CEF Digital
Connecting Europe

February 23th 2021- Starts at 3PM

How **BDTI** can support the Public Administration in using Big Data and developing their network

Taking the use of Big Data to the next level

Instructions for the live webinar:

This is an interactive session. There will be time for questions and answer throughout the presentation via slido on screen. You can also connect and direct questions with your smartphone. We hope you will share your views.

Please note that this webinar will be recorded.
The recording of the live event and the slides will be shared on the event page on CEF Digital

Welcome to the live BDTI webinar

Agenda for today

1. Introduction to the CEF
2. BDTI in a nutshell
3. BDTI Service Offering and how to get started
4. BDTI Community Portal
5. Municipality of Milan Showcase
6. BDTI Self-paced labs (descriptive analytics, big data and AI)
7. BDTI Technical Architecture & future vision
8. Q&A + Interaction Section

BDTI

01

Introduction to the CEF

CEF Digital
Connecting Europe

How can CEF Digital help you

Our mission is to increase the interconnection between trans-European networks, by helping public administrations, businesses and citizens fully benefit from what digital has to offer.

We promote the adoption of common digital standards by:

- Providing **technical support** to Public Administrations and businesses in their digital transition;
- Helping them develop **secure, interoperable digital services**;
- Providing funding to projects that can contribute to a more connected Europe;

This support package comes in the form of **Building Blocks**.

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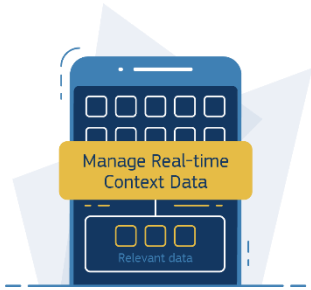
Meet the Building Blocks

Find the one you need

Big Data Test Infrastructure

Explore and experiment with big data for improved performance and decision making.

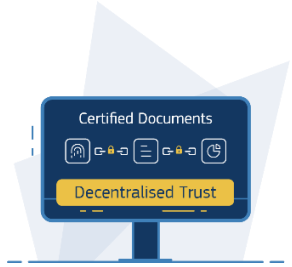


Context Broker

Gather, manage and share context data, in real-time, throughout Europe

eArchiving

Facilitates the preservation, migration, reuse and trust of your data.

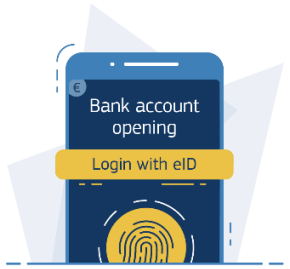


European Blockchain Services Infrastructure

Harness the power of a Europeanwide network of blockchain services, increasing trust through data security, privacy and transparency..

eInvoicing

Promote the implementation of the European standard for electronic invoicing across border



eID

Allow citizens to prove who they are across borders, making it easier to access online services in another EU Member State

eDelivery

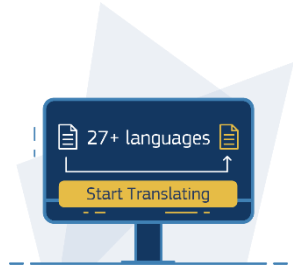
Exchange online data and documents reliably and securely

eSignature

Create and verify electronic signatures between businesses and EU citizens

Once Only Principle

Re-use data held by Public Administrations



eTranslation

Use machine translation to translate your documents and web content into any official EU language, and many more

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How to use a Building Block?

There are 3 options: **buy**, **build** or **reuse** and you can always **co-develop** your solution with other parties.

Buy

Buy a compliant, interoperable solution from the market.

Build

Build an EU-compliant solution from scratch based on Building Block standards. We'll help you test it for compliance and interoperability.

Reuse

Reuse a sample software available through CEF Digital.

Whatever you choose, **the relevant CEF Digital team will support you** in implementing the Building Block into your project.

Why choose CEF Digital

Here are some of the benefits of using a Building Block in your digital project.

Faster

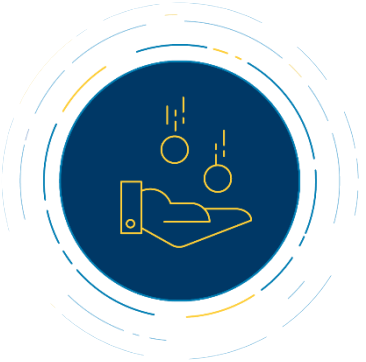
- The Building Blocks are mature, **ready-to-deploy** digital solutions;
- **This saves you time and money**;
- The CEF Digital website has details on a **range of services available** to help your Building Block implementation.

Safer

- The Building Blocks are based on open European standards, so you **avoid vendor lockin**;
- Our Building Block team ensures your project is **EU-compliant and interoperable**.

Future-proof

- Access a **larger market** thanks to interconnectivity
- Building Blocks **can be used in any digital European project;**
- Building Blocks are based on standards and ensure you comply with EU \regulation.



Funding

- You can visit INEA's website for more information on how to apply, or you can contact the Building Block's onboarding manager.
- Up to 75% of your costs are eligible for funding.

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02

BDTI in a nutshell

Andrea Biancini

Project Manager

DG DIGIT

CEF Digital
Connecting Europe

What is the Big Data Test Infrastructure

*The **Big Data Test Infrastructure** will provide a set of **data and analytics services**, from infrastructure, tools and stakeholder onboarding services, allowing European public organisations to **experiment with Big Data technologies** and move towards **data-driven decision making***

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BDTI Initiative drivers

Problem - *Solution*

Lack of Big Data technologies

Facilitate the prototyping and launching of pilot

Lack of Big Data skills

Facilitate Big Data knowledge in public sector

Data sharing among public organisations is not yet a common practice

Provide built-in connectors/APIs and foster the sharing of data sources to better support policy-making

Risk of replicating the efforts by implementing similar projects

Support public organisations through the creation of a Big Data community for the sharing of good practices, pilot outcomes, etc.

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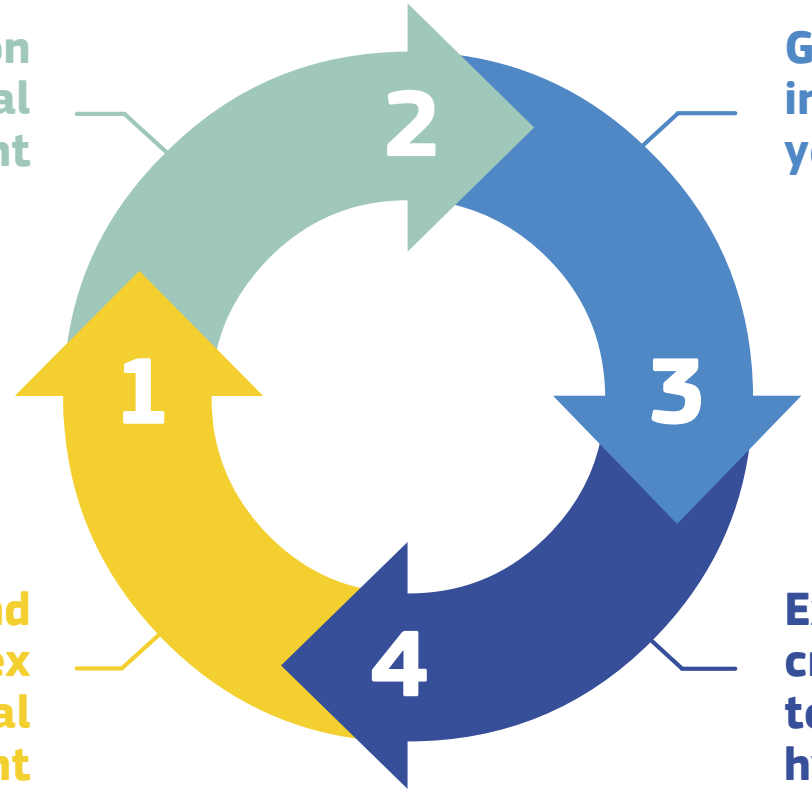
Is BDTI for me?

Yes, if you need to experiment with big data in a safe environment.

What can we help you achieve?



Develop pilot projects on big data in a virtual environment

Gather knowledge, insight and value from your data

Avoid setting up and maintaining a complex experimental environment

Experiment with and create quick prototypes to verify and test data hypotheses or data visualisations

BDTI Use Cases (1/2)

Descriptive Analysis

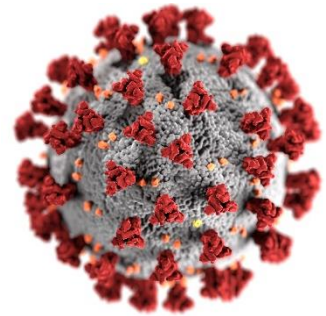
Use of statistics to quantitatively describe features of a collection of information

Social Media Analysis

Gather and analyse data from social media to improve business decisions

Time-series Analysis

Analyse time series data in order to extract meaningful statistics and other data characteristics



Covid 19 Analysis

Analyse Covid 19 information extracted from a dataset collecting data taken from medical papers

Predictive Analysis

Use statistical techniques that analyse current and historical facts to make predictions about future or unknown events

Network Analysis

Investigate any structures through the use of network and graph theories

Text Analysis

Use natural language processing to analyse unstructured text data, to derive pattern and trends

BDTI Use Cases (2/2)

Web Analysis (Scraping/Monitoring)
Gathering information from websites, involving data scraping (using both or web-crawler) and data parsing to extract un-organised web data, as well as data from API's, into manageable format.

Population/Customer segmentation
Dividing a broad population into sub-groups of consumers based on shared characteristics such as common needs, interests, similar lifestyles or even similar demographic profiles.

Route-Traceability/Flow monitoring
Tracking and detection of objects through the use of sensors (e.g. GPS, mobile phone signals, road cameras) or any other types of data usable for this purpose.

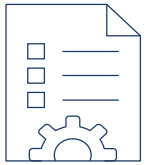
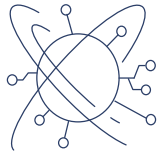
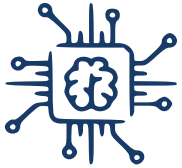


Image Processing
Computational operations using any form of signal processing for which the input is an image, a series of images, or frames of a video; output of image processing may be either an image or a set of characteristics / parameters related to the image.



IoT & Smart City
Gathering relevant information in IoT environments, in a Smart City context.

IoT Security
Safeguarding connected IoT devices and networks, since security often has not been considered in IoT product design.



Applying Bioinformatics to genetic data
The use of computational biology, applying data science techniques to understanding/organising biological information and analysing genetic data

Benefits and Provided Support

Main benefits

Access to a **ready-to-use testing environment** for your analytics experiments

The possibility to **share and re-use data** across policy domains and organisations

Access to **insights on best practices** with big data projects and other pilots

How do we support you?

Various **data sources, software tools and big data techniques** are made available for users

Advice and ongoing onboarding support from the CEF BDTI Team

Knowledge base that provides insights on the platform and big data techniques

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03

BDTI Service Offering and how to get started

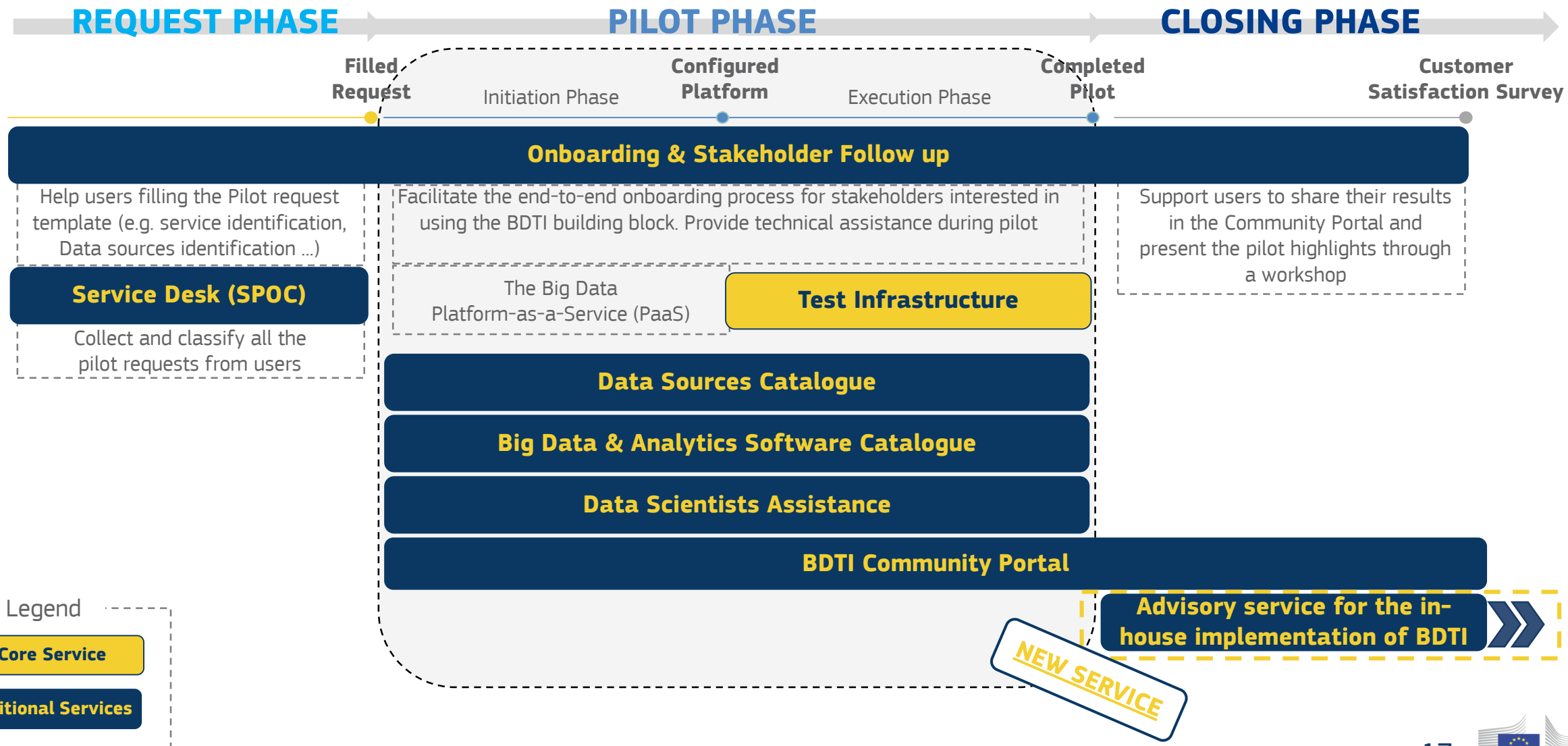
Francesca Vella

Pilot request Manager

BDTI Team

CEF Digital
Connecting Europe

BDTI Service Offering



How to get started with BDTI

Get familiar with BDTI services

Big Data Test Infrastructure offers a safe environment to experiment with Big Data technologies and to prototype Big Data solutions before deploying them in your own production environment

Define your data analytics use case

Build your BDTI use case. The support team is available to guide the users through the process of defining their organisation's use case, as well as to clarify any preliminary questions

Submit your "BDTI PILOT request"

Request to use BDTI by submitting an **online form.** The user provides information on the online form in order to clarify the pilot objective (general summary, short description and any supporting evidence)

Elaborate your business and technical need

The functional team will work with you on the elaboration of your business case to ensure that it fits within the CEF requirements, while our technical team will design your BDTI test environment which is tailored for your specific technical needs

Pilot project approval

The European Commission will give a final validation to run the pilot project.

Test environment set up

The BDTI technical team will set-up your tailored cloud-based data analytics environment so that you can start with your big data experiments.

Start the pilot and gain insight

The users can experiment with data on the test infrastructure provided by BDTI and share any lessons learned on our Community portal

Use cases acceptance criteria

Business criteria

- **Potential users**: Member State or public administration at **national** level, **regional** or **local** level
- **Clear value added**: Business and technical
- **Clear contact point** for the entire pilot

Functional criteria

- **Pilot duration**: 6 months
- **Pilot use cases**: (only use case in scope)
- **Resource usage limit**: based on CEF budget
- **Skills/Maturity level**: adequate skilled resources and/or level of maturity on the big data subject
- Pilot BDTI **geographical distribution/ resource allocation**

Case studies of ongoing pilots

Conselleria de Sanitat (CS)

Conselleria de Sanitat (CS) is the Health Public Administration, belonging to the Comunidad Valenciana (CV) Regional Government and it provides health services for all **5.2 million people** in the region. They needed a tool capable of analysing and synthetising the huge quantity of scientific clinical articles coming from different sources: PubMed.gov (more than 30M, and 1M coming every year) and the 100.000 + clinical articles Covid-19 related generated in the first 6 months of pandemic.

How BDTI is helping

BDTI is supporting Concelleria de Sanitat with advanced **data visualization** and **text mining** tools to help **extracting the knowledge contained in the documents**, supporting clinicians and managers in their clinical practices, management process and day-to-day work in fighting the virus.

Convalescent Plasma Database

The European Blood Alliance (EBA) is working together with the European Commission (DG SANTE, DG CNECT and DG DIGIT) to create and manage an **EU-wide open-access platform** that collects data to support a study on **Covid-19 convalescent plasma therapy**. The aim of the study is to assess in which conditions the convalescent plasma treatment is most effective, in order to take data driven decisions on the therapy and focus the efforts of the research in the most promising directions.

BDTI is supporting EBA and DG SANTE with a ready-to-use, virtual environment in which **data collected through a custom-built website**, are ingested and anonymized, to be then analysed with advanced data visualization and analytical tools. Initially, only donation data were processed, then the scope was increased to capture the **end-to-end of blood plasma, from donation to patient/clinical trial.**

City of Florence

The main goal of the Municipality is to perform a **cross correlation between the multiple datasets** available within the city to understand how people were and are moving between the different districts, to then derive precious insights about the most and the less crowded neighborhoods during and after the lockdown and about **how services can be relaunched to foster cultural activities and events.**

BDTI is supporting the City of Florence with predictive, descriptive and time-series analysis on multiple datasets collected **before, during and after the Covid-19 pandemic** such as: public wifi sensors, parking and geo-referenced data of people movements (i.e. tourists).

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04

BDTI Community Portal

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BDTI Community Portal

A Big Data Community where members can **develop and share Big Data knowledge and artefacts** (e.g. methodologies; use cases; new technologies; pilot's opportunities, insights and outcomes).

The BDTI Community Portal provides **a forum section**, where public administrations can contribute with their own ideas, launch new proposals and create effective synergies.

Share BDTI know-how

Members will be able to access the forum and discussions to develop and share their big data experiences and insights.

Share artefacts

Members will be able to access and discuss on big data artefacts: methodologies, use cases, pilot's outcomes.

Create a network

Members will be able to easily communicate and create synergies with other PA's, enlarging their own network and collaboration opportunities.

Access to news and events

Members will be able to access to news and events related to BDTI and on the broader Big Data field.

BDTI Community Portal Goals

ABOUT THE COMMUNITY SPACE:

To foster participation and engagement of the BDTI relevant stakeholders in a collaborative space, making them key actors in the European Big Data Ecosystem

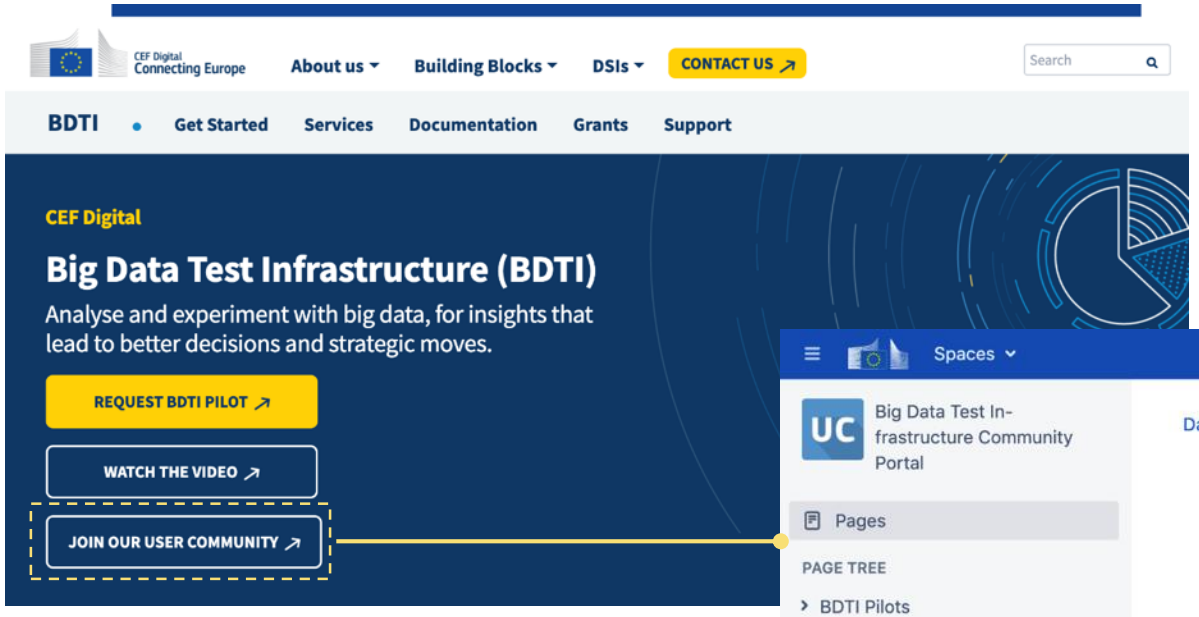
ABOUT THE ACTIONS

To develop and share knowledge, to discuss and contribute to the BDTI future shaping.

ABOUT THE INTERACTION

To virtually meet, discuss and share insights, practices and opportunities, in order to create a sound network of new contacts and synergies.

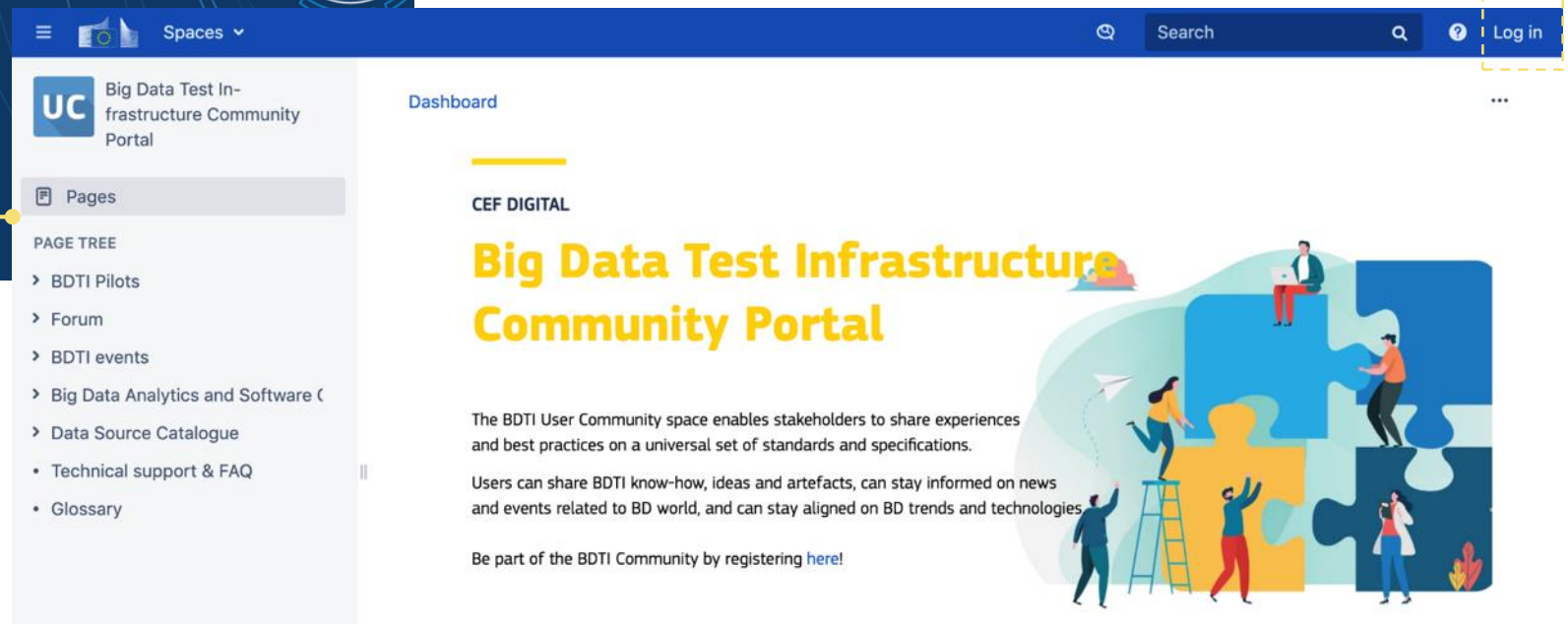
How to access on the Community Portal



1

Visit the official website of [CEF Digital Connecting Europe BDTI] and click on **JOIN OUR USER COMMUNITY**

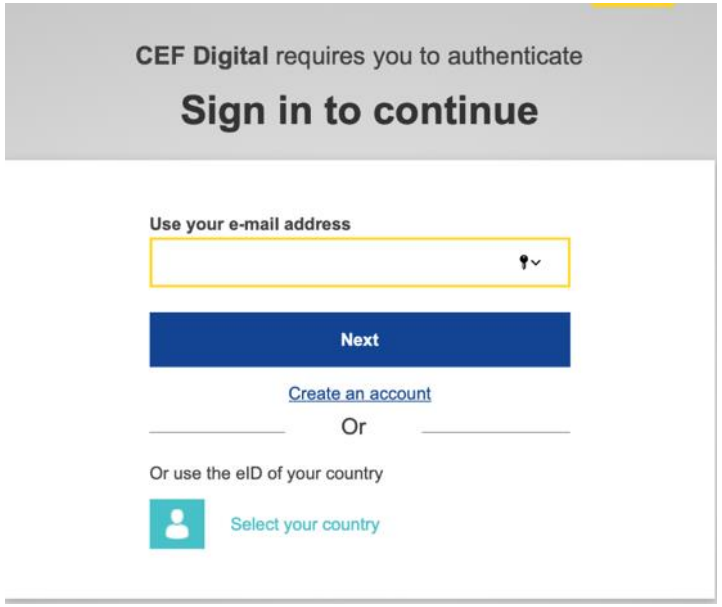
You can join it also from the [Services] section in the menu under Big Data Test Infrastructure Community Portal



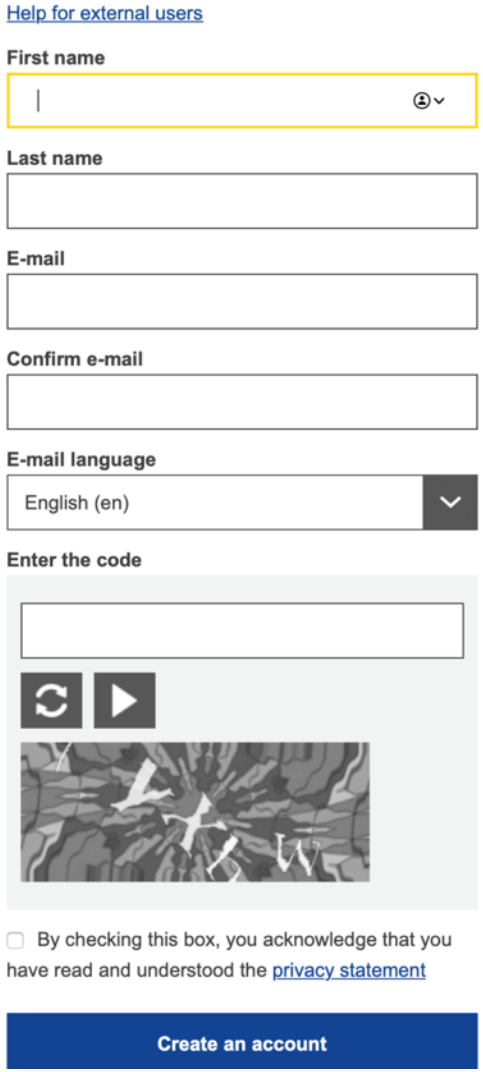
2

Click on **LOG IN** on the top right of the window

How to register/become a member



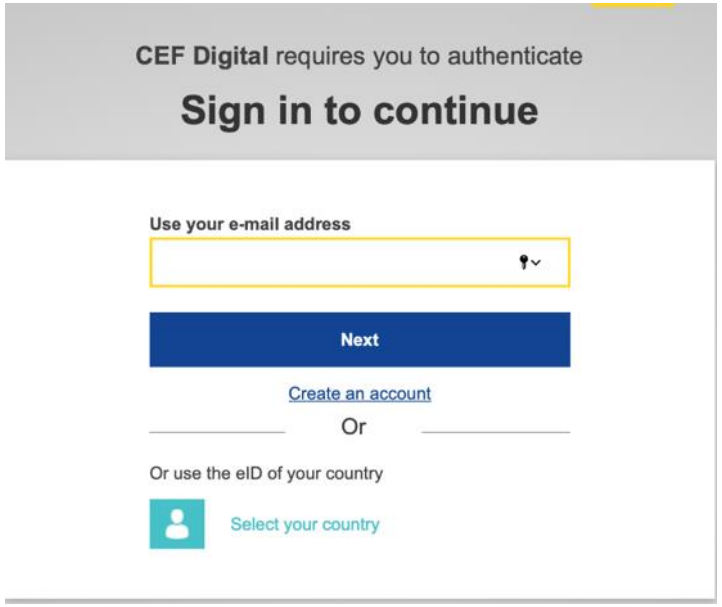
3 Click on **Create an account**



4 Fill the fields with the information required and click on **Create an account.** After that you will receive a confirmation by email

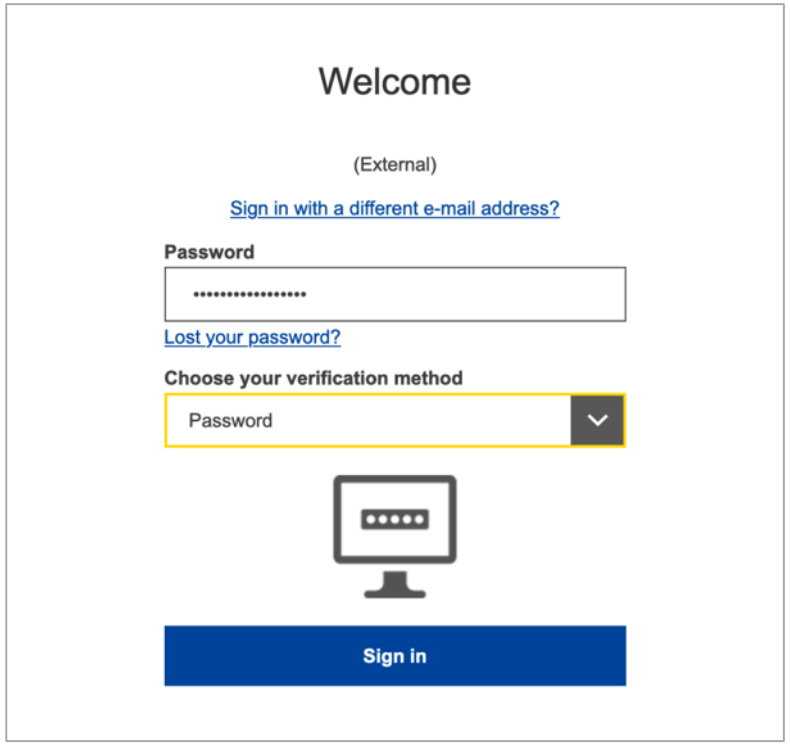
If you already have an account you can skip this part and go directly to step 5

How to access on the Community Portal



5

Insert your email address and click on **NEXT,**



6

Insert your password, put **“Password”** as verification method and click on **Sign in**

Let’s start the Navigation!

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05

Municipality of Milan Pilot Showcase

Elisa Bellistri
SIAD Management Instructor,
Analytics Data Science Unit
Municipality of Milan

Agenda

- Data governance in the city of Milan
- Covi 19 emergency
- Use of BDTI Platform
    - Preliminary results

Who we are

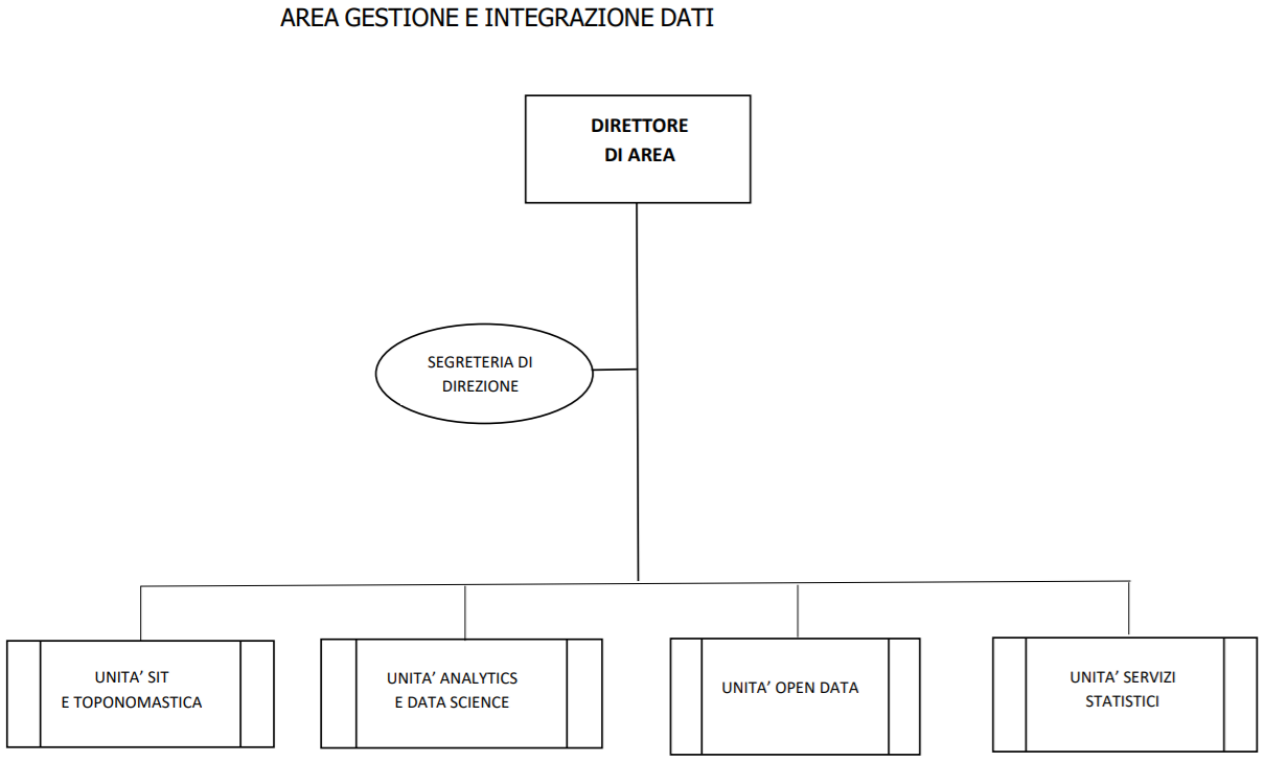
Data Management and Integration Division

- Three units composing the division

Analytics and data science unit

Main responsibilities

- Managing data and metadata, data governance and support to data driven decisional process, oriented to citizens and city users
- Support to the Chief Technology Officer for the management and analysis of big data



Covid19 emergency (1/2)

Measures to contrast the pandemic emergency considerably changed Milan city configuration.

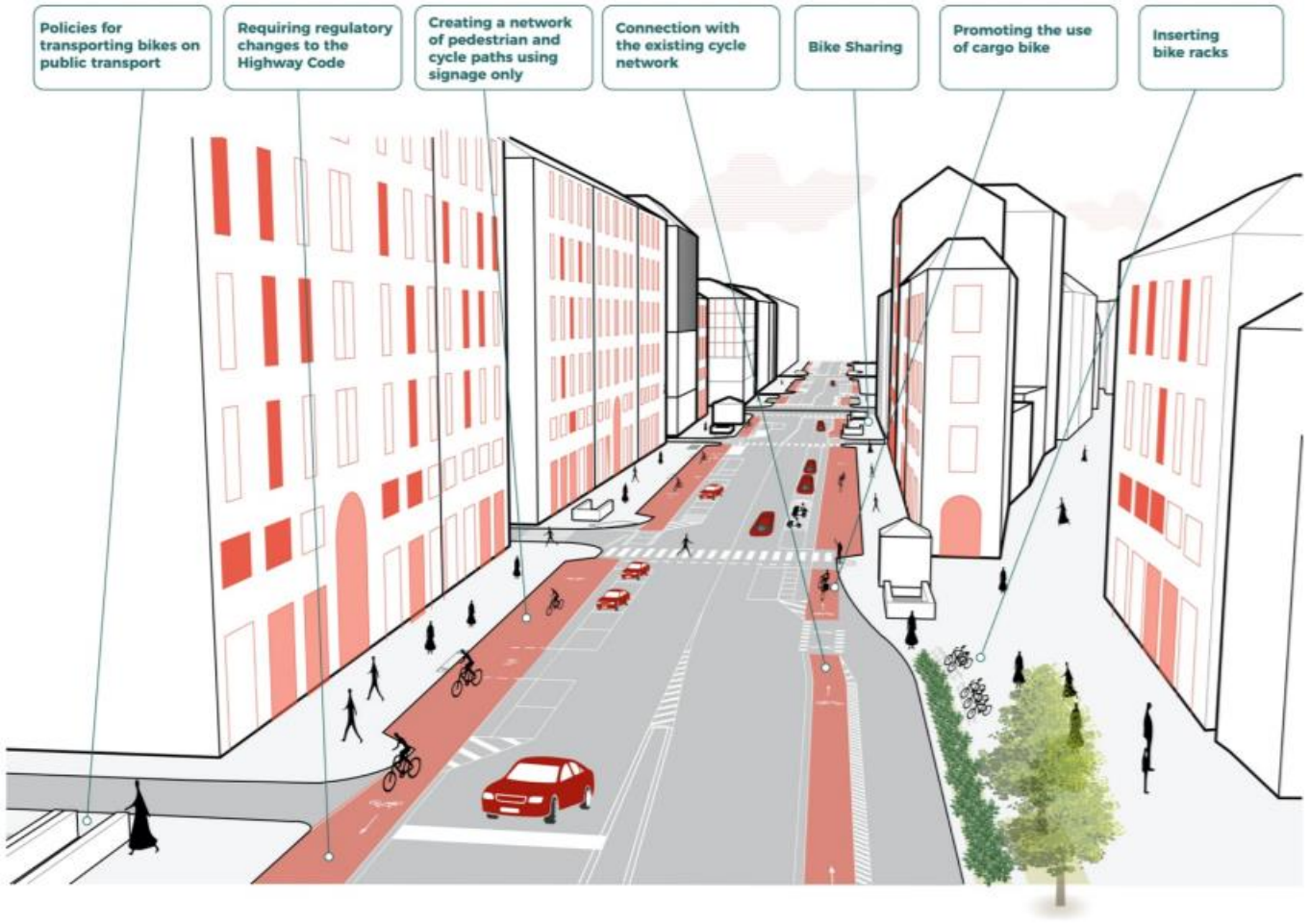
Lockdown restrictions dramatically decreased the **flow of people** within the city and throughout it. The aim to manage different scenarios during the ongoing pandemic emergency, quickly evolved into the purpose of redesigning the organization of the city's schedule.

The pandemic-period **organization of work, education and commercial activities** suggested a new way to redefine the use of roads and public spaces, to increase non-polluting mobility (walking, cycling, soft mobility) and to develop areas that will allow commercial, recreational, cultural, and sporting developments, while respecting the appropriate physical (but not social!) distances.

Covid19 emergency (2/2)

An example of solution to promote cycling mobility, in consequence of the restriction to the public transport.

(from «Milan 2020 Adaptation strategy» document)

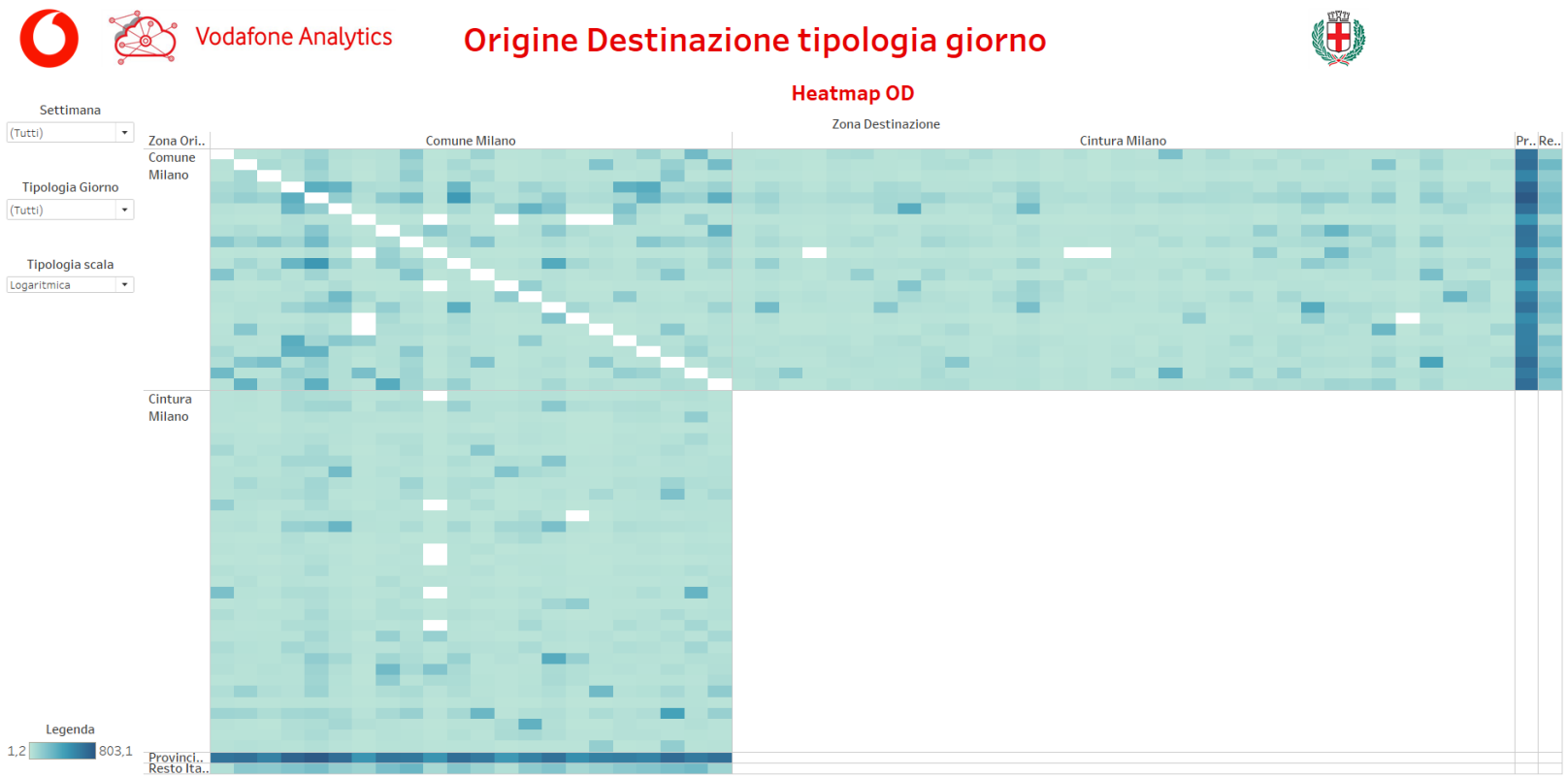


Corso Buenos Aires

Data analysis can support the comprehension of different mobility flows and the variables that underlie those flows.

Flow of people during the ongoing pandemic period

Through the collaboration with two of the main Telco companies in Italy, we were able to visualize the people movements within and outside the city during the first lockdown period.



Attributes of the flow and other parameters

Flow attributes

- Different time period of the day and of the week
- Nationality (italian or foreigner)
- Age range and gender
- Residence

Origin of the flow, determined as the place where she/he slept in the last x nights

Other parameters

- Number of employees in different activities
- Students vs tourists vs workers
- Georeferenced data of stores, industries, schools, etc.

BDTI platform

We joined the BDTI platform in order to build and environment where it is possible the integration of the dataset already available and the other parameters that charachterize the flows

First step: data quality assessment

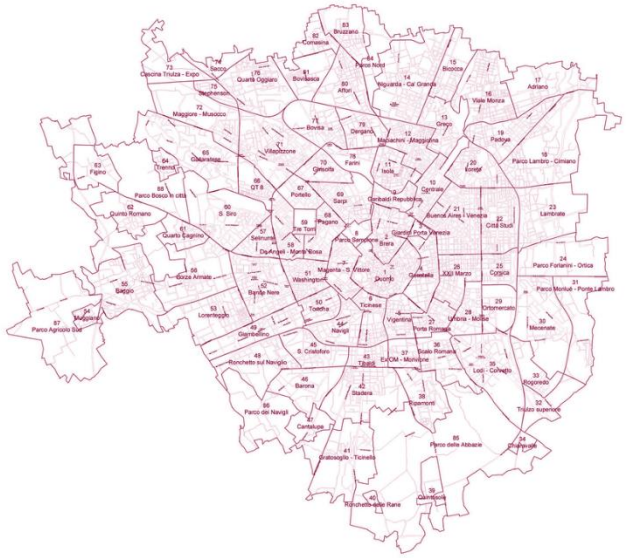
Data quality asessment

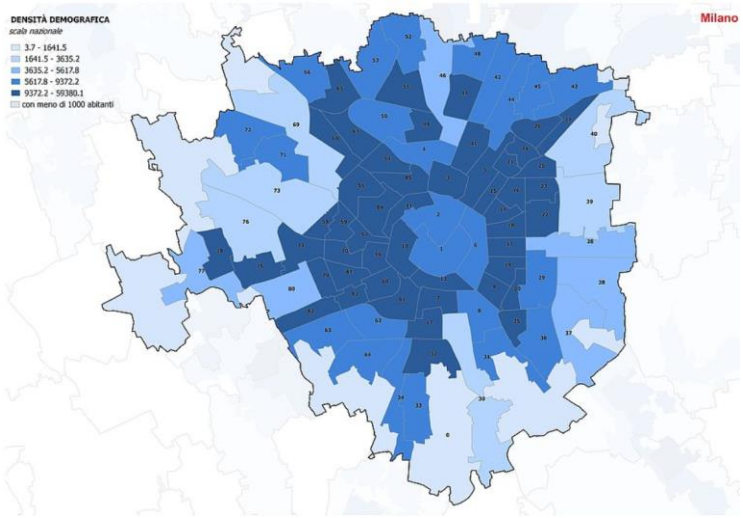
Merging two different telcos datasets, in order to get an assessment of the dataset → degree of agreement

NIL (88)

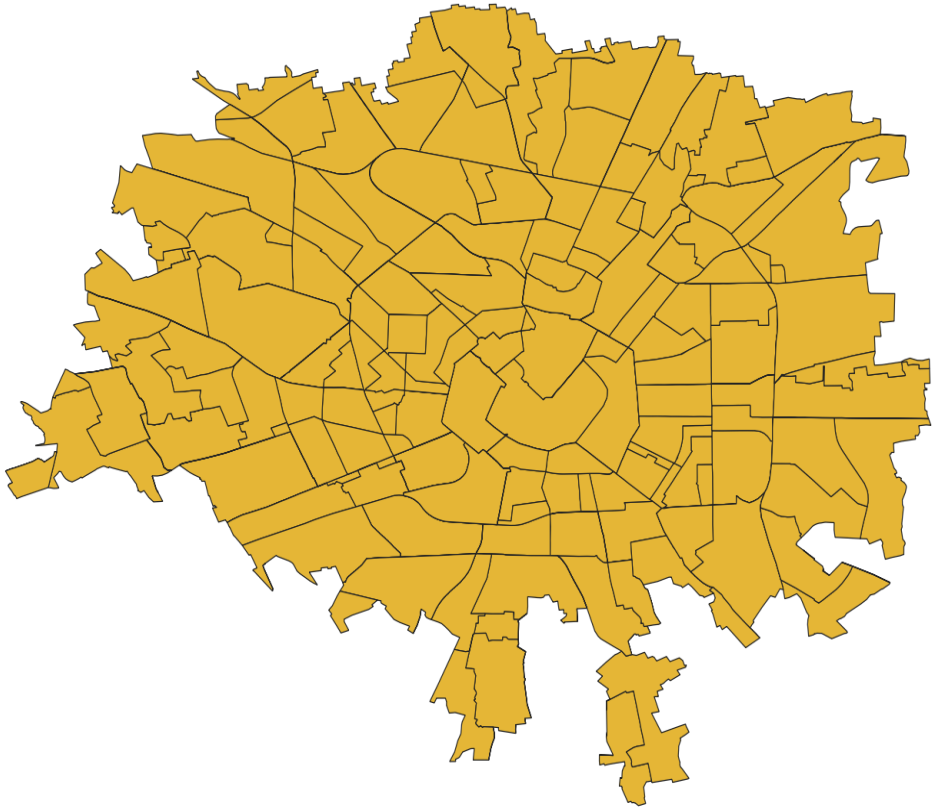
Two different ways of municipality reparting zones

ACE (85)





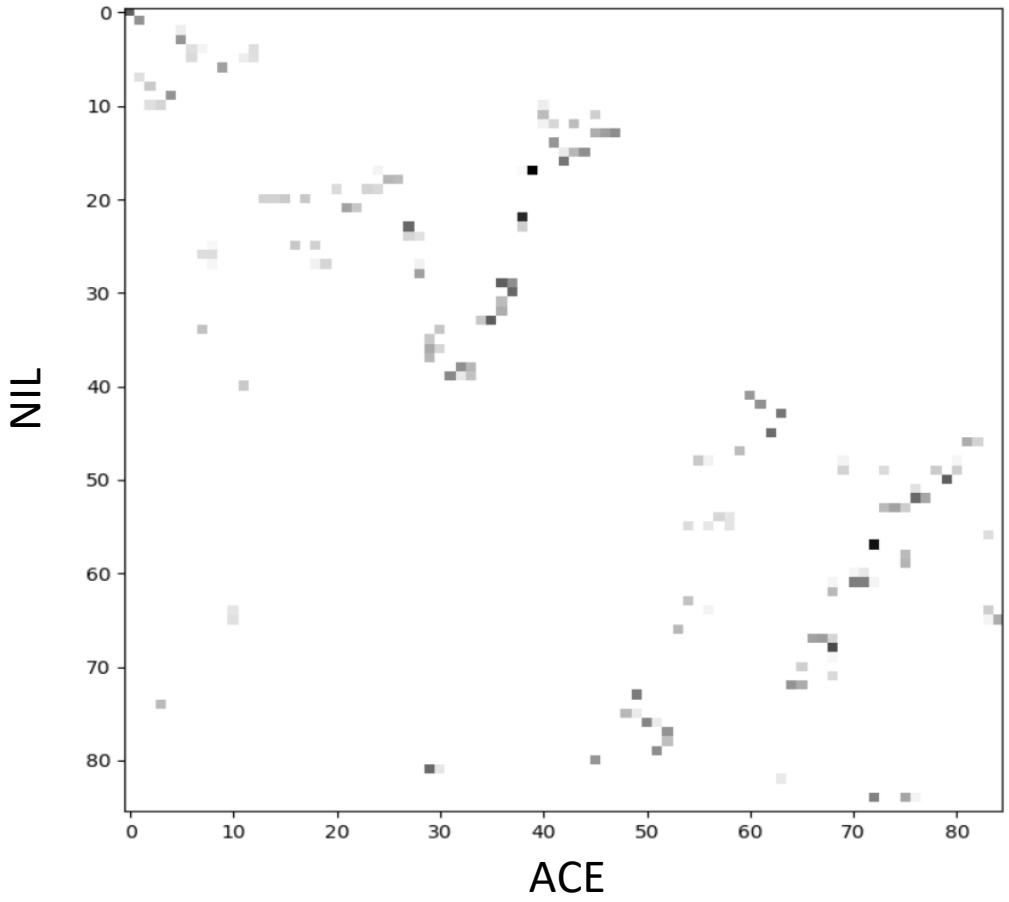
Preliminary results (1/2)



Overlapping the two geographical dataset to evaluate agreement coefficients

The created environment allows to integrate other datasets, p.e. open wi-fi data of users logged in.

Preliminary results (2/2)



Overlapping coefficients distribution between NIL and ACE

Normalization of the matrix in order to apply coefficients to OD matrices and evaluate agreement

BDTI opportunities

- Experimenting new ways to approach data, going beyond the usually single use case analysis

- Knowing how other municipalities or groups use the platform. Since many projects are focused on the pandemic emergency, also share different strategies to approach the emergency from the «big data» point of view.

- Sharing knowledge and ideas with other BDTI partners, in order to improve new methodologies of data analysis

Next Steps

- Integration of further dataset to the platform
- Construction of a predictive model, based on integrated dataset results
- More webinar and sharing knowledge opportunities!

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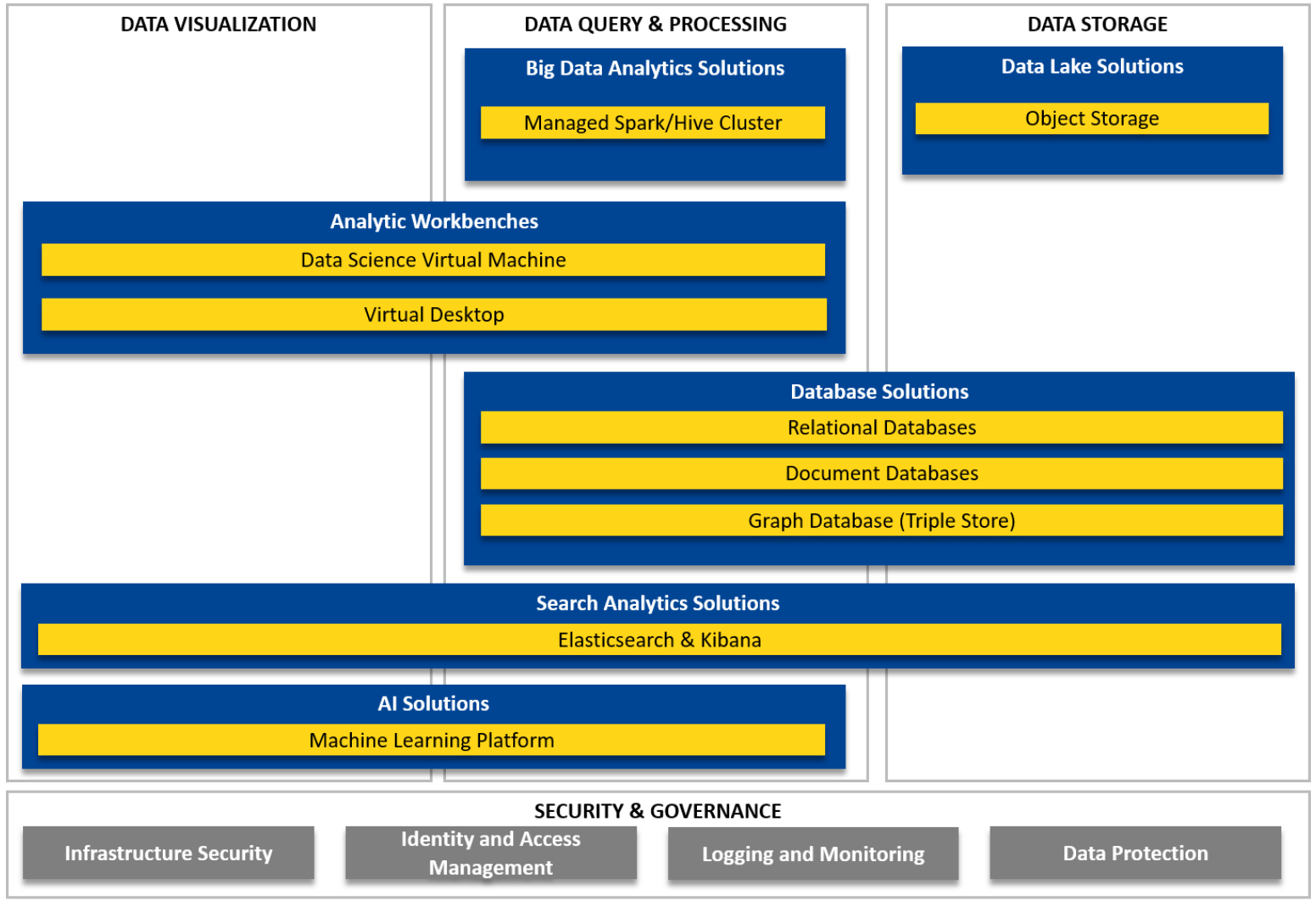
06

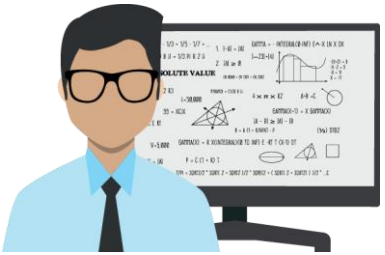
BDTI Self-paced labs

Ze Wen Wu
Cloud Engineer
BDTI Team

Why self-paced labs?

Pilot users are not all data scientists.





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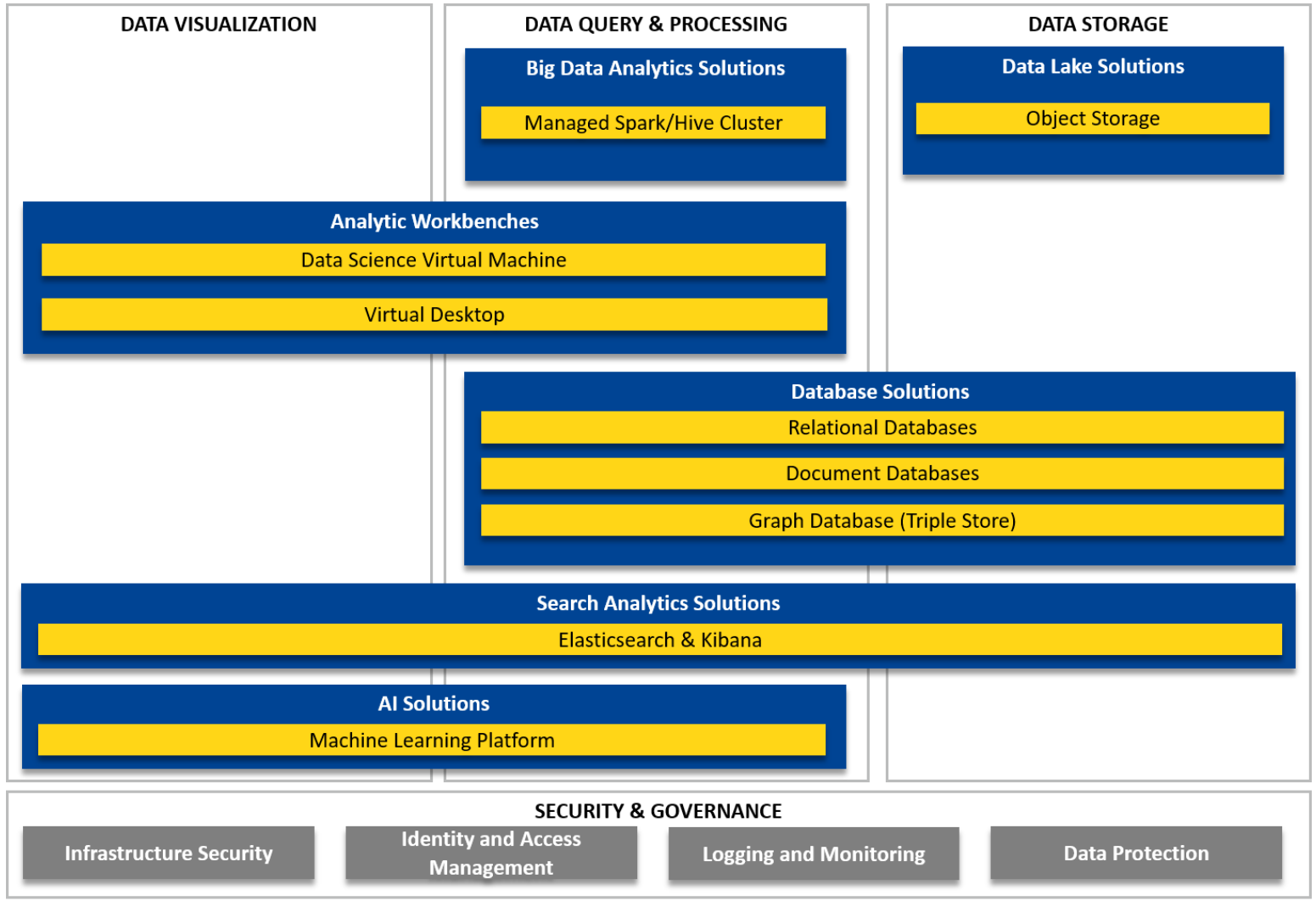
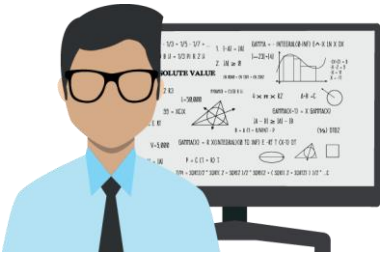
Why self-paced labs?

Pilot users are not all data scientists.





What are self-paced labs?

Here is an overview of what self-paced labs are.

Jupyter Notebook

- Text and code integration for **interactive learning experience.**

Frameworks

- Introduction popular **Python frameworks** for working with data.

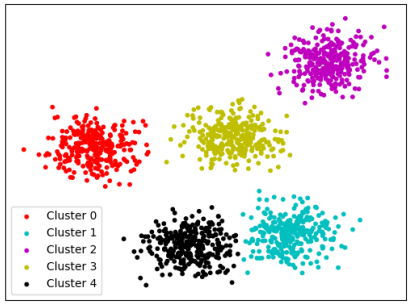
Open source data

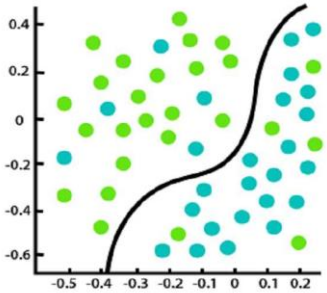
- Using data from **EU Open Data Portal** and **kaggle**.

What are the currently available self-paced labs?

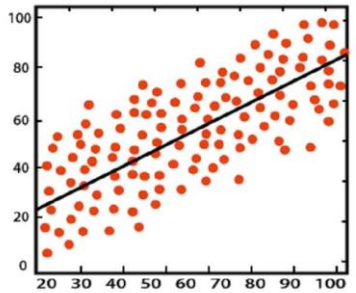
Here are some of the self-paced labs we have developed.

Machine Learning





Classification



Regression

Big Analytics Data Exploration

APACHE Spark™

HIVE

CEF Digital Connecting Europe

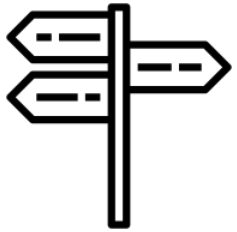
What are the currently available self-paced labs?

Here are some of the self-paced labs we have developed.

LAB	DATA	TOOLS
Python: Data Exploration	**EU Open Data:** Belgium COVID-19	• Pandas DataFrame • Matplotlib
Machine Learning: Regression	**EU Open Data:** Gender Equality Index Dataset	• Scikit-learn
Machine Learning: Classification	**Kaggle:** Breast Cancer Wisconsin Dataset	• Scikit-learn
Machine Learning: Clustering	**Kaggle:** Country Dataset	• Scikit-learn
Apache Spark: Data Exploration	**EU Open Data:** Belgium COVID-19	• PySpark DataFrame • Matplotlib
Apache Hive: Data Exploration	**EU Open Data:** Belgium COVID-19	• HiveQL • Matplotlib

How can self-paced labs help Pilot members?

Here are some of the benefits of using the self-paced labs.



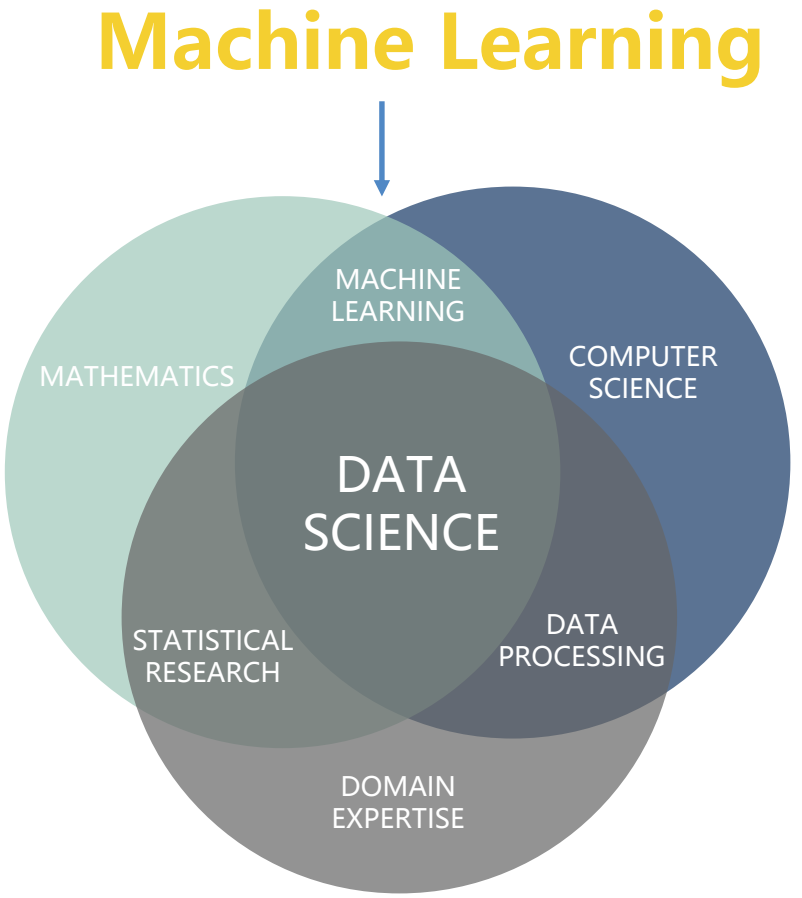
Guidance

- Pilot members can **copy-paste code snippets** when analyzing their own data

Educational

- **Teach Pilots members** to start working with their data as a data scientist.

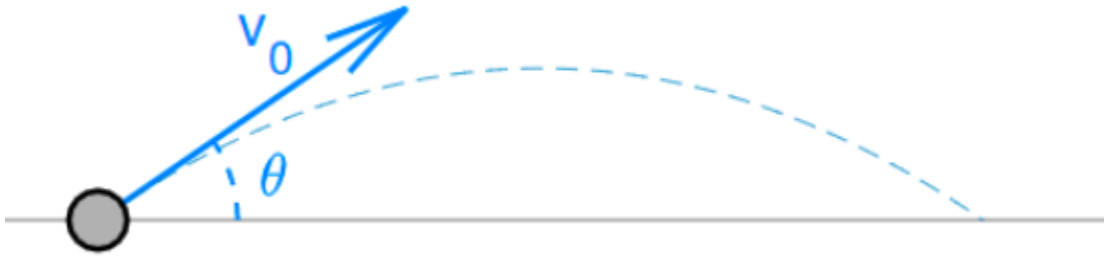
What is Machine Learning?



Data science

- *inter-disciplinary field that uses scientific methods, processes, algorithms and systems*
- ***extract knowledge and insights from many structured and unstructured data***

What is Machine Learning?



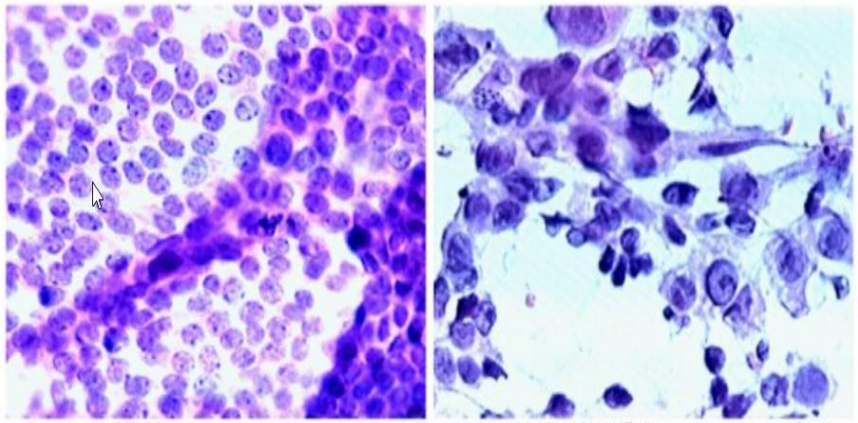
Machine Learning Applications

ML Problem	Description
Ranking	Helping users find the most relevant thing
Recommendation	Giving users the thing they may be most interested in
Classification	Figuring out what kind of thing something is
Regression	Predicting a numerical value of a thing
Clustering	Putting similar things together
Anomaly Detection	Finding uncommon things

Example

Medical sector:

Classifying a breast tumor as BENIGN or MALIGNANT



Smear with BENIGN diagnosis – uniform nucleus of cells, symmetrical, homogeneous, with areas within normal size

Smear with MALIGNANT diagnosis – nucleus of cells without uniformity, asymmetrical, not homogeneous (multiple sizes) and with areas above normal size

Overview: Self-paced labs

LAB	DATA	TOOLS
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DEMO Self-paced lab

Belgium COVID-19 Data Exploration

https://jupyterhub.cefbdti.eu/hub/login

BDTI

07

BDTI Technical architecture & future vision

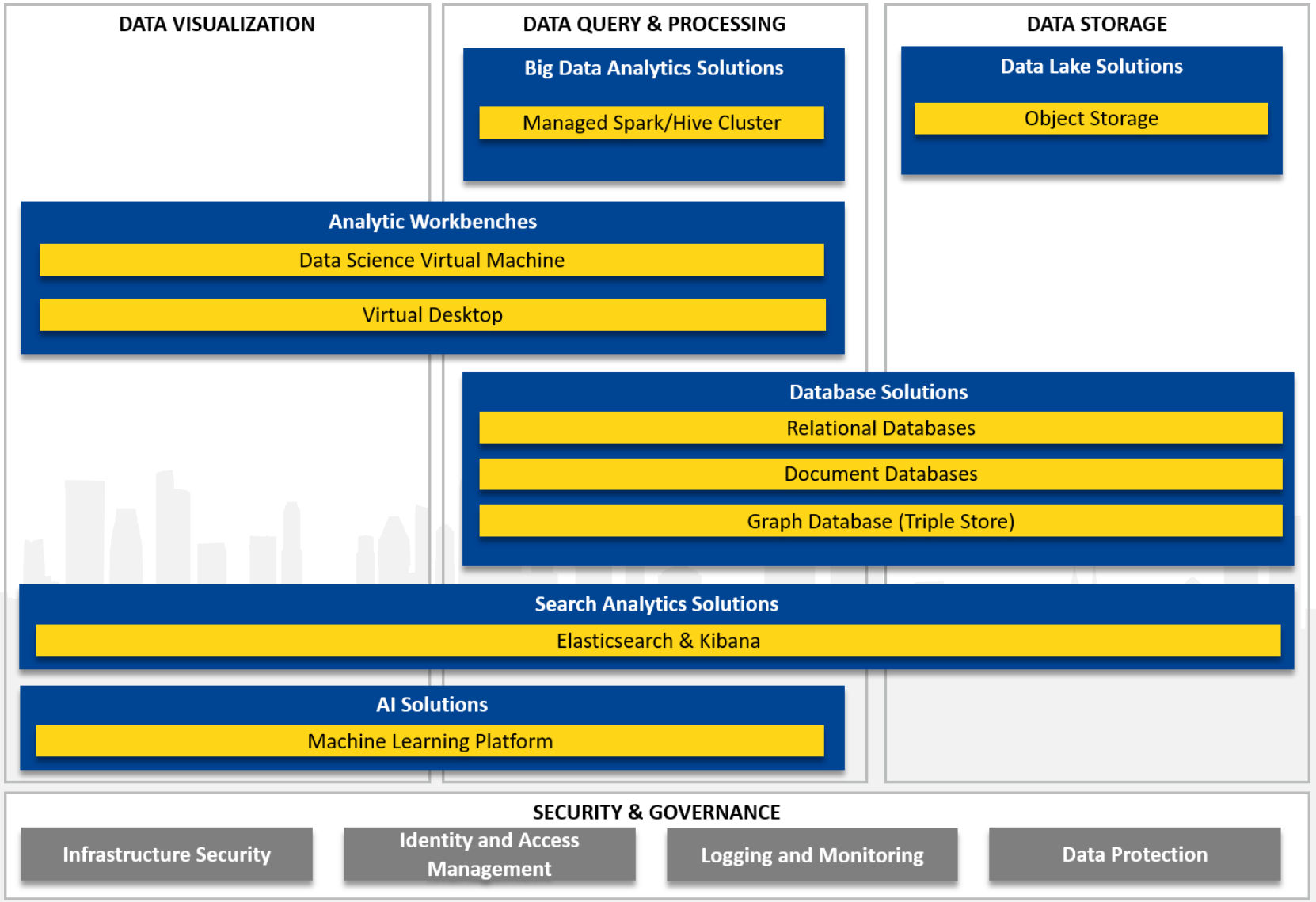
Kasper Rutten

Cloud Engineer

BDTI Team

CEF Digital
Connecting Europe

General BDTI service offering



Analytic Workbenches

An analytics workbench empowers users with the ability to autonomously produce and publish insights, mainly through self-service data preparation and visual data discovery tools.

Data Science Virtual Machine

Connect to a full-featured Ubuntu 18.04 LTS Desktop environment through your browser. Jupyter notebooks, RStudio Server or a Terminal session can be accessed securely from your browser.

- Use DSVM as your Analytics Workbench, perform ad-hoc analysis with Jupyter notebooks or RStudio.
- Access data from Database & Data Lake solutions
- Store processed data from Database & Data Lake solutions
- Visualize analysis with Jupyter or Rstudio
- Execute jobs on Spark/Hive cluster with Jupyter sparkmagic kernels

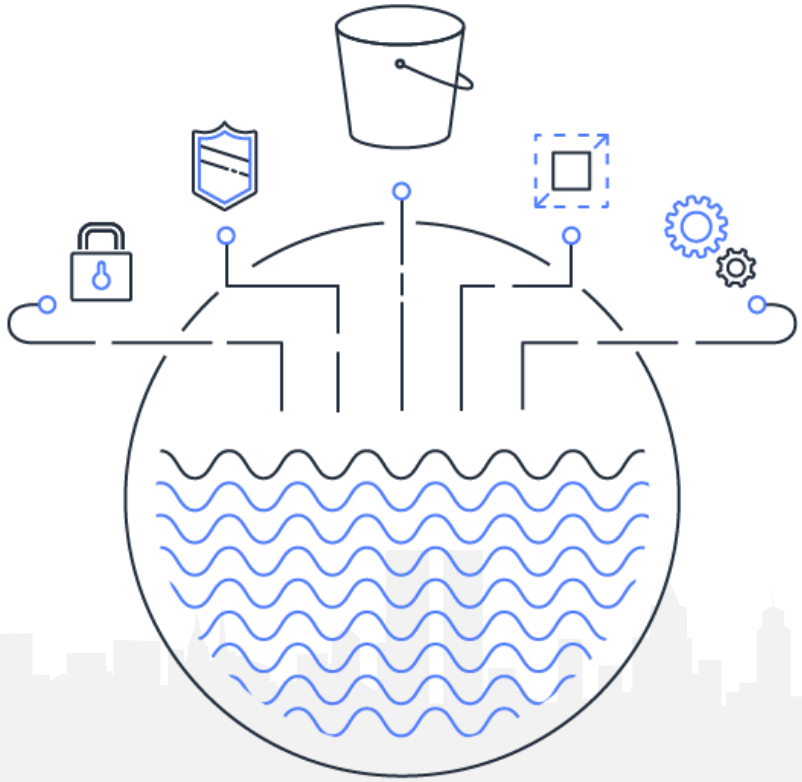
Virtual Desktop

Connect to a full-featured Windows Desktop environment through a remote client. Jupyter notebooks, Rstudio, KNIME Analytics, Anaconda are available and can be used for processing, analyzing and visualizing data.

- Use Virtual Desktop as your Analytics Workbench, perform ad-hoc analysis with Jupyter notebooks, KNIME Analytics or RStudio.
- Access data from Database & Data Lake solutions
- Store processed data from Database & Data Lake solutions
- Visualize analysis with Jupyter, Rstudio or your favorite plotting library.

Data Lake Solutions

A Data Lake is a repository of data stored in its raw format. It is the main starting place for self-service analytics. Typically Data Lakes store large volumes of information, classified as Big Data.



Object Storage

Amazon S3 is an object storage solution that stores objects up to 5 TB in buckets. In your pilot you can upload data to your S3 bucket(s) and structure them accordingly in folders and subfolders. You can upload as many objects as you want in Amazon S3, storage capacity will automatically scale.

- Use object storage as your primary storage for raw data (data lake solution)
- Starting point for big data analytics
- Access object storage from other BDTI resources such as a Data Science Virtual Machine or Spark/Hive Cluster

Big Data Analytics Solutions

Analyzing large data sets requires significant compute capacity that can vary in size based on the amount of input data and the type of analysis. Specialized tooling is therefore also necessary.

Managed Spark/Hive Cluster

Using open source tools such as Apache Spark and Apache Hive coupled with Object Storage enables performing big data analytics on vast amounts of data.

A Spark/Hive cluster is implemented with Amazon EMR which allows leveraing EMRFS, an S3 interface for Hadoop workloads.

- Perform big data analytics on large amounts of data
- Leverages the Hadoop ecosystem, an open source framework for distributed processing and big data analytics
- Execute Spark and Hive jobs on HDFS or Object Storage (Amazon S3)
- Leverage the Spark API for advanced analytics and processing
- Leverage Hive for Big Data warehousing

Database Solutions

Database systems are the most well-known and standardized solutions for data storage and querying. Different flavors are available depending on the use case.

Relational Database

Uses open source relational databases such as MySQL and Postgres.

Relational databases are implemented with Amazon RDS.

- Perfect fit for most transactional and analytical processing (OLTP & OLAP cases)
- Perform flexible SQL queries to extract and store data
- Can be scaled depending on the needs

Document Store

Leverage the NoSQL paradigm to store data as a collection of documents to allow further scaling of your data storage solution.

Document stores are implemented with Amazon DocumentDB.

- NoSQL solution, does not comply with the ACID constraints to allow better performance and scaling for specific use cases.
- Stores data as a colletion of documents.
- Query data with a Mongo-compatible API.

Search & Analytics Solutions

Search & Analytics solutions provide users with the ability to perform search queries on large amounts of text documents and in addition analyze its content.

Elasticsearch & Kibana

Use an open source search engine to perform text search and analytics on large collections of documents. Visualize insights with Kibana.

Elasticsearch & Kibana is implemented with Amazon Elasticsearch Service

- Search and analytics engine for performing real-time search in text-based data.
- Graphical user interface for visualization and querying (Kibana)
- Operational analytics (log analysis).

AI Solutions

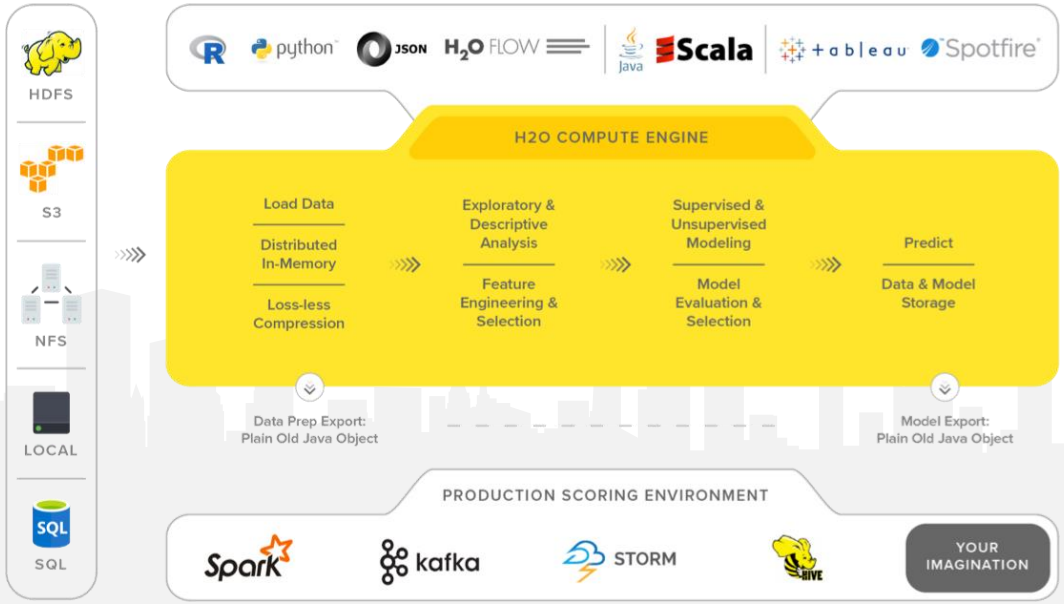
AI Solutions are specialized tools and frameworks to provide users with the ability to develop and publish artificial intelligence in the form of Natural Language Processing, Machine Learning, Data Mining and Predictive Modeling.

Machine Learning Platform (h2o.ai)

Use an easy-to-use open source platform to train machine learning models on your data.

Machine Learning Platform is implemented with h2o.ai

- Supports the most widely used statistical & machine learning algorithms (including gradient boosted machines, generalized linear models, deep learning and more).
- Use H2O Flow, an open-source user interface for H2O. It is a web-based interactive environment that allows you to combine code execution, text, mathematics, plots, and rich media in a single document



BDTI Security & Governance

Infrastructure Security

BDTI takes care of all operational aspects regarding infrastructure security (network security, disaster recovery, maintenance, ...)

Identity & Access Management

BDTI offers a managed centralized solution for identity and access management. Users can access all resources of their pilot through one BDTI account.

Logging & Monitoring

BDTI monitors all pilots for incidents and has logging in place for auditing and traceability.

Data Protection

BDTI protects all data that is being stored and processed in pilot environments.

All access needs to be authenticated and authorized. Data is encrypted in-transit and at-rest.

BDT pilots are deployed in Ireland.

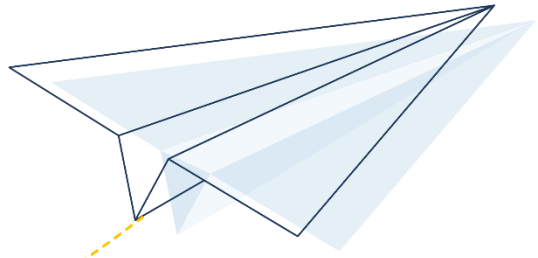
Q&A time

15 min

Ready to get started?

Reach out to us to learn more!

Visit us at https://ec.europa.eu/cefdigital/



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