

# Introduction to machine learning course

## Lecture 1: Introduction and general concepts

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## Before we start

I'd like to know a little bit more about you

- ▶ Short presentation: Name, occupation, ...
- ▶ Background in machine learning?
- ▶ Background in programming? Python?
- ▶ Background in mathematics?
- ▶ What do you expect from the course?

Please send me an email so that I have your contact:

`alexis.zubiolo@gmail.com`

**Disclaimer:** Some of the content has already been presented during the presentation.

# Presentation outline

- ▶ Introduction: What is machine learning?
- ▶ A few practical examples
  - ▶ classification
  - ▶ regression
- ▶ Goals and presentation of the course
- ▶ Python & sklearn: A quick overview
- ▶ Questions and answers

# What is machine learning?

Let's start with a simple example...



How to filter spam emails **automatically**?

# Machine learning paradigm

Goal: Build algorithms that can

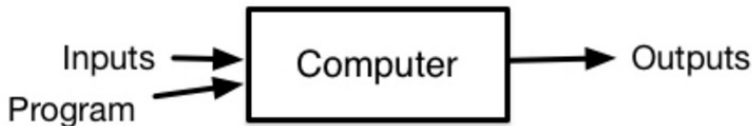
- ▶ **learn** from data
- ▶ **make predictions** on (new) data

# Machine learning paradigm

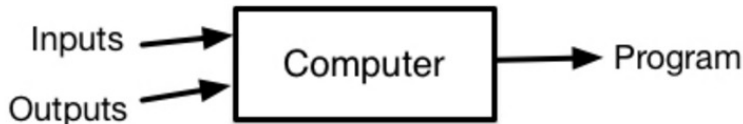
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- ▶ **make predictions** on (new) data

## Traditional Programming



## Machine Learning



# Main components of machine learning

## Mathematics

- ▶ Linear algebra
- ▶ Calculus
- ▶ Numerical optimization

## Statistics, probability theory

## Computer science



## Example 1: Regression

Regression = output is a **continuous** numerical value

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living area (m <sup>2</sup> )	price (1000's euros)
50	30
76	48
26	12
102	90

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living area (m <sup>2</sup> )	price (1000's euros)
50	30
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26	12
102	90
61	?

Linear model:  $\text{price} = \mathbf{a} \times \text{area} + \mathbf{b}$

Problem: optimal values for **a** and **b**?

# Regression

More data for a richer model:

living area (m <sup>2</sup> )	# bedrooms	price (1000's euros)
50	<b>1</b>	30
76	<b>2</b>	48
26	<b>1</b>	12
102	<b>3</b>	90
61	<b>2</b>	?

Linear model:  $\text{price} = \mathbf{a} \times \text{area} + \mathbf{b} \times \# \text{ bedrooms} + \mathbf{c}$

Problem: optimal values for **a**, **b** and **c**?

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- ▶ Object recognition in images or videos
  - ▶ input: image or video
  - ▶ (example) output: **face** or **not a face**

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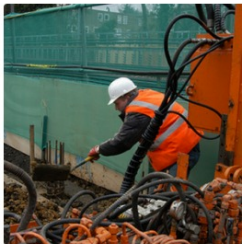
- ▶ Spam filtering
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  - ▶ output: **spam** or **not spam**
- ▶ Object recognition in images or videos
  - ▶ input: image or video
  - ▶ (example) output: **face** or **not a face**
- ▶ Image classification/description
  - ▶ input: image
  - ▶ output: image **description** or **label** (apple, car, ...)



# Automated image description generation



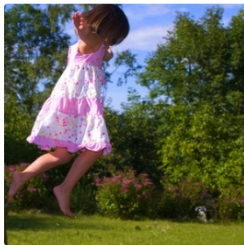
"man in black shirt is playing guitar."



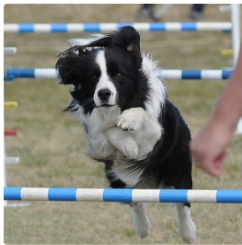
"construction worker in orange safety vest is working on road."



"two young girls are playing with lego toy."



"girl in pink dress is jumping in air."



"black and white dog jumps over bar."



"young girl in pink shirt is swinging on swing."

## Automated image description generation



## Automated image description generation



A man holding a red apple in his mouth

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- ▶ ...

# The course

Goals:

- ▶ Introduce **main concepts** of machine learning
- ▶ **Implement** these concepts in Python (Scikit-learn)



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## Practical information:

- ▶ ~ **10 90-min sessions**
- ▶ Alternating between **lectures and lab sessions**
- ▶ I will send you the slides + code after each course

# Course outline

- ▶ **General introduction** to ML and Python (course + lab)
- ▶ **Regression** model (course + lab)
- ▶ **Classification** models (course + lab)
- ▶ **Clustering** models (course + lab)
- ▶ **Evaluation** methods
- ▶ **General conclusion** + questions + remarks and feedback

**Note:** This is a first estimation. I will adapt to your needs.

# Python and Scikit-learn

## Why Python?

- ▶ Intuitive, interpreted language
- ▶ Cross-platform (Windows, MacOS, Linux)
- ▶ An active open-source community
- ▶ Easy-to-use ML libraries (e.g. Scikit-learn)

Let's see an example. . .

First lab session (about Python) next Thursday

# Want to work on your own computer?

Recommended setup:

## ► **Anaconda** for Python 2.7

<https://docs.continuum.io/anaconda/install>

Download for Windows    Download for OSX    **Download for Linux**

### Anaconda 4.2.0

#### For Linux

Anaconda is BSD licensed which gives you permission to use Anaconda commercially and for redistribution.

[Changelog](#)

1. Download the installer
2. Optional: Verify data integrity with [MD5](#) or [SHA-256](#) [More info](#)
3. In your terminal window type one of the below and follow the instructions:

**Python 3.5 version**

```
bash Anaconda3-4.2.0-Linux-x86_64.sh
```

**Python 2.7 version**

```
bash Anaconda2-4.2.0-Linux-x86_64.sh
```

NOTE: Include the "bash" command even if you are not using the bash shell.

**Python 3.5 version**

- 64-BIT INSTALLER (455M)
- 32-BIT INSTALLER (373M)

**Python 2.7 version**

- 64-BIT INSTALLER (446M)
- 32-BIT INSTALLER (365M)

## ► **Spyder** text editor

Thank you! Questions?

Don't forget to send me an email:  
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