Dynamické rozhodování a učení: nástroje umělé inteligence

Tatiana V. Guy

Head of Joint Research Laboratory PEF-ÚTIA

Department of Information Engineering, PEF ČZU

and

Department of Adaptive Systems, ÚTIA AVČR

guy@pef.czu.cz

AI vs. Decision Making (DM)

- Artificial intelligence is intelligence demonstrated by machines, as opposed to intelligence of humans.

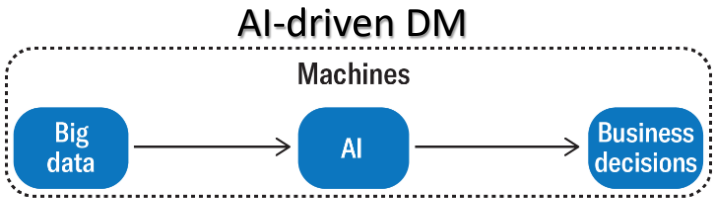
Remember: Artificial Neural Network is **not** AI!

- Decision making is the cognitive process of choosing a reasonable alternative from the available options.
- Decision-making theory is a theory of how rational individuals should behave under risk and uncertainty.

Humans and AI are only processors!

Source: Eric Colson

HBR



Source: Eric Colson

HBR

Why is DM so important?

All analyses and predictions on Data Science, ML, AI aim on better decisions (or improved decisions).

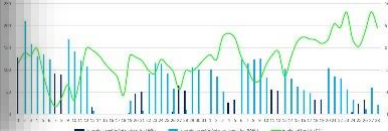
Trend 3 in 2021: Decision intelligence (Gartner) – true!

- *By 2023, more than 33% of large organizations will have analysts practicing **decision intelligence**, including **decision modeling**.*
- *It provides a framework to help data and analytics leaders design, model, execute, monitor and tune **decision models and processes** in the context of business outcomes and behavior.*

Gartner, Inc, is a global research and advisory firm providing information, advice, and tools for leaders in IT, finance, HR, customer service and support, communications, legal and compliance, marketing, sales, and supply chain functions (https://en.wikipedia.org/wiki/Gartner)

Sample DM applications

- Medical decision making (optimal personalised medical treatments).
- E-commerce (personalised offer; bidding for advertisements on I-net, …)
- Energy distribution and storage (optimising battery vs. solar (other) and price)
- Logistics (taxi services, supply chains,…)
- Autonomous vehicles, robots…



Agent and Environment

Agent

(*knowledge*, *observations*) → *actions*

built-in knowledge, DM objectives

Agent: human; artificial device; both

Environment: a part of the world

Physical vs. digital or virtual worlds make no conceptual difference

Agent and Environment

Agent

(*knowledge*, *observations*) → *actions*

observations

actions

built-in knowledge, DM objectives

Environment

Agent: human; artificial device; both

Environment: a part of the world

Physical vs. digital or virtual worlds make no conceptual difference

Magic of Feedback or Closed-loop

Actuate
(gas pedal)

Observation (sense) of car speed

Agent: Mr Bean
"computing" control action

Preferred speed

Problem!

Contemporary AI is ***not*** intelligent as it is mostly based on supervised learning (human is needed)

and has:

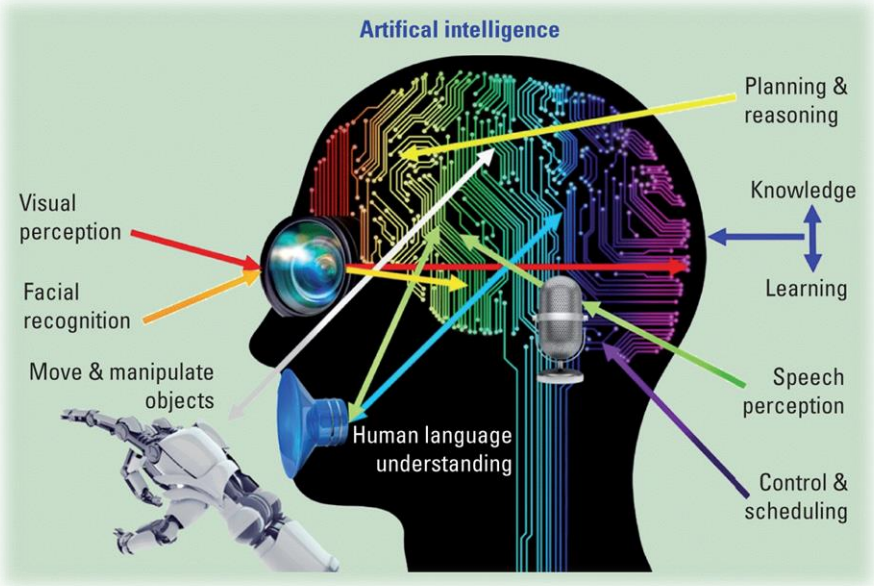
- *poor* ability of self-*improving*
- *poor* ability to predict *consequences* of planned decisions in *unknown* contexts
- *difficulty* of reacting to *rare* events.

Motivation of (super) AI

General need: Design, control and analysis of intelligent (human-centered) reliable agents able to support humans in varying environments.

Core abilities:

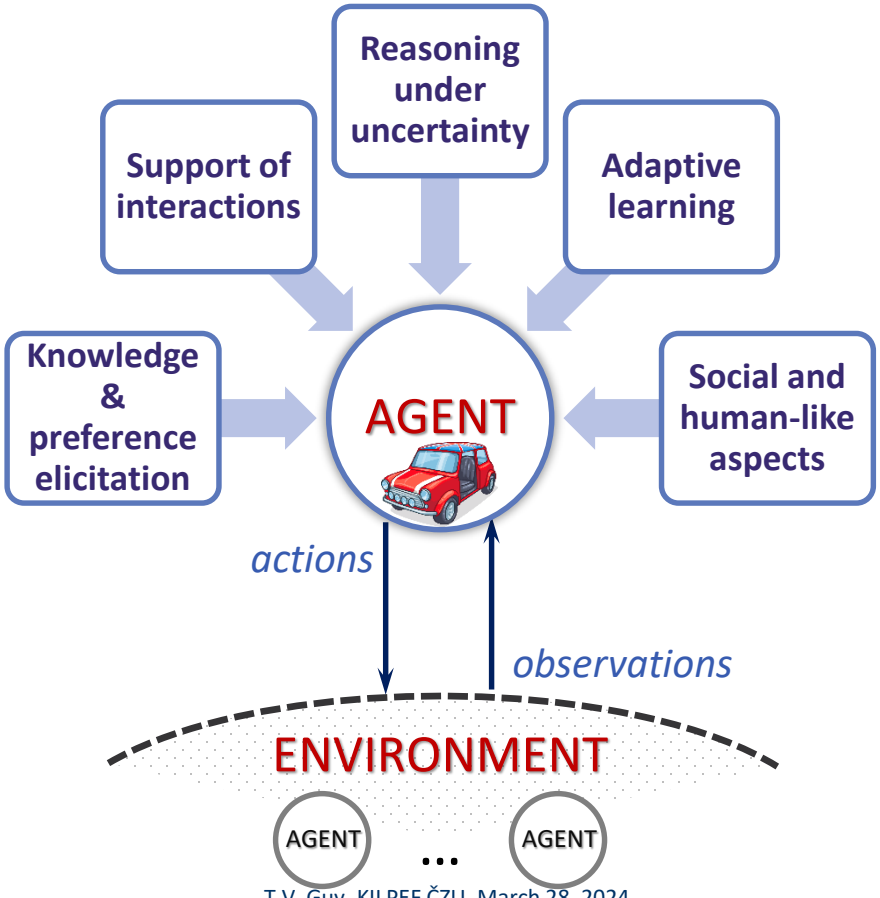
- high-level abstraction
- infer DM goals of human behaviour
- generalising
- adaptability
- lifelong learning



Sci-fi aim: creation of super intelligence capable of surpassing human intelligence by manifesting cognitive skills and developing thinking skills of its own.

Human-centric intelligent decision support

USER:
- constraints
- knowledge
- DM goals



If you are interested: open topics (BP, DP, PhD)

- How to learn our wishes? And how to use them?
- Eye-tracking and its use
- Trust and emotions in decision making?
- Will fairness influence our decisions?
- Deep transfer learning.
- Transfer learning in virtual (augmented) reality.
- … many other topics that can be adapted to your wishes

Applications: e-commerce, medicine, robotics,..

guy@pef.czu.cz

Take away message

- Intelligence has many faces (recall: ANN is mean not AI!).
- Real world is complex, but luckily structured.
- Your generation faces very interesting but complex tasks.
- (super-) AI is about “smart” math + multidisciplinary domains.
- SW development is more about support.
- Smart and thinking people are always wanted.

Good luck!