BTS | Barcelona Technology School

Data Science Foundations

Master in Big Data Solutions 2020-2021

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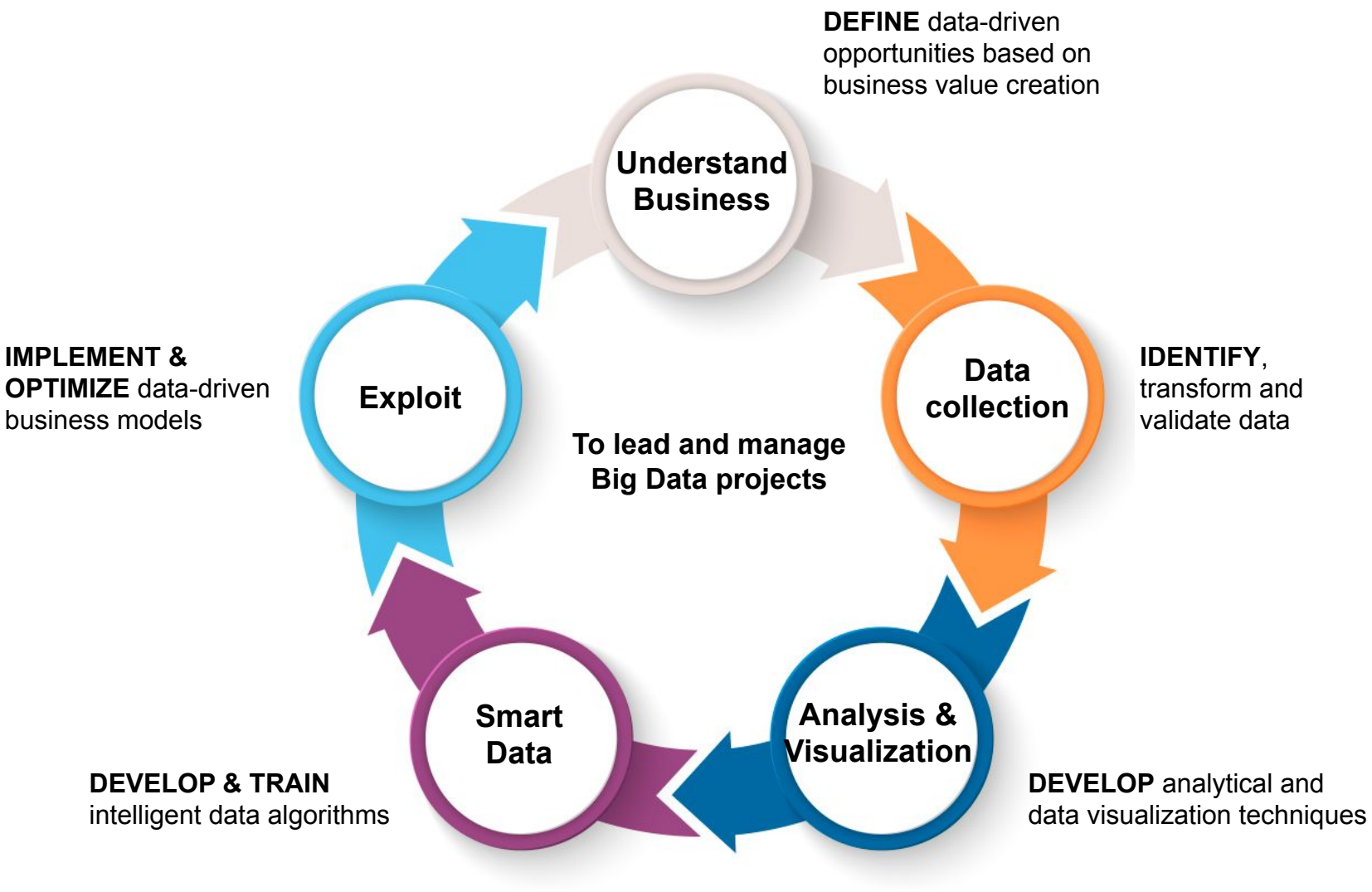
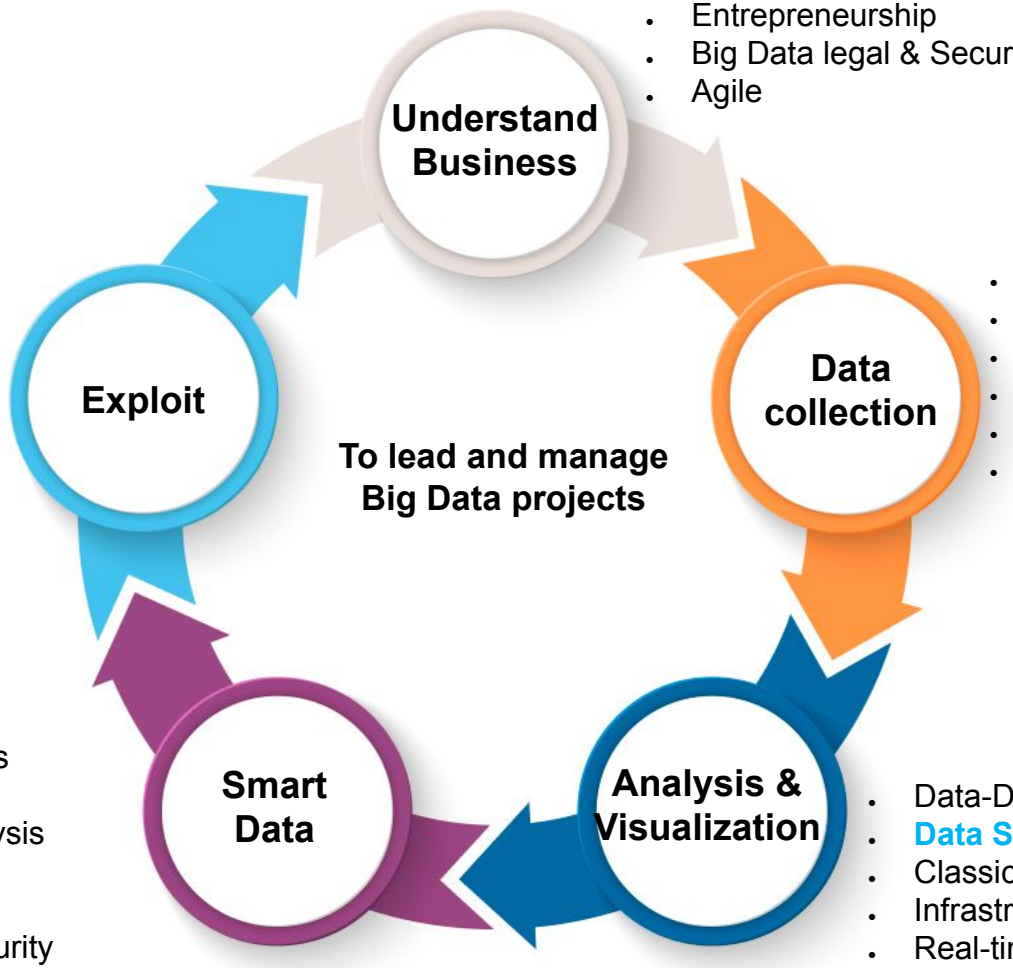
Project Lifecycle



Project Lifecycle



- Data-Driven Business
- Creative Technology
- Entrepreneurship
- Big Data legal & Security
- Agile

- Data-Driven Business
- **Data Science Foundations**
- Infrastructure
- Real-time Data Analysis
- Big Data legal & Security
- Agile

- Data-Driven Business
- **Data Science Foundations**
- Classical Data Analysis
- Infrastructure
- Real-time Data Analysis
- Big Data legal & Security
- Agile

- Data-Driven Business
- Data Visualization
- Advanced Data Analysis
- Artificial Intelligence
- Infrastructure
- Big Data legal & Security
- Real-time Data Analysis
- Agile

- Data-Driven Business
- Advanced Data Analysis
- Infrastructure
- Real-time Data Analysis
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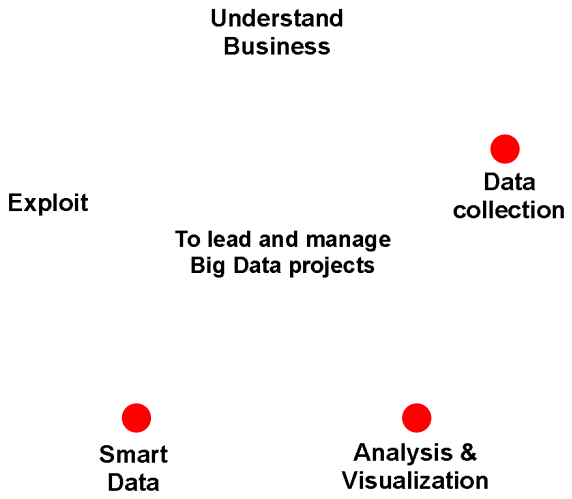
- Agile

Data Science Foundations

What we will learn

We'll learn how to collect, clean, process, manipulate, understand and visualize our data to accomplish our business objectives.

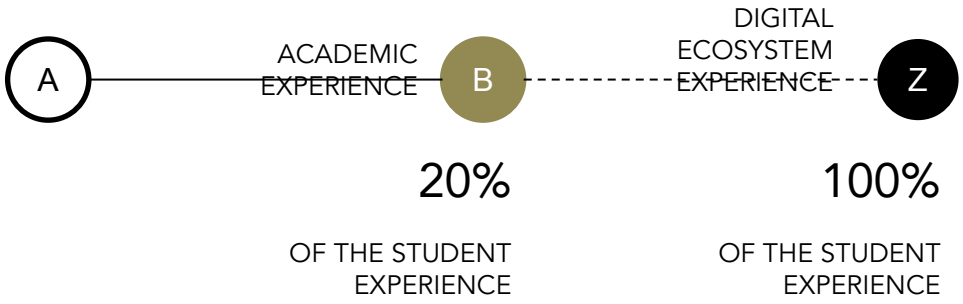


We will learn:

- Practical Data Manipulation in Python
- Basic data operations on relational data
- Loading and filtering text
- Loading and preprocessing images
- Data Manipulation
- Basic Data Analysis
- The process of data analysis
- Structured data types
- Overview of main analytic techniques
- The basics of putting a model into production

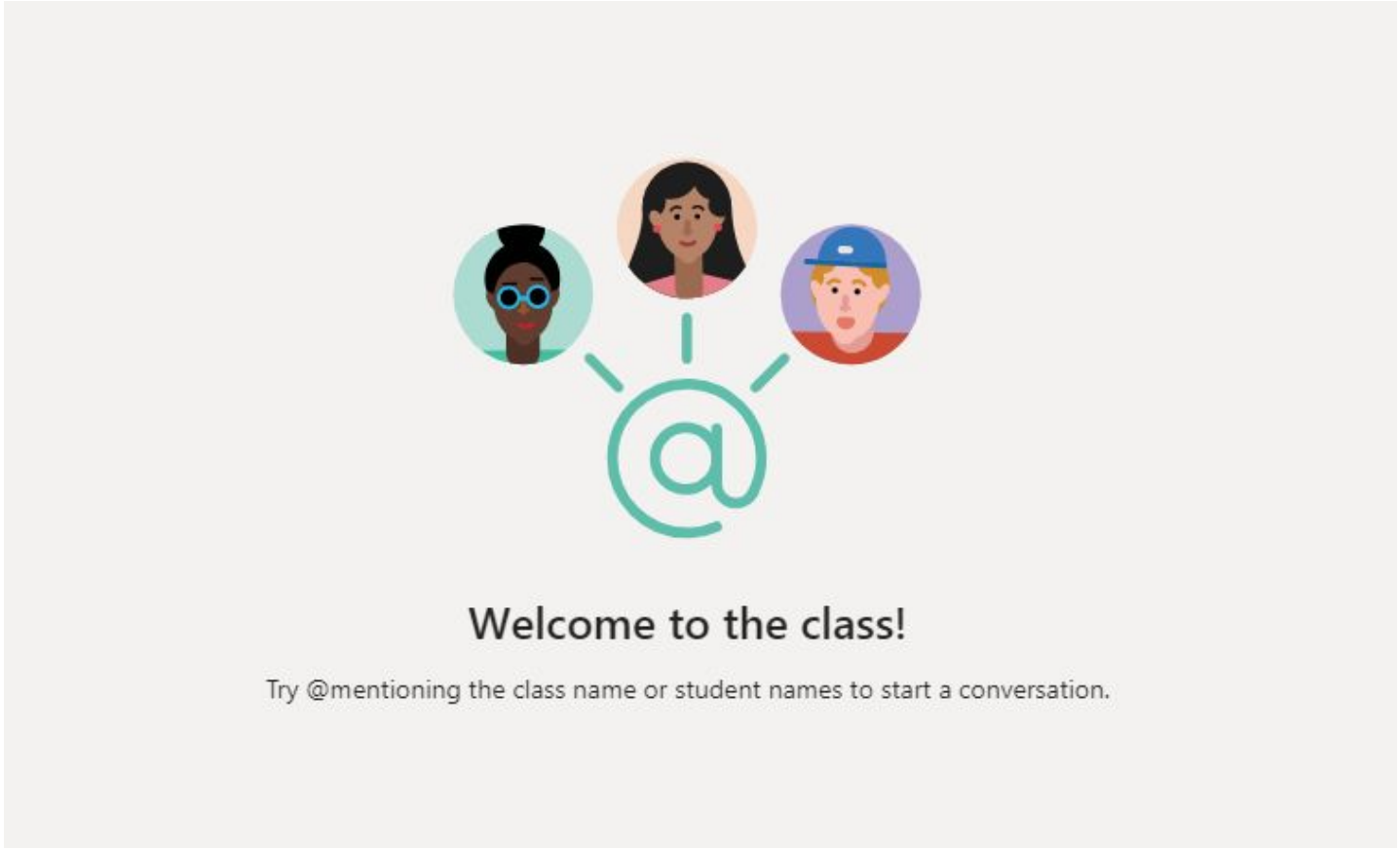
Student Experience

TRANSFORMATION SERIES	Industry congresses	Meetups	Keynotes	Visits to companies	**BTS DEMO DAY**



WORK ON YOUR PURPOSE - RESEARCH – DISCOVER – BUILD NETWORKING – JOIN COMMUNITIES – PARTICIPATE – GENERATE PUBLIC CONTENT

Curriculum review



A little bit about me

Introducing the course

Part I. Practical Data Manipulation in Python

1. Basic data operations on relational data (Pandas Introduction)
    - Recap of input/output and on-disk formats
    - Cleaning noisy data, normalizing
    - Filtering rows and columns
    - Joining data from multiple sources
    - Split-apply-combine workflows: groupby
2. Loading and processing images and text
    - Image loading, pre-processing and filtering
    - Image pre-processing for object detection and segmentation
    - Text pre-processing, normalization, stemming, stopword removal
    - Converting text to vectors and computing text similarity
3. Date manipulation
    - Basic data types, timezones
    - Resampling, shifting and windowing

Part II. Basic Data Analysis

4. The process of data analysis
   - Exploratory data analysis and insights finding
   - Feature engineering
5. Data types
   - Image processing
   - Time series analysis
   - Text processing
6. Overview of main analytic techniques
   - Regression on time-series, text and images
   - Classification on text and images

Part III. Data Science in production

7. The process of ETL (Extract Transform Load)
   - Data gathering and scraping
8. Packaging your model
   - Model evaluation and deployment
   - Containerize the model
9. The last mile to user: visualization and delivery
   - Visualization and reporting
   - Common delivery platforms

About the teaching methodology

Teaching methodology

- Two sessions of one and a half hours per day, divided in:
  - Theory (usually supported by notebooks)
  - In-class exercises (supported by notebooks)
- One assignment per week presented on Thurday's class and due next Thursday.
-
- Using the first 30 minutes of every Thursday class to comment the solutions.
- Using this git repository for notebooks (repository is private, you must request access).

Today's class

Today's Objective

- Understand the basic abstractions of pandas
  - Series, DataFrames and Indexes
- Explore techniques to read standard text files
- Learn how to do basic data exploration
- Do basic analytics with pandas

- Why is this useful for a digital project?
  - Understanding data manipulation is crucial for any data science project

Contents

1. Basic data operations on relational data (Pandas Introduction)
   - Recap of input/output and on-disk formats
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Pandas introduction

Pandas

Python Data Analysis library

Pandas

Python Data Analysis library

Pandas is a **Python package** providing fast, flexible, and expressive data structures designed to make working with “relational” or “labeled” data both easy and intuitive.

It aims to be the fundamental high-level building block for doing practical, **real world** data analysis in Python.

Additionally, it has the broader goal of becoming **the most powerful and flexible open source data analysis / manipulation tool available in any language**.

 Built on top of NumPy! 

Source

Pandas

Data Suitability

- **Tabular data** with **heterogeneously-typed columns**, as in an SQL table or Excel spreadsheet
- Ordered and unordered (not necessarily fixed-frequency) **time series data**.
- **Arbitrary matrix data** (homogeneously typed or heterogeneous) with row and column labels
- Any other form of **observational / statistical data sets**. The data actually doesn't need to be labeled at all to be placed into a pandas data structure

Source

Pandas

Why pandas is very adequate for data analysis?

- **Easy handling of missing data** (represented as NaN) in floating point as well as non-floating point data
- **Size mutability**: columns can be inserted and deleted from DataFrame and higher dimensional objects
- **Automatic and explicit data alignment**: objects can be explicitly aligned to a set of labels, or the user can simply ignore the labels and let Series, DataFrame, etc. automatically align the data for you in computations
- Powerful, flexible group by functionality to perform **split-apply-combine operations** on data sets, for both aggregating and transforming data
- **Easy conversion of different formats:** differently-indexed data in Python and NumPy data structures into DataFrame objects

Pandas

Why pandas is very adequate for data analysis?

- **Intelligent label-based slicing**, fancy indexing, and subsetting of large data sets
- **Intuitive merging** and **joining** data sets
- **Flexible reshaping** and **pivoting** of data sets
- **Hierarchical labeling of axes** (possible to have multiple labels per tick)
- **Robust IO tools** for loading data from flat files (CSV and delimited), Excel files, databases, and saving / loading data from the ultrafast HDF5 format
- **Time series-specific functionality**: date range generation and frequency conversion, moving window statistics, moving window linear regressions, date shifting and lagging, etc.

Pandas

Main data structures

Series

0.25	0.5	0.75	1.0

Value mutable / Size immutable

Index

A	B	C	D

Value inmutable / Size immutable

DataFrame

	columns
A	0.25
B	0.5
C	0.75
D	1.0

Value mutable / Size mutable

Pandas

Main data structures can be understood as:

Series	DataFrames	Index
As a 1-D NumPy array	As a 2-D NumPy array	As an immutable array
As a specialized Python dictionary	As a specialized Python dictionary	As an ordered set
	As a single Series on a DataFrame	
	As a structured list of dicts	
	As a dictionary of Series objects	

Pandas

Data Structures in code!

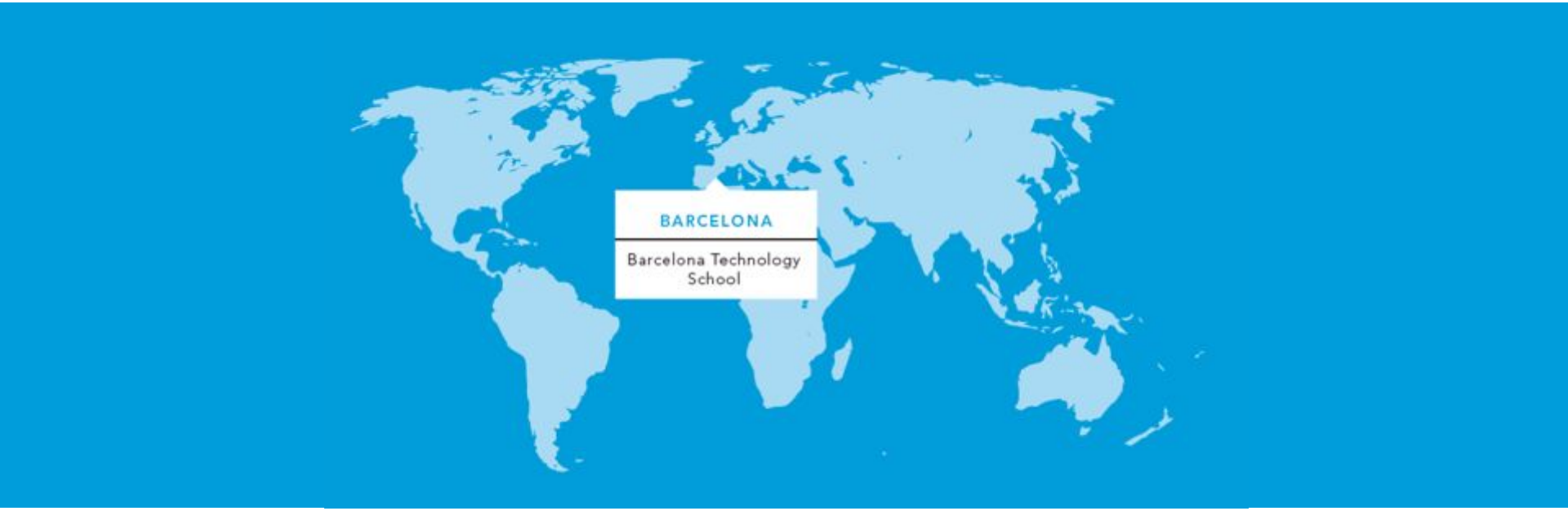
Go to the notebook here

Pandas functionality introduction and Class exercise

Pandas

Intro in code!

Go to the notebook here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