

# AI & Data Science

Applications of Artificial Intelligence



This lecture material is available at:



<https://github.com/bbs-emba-2024/applications>

# About this Part of the Course

**The AI & Data Science course is split into two (overlapped) parts**

- Theoretical lectures, given by prof. Michela Milano
- Application examples, discussed with prof. Michele Lombardi

We are about to start **the second part**

**What are we going to do in this second part**

- We will see **simple examples of industrial use cases** that can be solved with AI
- We will **discuss and analyze** them together
- We will **formalize** them using mathematical notation

...And we will attempt to do the same for use case **proposed by you**

But first, let's setup the stage with two questions:

**What do we mean by "industry"?**

**...And what can AI for an industrial process?**

# Industry

This is industry



# 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...

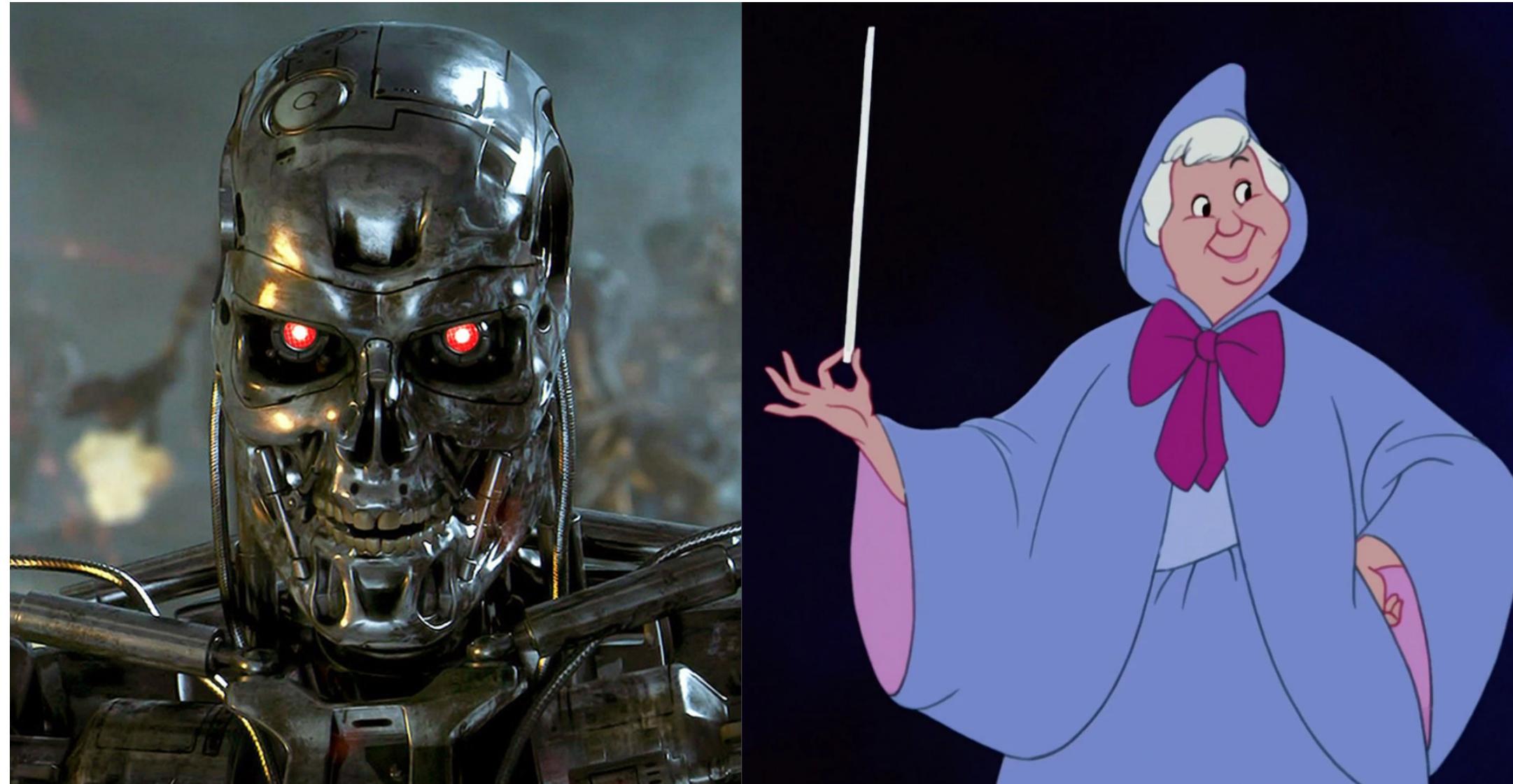
...And AI can help an industrial process to provide **more value**

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

But how?

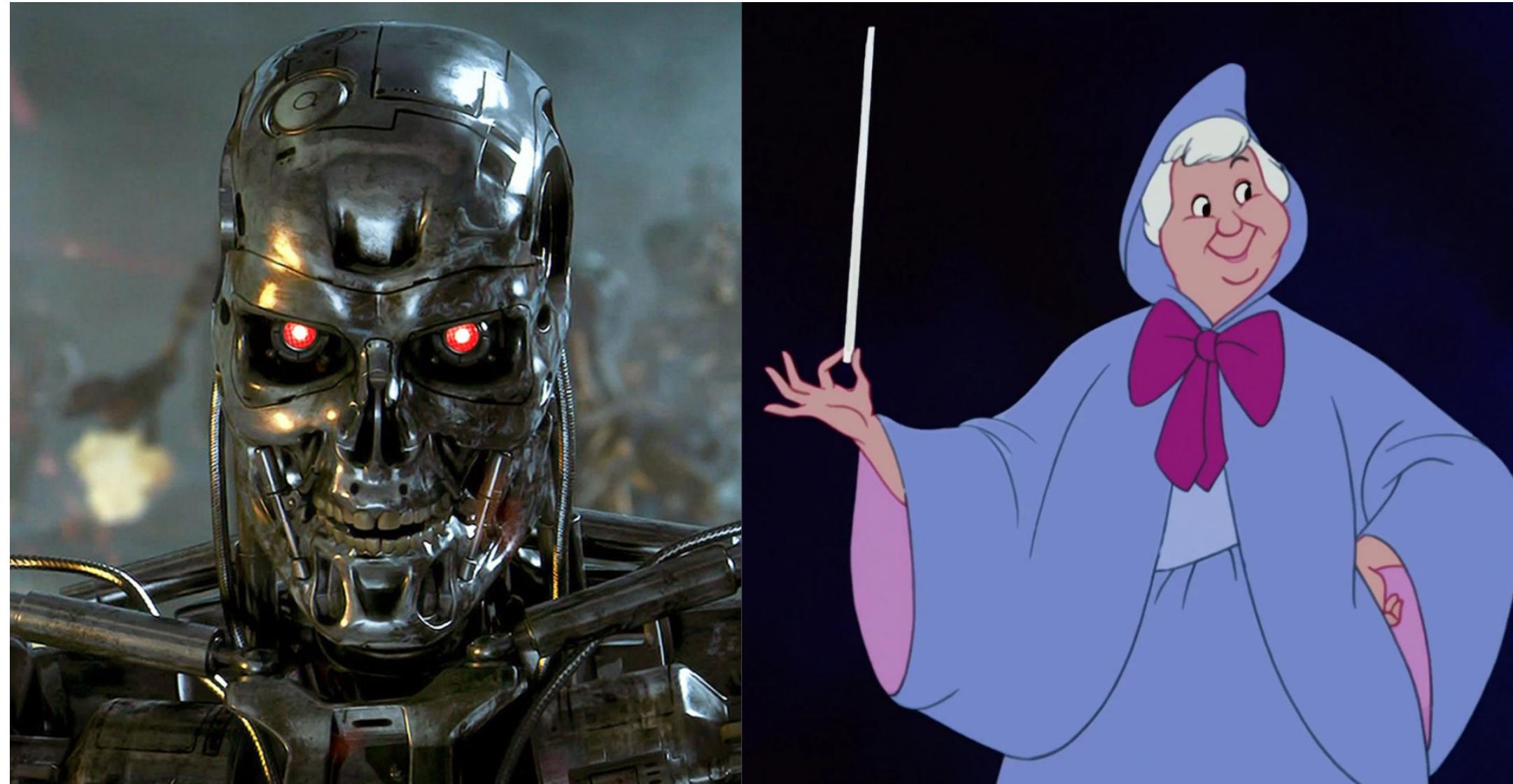
# How So?

Right now, the discussion on AI is often very polarized



# How So?

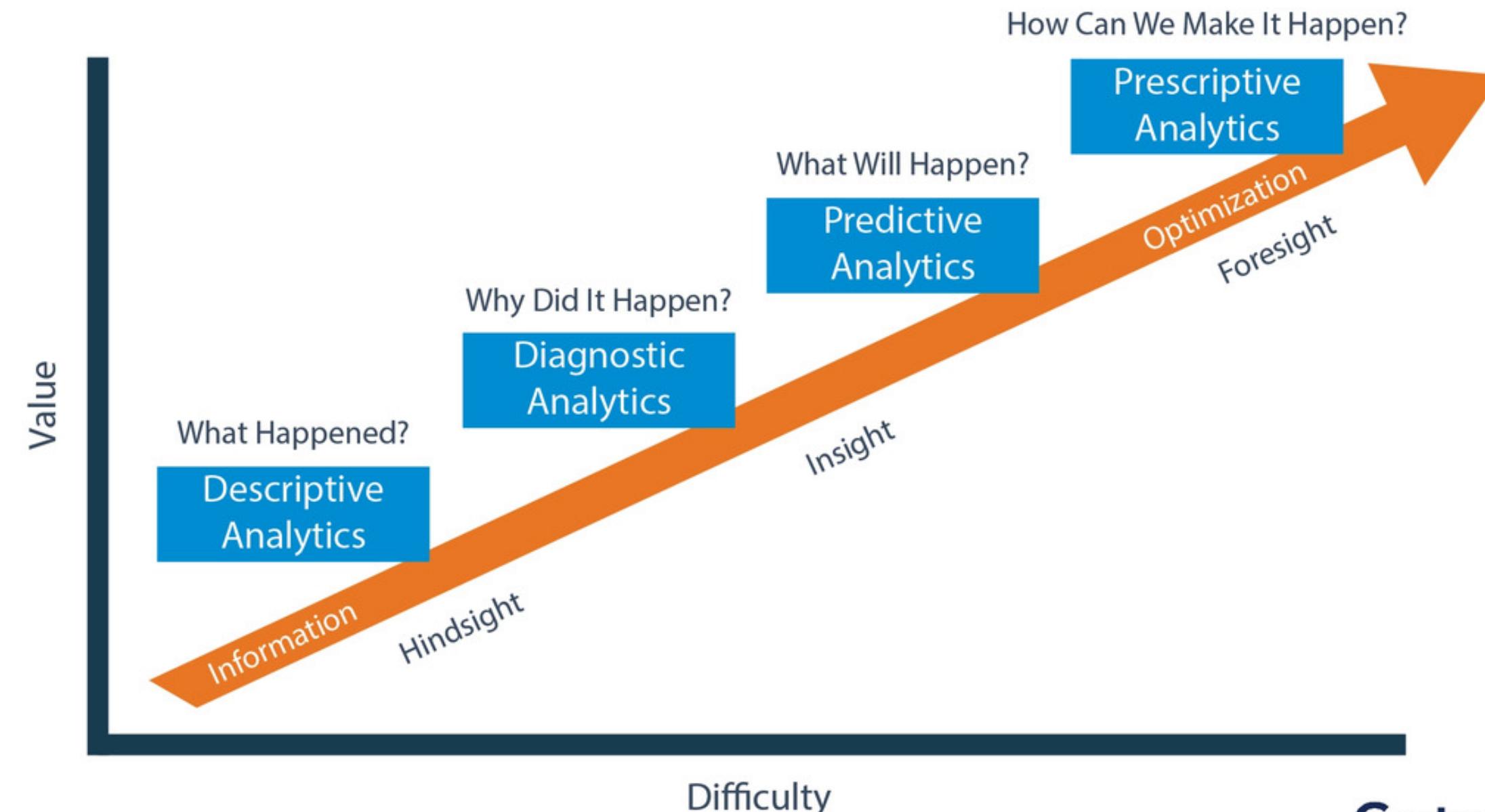
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So, let's make it more grounded

# Business Analytics

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

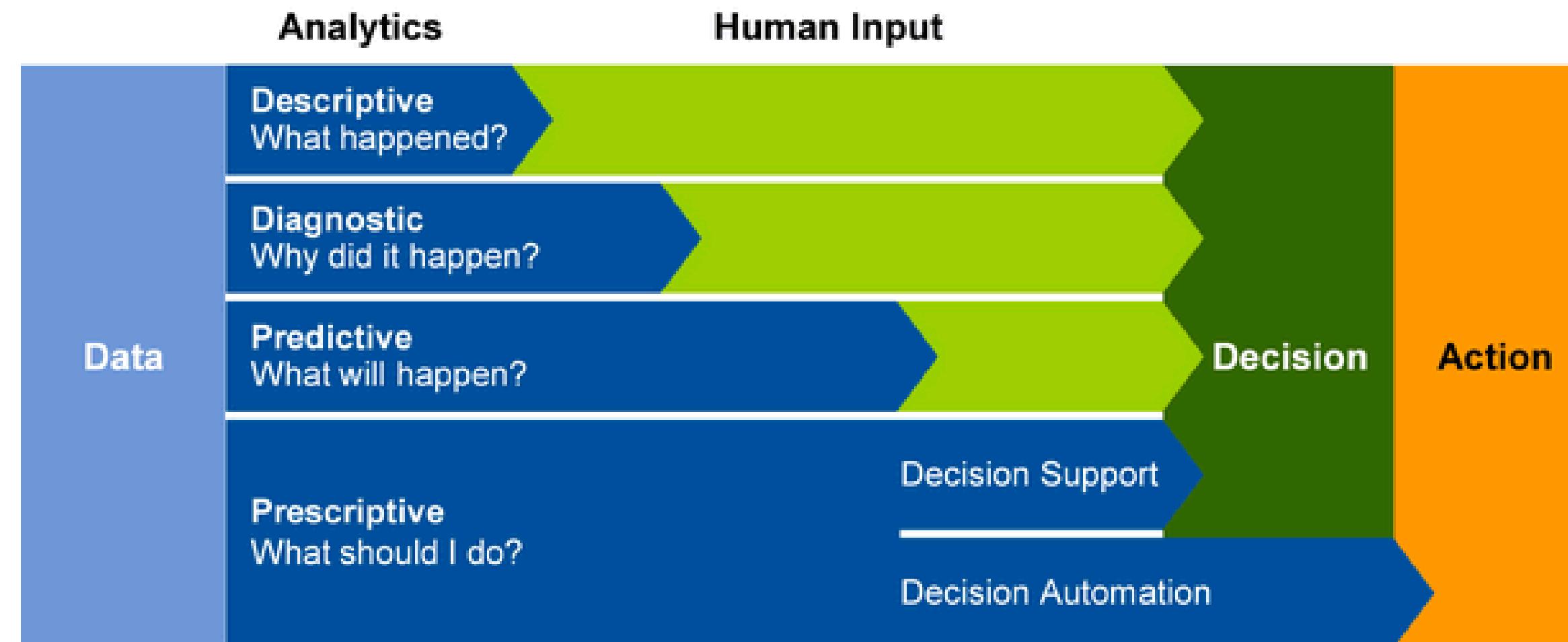


Source: Gartner Analytic Ascendancy Model (March 2012)

Gartner®

# Business Analytics

In terms of how far we push automation:



Type Markdown and LaTeX:  $\alpha^2$

# 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
- ...

# Order and Chaos

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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:**

Someteims, 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 will learn by **example**, and emphasize **analysis** and **formalization**
- We'll cover code and techniques, but never in detail
- ...Since you can contact full-time AI experts for that

# 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](mailto: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