



AI in Industry

Applications of Artificial Intelligence



This lecture material is available at:



<https://github.com/emaib-2024/lectures>

An Oddball

This is a strange course

For most courses, it's easy to figure out what to expect:

- "Fundamentals of Artificial Intelligence and Knowledge Representation"
- "Introduction to Algorithms and Programming"
- "Statistical and Mathematical Methods for Artificial Intelligence"
- "Machine Learning"
- "Deep Learning"
- "Combinatorial Decision Making and Optimization"
- ...

...But what for something called "AI in Industry"?

Let's start with a couple of questions:

What do we mean by "industry"?
...And what can AI do for an industrial process?

Industry

This is industry



BBS



Industry

This is also industry



Industry

This is also industry



Industry

This is also industry



Industry

We'll define "industry" as any activity that can generate **value**

Therefore we'll talk about industry in **very broad sense**

- Manufacturing, logistics, automation, energy systems, automation
- ...But also product design, healthcare, policy-making...

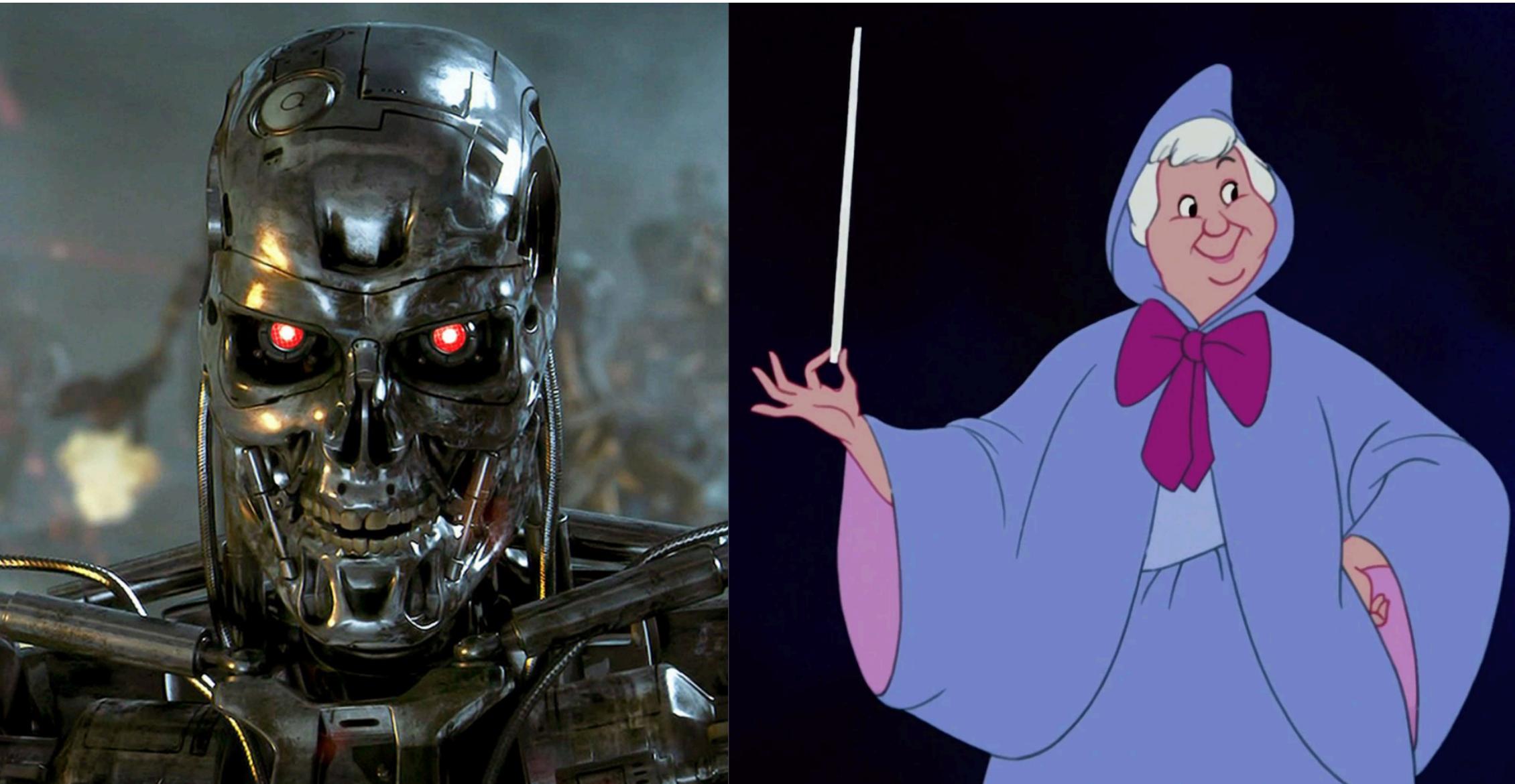
...And AI can help an industrial process to provide **more value**

- Whatever we our idea of "value" is (money, societal benefits, sustainability...)

But how?

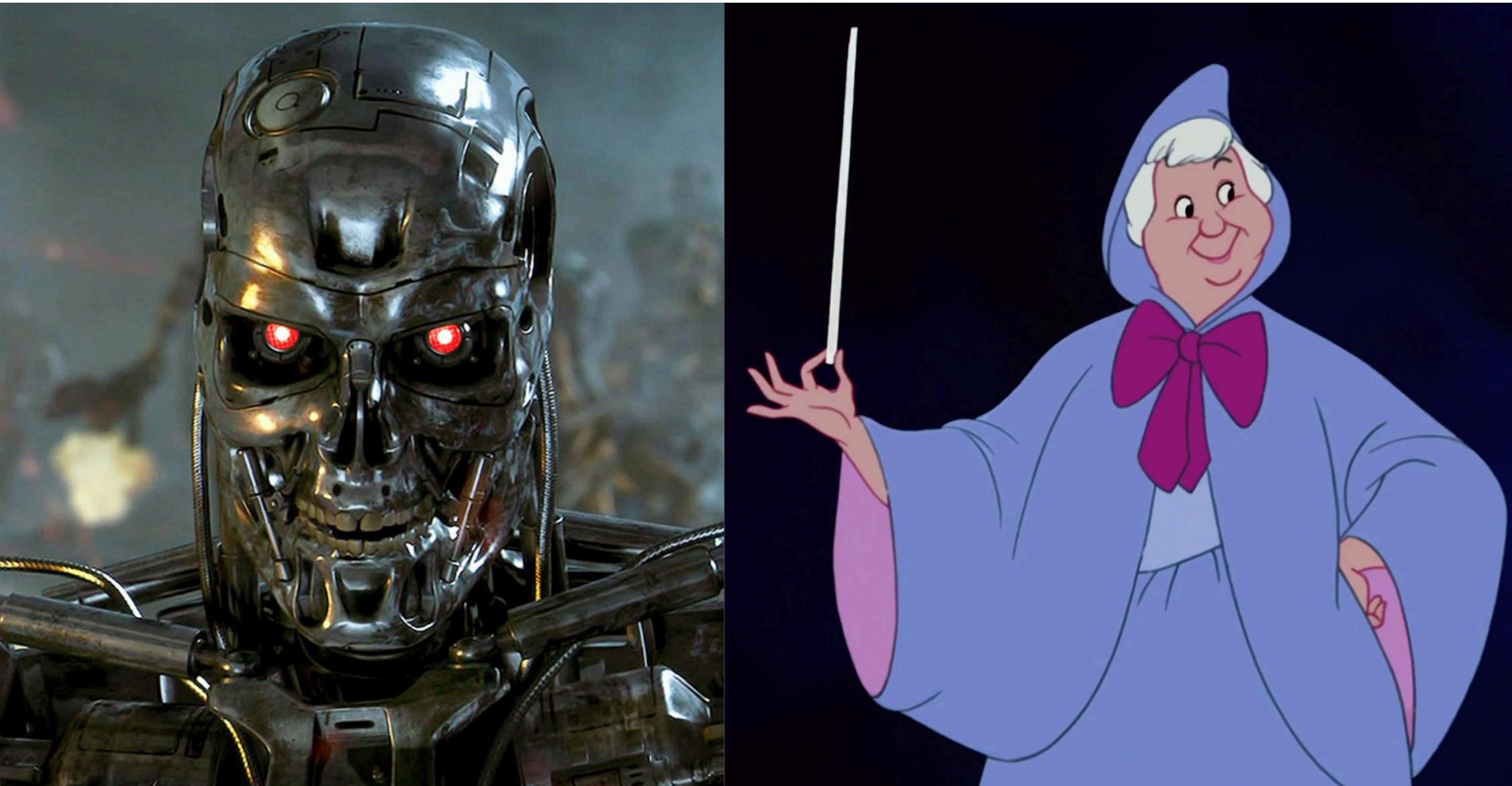
How So?

Right now, the discussion on AI is often very polarized



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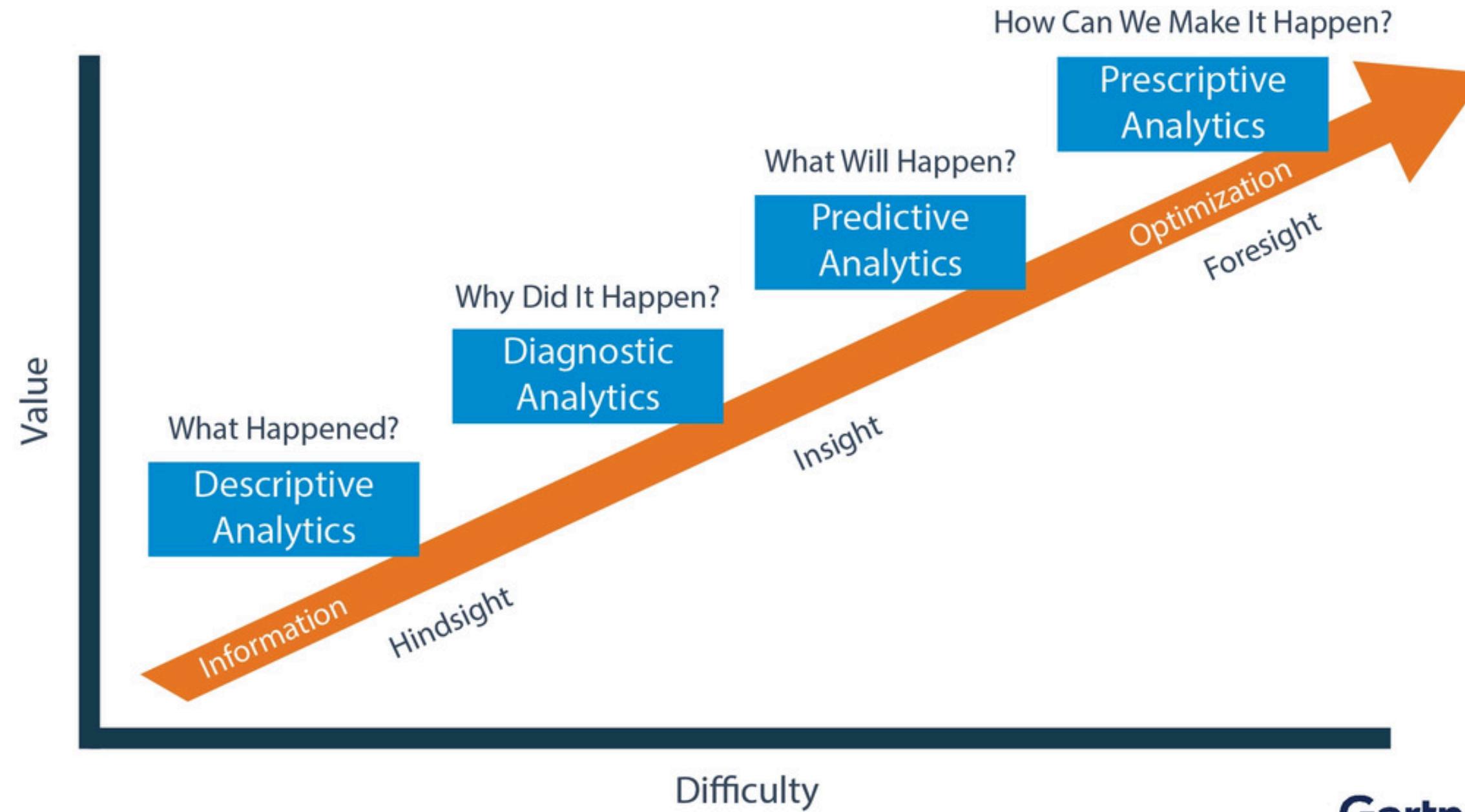
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So, let's make it more grounded

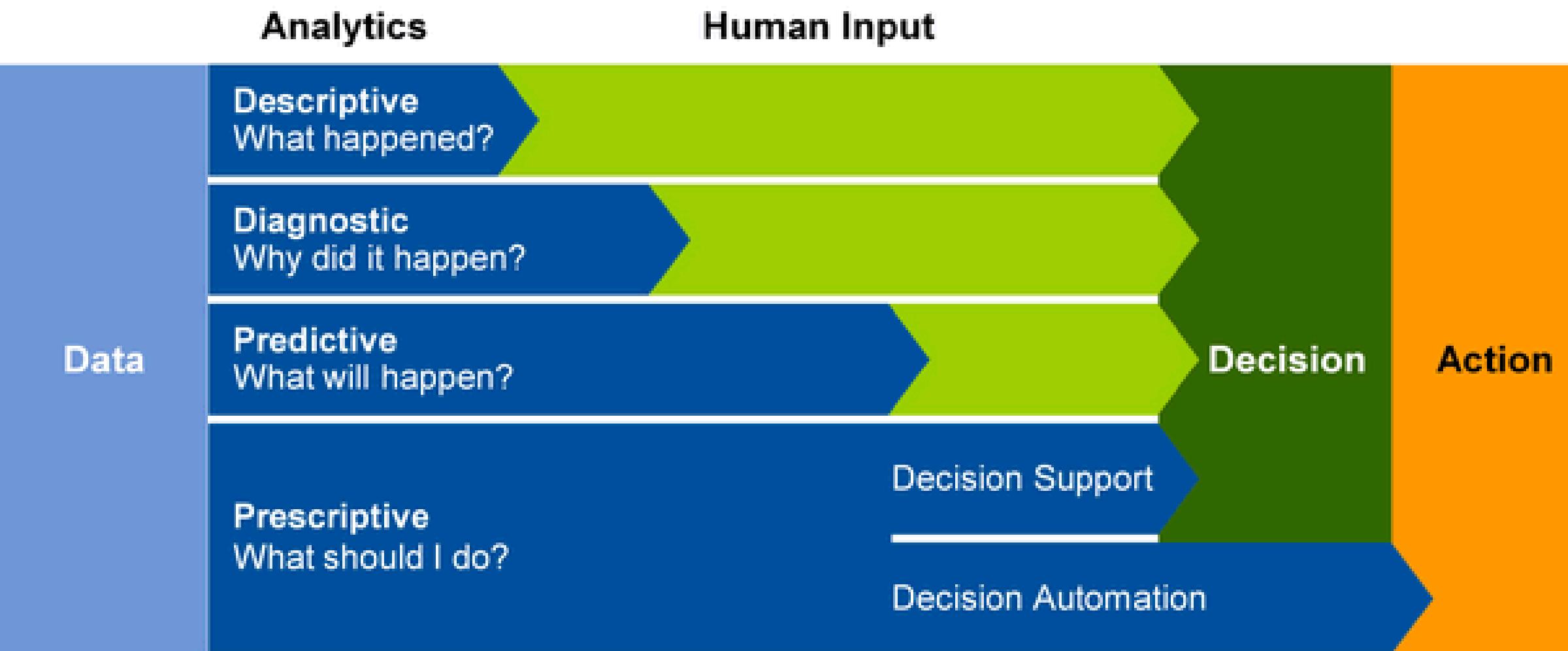
Business Analytics

You have surely seen something like this in the first course part:



Business Analytics

In terms of how far we push automation:



Order and Chaos

BA is a nice framework to characterize what AI can do for a business

...But the truth is more like this!



Order and Chaos

Industrial applications are **complicated**

- The problems are not well defined
- Similar techniques may be applied in multiple settings
- Classical tasks form typically only part of the whole problem
- It is often necessary to combine problems/techniques
- ...

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A common opinion:

Just come up with a quick solution

...we'll work on fixing it later

Order and Chaos

...But this is **evil!**



Order and Chaos

Specifically, it reaches a plateau real quick:

Sometimes, you solve your problem and you do it fast. But more often:

- You fail, and you don't understand why
- You end up with a much messier solution than needed
- You approach works in controlled conditions, but not in the field

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Our goal will be to bring (some) order to the chaos

- We'll try to be more systematic
- ...And to understand what is going on
- ...So that we can make more informed choices

It's not always doable, but it's a worthy goal!

Our Plan

The main goal is starting to learn a method

- Formalize the problem
- Build a baseline solution
- Interpret the results
- Repeat the process, introducing complexity as needed

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We'll learn by example

- We'll encounter multiple, simplified, use cases
- We'll emphasize **analysis** and **formalization**
- We'll cover code and techniques, but never in detail
- ...You'll be able to inspect it by yourself, or you might consult an expert

About the Teacher

Here's some information on the teacher for the 2nd part of the course

- name: Michele Lombardi
- email: michele.lombardi2@unibo.it
- You also book a Teams call via this booking page:



<https://book.morgen.so/michelelombardi03/student-hours>

About the Proposed Use Cases

We'll discuss several use cases together

...But you'll be asked to propose some of your own

- We'll start doing this from the next lecture
- You don't have to have a fully fleshed analysis: a starting idea is enough
- We'll reserve time every lecture to discuss your input

A few things to keep in mind

- We are going to stick to a simple analysis for your use cases
- We'll do this together, so be careful about commercially sensitive information
- If something is left out due to time or sentiveness, we can discuss via email or a call

...But please, favor the public format when possible