

## Software Lab:



# Let Graph Grow: Explore Web-based BIM Generative Design on Graphs

## Description

This project explores a graph-based approach to web-based BIM generative design, focusing on apartment-scale architectural layouts.

Instead of representing buildings as traditional geometric models, the project models an apartment as a **graph**, where nodes represent building objects (e.g., slabs, walls, doors) and edges are spatial and functional relationships between objects. This graph serves as the central representation for design understanding, reasoning, and generation.

A lightweight web-based BIM environment is built by wrapping the **Chilli3D** API into higher-level **design actions** (e.g., create walls, slabs, and generate openings for doors). These actions enable controlled modification and growth of the building graph.

Rather than prescribing a single generative approach, the project allows students to experiment with different generative models for graph-based design. Students may explore graph neural network (GNN)-related models to learn design patterns from graph representations or alternatively apply large language models (LLMs) to perform generative design directly through prompt-based reasoning over building graphs.

Therefore, the focus is not on model complexity, but 1) exploring using graphs as the data representation for supporting design understanding and generation, 2) BIM design tasks can be completed on your browser in a web-based way rather than heavy desktop applications.

## Task

1. **API Abstraction:** Wrap Chilli3D BIM APIs into reusable, high-level design actions suitable for web-based interaction.
2. **Graph Representation:** Define a graph data model for apartment design, including nodes, edges.
3. **Generative Design:** Explore and implement one or more generative approaches for graph-based design
4. **Prototype & Evaluation:** Implement a simple web-based prototype and demonstrate graph-driven apartment layout generation.

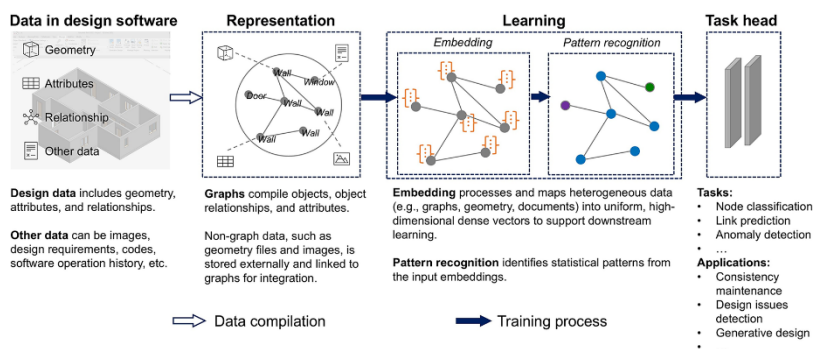
## Supervisor

Zihan Deng, CCBE/TUM GNI, zihan.deng@tum.de

Zijian Wang, CCBE/TUM GNI, zijian.wang@tum.de

## References

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