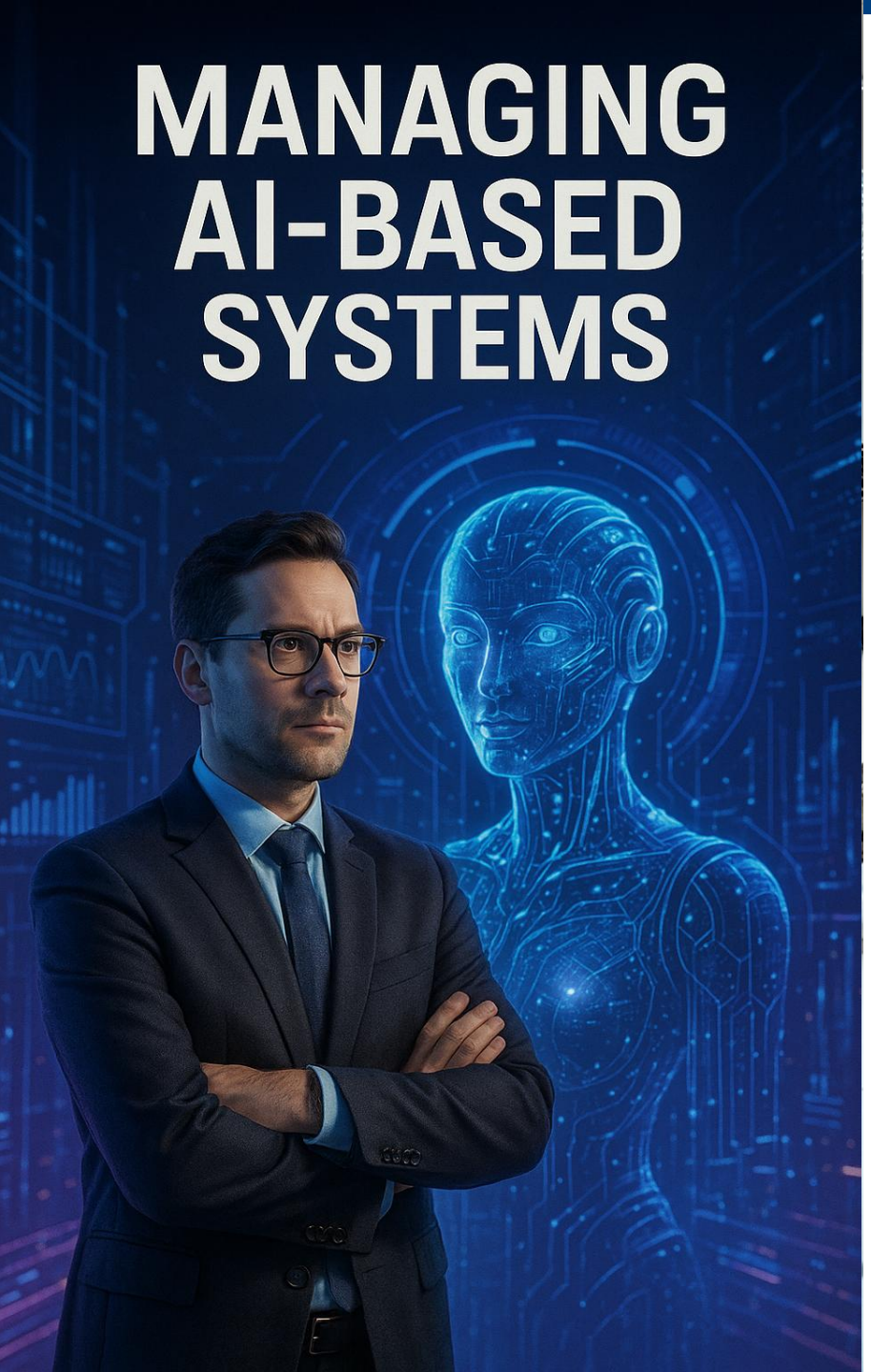

Session 1: Welcome and introduction

Managing AI-based Systems

Prof. Dr. Nils Urbach

Frankfurt University of Applied Sciences,
Research Lab for Digital Innovation & Transformation

FIM Forschungsinstitut für Informationsmanagement

Fraunhofer-Institut für Angewandte Informationstechnik FIT,
Institutsteil Wirtschaftsinformatik

www.ditlab.org
www.fim-rc.de
www.wirtschaftsinformatik.fraunhofer.de

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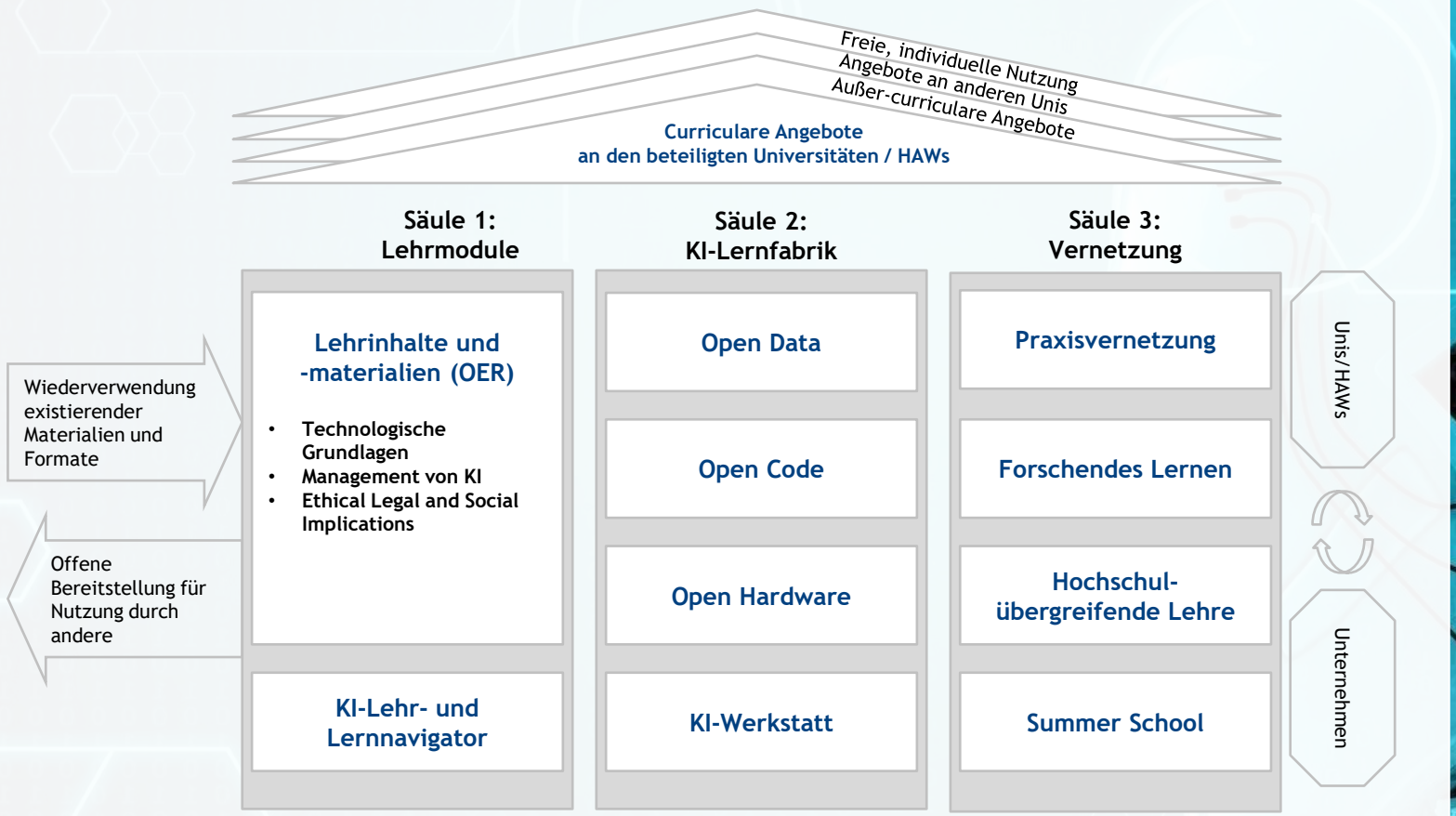
ABBA - AI for Business | Business for AI



gefördert durch:

Projektpartner:

Current reference to motivate taking part in our lecture

Künstliche Intelligenz

Diese KI-Führungskräfte brauchen Unternehmen jetzt

Ingenieure, Evangelisten, Regenmacher: Um KI erfolgreich einzusetzen, brauchen Unternehmen neue Managementrollen. Die fünf wichtigsten Typen und wie Unternehmen sie richtig einsetzen.

Lina Knees
07.10.2023 - 10:05 Uhr

- **AI Relation Manager:**
  - especially for companies important that already implemented AI
  - act as a coordinator between technology and business
  - know the product, the employees and supplier and build an interface between them
  - have a balanced mix of technical knowledge, business acumen and social skills
- **AI Rainmaker:**
  - enable companies that want to maximize their business with AI
  - scrutinizes processes, identifies problems that can be solved with AI and develops a long-term strategy for the use of AI
  - scientific background, a good understanding of business and many years of experience in strategy or transformation projects
  - confident appearance, a clear vision and the courage to dare something new
- **AI Engineer:** not part of this lecture

This lecture will train you to become AI managers – a highly demanded job position in the industry now and in the future

Knees, 2023

Current reference to motivate taking part in our lecture

Künstliche Intelligenz

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Lina Knees
07.10.2023 - 10:05 Uhr

- **AI Evangelist:** not part of this lecture
- **AI Ethicist:**
  - advise companies on the impact of AI, taking into account the interests of government, employees and society
  - balance economic and technical expertise with sociological perspectives
  - Establish processes to continuously review and assess AI systems for ethical risk, for example, to prevent misinformation or misconduct by AI

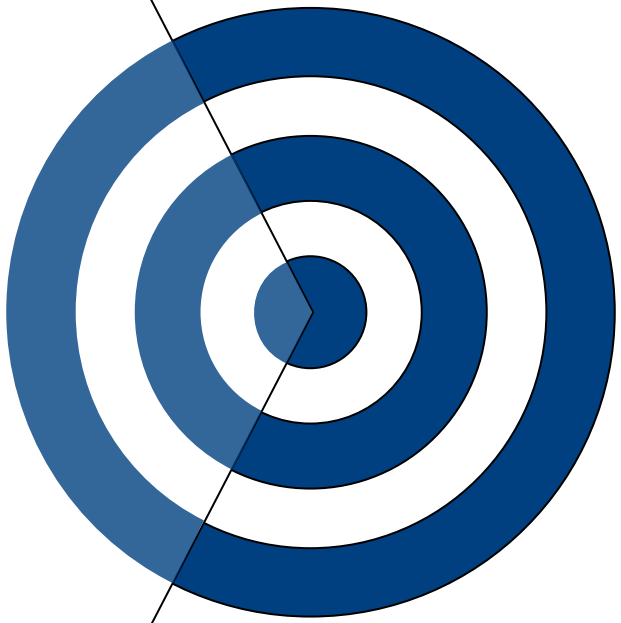
Overall, this course will give you unique knowledge to become one of the AI managers - use this chance and actively participate in the course!

This lecture will train you to become AI managers – a highly demanded job position in the industry now and in the future

Knees, 2023

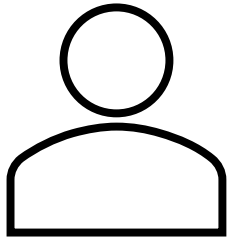
Objectives of today's lecture

1. Define and delineate Artificial Intelligence (AI)
2. Comprehend the historical development of AI
3. Understand the hype around AI
4. Obtain an administrative overview of the entire course



Human or Artificial Intelligence

http://www.bbc.com/news/technology-35977315



Human

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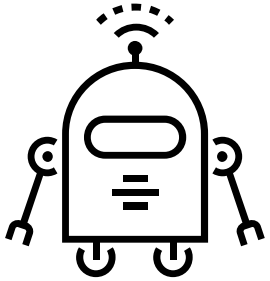

AI

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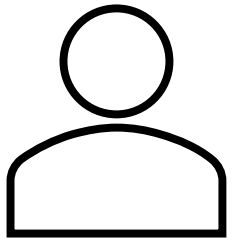
(1) nextrembrandt.com

Human or Artificial Intelligence

http://www.bbc.com/news/technology-35977315



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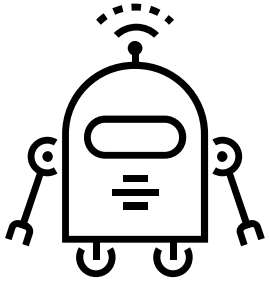

AI

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(1) nextrembrandt.com

Human or Artificial Intelligence

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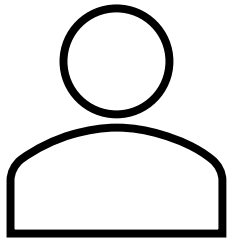

Human

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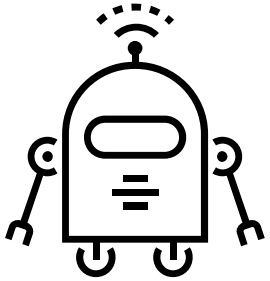


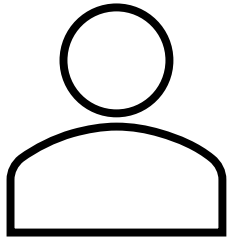
AI

B

(1) theverge.com, 2019

Human or Artificial Intelligence

http://www.bbc.com/news/technology-35977315



Human

A

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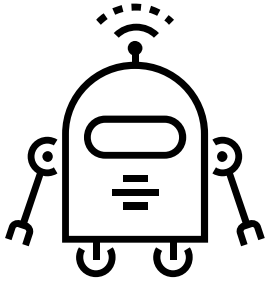


AI

B

(1) unsplash.com

DALL-E conquers the world

News

Dall-E Mini: Diese KI kreiert faszinierende und zugleich gruselige Bilder

DALL E-2 CAN CREATE ITS OWN SECRET CODE! IS IT COMMUNICATING WITH ALIENS?

Dall.E mini: The AI image generator everyone's using to make wild memes

Comment

Live news

Is AI the future of art?

Kreativer Algorithmus DALL.E

Diese KI macht aus jedem Text ein Bild

Kunstwerk auf Kommando: KI den Pinsel schwingt

Neuronale Netzwerke erzeugen zunehmend bessere Bilder nach

„Unheimlich": Diese KI erstellt Bilder aus Text

DALL·E 2 – Art of tomorrow?

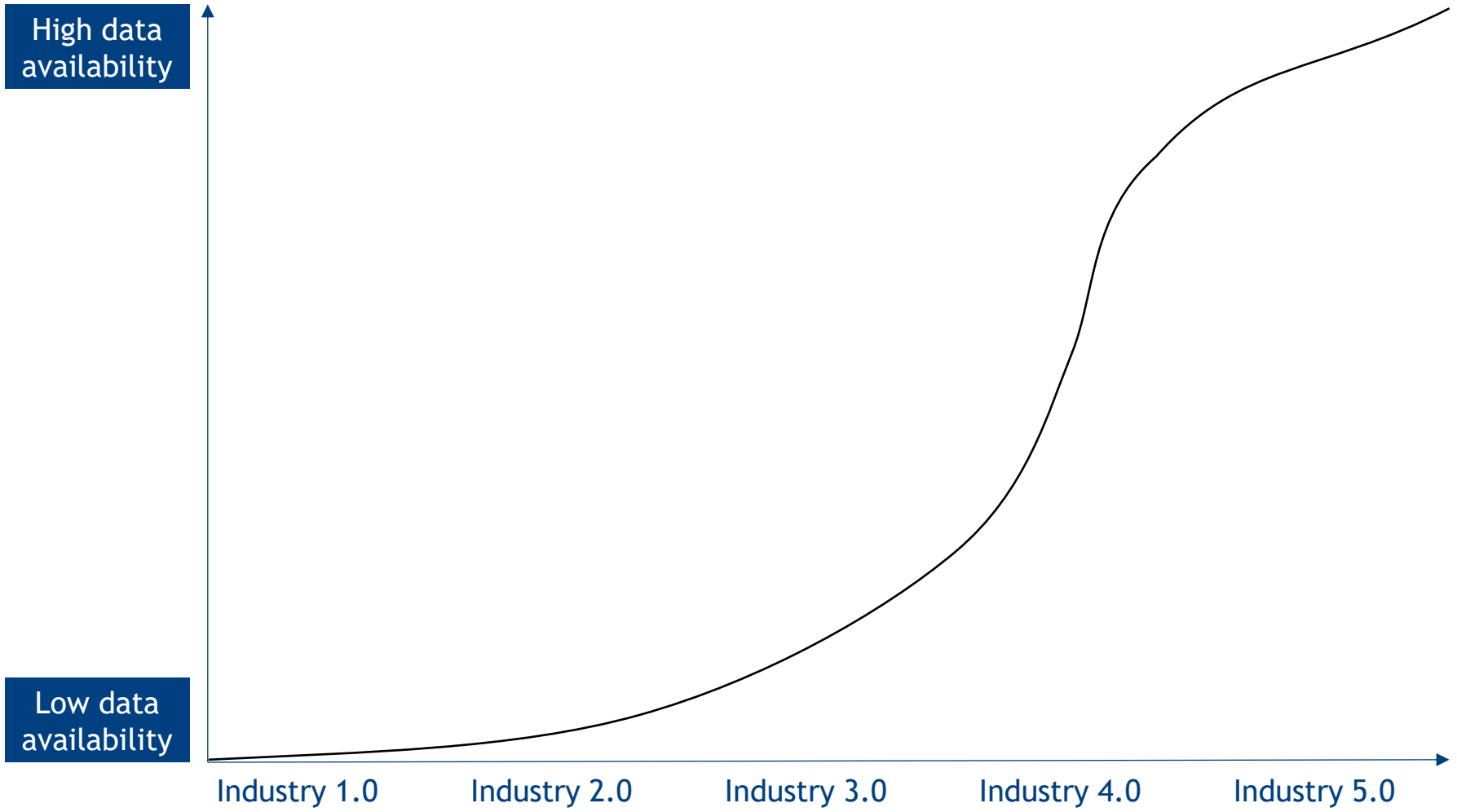
a dolphin in an astronaut suit on saturn, artstation

a propaganda poster depicting a cat dressed as french emperor napoleon holding a piece of cheese

a teddy bear on a skateboard in times square

(1) Ramesh et al. (2022)

Digital Trends



Birth of **Industry 5.0:**

Utilization of Big Data and the Internet of Things (IoT) with **artificial intelligence (AI)**

(1) Özdemir & Hekim, 2018, (2) twi-global.com

Companies with digital business models overtake established players with classic business models

Largest companies in the world by market value

2009 (third quarter)		2019 (third quarter)	
1. Exxon Mobil	329.725	1. Microsoft	1.062.000
2. PetroChina	325.097	2. Apple	1.012.000
3. ICBC	237.951	3. Amazon.com	858.680
4. Microsoft	229.630	4. Alphabet	838.020
5. HSBC	198.561	5. Berkshire Hathaway	508.530
6. China Mobile	195.680	6. Facebook	508.050
7. Wal-Mart	189.331	7. Alibaba Group	435.400

All market capitalisation figures are in millions of USD.

“The world’s most valuable resource is no longer oil, but data.”

- The Economist 2017

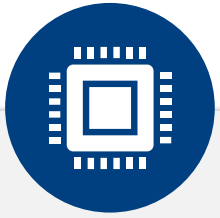
„If data is the new oil of our economy […], then AI can analogously be referred to as the engine.“

- Agrawal et al. 2018

Introducing AI often presents companies with several challenges

Employees need to accept and build trust in AI applications

New requirements for company's workforce, with a shift towards hiring AI specialists



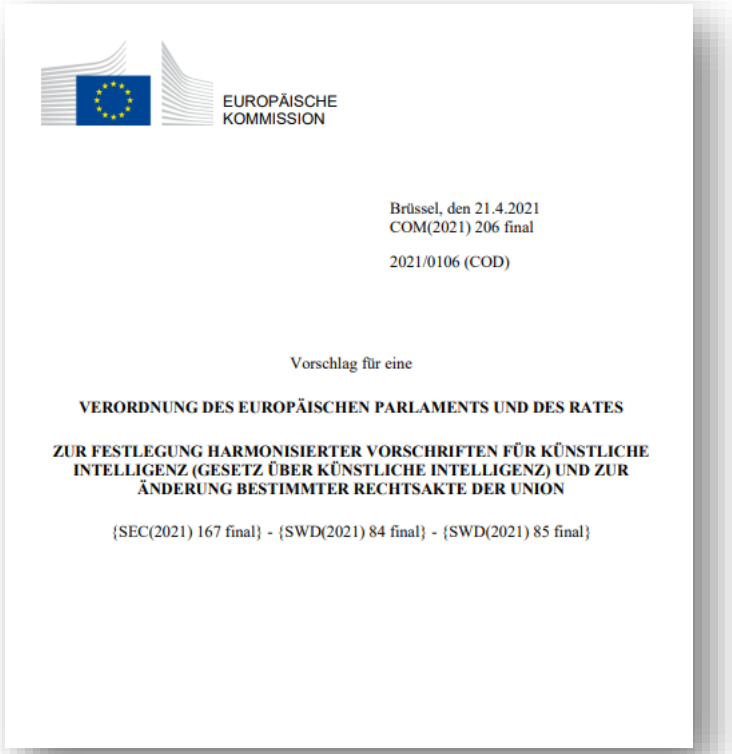
Data quality, availability, and correct usage challenges

Data privacy and data loss challenges

Liability question

AI brings significant changes: At the business level, processes and tasks are greatly impacted using AI

A trend towards more deployment of AI – The EU AI Act regulates the development and use of AI within the EU



EUROPÄISCHE KOMMISSION

Brüssel, den 21.4.2021
COM(2021) 206 final

2021/0106 (COD)

Vorschlag für eine

VERORDNUNG DES EUROPÄISCHEN PARLAMENTS UND DES RATES

ZUR FESTLEGUNG HARMONISIERTER VORSCHRIFTEN FÜR KÜNSTLICHE INTELLIGENZ (GESETZ ÜBER KÜNSTLICHE INTELLIGENZ) UND ZUR ÄNDERUNG BESTIMMTER RECHTSAKTE DER UNION

{SEC(2021) 167 final} - {SWD(2021) 84 final} - {SWD(2021) 85 final}

Target of the EU regulation

1. It must be ensured that the AI systems launched and used on the Union market and used are **safe** and **respect the existing fundamental rights and values** of the European Union.
2. To promote investment in AI and innovative AI, **legal certainty** must be guaranteed.
3. **Governance** and the effective enforcement of applicable law to safeguard fundamental rights as well as the security requirements for AI systems must be strengthened.
4. The **development of a domestic market** for legally compliant, secure, and trustworthy AI applications must be facilitated and market fragmentation must be prevented.

There is a need for AI governance and AI management

The AI implementation process consists of four phases

2 3 4 Basic understanding of AI and its business potential

AI Ideation

5 Application potentials of AI technologies

6 Identification, design and evaluation of AI use cases

AI Strategizing

7 Evaluation an organization's AI readiness

8 Management and governance of AI

AI Design & Development

9 Architectures of AI applications

10 Data Management and Model Transparency

11 Design of human-AI interactions

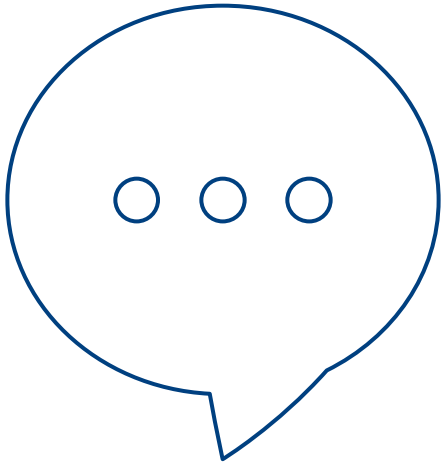
AI Operations at Scale

12 KPI-based Monitoring and Change Management

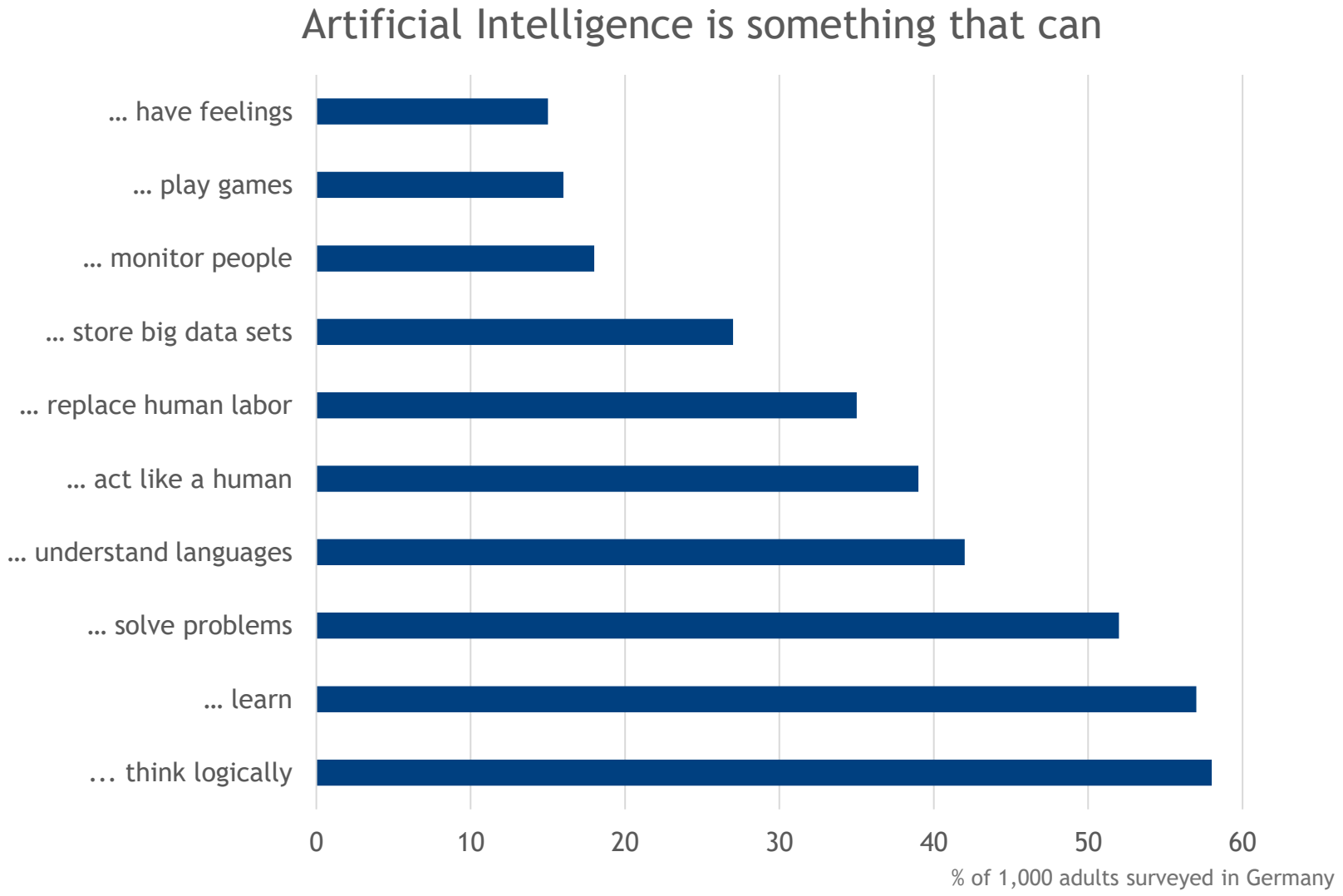
13 Ethical, legal and social implications of AI

Implementation

What do you think of when you think of AI?



What do 1,000 people think of when they think of AI?



(1) Pegasystems, (2) Statista

Definitions – Artificial Intelligence

"The goal of AI is to develop machines that behave as if they possess intelligence" (McCarthy, 1956)

"Artificial Intelligence is the study of how to make computers do things at which, at the moment, people are better" (Rich & Knight, 1991)

"Artificial intelligence (AI) refers to systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals" (European Commission, 2018, p. 1)

"Artificial intelligence is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings" (Copeland, 2023)

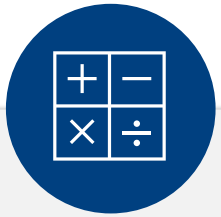
There is no single all-encompassing definition of AI

What is AI in this lecture?

There is not the one AI, but there are various AI technologies, applications, perspectives, and research fields

Philosophy

- Knowledge
- Rules
- Validity



Mathematics

- Computing
- Formalization
- Logic
- Probability

Economics

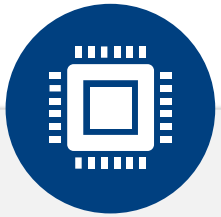
- Profit
- Utility
- Decision theory

Neuroscience

- Information processing of the brain

Psychology

- Human behavior
- Cognitive psychology

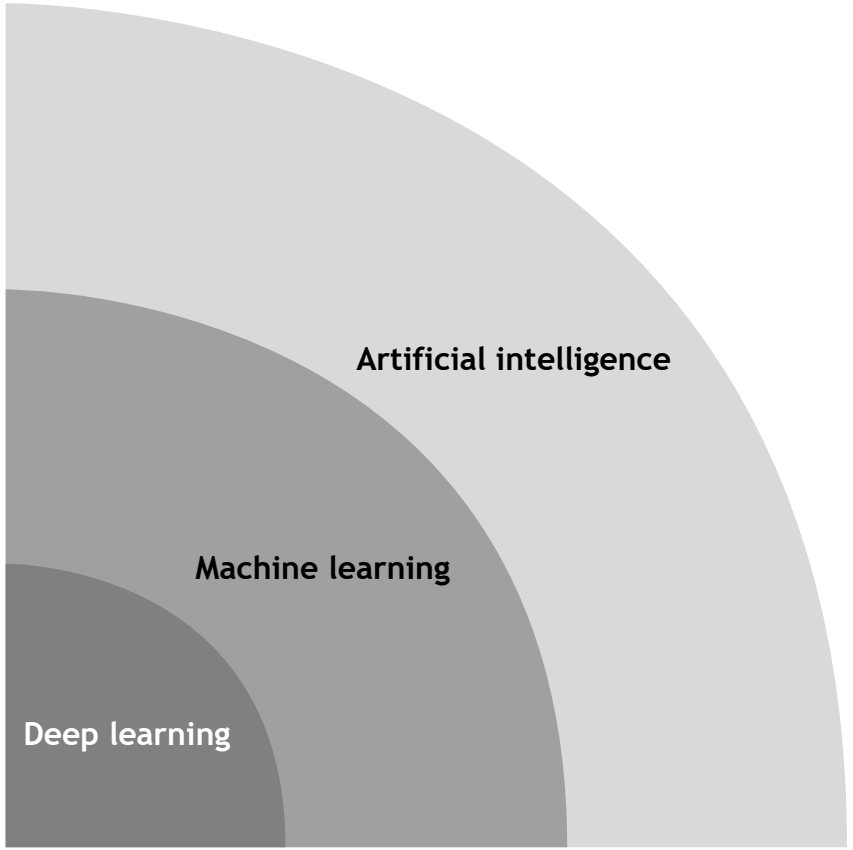


Computer engineering

- Programming
- Operational systems

(1) Russel und Norvig, 2010

AI vs machine learning vs deep learning

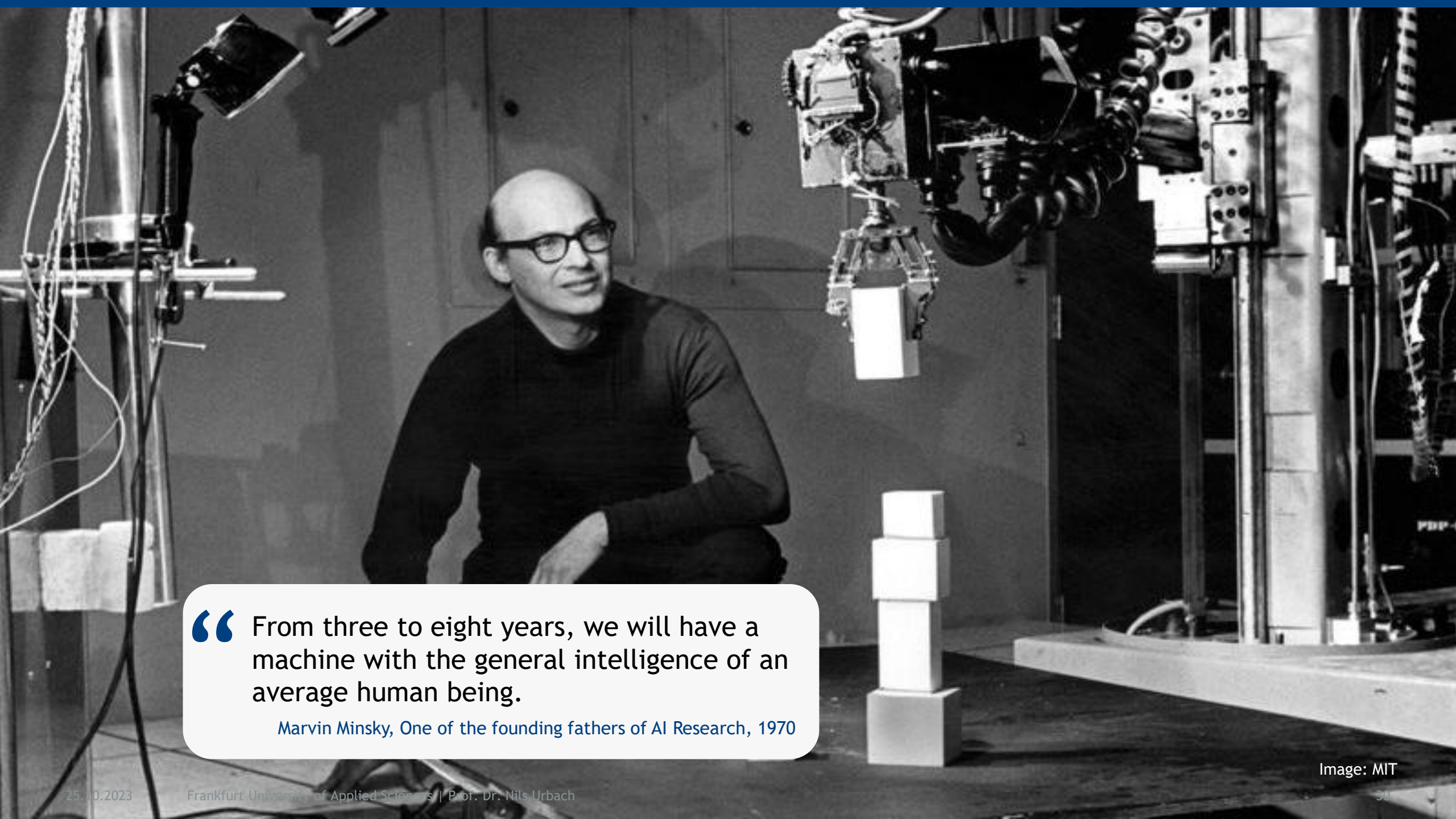


Artificial Intelligence can be based on programmed processes or generated by machine learning or deep learning algorithms

Machine learning are methods of learning processes that can be used to identify relationships/ patterns in existing data sets in order to make predictions based on them

Deep learning is a specialized branch of machine learning that employs artificial neural networks with multiple layers to process and learn from extensive data

(1) Murphy, 2012



> From three to eight years, we will have a machine with the general intelligence of an average human being.
>
> Marvin Minsky, One of the founding fathers of AI Research, 1970

Image: MIT

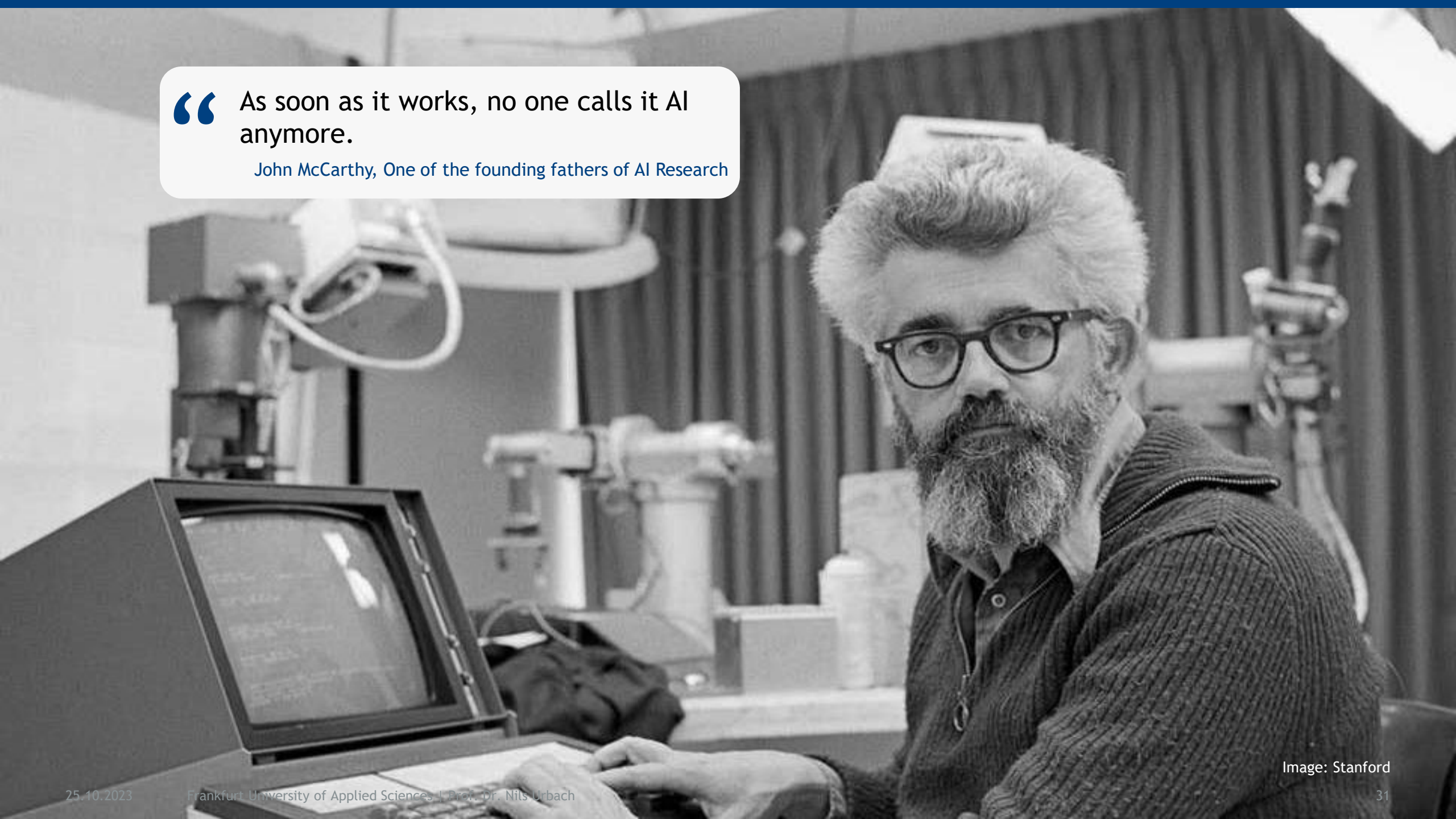
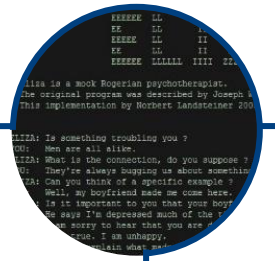


Image: Stanford

The long history of Artificial Intelligence

1950

Turing Test



ELIZA

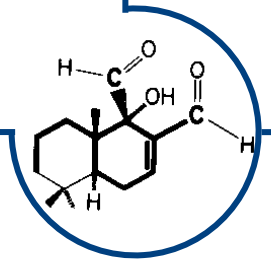
First Chatbot

1966

1972

MYCIN

Expert system



R1

Expert system

1978

(1) Wikimedia, (2) Wikipedia, (3) Jeopardy, (4) Wired, (5) Forbes, (6) Zeit online

The long history of Artificial Intelligence

1997

Deep Blue

wins chess match

2011

IBM Watson

wins Jeopardy

2016

Alpha GO

wins GO

2020

BlueDot

AI warns the world about covid-19

(1) Wikimedia, (2) Wikipedia, (3) Jeopardy, (4) Wired, (5) Forbes, (6) Zeit online

AI in action in the Covid-19 pandemic

AI is instrumentalized in the fight against the Corona virus

Support in the search for a vaccine

- AI examines compounds and matches them with a parameter database
- Shortening the period until the first tests of the vaccine

Prediction of the pandemic

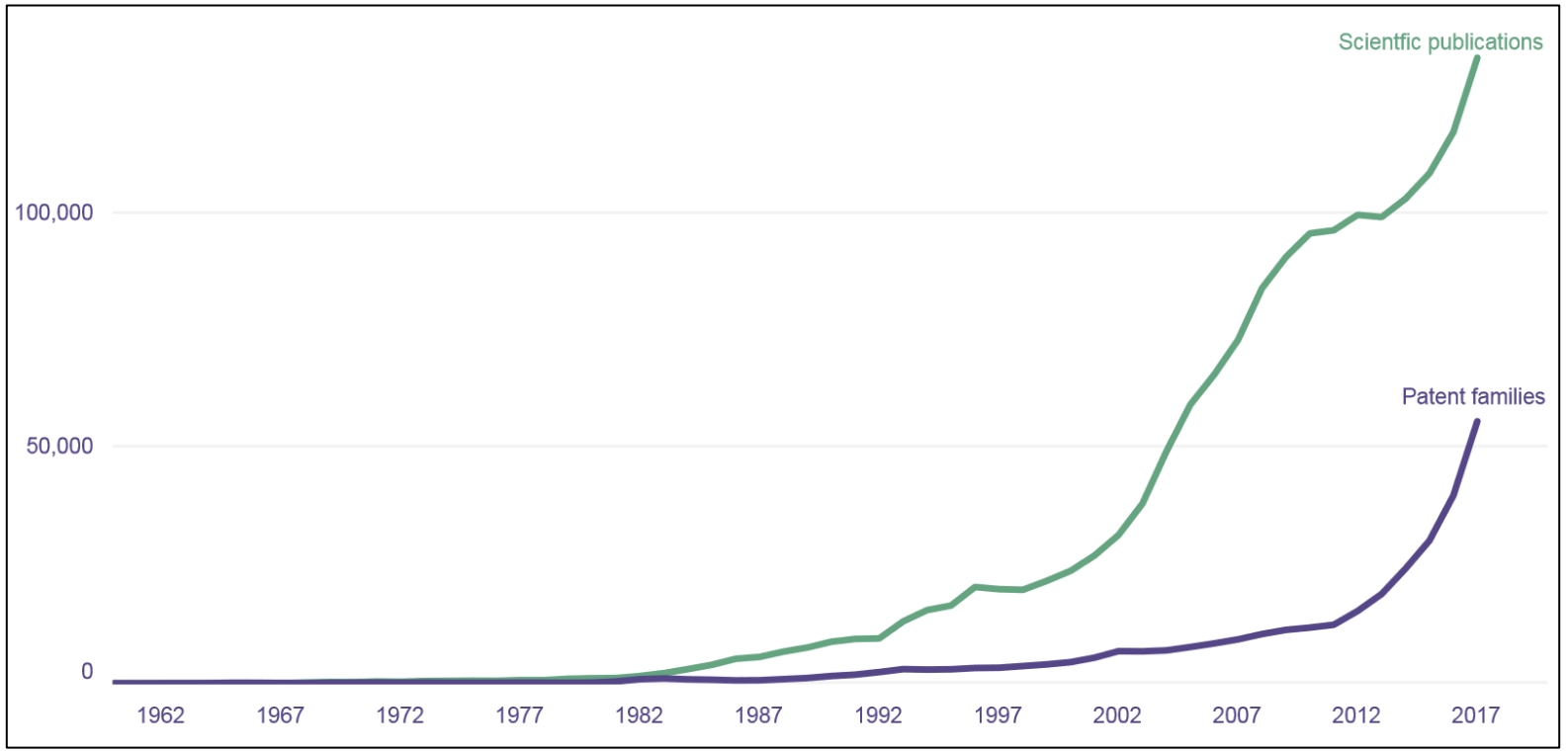
- Early detection of the virus, through analysis of data sets such as news, airline ticket sales, demographic data, and climate data
- Forecasting Corona hotspots

Quick diagnoses

- AI exchanges data with CT scanners in hospitals
- AI analyzes CT images of the lungs, identifies the signs of coronavirus and evaluates the changes

In addition, AI supports the nursing staff, controls citizens, evaluates policies and measurements, ...

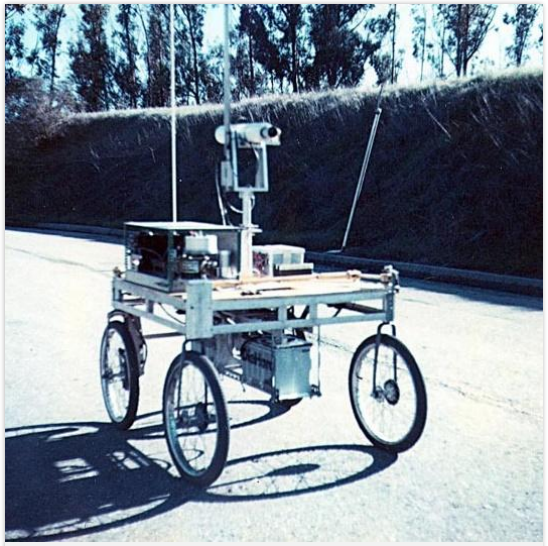
Artificial Intelligence - Why now?



Between 1960 and early 2018, nearly 340,000 patent families and more than 1.6 million scientific papers related to Artificial Intelligence were published

Artificial Intelligence - Why now?

Past



Stanford Cart (1971)

Present

Tesla Autopilot (2018)

In the past, the focus was particularly on basic research in the field of AI. Today, however, AI is increasingly being used in business models, services and products.

(1) Stanford, (2) Tesla

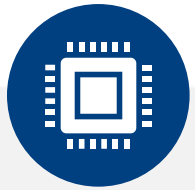
Why now?
Four key developments enable the application of AI

Necessary data is available and usable

Digital technologies create data that can be used for AI applications through Big Data technologies

The machine learning algorithms have been improved

In recent years, significant progress has been made, especially through deep learning algorithms



Cloud services provide the required computing power

Cloud services enable fast, flexible and affordable use of computing resources without major upfront investments

The application of AI is no rocket science

High-performance (open source) toolkits and libraries are available

AI trends and developments provide major opportunities and risks for businesses

AI trends

- Data analytics & management
- Machine learning & RPA
- Autonomous driving
- Cybersecurity
- Creative AI & Metaverse

Opportunities and risks

- \+ Increased productivity
- \+ Increased efficiency
- \+ Increased flexibility and speed
- \+ Improved ROI
- – Flawed data
- – Implementation errors
- – Security risks
- – Blind faith in AI

There is a need to manage AI systems (e.g., risk management, data management, …)

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AI Operations at Scale

12 KPI-based Monitoring and Change Management

13 Ethical, legal and social implications of AI

Implementation

The AI implementation process consists of four phases

2
3 Basic understanding of AI and its business potential
4

AI Ideation

5 Application potentials of AI technologies

6 Identification, design and evaluation of AI use cases

7

8

L2: Technical & Mathematical Fundamentals
- Technical basics
- AI learning methods
- Mathematical algorithms

L3: Neural Networks
- Basic intuition
- Training process of neural networks
- Large language models

L4: AI Metrics
- AI models
- Metrics
- Hyperparameter optimization

AI Operations at Scale

13 KPI-based Monitoring and Change Management

14 Ethical, legal and social implications of AI

Implementation

The AI implementation process consists of four phases

2
3 Basic understanding of AI and its business potential
4

AI Ideation

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6 Identification, design and evaluation of AI use cases

7

8

L5: Application potentials of AI technologies
- Human AI interaction
- AI-based process optimization
- Cross-technology AI innovation

L6: Identification and evaluation of AI use cases
- Identifying AI use cases
- Designing AI use cases
- Evaluating AI use cases

AI Operations at Scale

13 KPI-based Monitoring and Change Management

14 Ethical, legal and social implications of AI

Implementation

The AI implementation process consists of four phases

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4

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7 Evaluation an organization's AI readiness

8 Management and governance of AI

L7: AI readiness
- Organizational AI readiness factors
- Integrating AI service platforms

L8: Management and governance for AI
- AI application management model
- Team structures
- AI Governance

ns at Scale

Monitoring
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ement

l and social
ons of AI

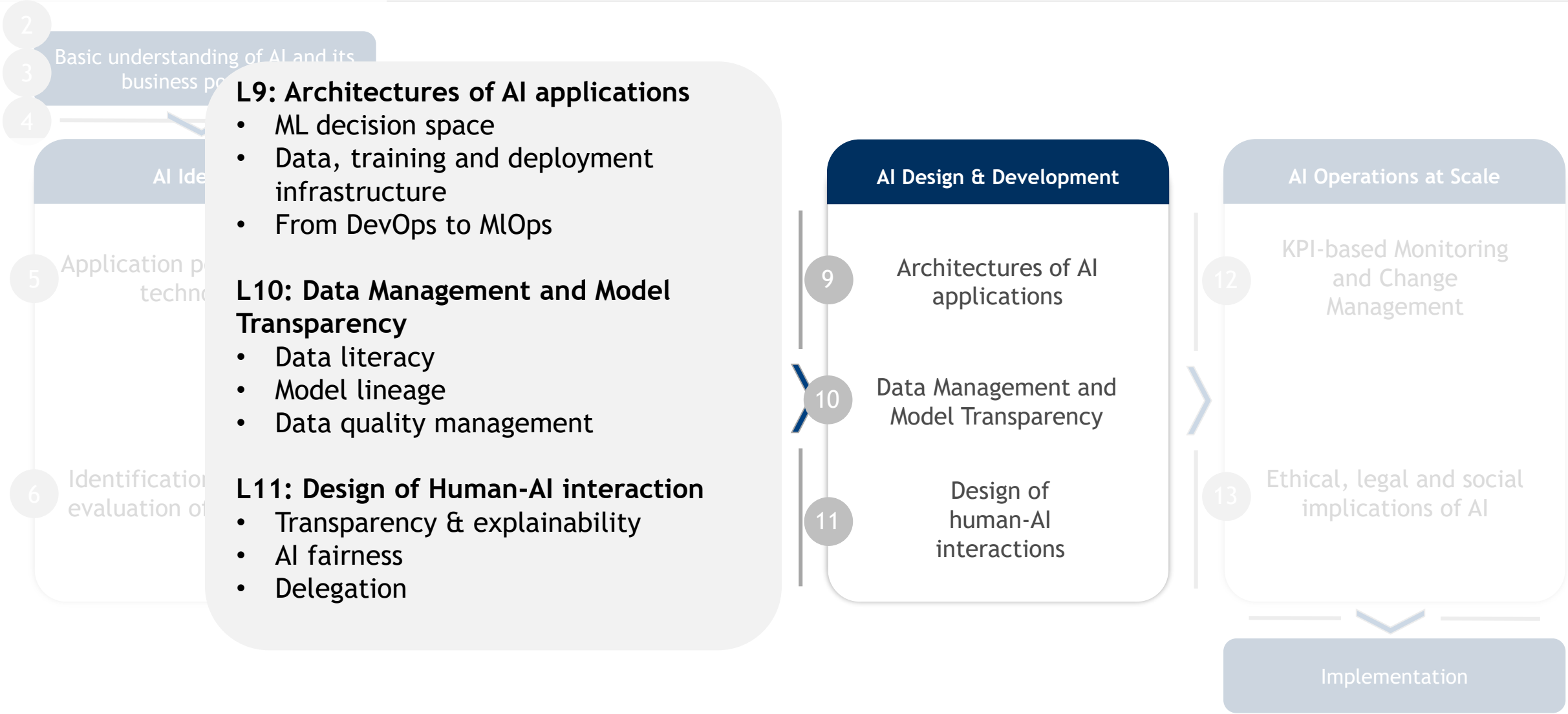
Implementation

The AI implementation process consists of four phases

L9: Architectures of AI applications
- ML decision space
- Data, training and deployment infrastructure
- From DevOps to MlOps

L10: Data Management and Model Transparency
- Data literacy
- Model lineage
- Data quality management

L11: Design of Human-AI interaction
- Transparency & explainability
- AI fairness
- Delegation



The AI implementation process consists of four phases

2
3 Basic understanding of AI and its business potential
4

AI Ideation

5 Application potentials of AI technologies

6 Identification, design and evaluation of AI use cases

7

8

L12: KPI-based Monitoring and Change Management
- Key performance indicators for AI
- Machine learning monitoring

L13: Ethical, legal and social implications of AI
- Moral agency
- Trustworthy AI
- Legal implications

AI Operations at Scale

12 KPI-based Monitoring and Change Management

13 Ethical, legal and social implications of AI

Implementation

Today’s lecture at a glance

- We understand AI as systems that display intelligent behavior by analyzing their environment and taking actions – with some degree of autonomy – to achieve specific goals
- We know that AI is not the perfect solution for everything and thus has chances and risks
- We understand the need for systematic management of AI applications
- We know and understand the administrative framework of the course

Questions, comments, observations

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