Innovation & AI
Tricky business?

Erasmus Hogeschool Brussel
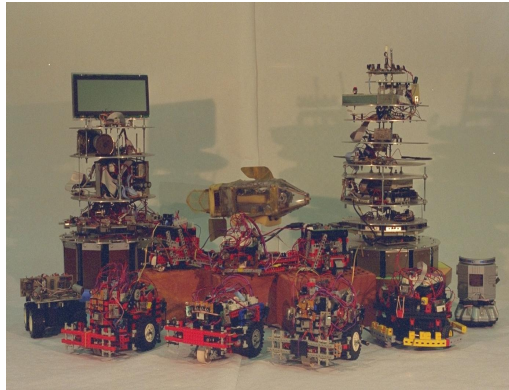
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VUB Artificial Intelligence Lab

Strong heritage, leading position

Founded in 1983
by Prof. Luc Steels

First AI lab on the European mainland

36 years of **experience**

50 researchers from 22 countries
14 professors

950 publications
28 000 citations

Current projects
4 EU projects
20+ national projects
10 industry funded projects

5 spin-offs
former colleagues @ DeepMind, Prowler, MIT, CalTech, Collibra, Sony, …

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AI studies…

1. the nature and mechanisms of **intelligence**

2. Using **formal methods**, an

3. Attempts to **reconstruct** it.

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Playing chess...

Still a manifestation of (human) intelligence?

Will a computer use
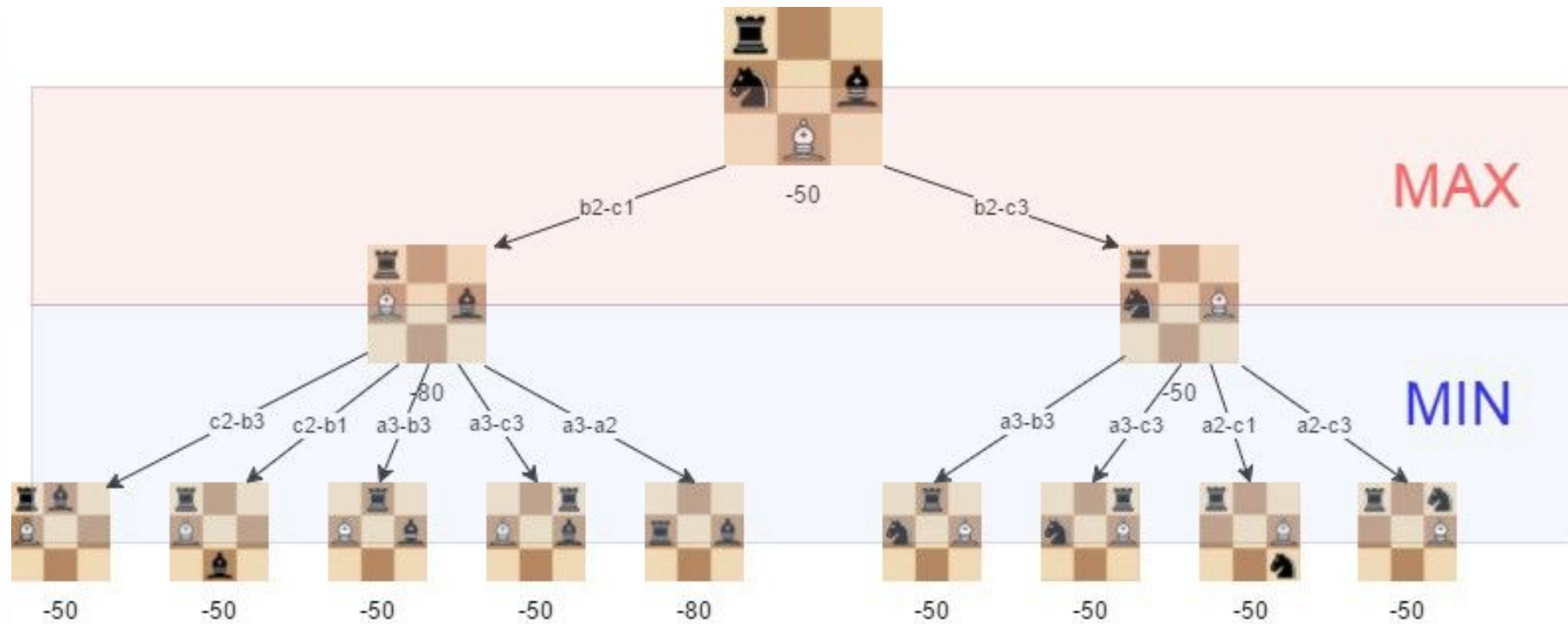 the same "intelligence"?

A machine that can fly

- Do not copy the flapping wings

- But learn how a bird uses physics to fly

The question of whether a computer can think is no more interesting than the question of whether a submarine can swim -- Edsger W. Dijkstra
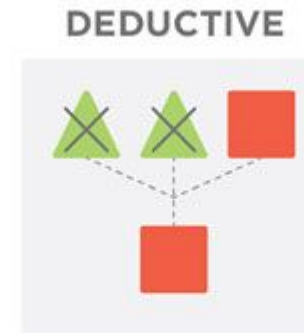
SEARCH

LOGIC
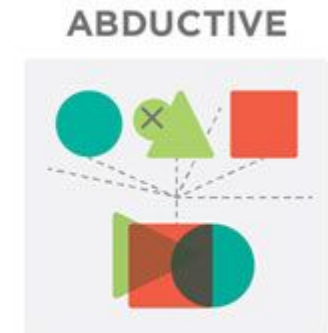
(e.g. model expansion, business rule engines)
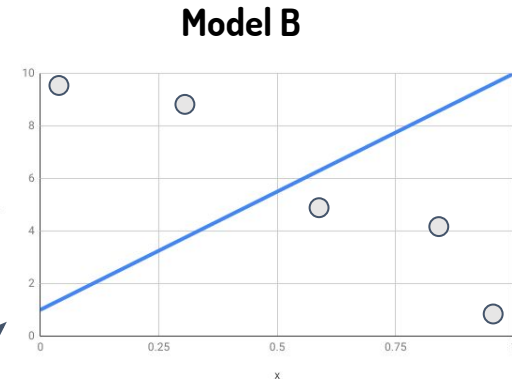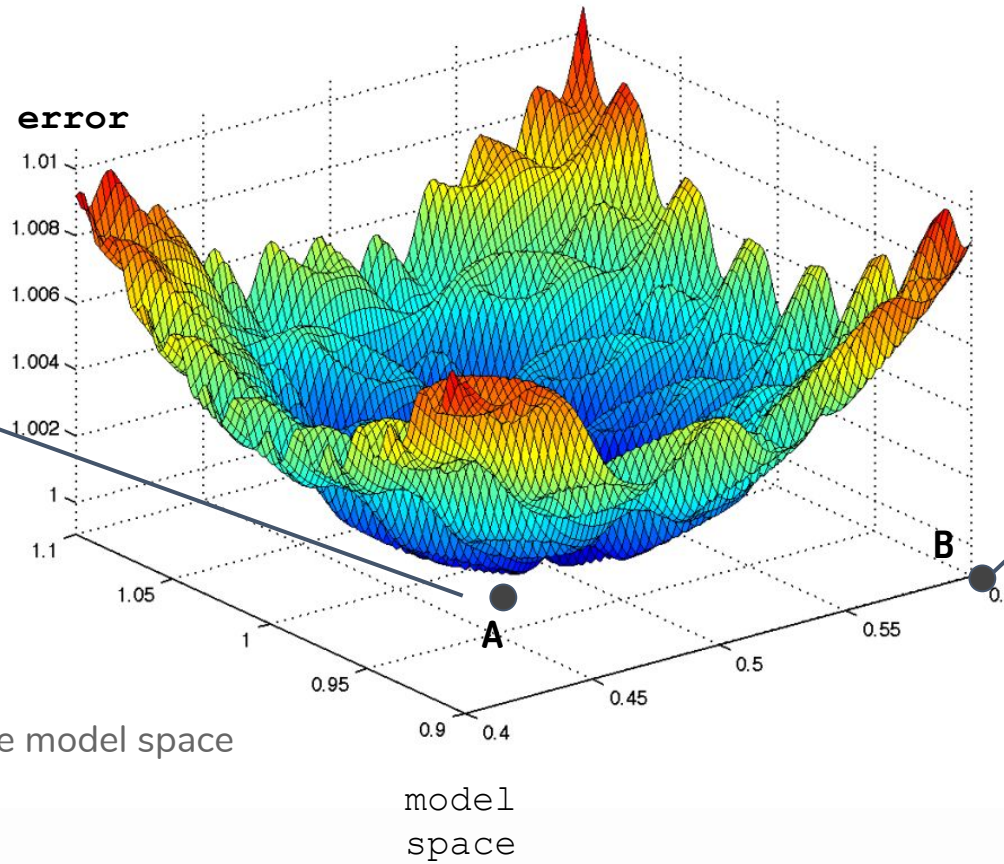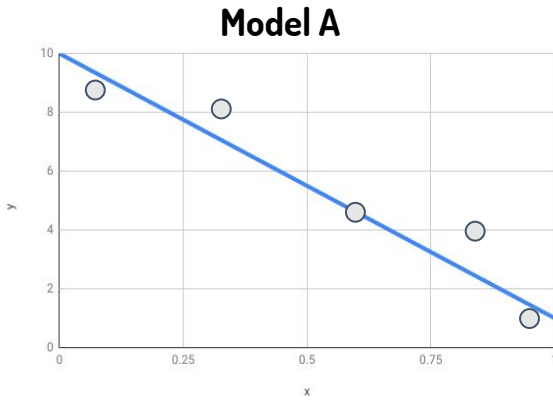
MODELLING & OPTIMIZATION

("machine learning")

You should care: AI is transformative

AI is **transformative**

1. Changes the nature of **knowledge**
   a. Allows companies to formalize knowledge
   b. Moves from humans to self-learning machines

2. **Relationship** with autonomous machines **changes**
   a. humans go from commanding to (intuitive?) **interacting**
   b. go beyond our understanding (e.g. high dimensional)

3. They have "infinite" **scale**.
   a. micro-personalization, human empowerment
   b. reason, on the basis of millions, about *you*.

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We have come to a point that the systems we need
are **too complex for humans** to build, understand or maintain.
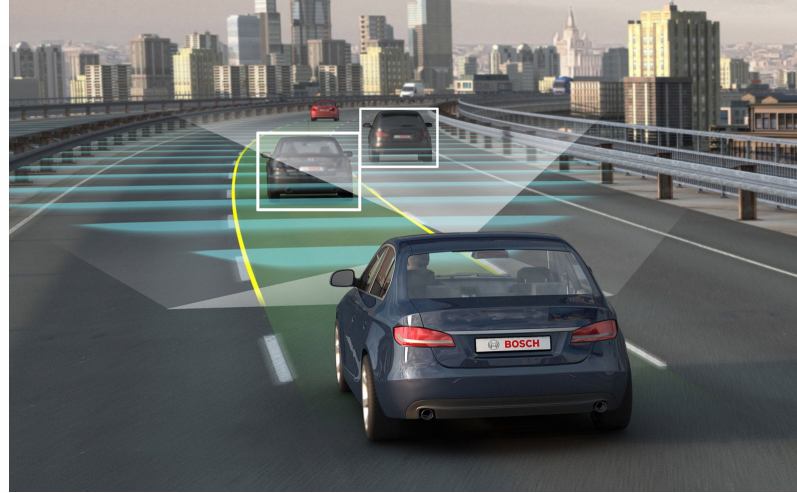
The real transformative value of AI lies exactly in the systems we do not understand

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AI is **hard**

Conceptually

- What is **intelligence**? Is intelligent **behaviour** enough?

- AI is always "on the edge": once a problem is solved, we no longer call it AI…
  - playing chess
  - route planning
  - predictive models
  - ?

- It **challenges our thinking** too, our mental models!!

Example: meeting room occupation

temperature IR sensor

We want to detect automatically when the classroom is occupied.

⇒ Set up an experiment to learn the relation!

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First look at sensor data
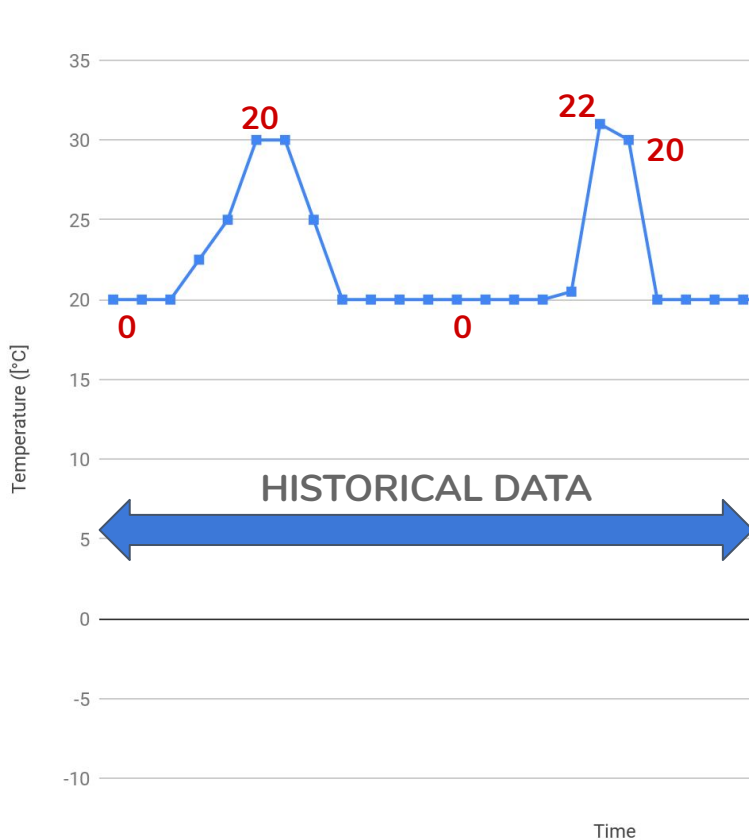
Nice: we can use AI to learn the #persons in the room.

Used for decision making:

Rooms with <20 users/day will be discarded.

First look at sensor data
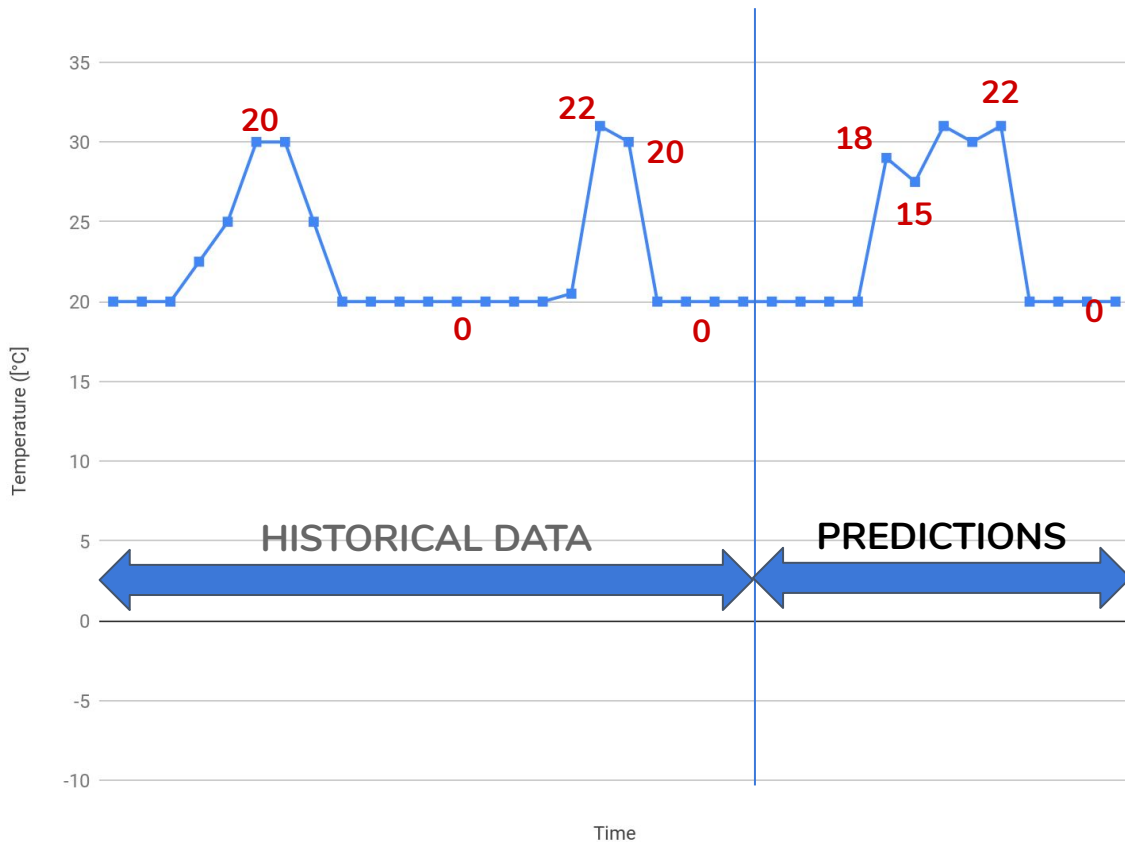
The board decides to **cut down energy.** What will happen to the predictions?

Energy saving ⇒ A/C off at night

Negative #persons?! What is the consequence?

The model **overgeneralized.**

Room will be discarded as the sum < 20.

AHA!

_We_ know that the #persons cannot be negative.

Strange... what happens here?

Room no longer in use?
Very cold outside?

The **sensor** input was **blocked** and outputs 0.

Room will be discarded.

Then summer comes...
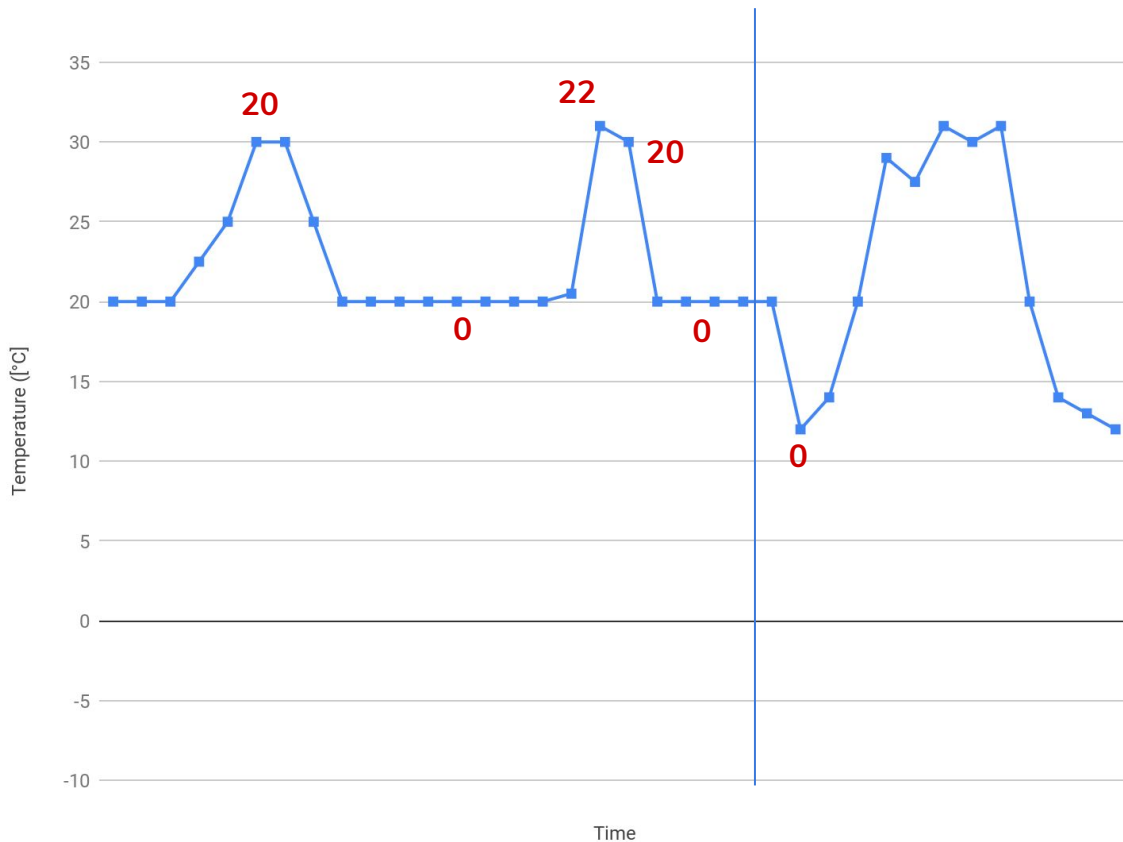
A/C is shut off in summer.
20 °C is no longer a reference.

We know the sensor is just a proxy to measure t° increase by human presence

Algorithms have no idea of the **context**, unless you tell them so.

We **underestimate** our intelligence!

- Tactile feedback

- Substance identification

- Memory of weight

- Geometric laziness

Interdisciplinary (intersection, not union)

abstract

AI formalisms

mathematics

computer science

hands-on

application domain
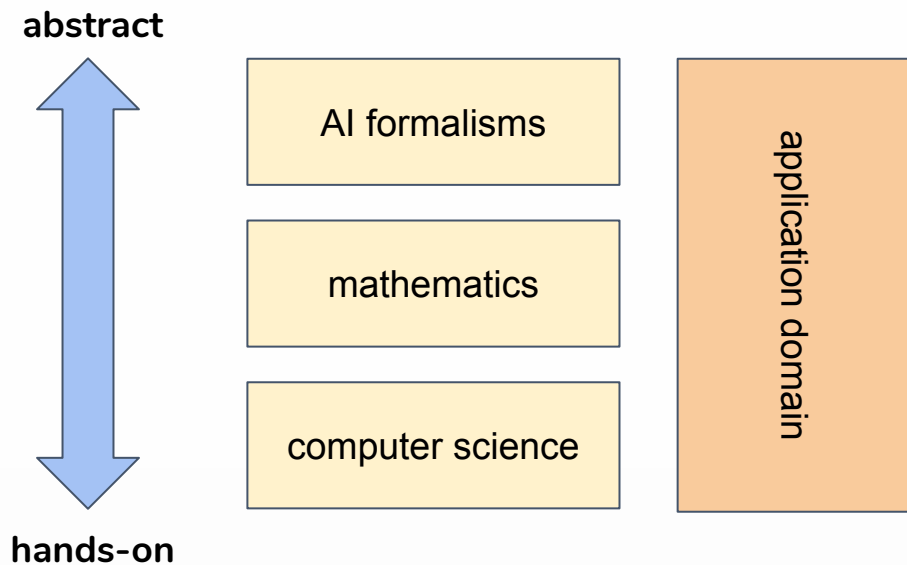
how does my business work?

but explained **to** a computer...

that is, **in mathematical terms?**

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Be careful with the word **understanding**

- Recognizing a **picture** of a guitar

-     <> knowing what a guitar is

impact for your organisation

Skills of the future

- **new cognitive skills**
  - new technologies
  - interdisciplinary + expert

- **meta-cognitive skills**
  - coping with ever changing knowledge & technology
  - lifelong learning

- **non-cognitive "soft" skills**
  - empathy: listen to different stakeholders
  - creative
  - open-minded; accept machines / open to other disciplines
  - critical thinking

Interdisciplinary, inter-"species"

- Data from across business units

- Interdisciplinary AI/HI teams

- Business - IT fusion
  + faster IT - semi-automated

- Business case hard to predict as AI becomes part of the problem solving phase

Data management & governance

- Collection of "the right" data
  (meant for computers, not humans)

- Data quality

- Sample cost

- Biases

- Future proof learning signals (e.g. annotation)

What can you do?

Not black/white

- **Analytics 3.0**
  - **Descriptive**: what did I do **right/wrong?**
    → what *actions* in the past led to my current success? (credit assignment problem)

  - **Predictive**: simulate **what-if** scenarios
    → what results will I obtain, given future actions that I will take?

  - **Prescriptive**: what should/could I **do** next?
    → what actions to take to obtain a desired result? Causality?

- **Prioritization**

- **Personalization**

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Many settings besides automation

- **Summarization** of data & **visualizations**
  → e.g. overall quality instead of samples

- Planning and **orchestration**

- **Enrichment** of data
  → psychometrics, IOT, more interpretation of data

- Intuitive **interfaces**
  → voice / gestures / chatbots

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Start *today*...

1. Gain **insight** in the **technology** and its limits.

2. Understand the new **business models** (platforms)

3. Understand your **value chain.**

4. Think global (competition) and **across silo's** (internal)**.**

Start *today* (part 2)

5. **Small is *not* necessarily better** in AI!

6. Separate your **business logic** from peripheral operations.

7. Create a data **strategy**. Go find **good learning signals**

8. Collect both data and the **process** that generates this data!

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Start *today* (part 3)

9. Consider **all kinds** of AI & settings

10. Do NOT approach it as a technical problem!

11. Think HI/AI teams, AI is good in:
    - high-dimensional data
    - non-linearity
    - entangled information

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Interested in trainings / our R&D offer?

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