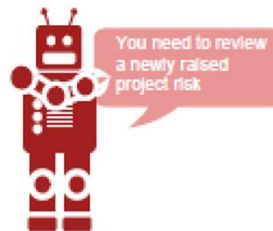
Forecast Prediction

- Estimation and resource tools, based on historical data and ML algorithms (i.e. Reinforcement Learning), could be used as a decision support system and takes part in the existing estimation and forecast process.
- i.e. NewRelic (<https://newrelic.com/platform/applied-intelligence>) is a Resource Management Tool - also available as PlugIn for Atlassian products.

Using the chatGPT and AddOns with Natural Language Processing

- Intelligent bots can process conversations and recognize and recommend task assignments to the project manager and the teams.
- Chatbots that send reminders to teams and tracks their performance and will let you check on the status of projects quickly.
- Collecting and condensing status reports and transmitting them.
- Answering 1st-level requests.
- ...

Anticipated Evolution of AI in Project Management



	Integration & Automation	Chatbot Assistants	Machine learning-based project management	Autonomous project management
Key elements	Streamlining and automating tasks through integration and process automation.	Integration and automation with additional human-computer interaction , mainly based on speech or text recognition.	Enabling predictive analytics and advice to the project manager based on what worked in past projects.	Combining the previous phases, autonomous project management leads to little-to-no human interaction in a project.
Outlook	<p>Sophisticated project management tools will enhance the quality of project management processes and reduce the effort and labor costs.</p> <p>Project managers can focus more on complex project activities creating value for the project.</p>	<p>Chatbot assistants will take over basic project management tasks, relieve project teams of repetitive tasks and provide more interactive automation capabilities.</p> <p>The classic project manager leading a PMO will be increasingly replaced by project assistants.</p>	<p>Predictive project analytics will give project managers better visibility into the project's future and enhance the quality of decision making.</p> <p>Machine learning-based project management agents will give intelligent advice and may take action on key PM activities, i.e. scheduling and project risks.</p>	<p>Implementation of autonomous project management for smaller, standardised projects involving relatively little human/ stakeholder interaction.</p> <p>Purely autonomous project managers seem unlikely within the next 10 to 20 years.</p>

Source: Lahmann M., Probst M.: Artificial Intelligence and Project Management: Beyond Human Imagination, PwC Switzerland, PMDays Bulgaria 2018

What can't (yet)?

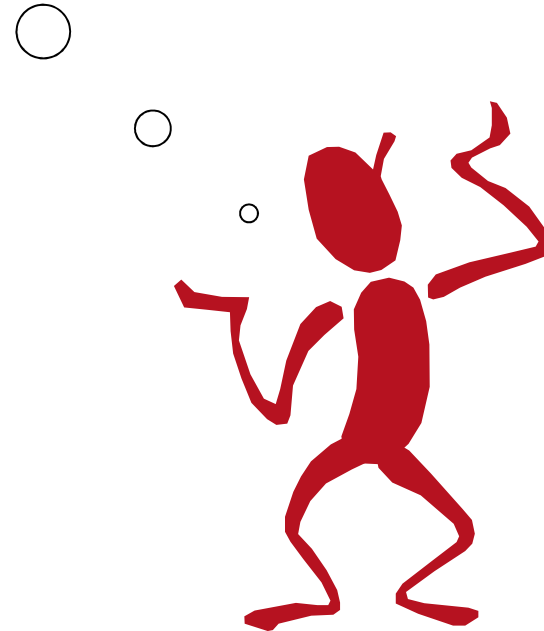
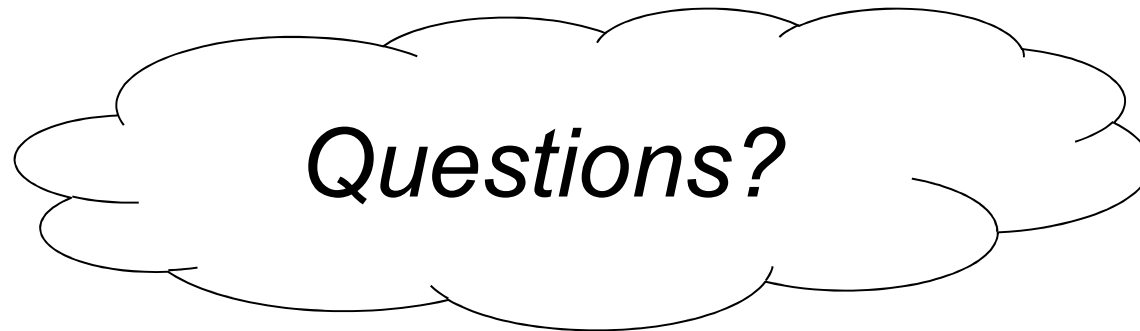
Some pitfalls

- Not always true (you have to check) – think about the probabilistic characteristics of AI models
- Insufficient systematic data collection of past projects (catchword knowledge preservation)
- Cultural acceptance (Change Management project)
- The target of 100% automatism or 100% accuracy is misleading and unrealistic in AI context
- The traceability of decisions of algorithms is not given, especially with deep learning networks. Using new techniques and methods, i.e. Explainable AI (XAI) methods i.e. explanations based on decision trees etc.
- Real creativity (except incremental creativity processes)
- Are we able to correctly assess and interpret predictions?
 - ➔ Problem correlation ↔ causality
- Can we estimate the negative consequences of false prediction (false positive / false negative)?
- Data security? DSGVO? (Azure OpenAI in Europe (soon) available)

Conclusion: Role of AI in IT Project-Management

- Use of AI in project management is still in its early stages
- AI will assist, not replace, Project Managers
- AI as an additional view to reduce complexity
- Strong interpersonal skills are essential to a Project Manager and can't be replace by machines (until now 😊)
- Project-Manager has to decide – not the algorithms
- Creativity of Project Manager cannot be replaced
- The information here will probably be outdated again tomorrow 😊

Discussion



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