

Course Introduction

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 the Industry"

Industry

What do we mean by industry?



Industry

We will talk about industry in a **broad sense:**

- Factories of course, but also...
- Transportation companies
- Power generation
- Grid operation
- Product design
- Smart cities
- Policy management
- ...

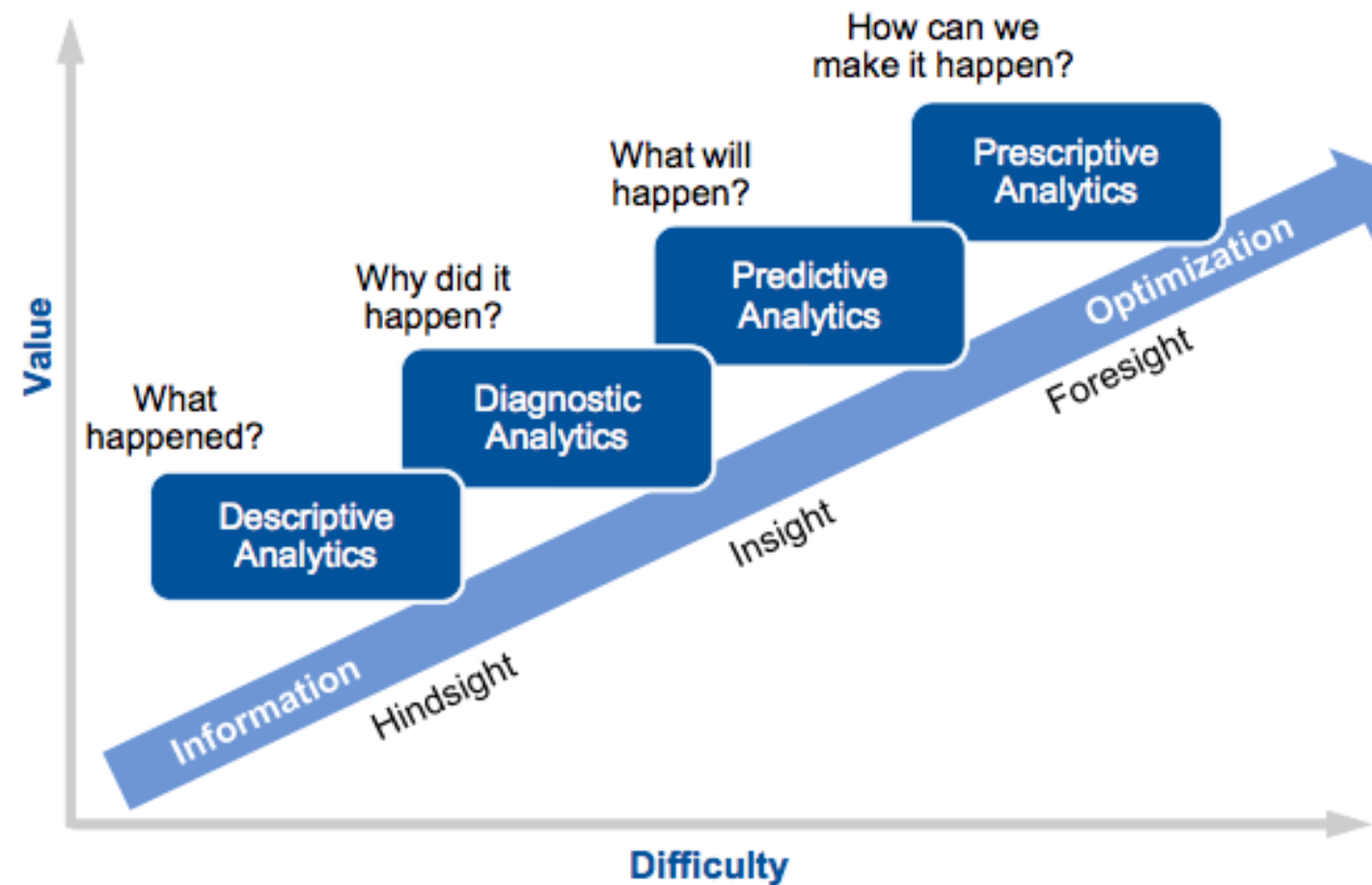
Basically any activity that can generate **value**

What can AI do in this context?

Business Analytics

A good starting point: **business analytics**

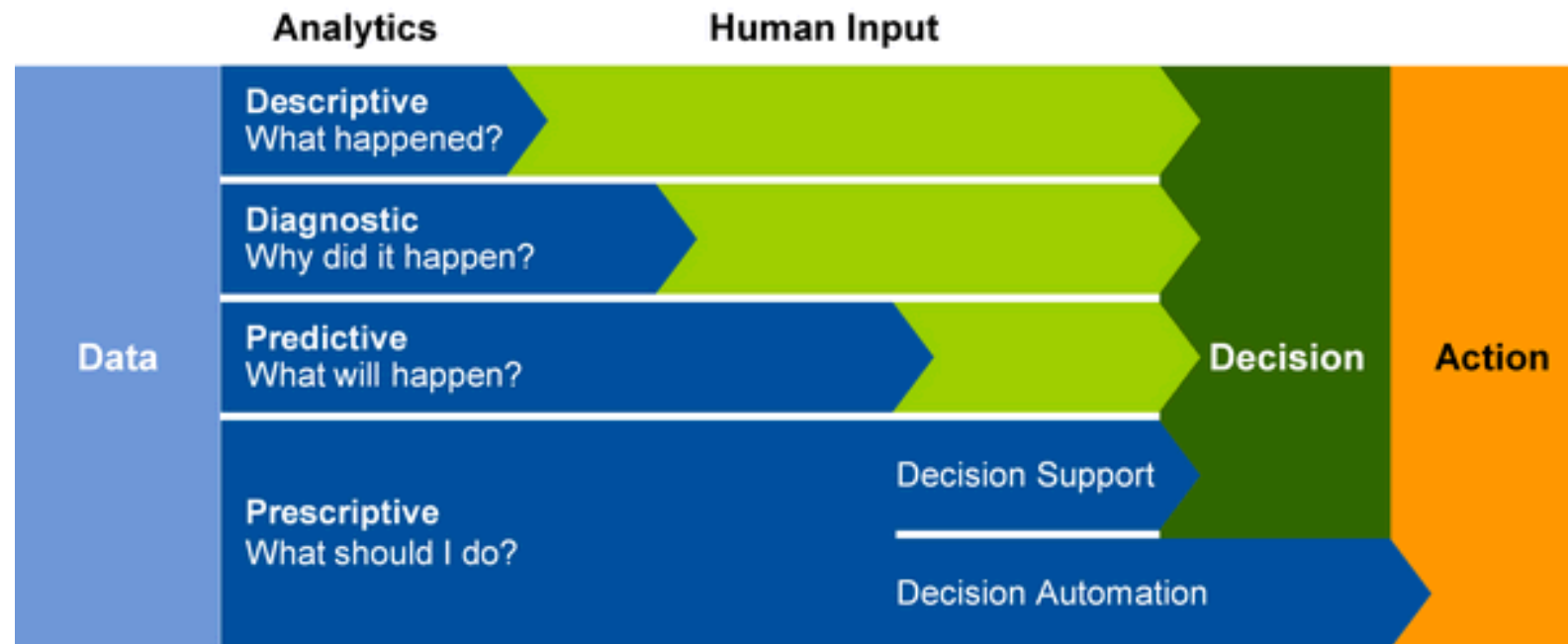
Figure 2. Gartner Analytic Ascendancy Model



Source: Gartner (March 2012)

Business Analytics

In terms of how far we push automation:



Business Analytics

The usual, rough, distinction is:

- **Descriptive Analytics** are about statistics, data compression, visualization
- **Diagnostic Analytics** are about statistics and Machine Learning
- **Predictive Analytics** are about statistics and Machine Learning (again)
- **Prescriptive Analytics** are about optimization

This is all very useful...

Business Analytics

...But the truth is messier, by far!



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This is all very useful... but the truth messier, by far!

- Problems are not well defined
- (Essentially) The same problems can be found at multiple levels
- It is often necessary to combine problems/techniques
- ...

How do you teach **that**?

How I am Going to Play It

I am going to follow a few guiding principles

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How: Examples! I.e. Use Cases

- Every few lectures we will introduce a new use case
- They will be simplified industrial problems
 - Real industrial problems are too complicated
 - ...And we would see too few of them
- They will nevertheless be representative
- Some uses cases will be covered in seminars by industrial partners
- Occasionally: (optional) open questions to be freely investigated

How I am Going to Play It

I am going to follow a few guiding principles

What: techniques, best practices, formalization

- Every use case will serve to introduce new techniques
- ...Ways to apply known techniques
- ...Ways to combine known techniques
- ...Some (light) software engineering
- ...And how to formalize problems and ideas

How I am Going to Play It

I am going to follow a few guiding principles

Why: "out there", I want you to have an edge

- Problems/solutions are often poorly understood
 - Formalizing is the first step towards understanding
- Different problems call for different tools
 - Using (say) ML for everything is just **inefficient**
- Many people can apply "boilerplate", mainstream AI method
 - ...But much fewer are capable of **combining** them

On the Art of Cooking

At some point, the course will start feeling like a cookbook



When you get there, there is one thing you should remember

On the Art of Cooking

Most people read cookbooks to follow recipes



On the Art of Cooking

...But **true chefs** read cookbooks to find **ideas**



Teachers

Teacher:

- Michele Lombardi (michele.lombardi@unibo.it)
- Office:
 - Phone: 051 2093270
 - Close to teaching room 5.7 (look for a yellow door)
- Reception hours: on appointment (send an email)

Tutor:

- Selection in progress! I'll let you know as soon as the results arrive
- Mainly assistance with projects (see later), plus questions
- Reception hours: on appointment (send an email)

Course Material

Reference: [course web site on virtuale.unibo.it](https://virtuale.unibo.it)

- Docker containers + Jupyter notebooks
 - You will need to install Docker
 - Use "Docker Desktop" on Win/OSX
 - Instructions on the course web site
- PDF notes (also included in the container)
- Recorded lectures (links on the web site)

This is the first edition of the course

- This means that the course will **grow with you**
- ...But comes with **some inconveniences**
 - Typically: material arriving only one/two days before lectures

Exam

The exam will consist of project:

- You can either propose a topic
- ...Or pick one from a list (presented mid course)
- In both case, the topics must be confirmed by the teacher before starting
- The students will need to:
 - Deliver the project code
 - Give a presentation
 - Discuss their work
- Single students or groups (max three persons)

Exam

The evaluation

- Will **not** focus on how successful your results
- ...But on **how you reached them**
- This means I will evaluate
 - Why you made the choices you made
 - How you have interpreted the results
 - What you can infer

Exam

About the optional 3 credits project

- Usually, this will be a follow-up of the exam work
- Same structure for the evaluation
 - I.e. code, presentation, and discussion
- But there are no grades
 - Usually, when you present it means you already passed
 - ...I'll stop you earlier if this is not the case ;-)