What is AI?

Prof. Dr. Kristian Kersting
The dream of AI is not new. Talos, an ancient mythical automaton with artificial intelligence.
The dream of AI is not new

Leibniz „philosophises about `artificial intelligence‘ (AI). In order to prove the impossibility of thinking machines, Leibniz imagines of `a machine from whose structure certain thoughts, sensations, perceptions emerge““ — Gero von Randow, ZEIT 44/2016
AI today
So, AI has many faces

Saviour of the world

Downfall of humanity
Humans are smart

https://www.youtube.com/watch?v=XQ79UUIOeWc
AI asks, can machines be smart, too?

"the science and engineering of making intelligent machines, especially intelligent computer programs.

It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable."

- John McCarthy, Stanford (1956), coined the term AI, Turing Awardee
AI wants to build intelligent computer programs. How do we do this?

We use algorithms: unambiguous specifications of how to solve a class of problems – in finite time.
Think of it as a recipe!
Learning  Thinking  Planning

AI = Algorithms for ...

Vision  Behaviour  Reading
Machine Learning

the science "concerned with the question of how to construct computer programs that automatically improve with experience"

- Tom Mitchell (1997) CMU
Deep Learning

a form of machine learning that makes use of artificial neural networks

Geoffrey Hinton  
Google  
Univ. Toronto (CAN)

Yann LeCun  
Facebook (USA)

Yoshua Bengio  
Univ. Montreal (CAN)
Overall Picture

Deep Learning

Machine Learning

Artificial Intelligence
1956
Al is Born

A Proposal for the
DARTMOUTH SUMMER RESEARCH PROJECT ON ARTIFICIAL INTELLIGENCE

We propose that a 2 month, 10 man study of artificial intelligence be
carried out during the summer of 1956 at Dartmouth College in Hanover, New
Hampshire. The study is to proceed on the basis of the conjecture that every
aspect of learning or any other feature of intelligence can in principle be so pre-
cisely described that a machine can be made to simulate it. An attempt will be
made to find how to make machines use language, form abstractions and concepts,
solve kinds of problems now reserved for humans, and improve themselves. We
think that a significant advance can be made in one or more of these problems if
a carefully selected group of scientists work on it together for a summer.

Dartmouth Conference

John McCarthy
Turing Award 1971

Marvin Minsky
Turing Award 1969

Allen Newell
Turing Award 1975

Herbert A. Simon
Turing Award 1975
Nobel Prize 1978
Since 2010s: Deep Learning — “akin to the human brain”, millions of simple compute units process informations
What’s different now than it used to be?

#1 models are bigger
#2 we have more data
#3 we have more compute power
#4 the systems actually work for several tasks
AI does the laundry
AI knows a lot
Al is an Artist
Schachmatt durch „CrazyAra“

Künstliche Intelligenz schlägt mehrfachen Weltmeister im Einsetzschach


AI plays chess and GO
A.I. Is Harder Than You Think

By Gary Marcus and Ernest Davis

Mr. Marcus is a professor of psychology and neural science. Mr. Davis is a professor of computer science.

May 18, 2018
Humans, but Not Deep Neural Networks, Often Miss Giant Targets in Scenes

Miguel P. Eckstein, Kathryn Koehler, Lauren E. Welbourne, Emre Akbas
Semantics derived automatically from language corpora contain human-like biases

Aylin Caliskan, Joanna J. Bryson, Arvind Narayanan

Science 14 Apr 2017
Vol. 356, issue 6334, pp. 1183–1186
DOI: 10.1126/science.aal320

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„Moral“ Choices

https://www.hr-fernsehen.de/sendungen-a-z/hauptsache-kultur/sendungen/hauptsache-kultur,sendung-56324.html
Algorithms of intelligent behaviour teach us a lot about ourselves

The twin science: cognitive science
"How do we humans get so much from so little?" and by that I mean how do we acquire our understanding of the world given what is clearly by today's engineering standards so little data, so little time, and so little energy.
Getting deep systems that reason and know what they don’t know

Responsible AI systems that explain their decisions and co-evolve with the humans

Open AI systems that are easy to realize and understandable for the domain experts

„Tell the AI when it is right for the wrong reasons and it adapts ist behavior“
And this is AI
It is a revolution but there is still a lot to be done! This is a team sport. We need you!

Prof. Dr. Kristian Kersting