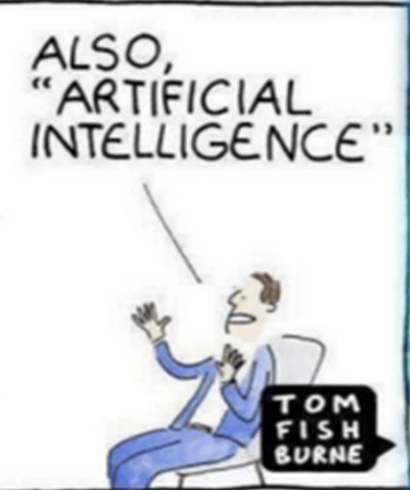
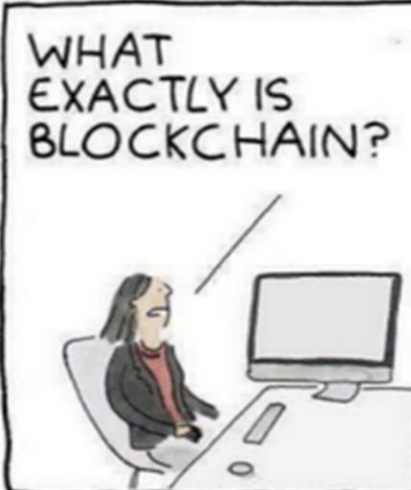
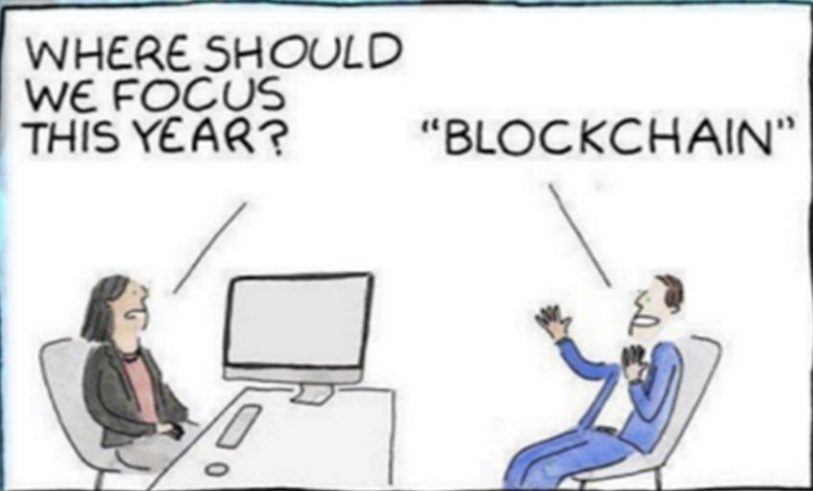


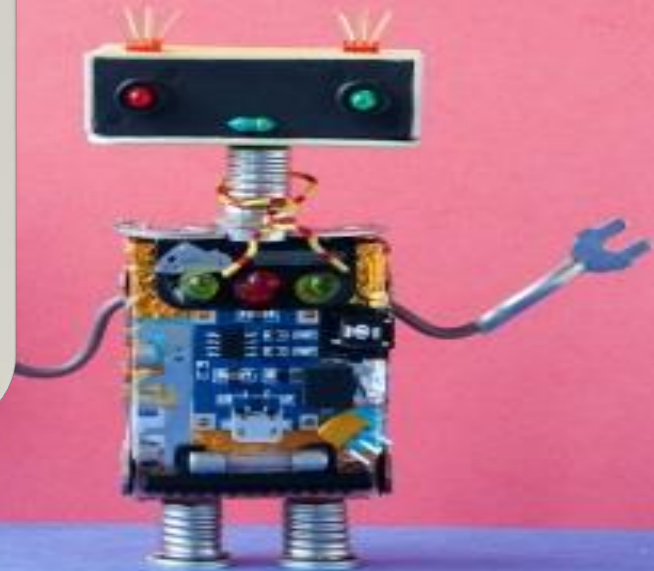
# A recent conversation in an Indian school ...

Headmaster

CS -Teacher



# Approaches to Artificial Intelligence in School Education



**Peter Micheuz (15?-50-75?-90?), Alpen-Adria-University / Gymnasium / Austria**



# What expects you?

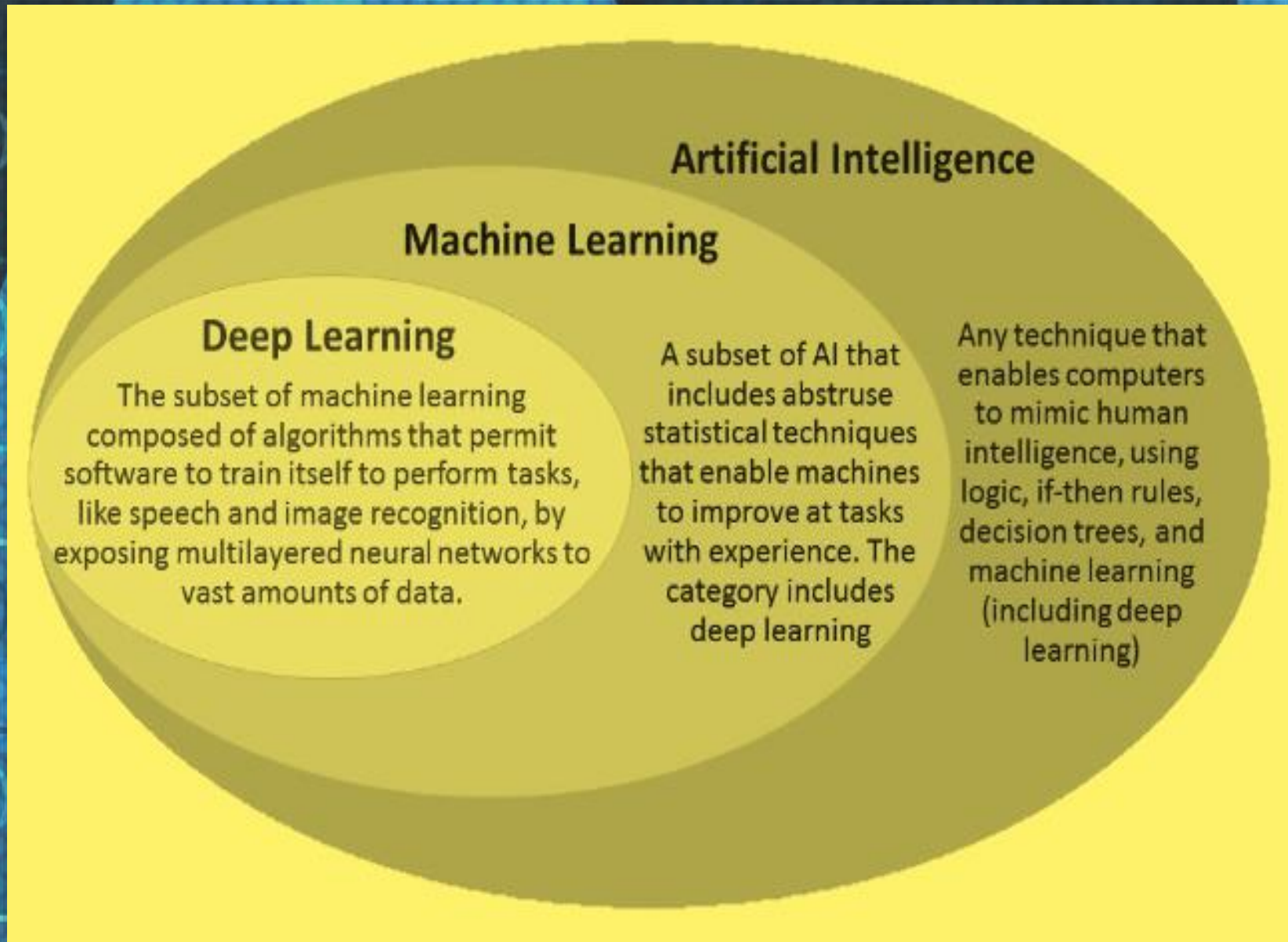
- **Introductory Remarks**
- **What is it all about?**
  - **From Deep Learning to AI**
  - **AI in a Wider Context**
- **Remarks on AI-History**
- **Current Initiatives in K-12 Education**
- **Interdisciplinarity**
- **Implications and Outlook**



# ~~AI in School Education~~

# AI-Education in Schools





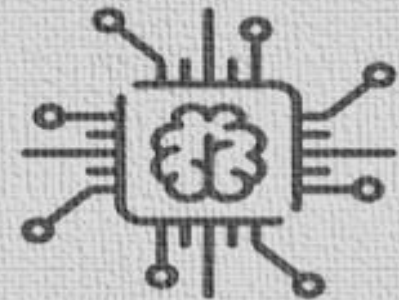
## Data Science

- based on strict analytical evidence
- deals with structured & unstructured data
- includes various data operations



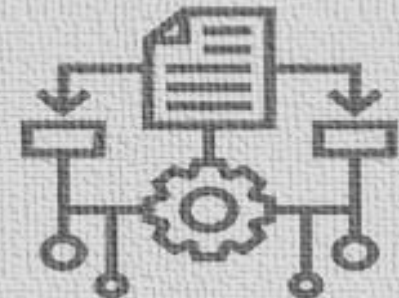
## Artificial Intelligence

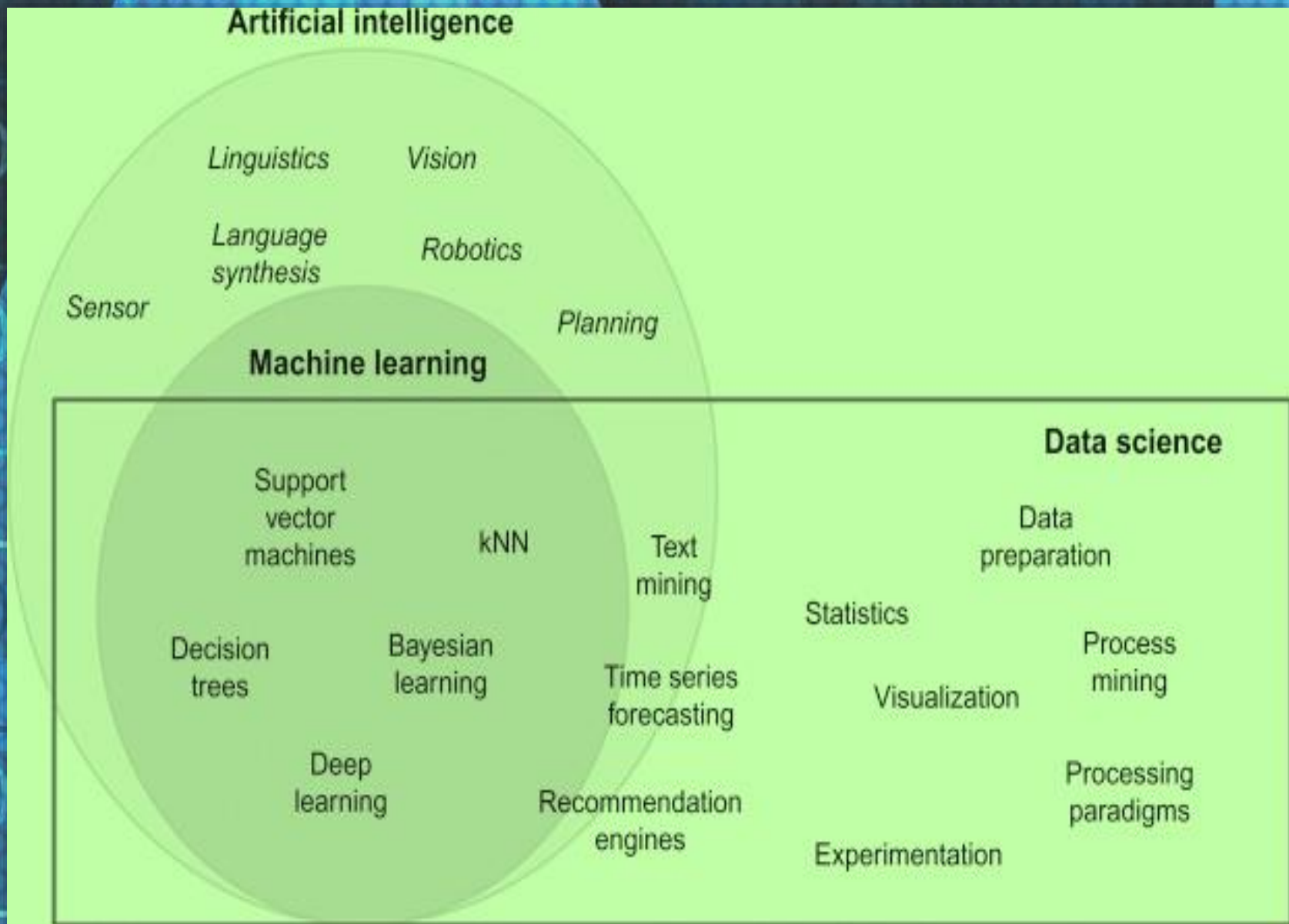
- imparts human intellect to machines
- uses logic and decision trees
- includes machine learning



## Machine Learning

- subset of AI
- uses statistical models
- machines improve with experience





# DATA - ONE BUILDING BLOCK OF AI

(besides COMPUTING POWER and advanced ALGORITHMS based on advanced MATHEMATICS)

Practices				Core Technologies				Grades			
<ul style="list-style-type: none"><li>acquisition</li><li>cleansing</li><li>modeling</li><li>implementation</li><li>optimization</li><li>analysis</li><li>visualization</li><li>evaluation</li><li>sharing</li><li>archiving</li><li>erasure</li></ul>				file stores, databases, data stream systems, data analyses, data mining, semantic web, document stores				820 mittel			
				Design Principles		Mechanics		824 mittel			
				<ul style="list-style-type: none"><li>data independence</li><li>integrity</li><li>consistency</li><li>isolation</li><li>durability</li><li>availability</li><li>partition tolerance</li><li>concurrency</li><li>redundancy</li></ul>		<ul style="list-style-type: none"><li>partitioning</li><li>transportation</li><li>transaction</li></ul>		823 mittel			
								821 mittel			
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								827 schleuerig			
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								829 schleuerig			

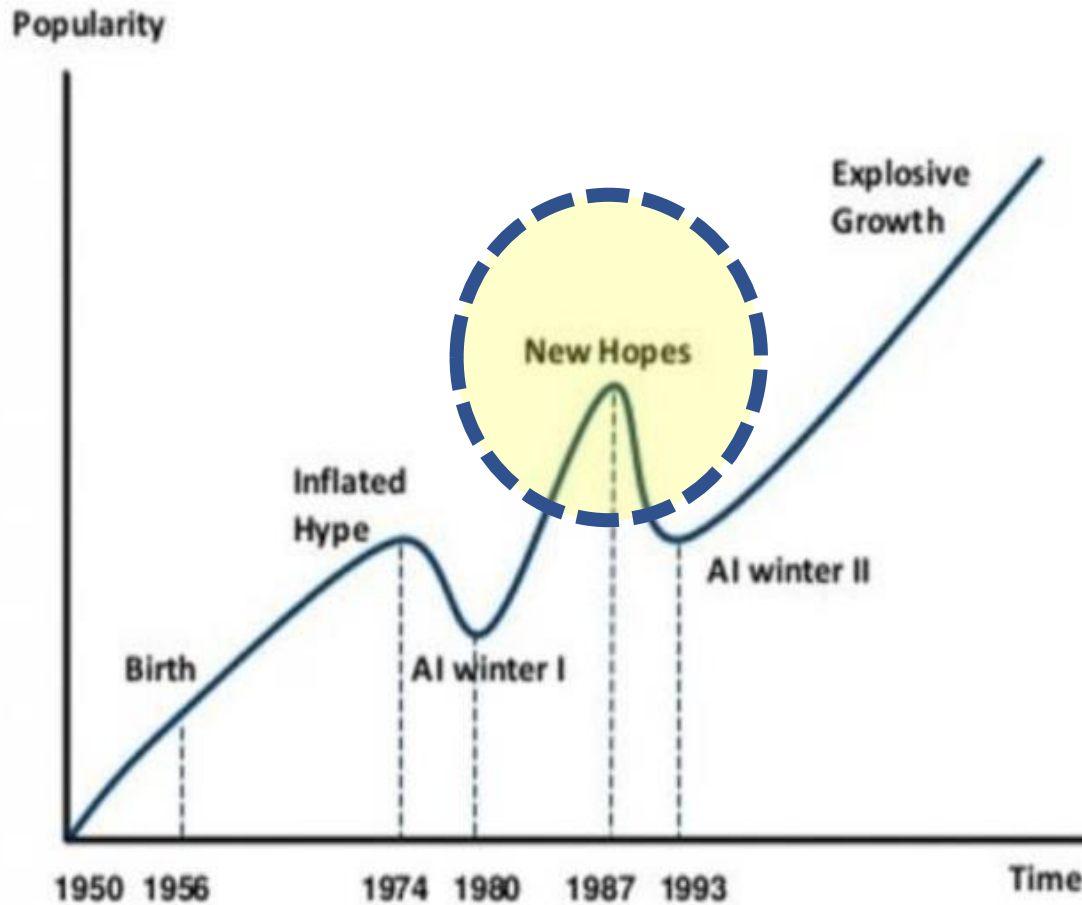
**DATA MANAGEMENT**  
Grillenberger, Romeike 2017

**DATA LITERACY**  
Grillenberger, Romeike 2018





# AI's HISTORY of expectations ... and ...



## Timeline of AI Development

- **1950s-1960s:** First AI boom - the age of reasoning, prototype AI developed
- **1970s:** AI winter I
- **1980s-1990s:** Second AI boom: the age of Knowledge representation (appearance of expert systems capable of reproducing human decision-making)
- **1990s:** AI winter II
- **1997:** Deep Blue beats Gary Kasparov
- **2006:** University of Toronto develops Deep Learning
- **2011:** IBM's Watson won Jeopardy
- **2016:** Go software based on Deep Learning beats world's champions

Source: <https://venturebeat.com/category/ai/>

# Borland's Turbo Prolog, the natural introduction to Artificial Intelligence

Nothing says Artificial Intelligence has to be complicated, academic or obscure. Turbo Prolog\* proves that. It's intelligent about Intelligence and teaches you carefully and concisely so that you soon feel right at home.

Which is not to say that Artificial Intelligence is an easy concept to grasp, but there's no easier way to grasp it than with Turbo Prolog's point-by-point, easy-to-follow Tutorial.

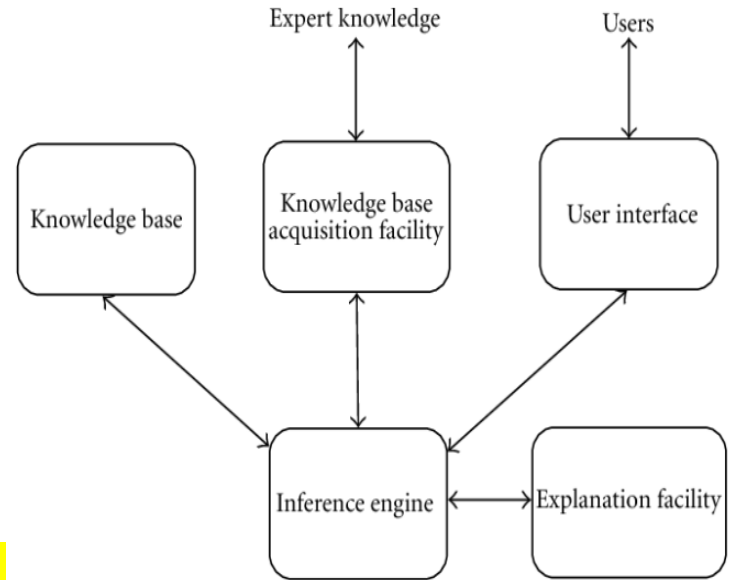


Borland's new Turbo Prolog

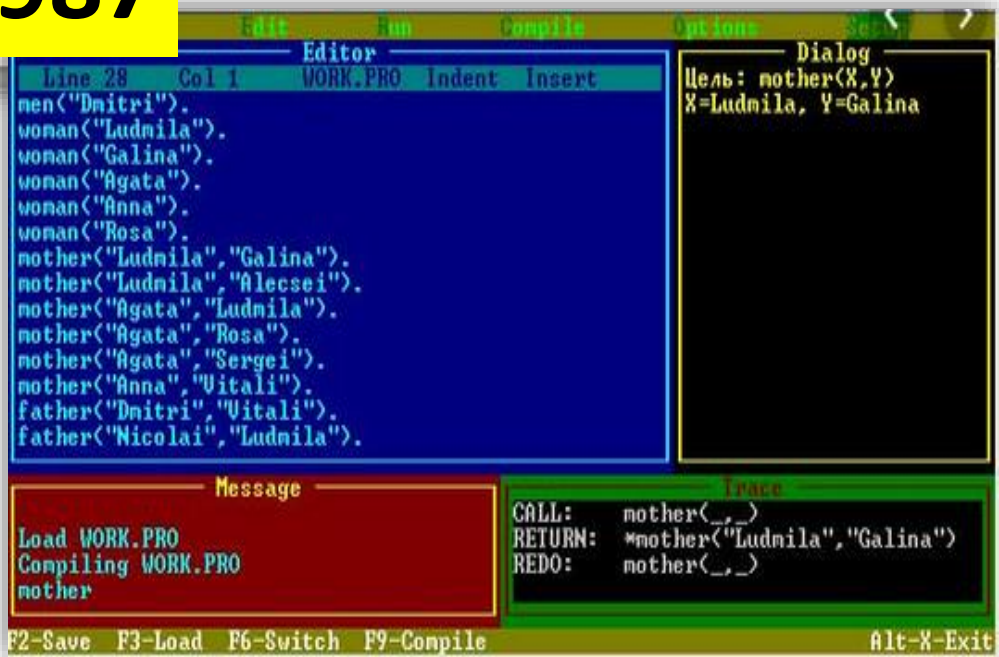
### Turbo Prolog Features:

- ☑ A complete development environment
  - ☑ A fast incremental compiler
  - ☑ A full-screen interactive editor
  - ☑ Graphic and text window support
  - ☑ Tools to build your own expert systems
  - ☑ Full DOS access and support
  - ☑ A free Tutorial
  - ☑ The free Geol query language
  - ☑ An easy-to-use page manual
- All this and more

**1987**



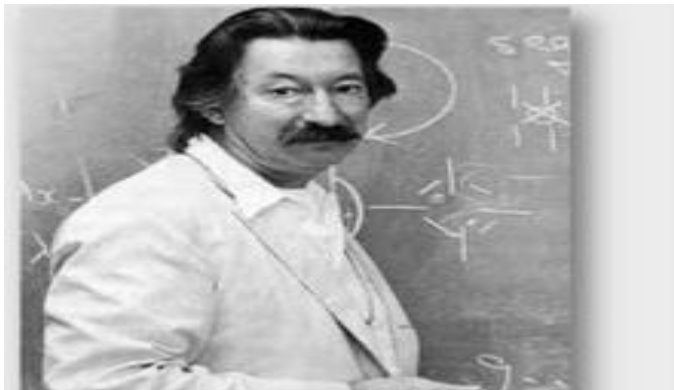
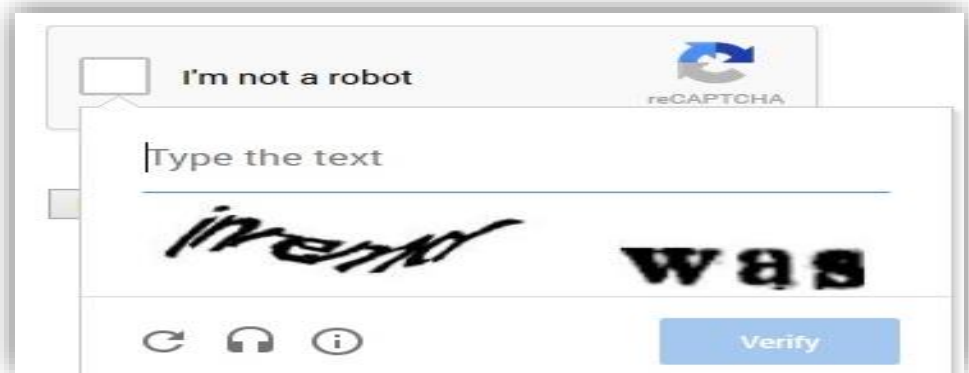
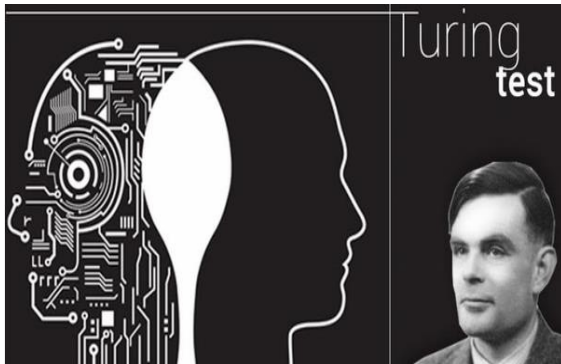
**„Neuronal networks are doomed to failure ...“**





**Descartes:** Distinction between “machines learn about performing one **specific task**”, and “machines learn to be able to adapt to any job”.

-> **Specialized and General AI.**



```
> Hello, I am Eliza.  
* I am afraid.  
> How long have you been afraid?  
* Since midterms.  
> Tell me more...  
* I am afraid that I will fail  
my course.  
> Do you enjoy being afraid that  
you will fail your course?
```

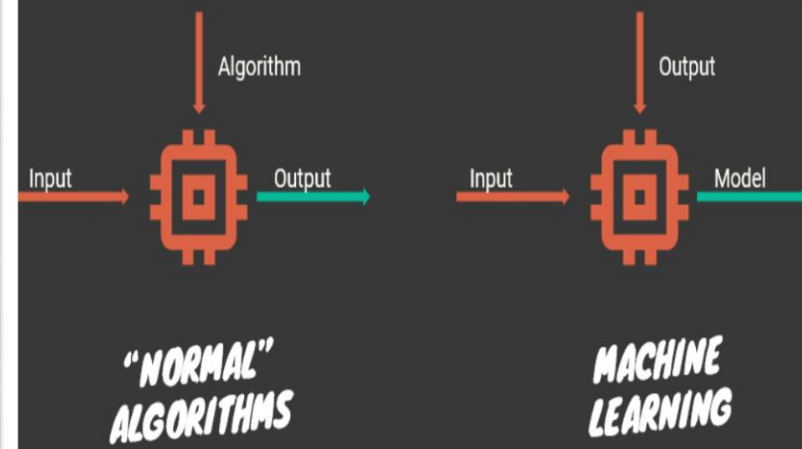
# Current AI Approaches/Projects in Schools



# Current AI Approaches/Projects in Schools

## AI UNPLUGGED

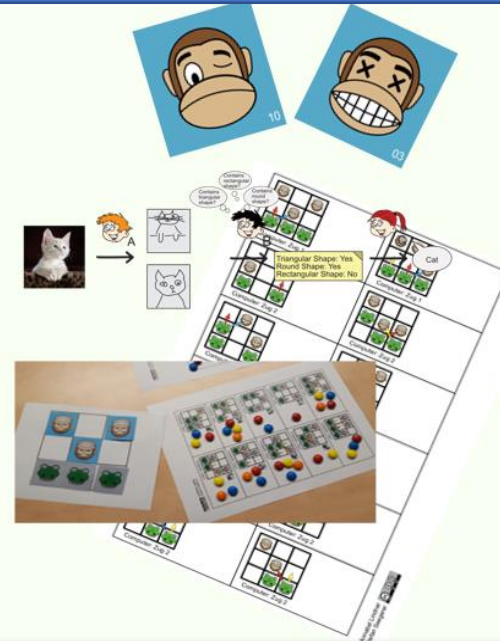
Wir ziehen Künstlicher  
Intelligenz den Stecker



## Germany (Bavaria)

### AI Unplugged

- Activity 1: Classification with Decision Trees - The Good-Monkey-Bad-Monkey Game
- Activity 2: #deeplearning - Recognition of images with Neural Networks
- Activities 3 & 4: Reinforcement Learning - "Beat the Crocodile" & Back to the Roots - Crocodile Chess and Classic AI
- Activity 5: "And oh! I am glad that nobody knew I'm a computer!" - The Turing Test



# Current AI Approaches/Projects in Schools

## UNDERSTANDING ARTIFICIAL INTELLIGENCE

### A PROJECT FOR THE DEVELOPMENT OF

### COMPREHENSIVE TEACHING MATERIAL

Germany (Paderborn)

#### Materials

- Simulation Game "Man, Machine!"
- Booklet for Teachers
- Learning diary for students
- Supporting (online) material



#### Module 1

Introduction - students' everyday experiences with AI

#### Module 2

How does Machine Learning work?

#### Module 3

What's the difference between man and machine?

#### Module 4

Historical Overview of the Development of Artificial Intelligence

#### Module 5

The distribution of roles of man and machine - ethical and societal aspects

#### Module 6

In which AI world do we want to live?

# School-Textbooks for AI?, but where ???

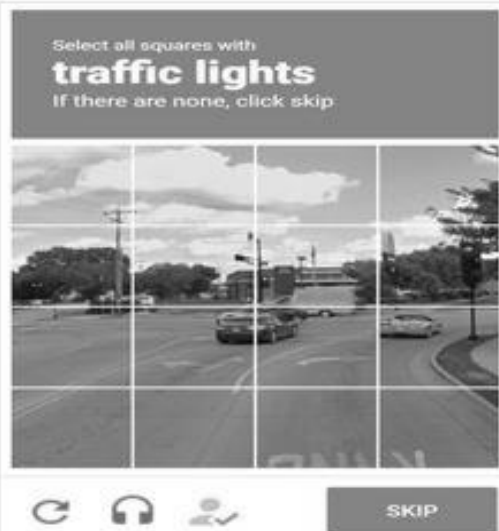
## New textbook content catalogue system

- Unit 1 recognizes artificial intelligence
  - 1.1 Artificial intelligence around you
  - 1.2 The main drivers of artificial intelligence
- Unit 2 Intelligent Robot Preliminary
  - 2.1 Recognize and build intelligent robots
  - 2.2 Sensory and control of the robot
  - 2.3 Let the robot car drive intelligently
  - 2.4 Realizing the Obstacle Avoidance of Robot Cars
  - 2.5 Realize remote interaction and control of robot car
- Unit 3 Simple Smart Home System
  - 3.1 Smart Home and Life
  - 3.2 Smart Home Green Lighting
  - 3.3 Smart home audio and air conditioning
  - 3.4 Simple smart home scene mode
  - 3.5 Intelligent Robot Manager
- Unit 4 Artificial Intelligence Core Technology
  - 4.1 Machine Learning and Its Applications
  - 4.2 Understanding Artificial Neural Networks
- Unit 5 The future of artificial intelligence
  - 5.1 The development direction of artificial intelligence
  - 5.2 Potential value of artificial intelligence
  - 5.3 Artificial Intelligence challenges the legal system and ethics

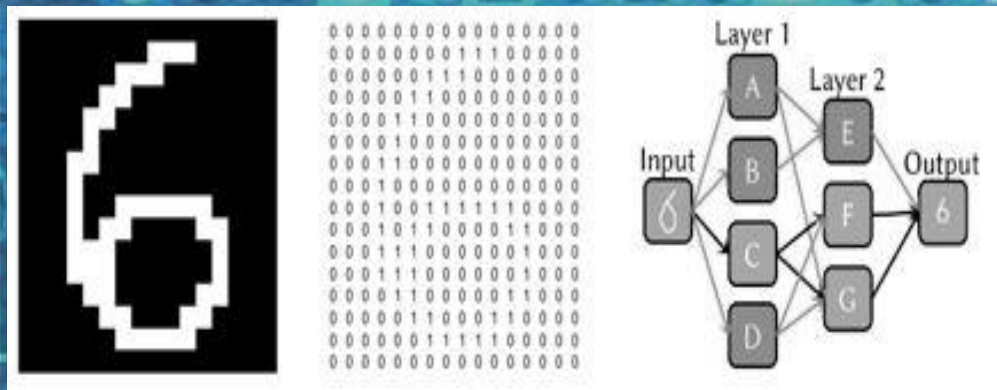
## Old textbook content catalogue system

- Chapter 1 Getting to know artificial intelligence
  - 1.1 What is artificial intelligence?
  - 1.2 What can artificial intelligence do for us?
- Chapter 2 Understanding Artificial Intelligence Language
  - 2.1 Understanding Prolog
  - 2.2 Using Prolog
  - 2.3 Artificial Intelligence Language
- Chapter III Representing Knowledge by Computer
  - 3.1 Knowledge and its type
  - 3.2 Introduction to Knowledge Representation
  - 3.3 Common methods of knowledge representation
- Chapter IV Using Computer Reasoning
  - 4.1 What is an expert system?
  - 4.2 How does the expert system work?
  - 4.3 How to develop an expert system
- Chapter 5 Solving Problems with Smart Search
  - 5.1 Problems that can be solved by searching
  - 5.2 Blind search
  - 5.3 Heuristic search
- Chapter VI Development and Future of Artificial Intelligence
  - 6.1 Development of artificial intelligence
  - 6.2 The future of artificial intelligence

# Example Image Recognition and Production

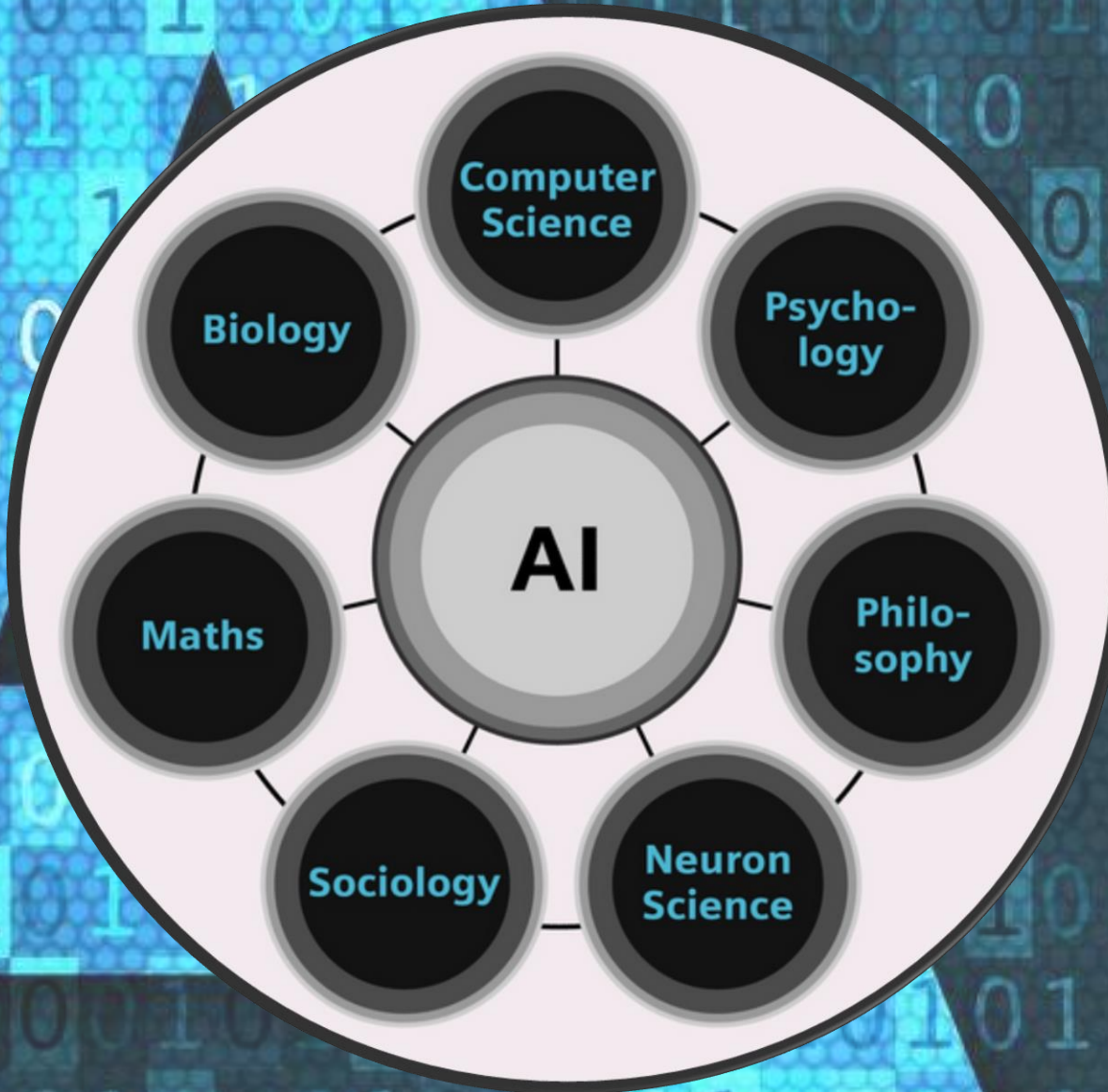


Imagined by a GAN (generative adversarial network)  
StyleGAN (Dec 2018) - Karras et al. and Nvidia  
Original GAN (2014) - Goodfellow et al.  
Don't panic. Learn about how it works.  
Help me figure out what was learned here.  
Help this AI continue to dream  
Another | Save • Cats | Articles | TV Friends - Office |





# AI is highly interdisciplinary



# Concluding Remarks

## Pedagogical/didactics considerations [breadth and depth of a wide field]

- Approach from a **social** and **philosophical** standpoint  
**(talking and reasoning about AI)**
- Dealing with AI by a **conscious awareness of AI applications** on a phenomenological level **(knowing about AI)**
- Applying AI through a **grey box models**, requiring a basic knowledge of its key concepts **(applying AI)**
- Putting the **mathematical, statistical and computational perspective** into the foreground **(constructing AI)**

**AI has the potential to extend and enrich computing in schools.**

**But there is still a long way to go and to find the right approaches and reasonable levels and requirements for the particular age-groups.**

**Above all, it needs curious educators, teachers and teacher trainers who are able to incorporate this important and prospective field into general, specific and vocational education.**

# DON'T PANIC ABOUT THE FUTURE OF AI – JUST TEACH IT.

## Myth:

Superintelligence by 2100 is inevitable

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

## Myth:

Superintelligence by 2100 is impossible

## Fact:

It may happen in decades, centuries or never: AI experts disagree & we simply don't know



## Myth:

Only Luddites worry about AI



## Fact:

Many top AI researchers are concerned



## Mythical worry:

AI turning evil



## Actual worry:

AI too competent, with goals misaligned with ours



## Mythical worry:

AI turning conscious

## Myth:

Robots are the main concern



## Fact:

Misaligned intelligence is the main concern: it needs no body, only an internet connection



## Myth:

AI can't control humans



## Fact:

Intelligence enables control: we control tigers by being smarter



## Myth:

Machines can't have goals



## Fact:

A heat-seeking missile has a goal



## Mythical worry:

Superintelligence is just years away



## Actual worry:

It's at least decades away, but it may take that long to make it safe



**THANK YOU!**