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INTRODUCTION

Machine Learning for Marketing

Acreditações e Certificações

Instituto Superior de Estatística e Gestão da Informação
Universidade Nova de Lisboa

Summary

1. Introduction to Machine Learning
2. Machine Learning applications in marketing
3. Tools setup

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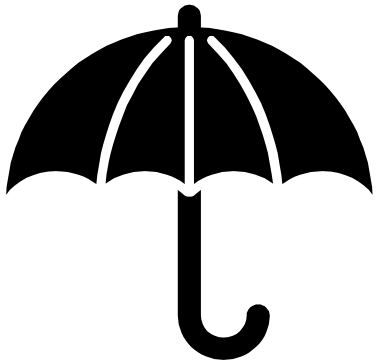
1.1

Introduction to Machine Learning

Introduction

BUSINESS INTELLIGENCE, ANALYTICS, AND DATA SCIENCE



Interchangeable terms employed to describe a collection of computer technologies that support **decision making**

[Sharda R., Delen D., Turban E., 2018]

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Machine Learning

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Definitions

"Field of study that gives computers the ability to learn without being explicitly programmed"

[Arthur Samuel, 1959]

"A computer program is said to learn from experience E with respect to some task T and some performance measure P, if its performance on T, as measured by P, improves with experience E"

[Thomas M. Mitchell, 1997]

Optical Character Recognition (OCR example)

- **Task (T)**: hand-written letters recognition
- **Experience (E)**: set of hand-written letters labeled by humans
- **Performance measure (P)**: percentage of letters classified correctly

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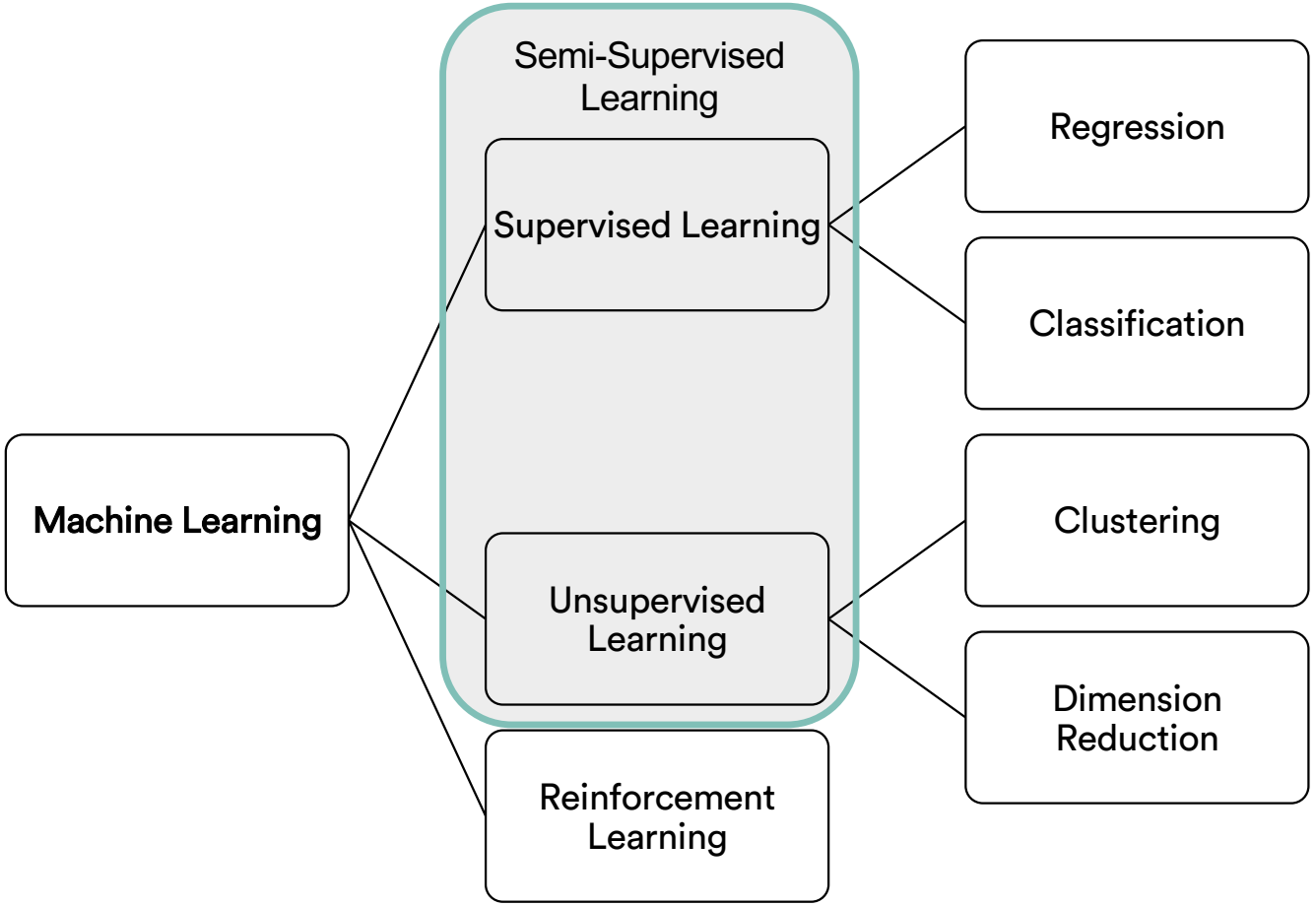
Exercise

Assuming we have an email program that based on emails that the user mark as spam or non-spam, learns how to improve its own spam classification. What is task (T), measure (P) and experience (E)?

1. Application classifies emails as "spam" or "non spam”
2. See how the user marked the email ("spam" or "non spam")
3. The number (or fraction) of emails correctly marked as "spam" / "not spam"

Machine Learning types of problems

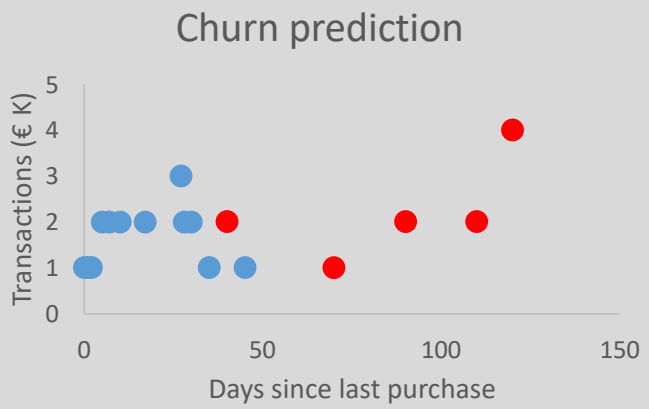


Supervised learning

Uses **labeled** input attributes to predict an outcome

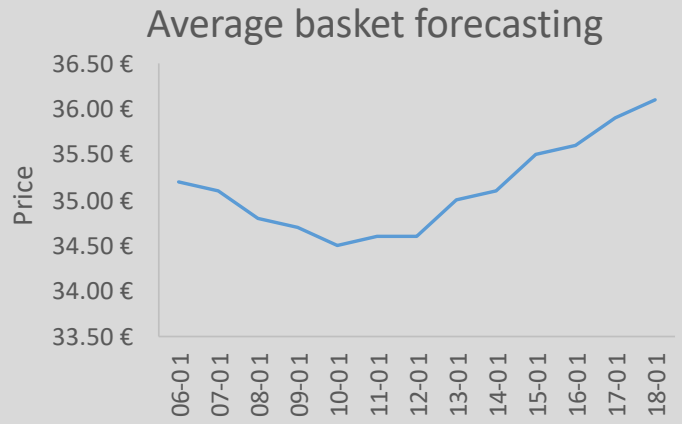
Classification

Process of finding a model to predict data classes or concepts (the outcome is categorical)



Regression

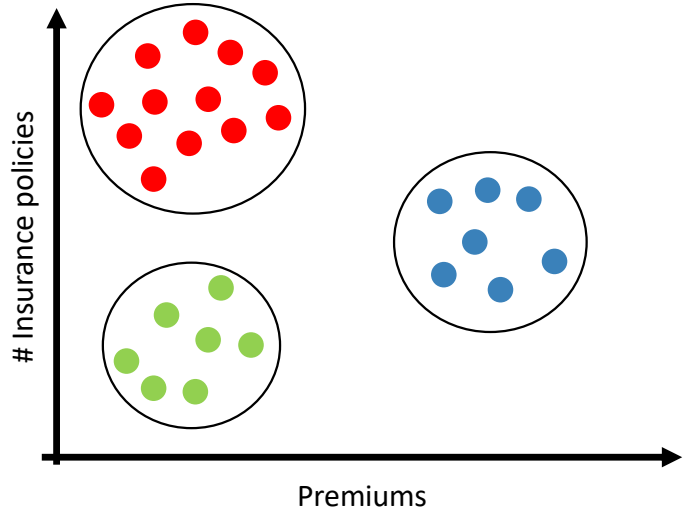
Process of finding a model to predict numeric outcomes (the outcome is continuous)



Unsupervised learning

When the input attributes are **not labeled** and there is no target

- Clustering:
  - Method for the **partition of multiple entities into groups** so that, within the same group, entities share a certain degree of similarity, but are ideally very dissimilar to the entities in the other groups (e.g., customer segmentation)



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Types of problems

- **Semi-supervised learning:** makes use on non-labeled input attributes to gain more understanding of the population
- **Reinforcement learning**: when input attributes are not labeled, or labels are not defined, and model learns from a rewarding process

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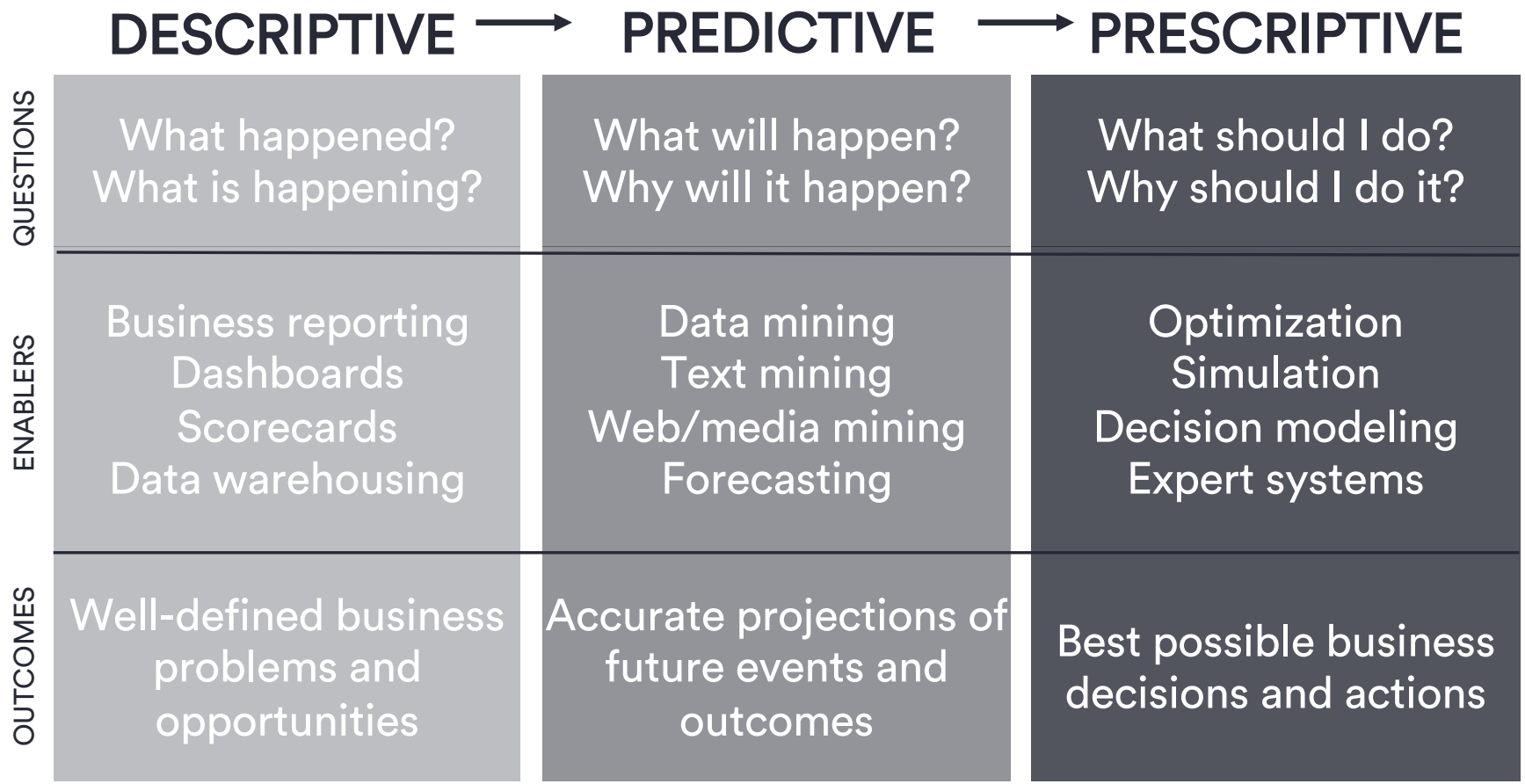
Analytics

What is today known as “Analytics”

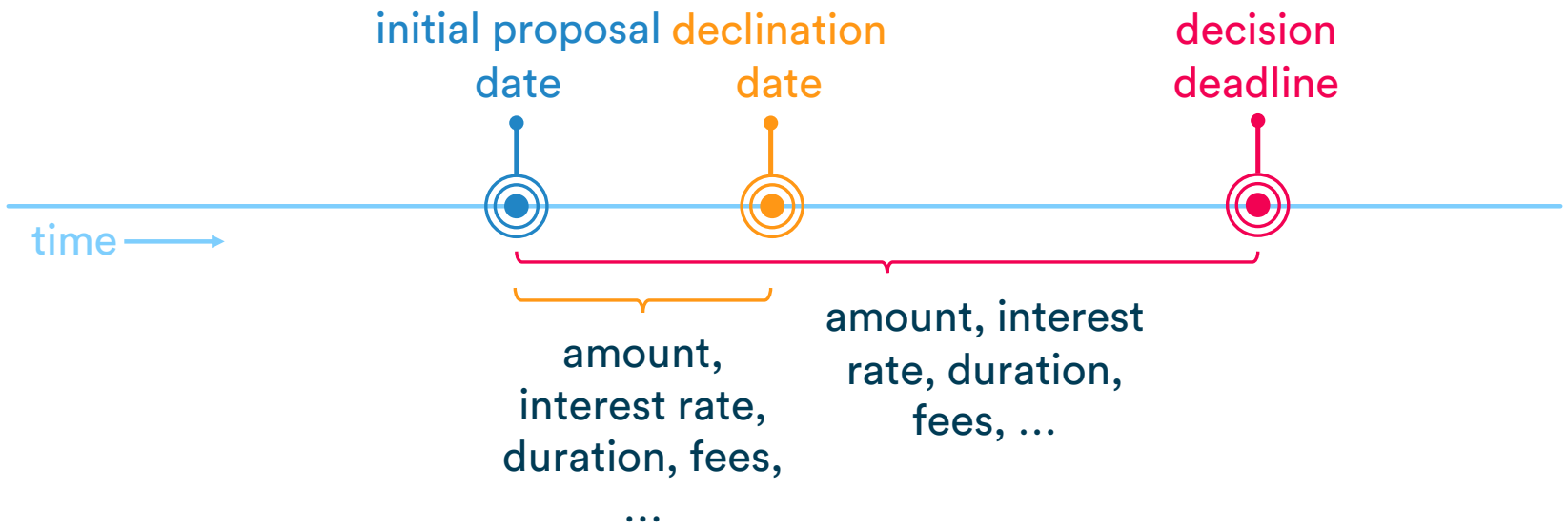


Descriptive vs Predictive

DESCRIPTIVE	PREDICTIVE
What was the rate of returning customers buying on the website?	What is the likelihood that the customer buys online again?
How many cases of fraud were investigated last month?	What is the likelihood that the transaction is fraudulent?
What were the email open, click-through, and response rates?	What is the likelihood an email will be opened?
How many customers made a purchase after 5 minutes?	What is the likelihood the website visitor is an impulsive buyer?

Descriptive vs Predictive Analytics

data attributes must be from before the target being predicted

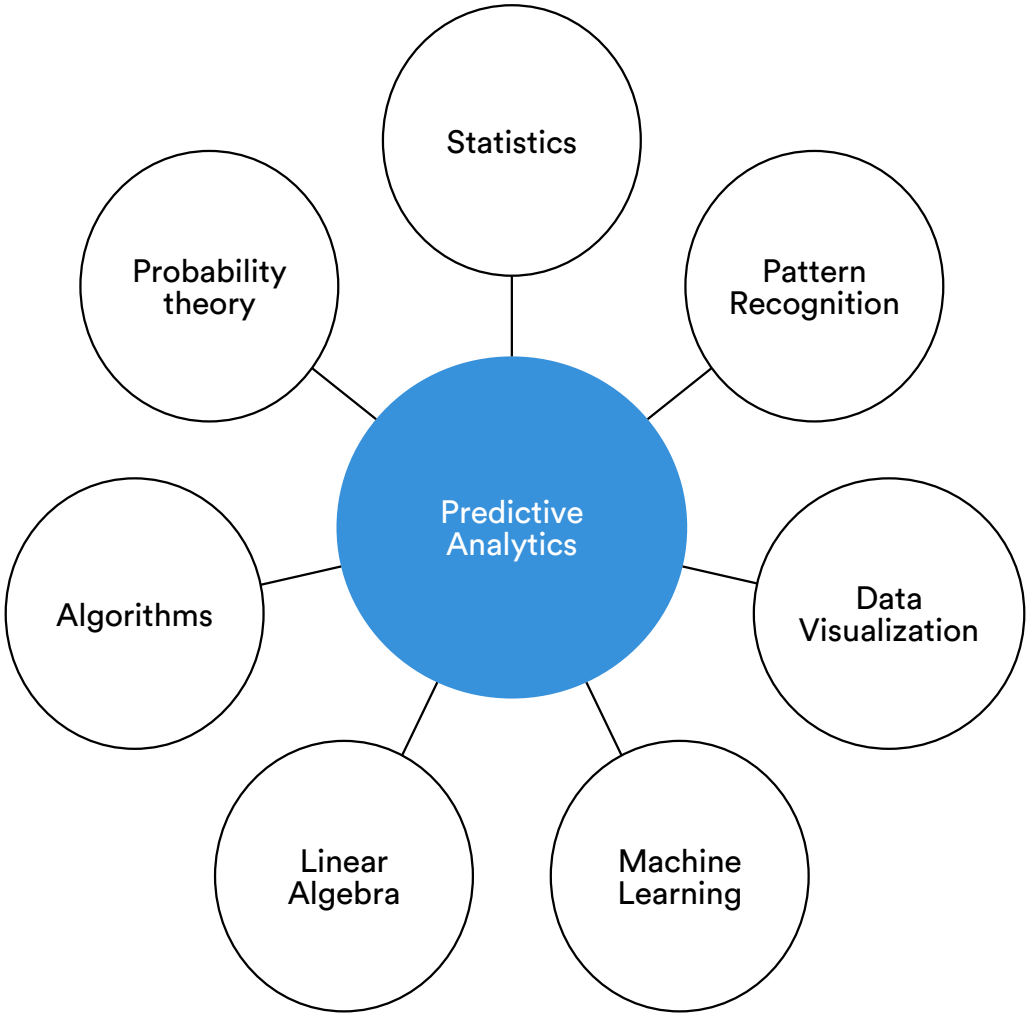


Predictive analytics definitions

"Predictive analytics is the process of discovering interesting and meaningful patterns in data" [Han, J., Kamber, M., Pei, J. (2012)]

"**Is an applied field**. There is no such thing as Theoretical Predictive Analytics… keep in mind that you will be always using Predictive Analytics to solve problems within a domain, which is why having the context of the problem and **domain knowledge** is a key aspect of doing Predictive Analytics" [Fuentes, A. (2018)]

Predictive analytics techniques



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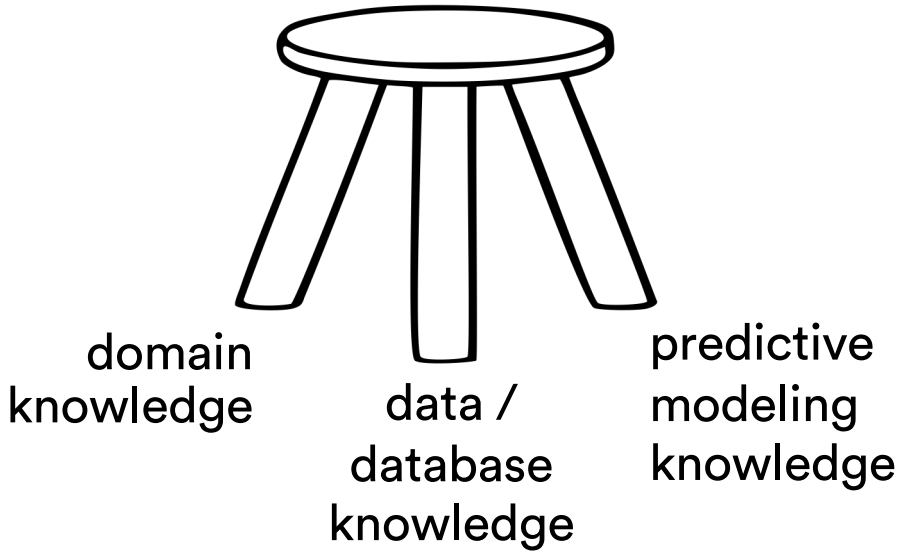
Predictive modeling requires



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1.2

Examples of Machine Learning applications in Marketing

Introduction


Product
MARKETING
Customer
Traditional
Predictive
Industrial era =
Mass Production & distribution
Technology era =
Informative & customization
Develop & sell products
Find customers who will want your products
Develop & manage customer relationships
Find products to that your customers will want
Maximize sales /market share of products
Maximize customer lifetime value /share-of-wallet
Products are your assets
Customers are your assets
Structure and manage organization around products/brands
Structure and manage organization around customer segments
Use mass distribution & media
Use technologies and configure processes to find ways to customize interactions
Use targeted distribution and media

Personalized experiences

- Predict future customer experiences and interactions:
  - When is going to buy
  - What is going to buy
- Understand products similarity

With this information, marketers can improve personalization, relevancy, and timing of customer interactions. This can maximize each customer lifetime value (LTV) and thereby the all company sales

Customer retention and loyalty

- Predict when, why, and which customers will return
- Predict when, why, and which customers will leave (Churn)
- Understanding the different type of customers (segments)

Models can generate insights about loyalty-inducing behaviors that maximize customer lifetime value (LTV)

Optimize customer engagement

- Predict responses to promotions and campaigns
- Predict which prospects will buy or will become high-value customers
- Predict which channels will be more profitable
- Predict which customers would be interested in a specific product
- Predict sales of a shop at a specific location

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1.3

Tools setup

Introduction

Anaconda

- Navigate to https://www.anaconda.com/distribution/
- Click **Download** on the Anaconda Individual Edition
- Select the latest version (Python 3.9 version – Graphical installer)
- After download, run the file to install and follow the setup instructions
- To run the Jupyter notebook use the **Anaconda Navigator** or the **Terminal** (Linux/Mac OSX) / **Command Prompt** (windows) and then run **jupyter notebook**

Other recommended Python editors (free)

- Visual studio code:
  - Download at https://code.visualstudio.com/download
  - Python extension (if not installed automatically): https://marketplace.visualstudio.com/items?itemName=ms-python.python
- Google colab:
  - Use online from: https://colab.research.google.com
- Deepnote:
  - Use online from: https://deepnote.com

Python online courses

For students not familiar with Python or students that want to improve their Python skills:

- Enroll **for free** on Datacamp (email received from the instructors)
- For students not familiar with Python, conclude the courses Introduction to Python, Intermediate Python, and Data manipulation with Pandas (before the fourth week of classes)

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Demo

1. Open the file “PredictSales.ipynb”
2. Evaluate:
    1. Autocomplete and IntelliSense
    2. Snippets
    3. Run file/from line/selection in interactive window

Questions?

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