SOBIGDATA
RESEARCH INFRASTRUCTURE

Development of a Proof of Concept (PoC) for Data-Driven Decision Making in Sustainable Construction and Resource Optimization

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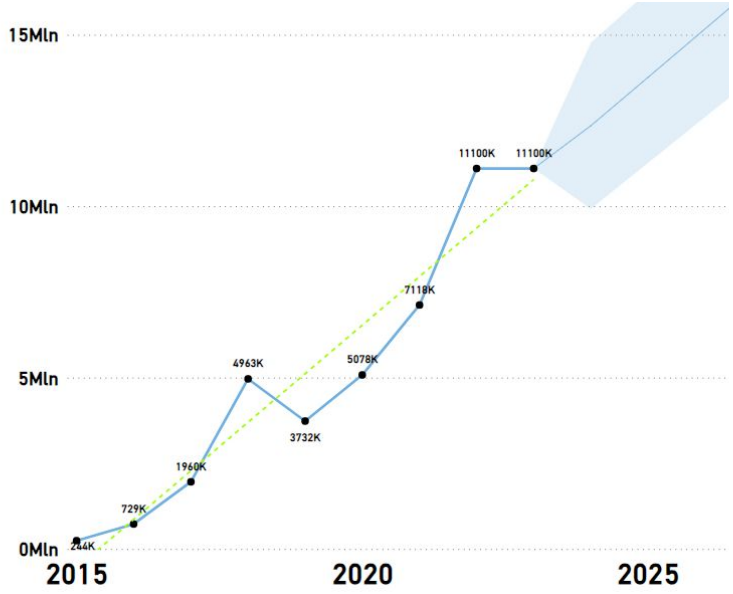
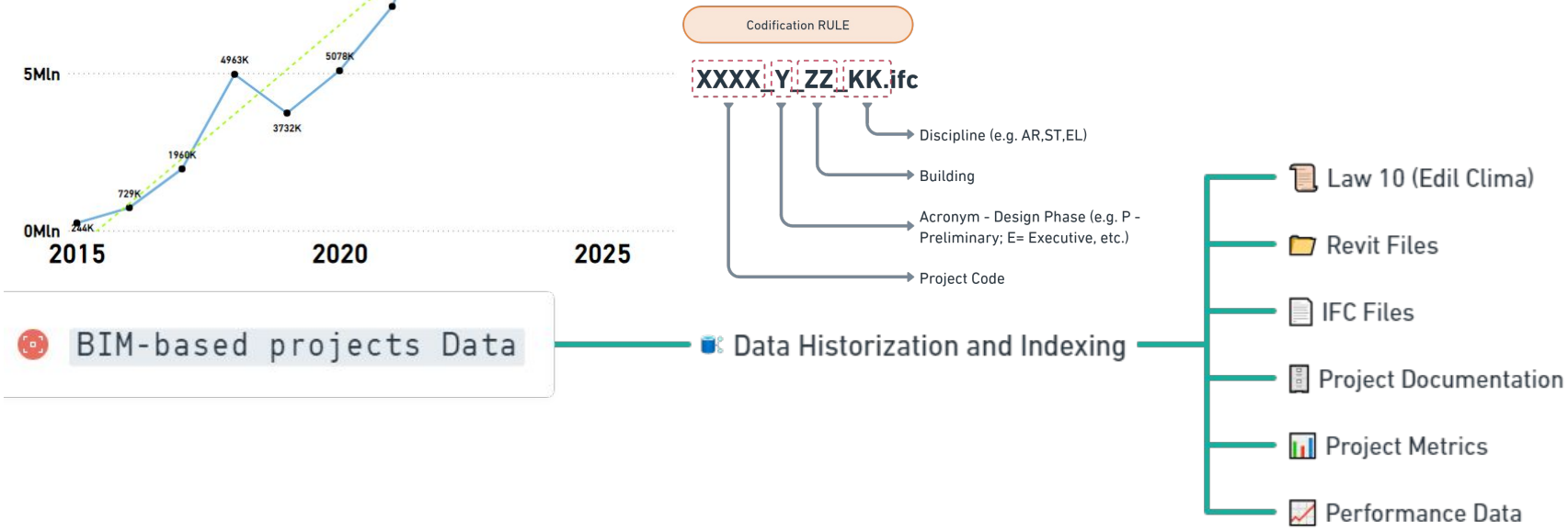
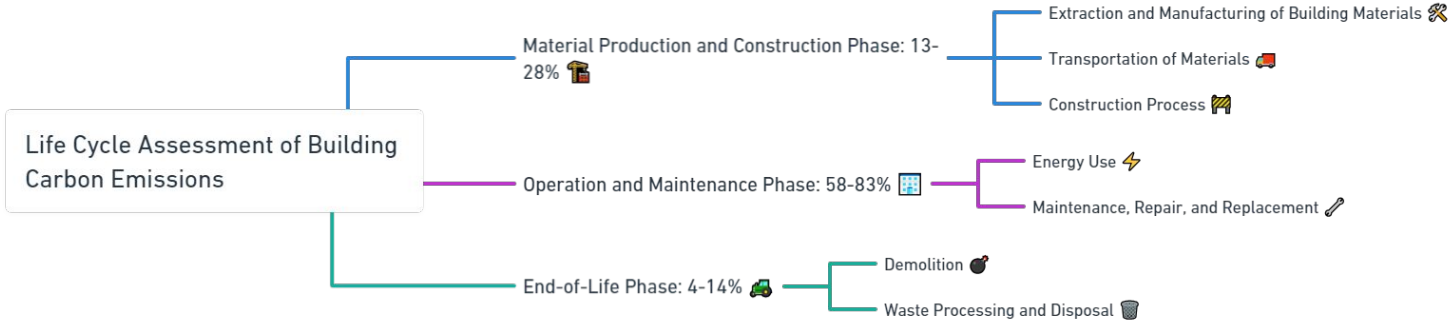
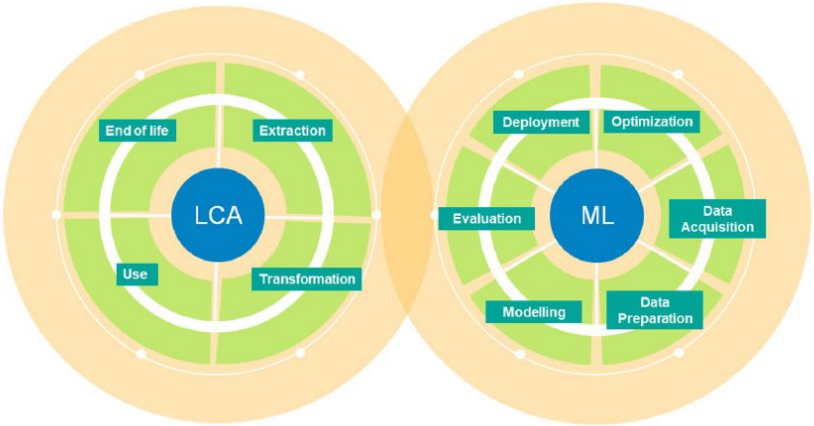
Consiglio Nazionale delle Ricerche
Area della Ricerca di Pisa



ATI Server Data - From 2015 to present, the growth has been steady and unstoppable. Our forecasting tool predicts a fascinating projection for the future.



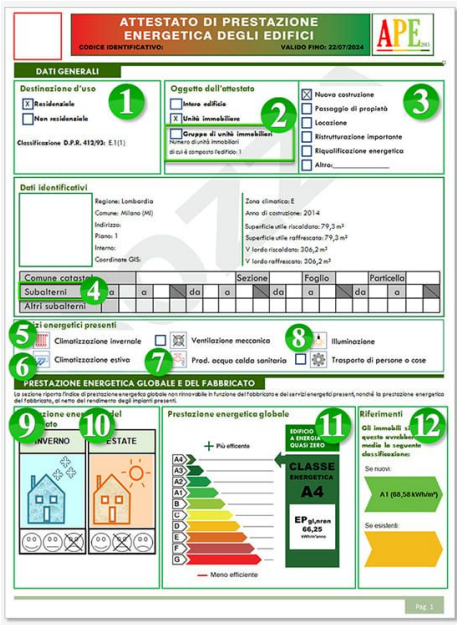


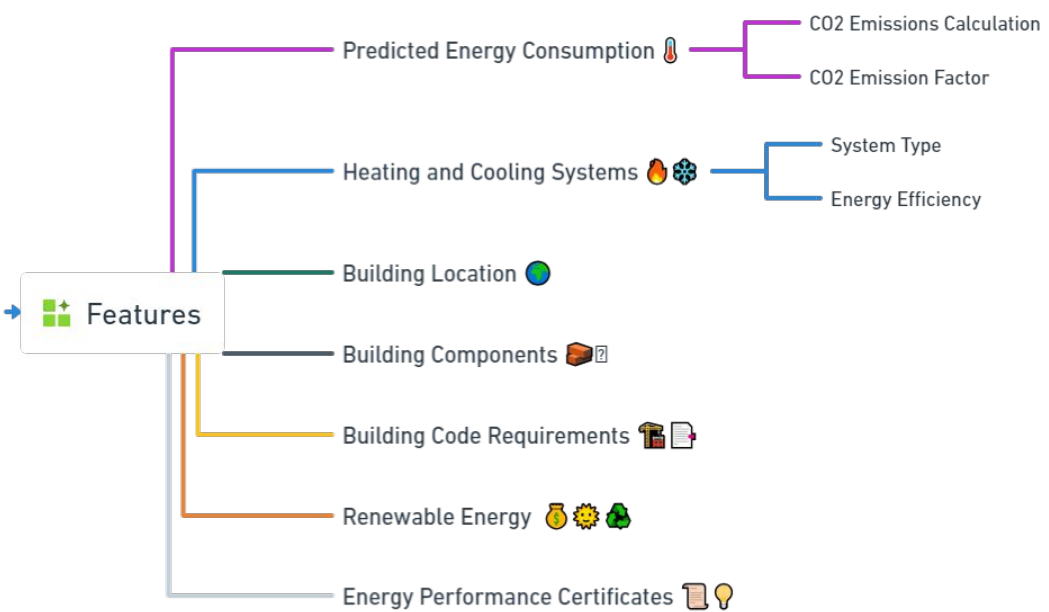


Problem definition - Identification of the ML problem in terms of output(s) of interest and relevant input features.

Data-Driven Decision - In the context of our project, we can leverage ML methods to analyze the BIM data and other relevant data sources. This can help us to more accurately assess the environmental impacts of different construction practices and materials, thereby informing sustainable decision-making.

Data collection - The training dataset has been prepared by parsing pdf and ifc documents and integrating national open data (ENEA).





IFC4.3.2.0 Documentation

XXXX_ProjectName

XXXX_Y_ZZ_AR.ifc

XXXX_Y_ZZ_AR.xls

XXXX_Y_ZZ_ST.ifc

XXXX_Y_ZZ_ST.xls

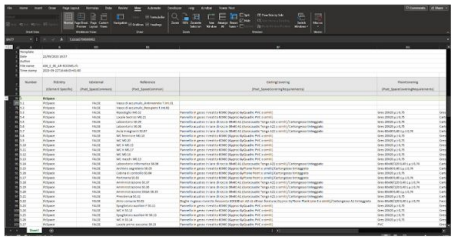
XXXX_Y_ZZ_AR-ROOMS.ifc

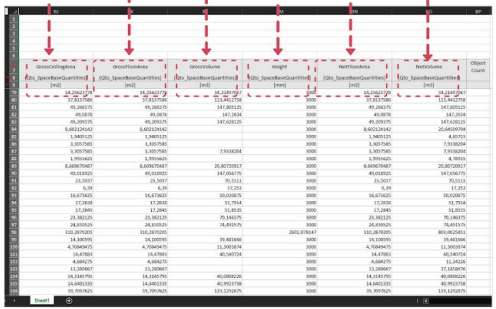
Exported

IfcSpace

5.4.3.64 IfcSpace - IFC4.3.2.0 Documentation

XXXX_Y_ZZ_AR-ROOMS.xls



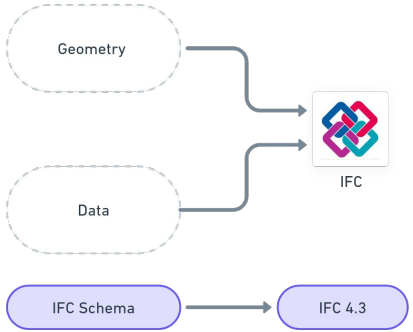


Qto_SpaceBaseQuantities

Base quantities that are common to the definition of all occurrences of spaces.

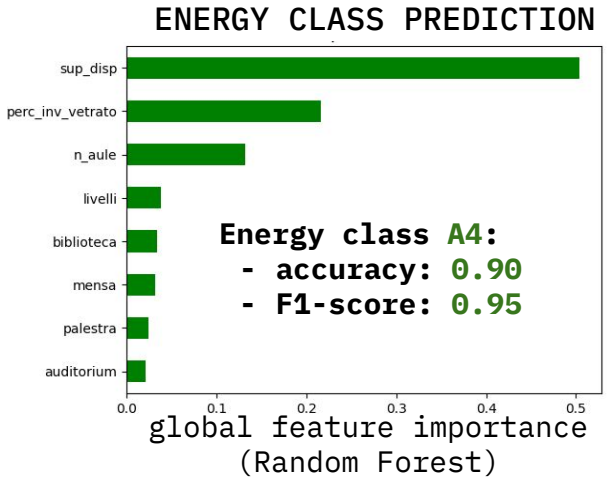
ifc43-docs.standards.buildingsmart.org/IFC/RELEASE/IFC4x3/HTML/lexical/Qto_SpaceBaseQu

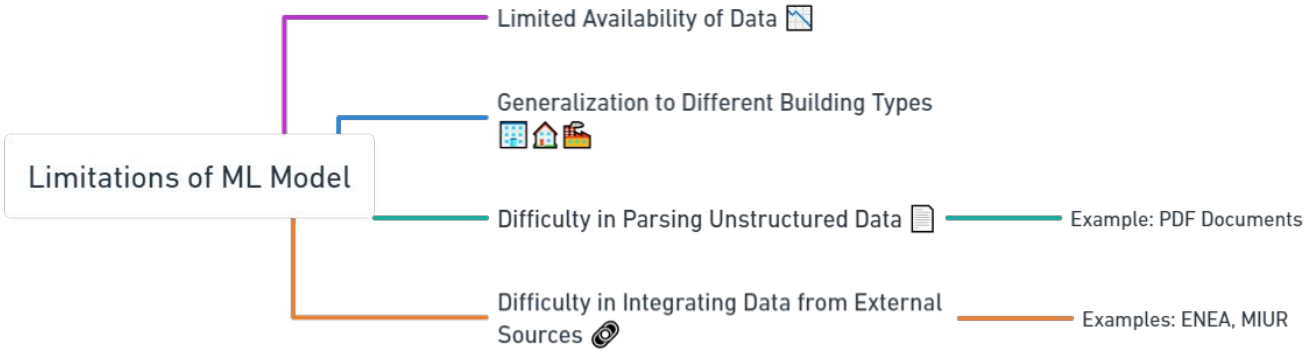
Name	Data Type	Description
Height	IfcQuantityLength	Characteristic height Total height (from base slab without flooring to ceiling without suspended ceiling) for this space (measured from top of slab below to bottom of slab above). To be provided only if the space has a constant height.
FinishCeilingHeight	IfcQuantityLength	Height of the suspended ceiling (from top of flooring to the bottom of the suspended ceiling). To be provided only if the space has a suspended ceiling with constant height.
FinishFloorHeight	IfcQuantityLength	Height of the flooring (from base slab without flooring to the flooring height). To be provided only if the space has a constant flooring height.
GrossPerimeter	IfcQuantityLength	Gross perimeter at the outer contour of the object. Measured at floor level with all sides of the space, including those parts of the perimeter that are created by virtual boundaries and openings (like doors).
NetPerimeter	IfcQuantityLength	Net perimeter at the floor level of this space. It excludes those parts of the perimeter that are created by by virtual boundaries and openings (like doors). It is the measurement used for skirting boards and may include the perimeter of internal fixed objects like columns.
GrossFloorArea	IfcQuantityArea	Sum of all gross floor areas within the spatial structure element. Includes the area covered by elements inside the space (columns, inner walls, etc.) and excludes the area covered by wall claddings.
NetFloorArea	IfcQuantityArea	Sum of all net usable floor areas. It excludes the area covered by elements inside the space (columns, inner walls, built-in's etc.), slab openings, or other protruding elements. Varying heights are not taking into account (i.e. no reduction for areas under a minimum headroom).
GrossWallArea	IfcQuantityArea	Sum of all wall (and other vertically bounding elements, like columns) areas bounded by the space. It includes the area covered by elements inside the wall area (doors, windows, other openings, etc.).
NetWallArea	IfcQuantityArea	Sum of all wall (and other vertically bounding elements, like columns) areas bounded by the space. It excludes the area covered by elements inside the wall area (doors, windows, other openings, etc.).
GrossCeilingArea	IfcQuantityArea	Sum of all ceiling areas of the space. It includes the area covered by elementsinside the space (columns, inner walls, etc.). The ceiling area is the real (and not the projected) area (e.g. in case of sloped ceilings).
NetCeilingArea	IfcQuantityArea	Sum of all ceiling areas of the space. It excludes the area covered by elementsinside the space (columns, inner walls, etc.). The ceiling area is the real (and not the projected) area (e.g. in case of sloped ceilings).
GrossVolume	IfcQuantityVolume	Total gross volume of the object. Openings, recesses, enclosed objects and projections are not taken into account.
NetVolume	IfcQuantityVolume	Total net volume of the object, taking into account possible processing features (cut-out's, etc.) or openings and recesses.



PoC Development: build a ML model for predicting the energy efficiency of a building at its first stages of development.

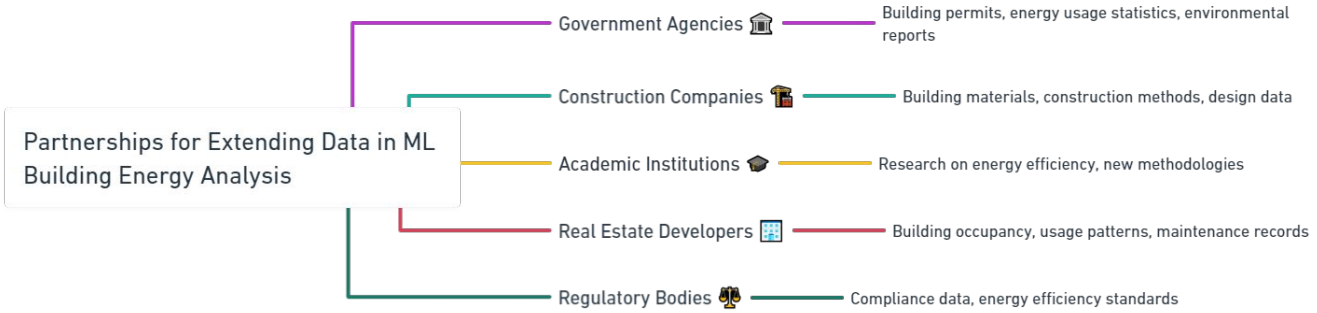
- **Prediction task.** Exploration of viable prediction tasks (i.e., regression vs classification) and respective algorithms.
- **Results.** Feature engineering, assessment of relevant features and feasibility of extracting and computing important energy variables at early stages of design.



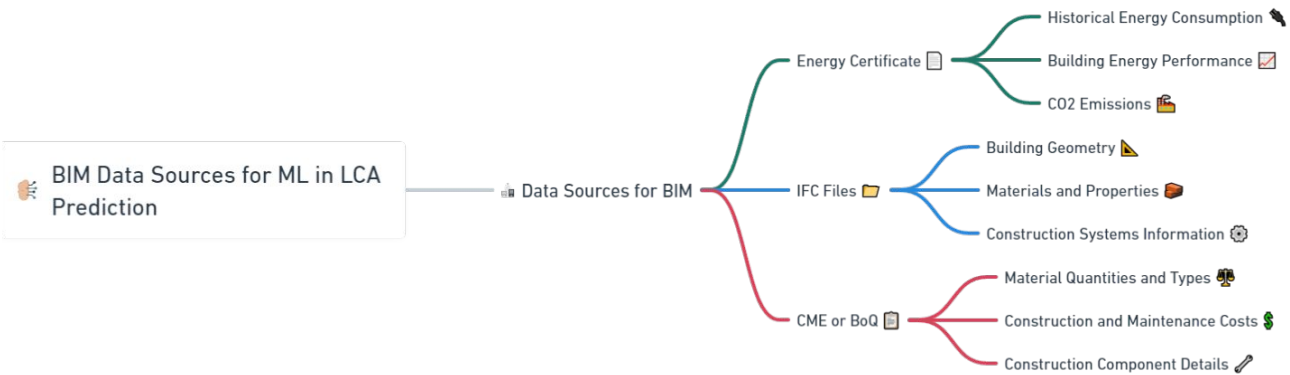


Future development:

- Establishing partnerships with agencies and stakeholders is a strategic approach to extending the data available for an ML model.



- Extend the input features by considering all relevant data associated with building projects



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THANKS FOR YOUR ATTENTION AND SUPPORT!

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