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
- ...

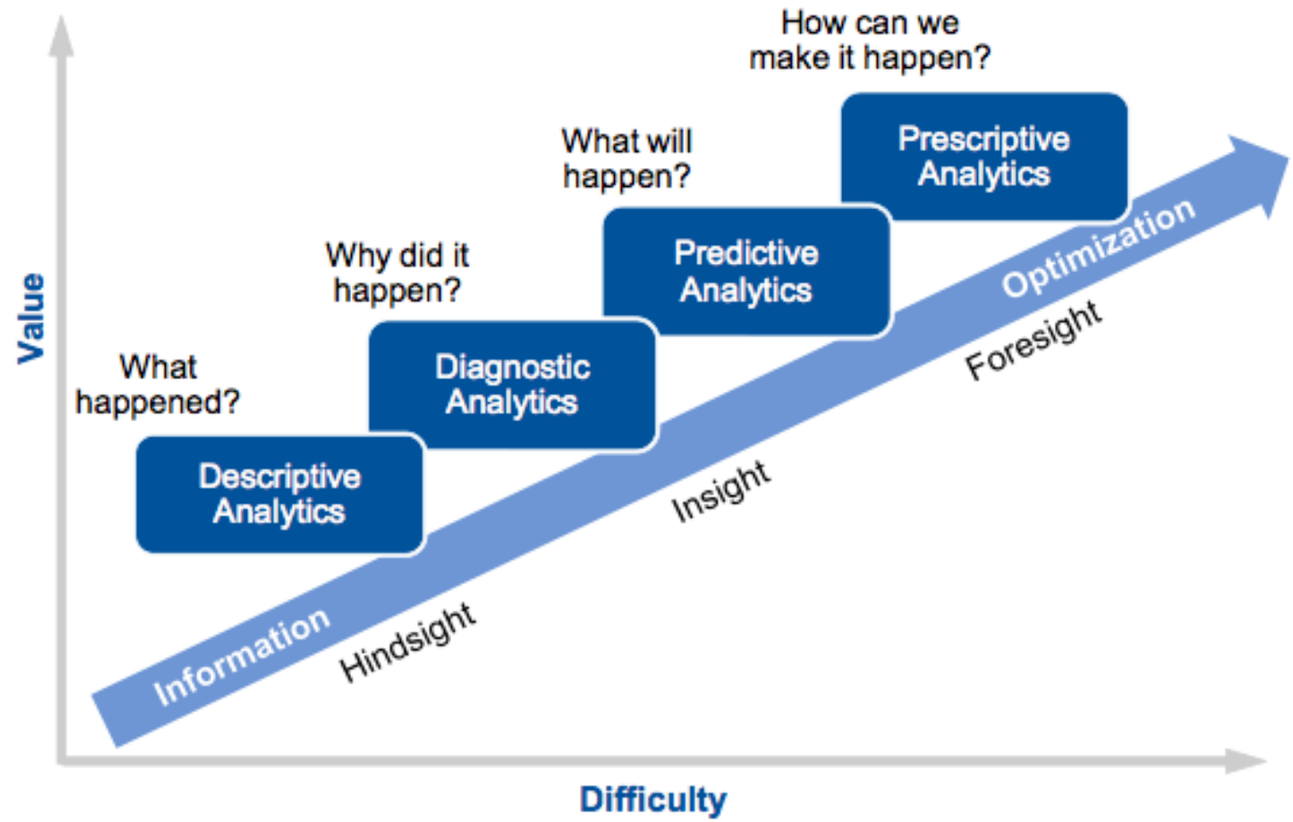
Basically any activity that can generate value

What can AI do in this context?

Business Analytics

A good starting point: business analytics

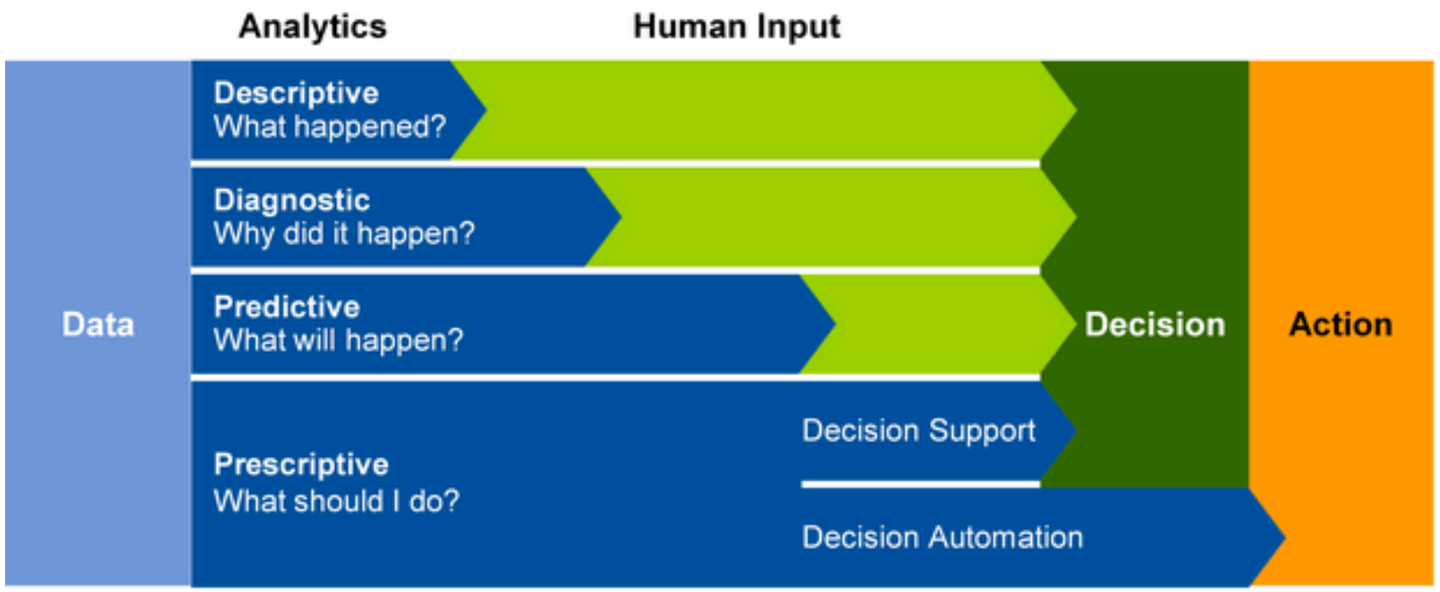
Figure 2. Gartner Analytic Ascendancy Model



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 Analitics are about statistics and Machine Learning
- Predictive Analitics are about statistics and Machine Learning (again)
- Prescriptive Analitics 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

- 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 ;-)