

Artificial Intelligence

VERY BRIEF INTRODUCTION

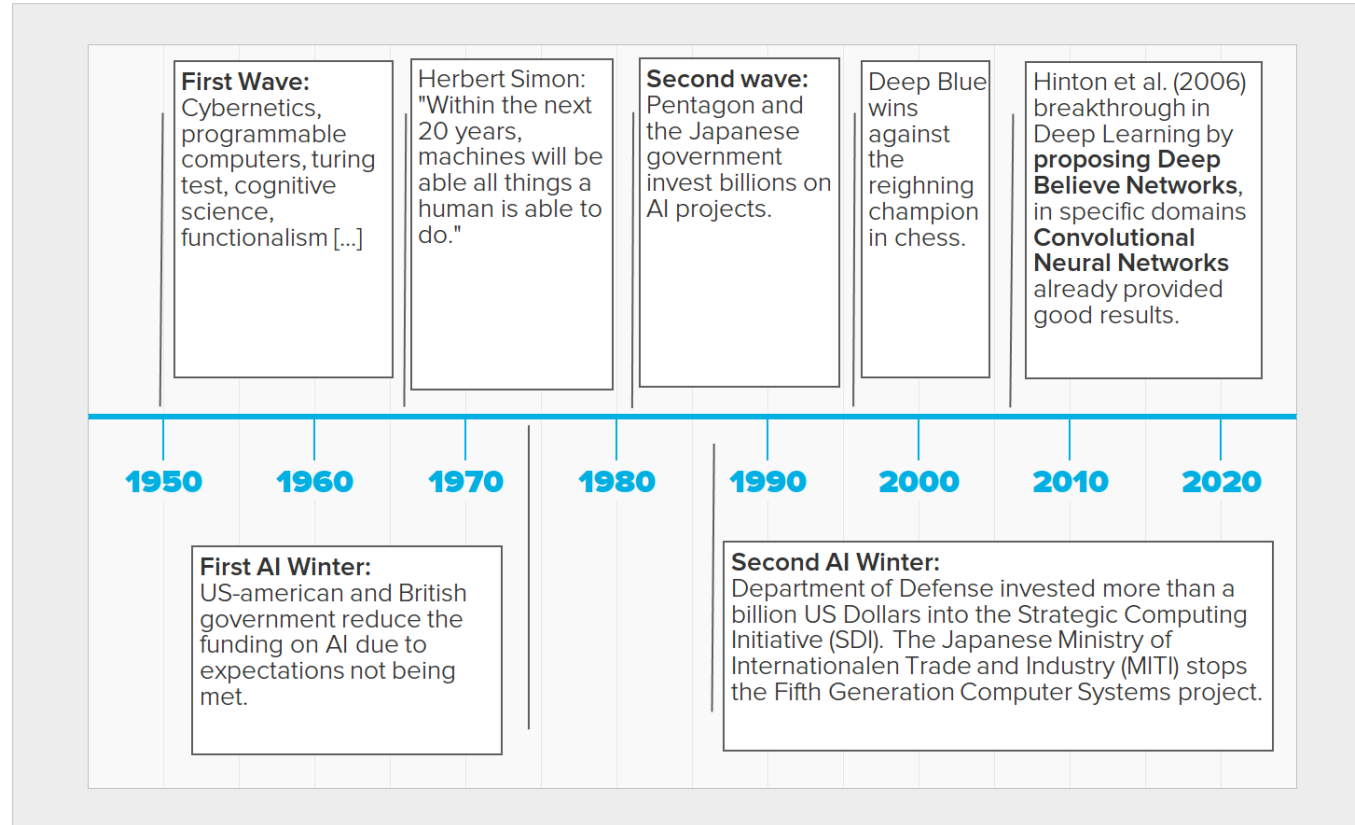
Dr. Roman Kern



INTRODUCTION



HISTORY OF ARTIFICIAL INTELLIGENCE



TYPES OF ARTIFICIAL INTELLIGENCE

- Strong AI (full AI, artificial general intelligence)
 - Machines act as if they were able to reason
- Weak AI (narrow AI, applied AI)
 - Pattern-based AI, data-driven AI
 - „Capability of machines to imitate intelligent human behaviour”
 - Machines support humans in relatively simple tasks
- Artificial super intelligence



Good results!



Research needed

- Test of the (strong) AI

- Turing test

- Can a human distinguish between a human and the AI?

- Reverse turing test

- CAPTCHA

- Lovelance test

- Human asks the machine for a creative work, e.g. poem, picture, ...



AI is often associated
with intelligent agents

MAIN APPROACHES

- Main approaches to (weak) AI
 - Logic and rules
 - Expert systems
 - Data-driven, pattern-based
 - Machine learning

- Logic-based AI
 - Rules formulated by human experts
 - Knowledge represented in a formalised way
 - Decisions can be explained
 - Allows to automate processes
 - E.g. Workflow processes

- Pattern-based AI
 - Machine identify patterns within data
 - Based on mathematical/statistical models
 - And assumptions
 - Decisions are often hard to explain
 - Also profits from expert knowledge (hybrid models)

- If a typical person can do a mental task with less than one second of thought, we can probably automate it using AI either now or in the near future.
 - Andrew Ng

- AI as a marketing tool, for example
 - IBM Watson
 - Jeopardy!
 - Google Alpha Go
 - Beats human pro player

- Two main reasons for break-through in recent times
 1. Larger data sets
 2. Increase in computational power
 - Distributed computing

MACHINE LEARNING



- **Machine learning**
 - Making use of (large) amounts of data
 - “Machine programs itself”
- **Data science**
 - Making sense (insights) out of data



CHALLENGES OF MACHINE LEARNING

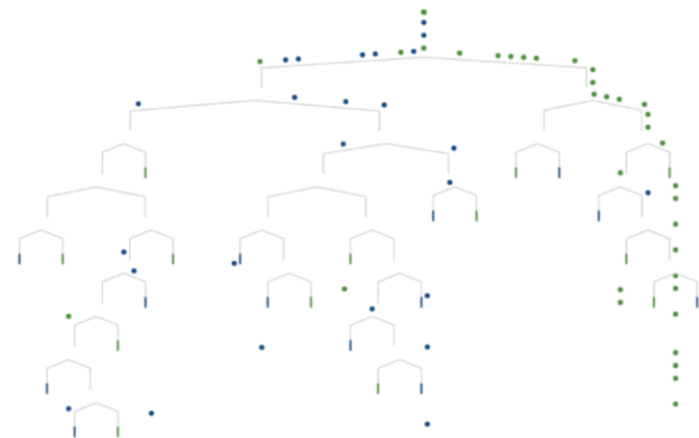
- Requires large amounts of data
 - Typically clean, unambiguous data
- Interpretable models
 - Understand why the machine made a decision
- Skills
 - Select appropriate approaches
 - Put results in context



“Machine learning can’t get something from nothing...what it does is get more from less.” – Pedro Domingo.

TYPES OF MACHINE LEARNING

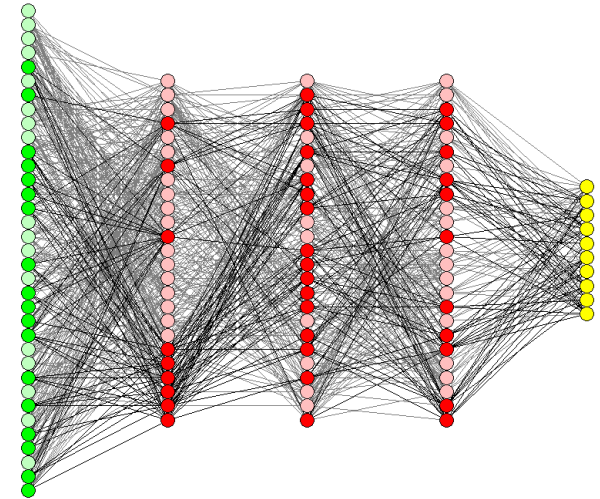
- Supervised learning
 - Response for a given input
 - $A \rightarrow B$
- Unsupervised learning
 - Find pattern in data
- Reinforcement learning
 - Learn via interaction with environment



Source: <https://www.techemergence.com/what-is-machine-learning/>

“We are drowning in information and starving for knowledge” -- John Naisbitt.

- **Deep learning**
 - Synonymous with AI
 - Typically neural networks
 - Expensive to compute
 - Amount of data
 - Amount of computational resources
 - Impressive results



Source: <https://www.techemergence.com/what-is-machine-learning/>

Deep learning is not “a universal solvent, but one tool among many” -- Gary Marcus.

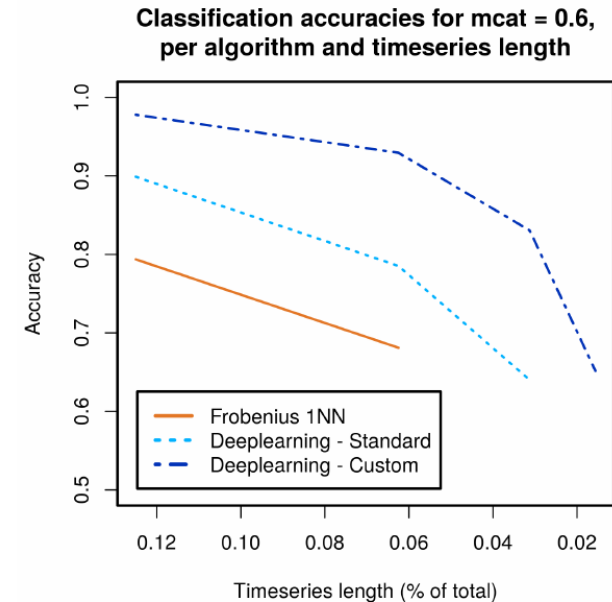
- Early classification with deep learning

- Detect gestures of sign language

- Based on sensory data

- Results

- 65% of maximal accuracy with only ~1.5% of the full data!



- Artificial Intelligence: A Modern Approach
 - Stuart Russell, Peter Norvig
- <https://www.slideshare.net/HarrySurdén/harry-surdén-artificial-intelligence-and-law-overview>
- https://www.slideshare.net/EdurekaIN/what-is-artificial-intelligence-artificial-intelligence-tutorial-for-beginners-edureka/16-Copyright_2017_edureka_andor_its
- <http://kti.tugraz.at/staff/denis/courses/kddm1/>
- <http://kti.tugraz.at/staff/rkern/courses/kddm2/>



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