SpatiaLLM

GEOIT1501

Bridging the Gap Between Natural Language and 3D Scans

Under supervision of:

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Hongyu Ye

Segher ter Braak

Julia Pille

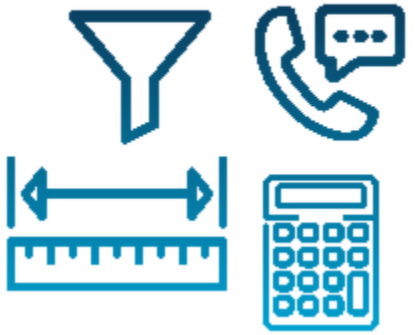
Neelabh Singh

TU Delft

Scanplan

“What does it cost to repaint all the walls in the living room?”

Pictures
3D-scan
BIM-models



“What does it cost to repaint all the walls in the living room?”

SpatiaLLM

The Team

Project manager

Mark van der Meer

Technical manager

Hongyu Ye

Technical manager

Segher ter Braak

Communication manager

Neelabh Singh

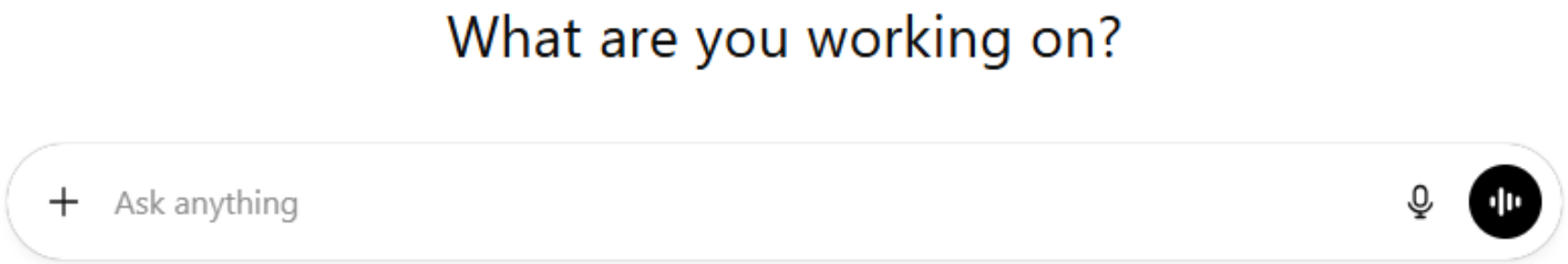
Reporting manager

Julia Pille

Scanplan
pointclouds to data

- **Motto:** Make point cloud data accessible, intelligent, and usable anywhere. Their AI-driven platform stores, classifies, and streamlines raw scans into BIM, simplifying complex 3D workflows.

- **Need:** A chatbot interface so non-experts can get quick, intuitive insights.


What are you working on?
Ask anything

Problem, Summary and Goal

- **Problem:** LLMs can answer questions from an image, showing basic visual understanding, but can they can not yet answer questions directly from 3D scans.

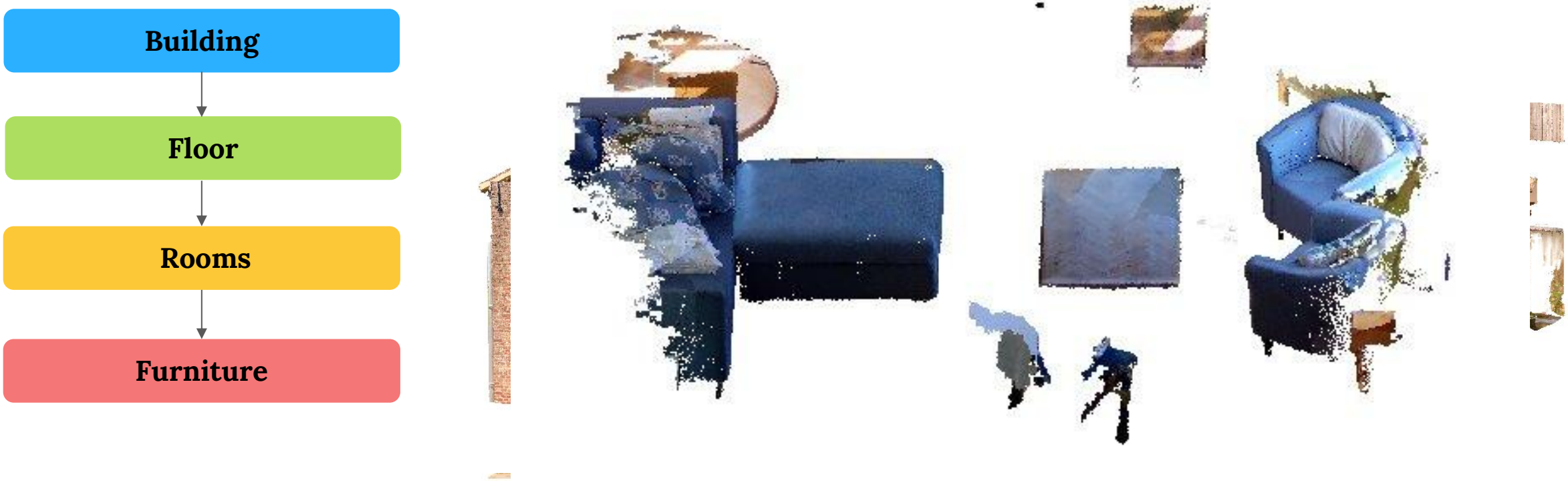
- **Summary:** Develop a chatbot that understands natural-language queries and gives back relevant spatial and visual evidence.

- **Goal:** Bridge human language with spatial-visual reasoning.

Area
Volume
Distance
Color

“What does it cost to repaint all the walls in the living room?”

“It costs … euros to paint all the walls in the living room.”


Building
Floor
Rooms
Furniture

Structural

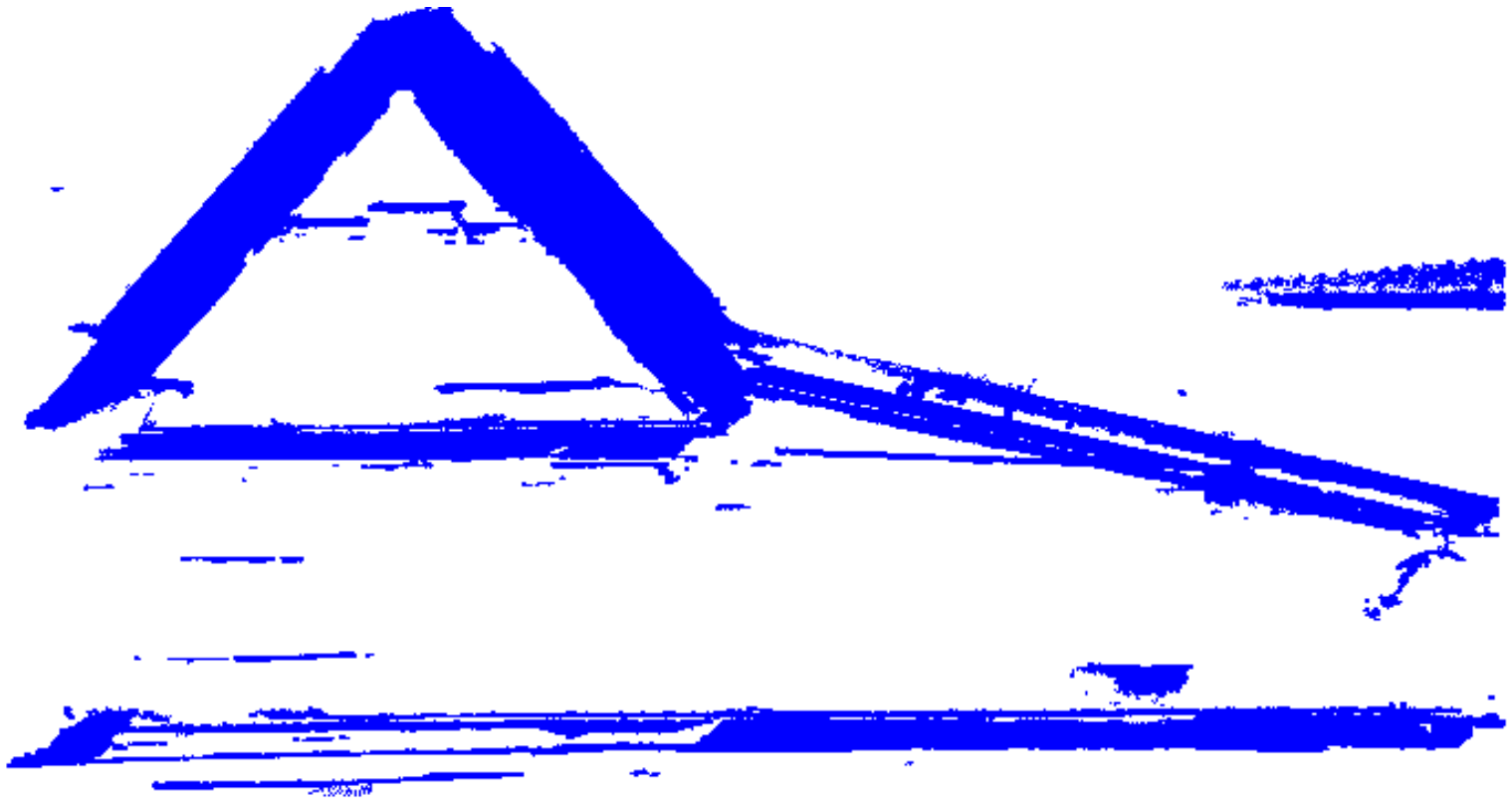
Non-structural

Building

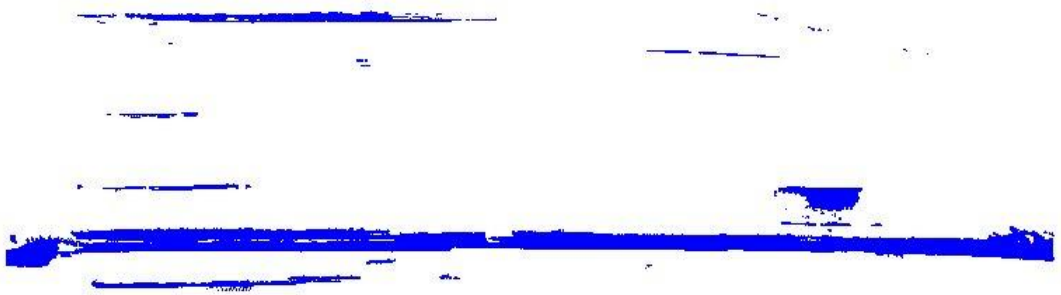
↓

Floor

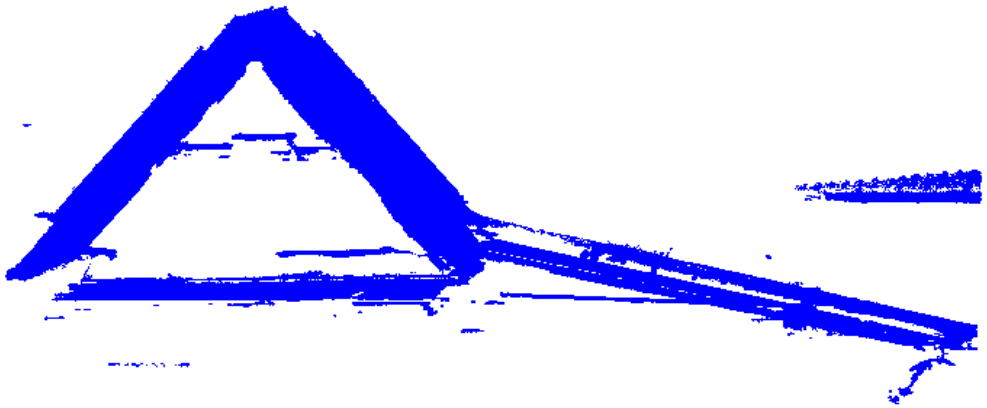
Floor & Ceiling



Floor



Ceiling



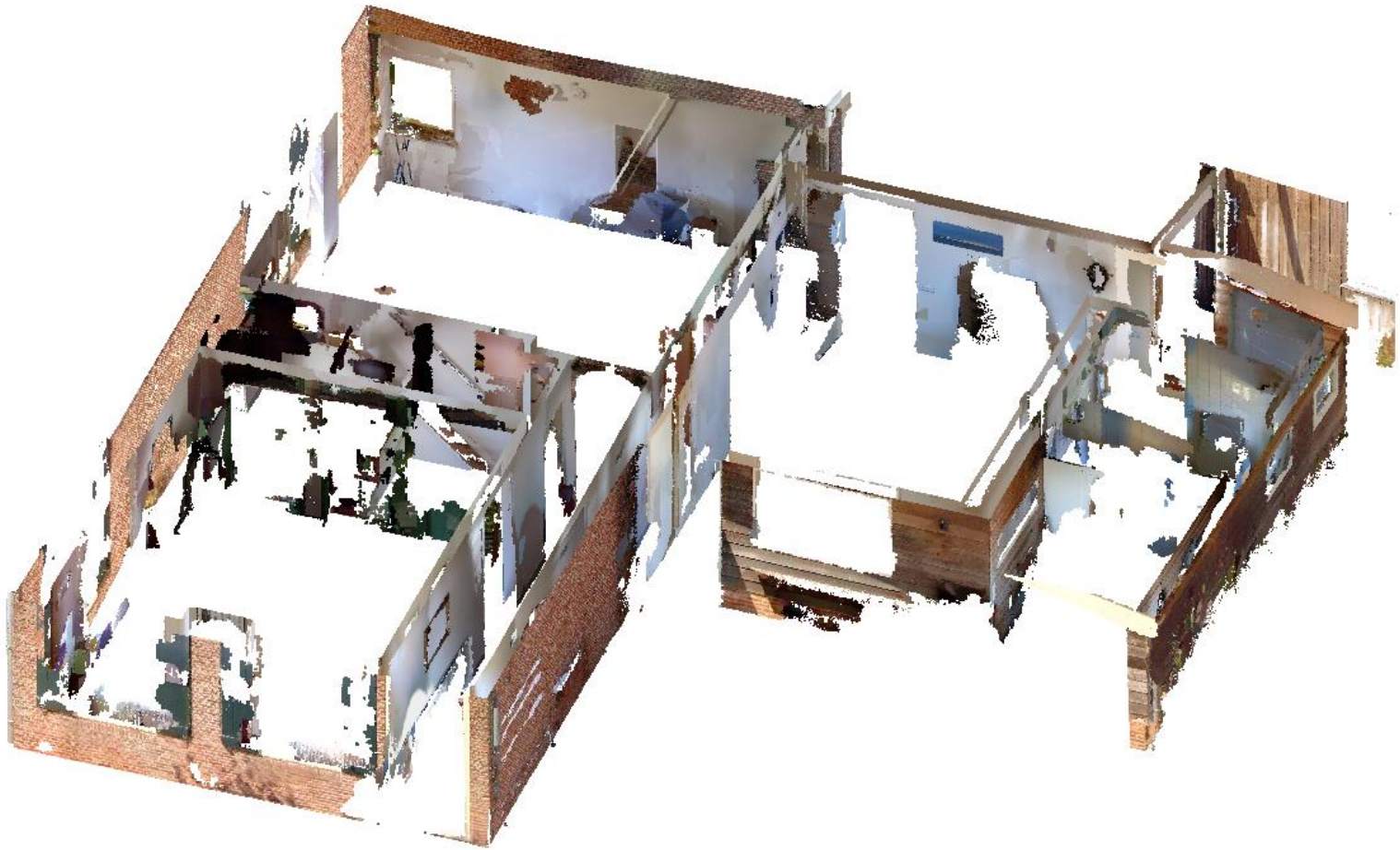
Building

↓

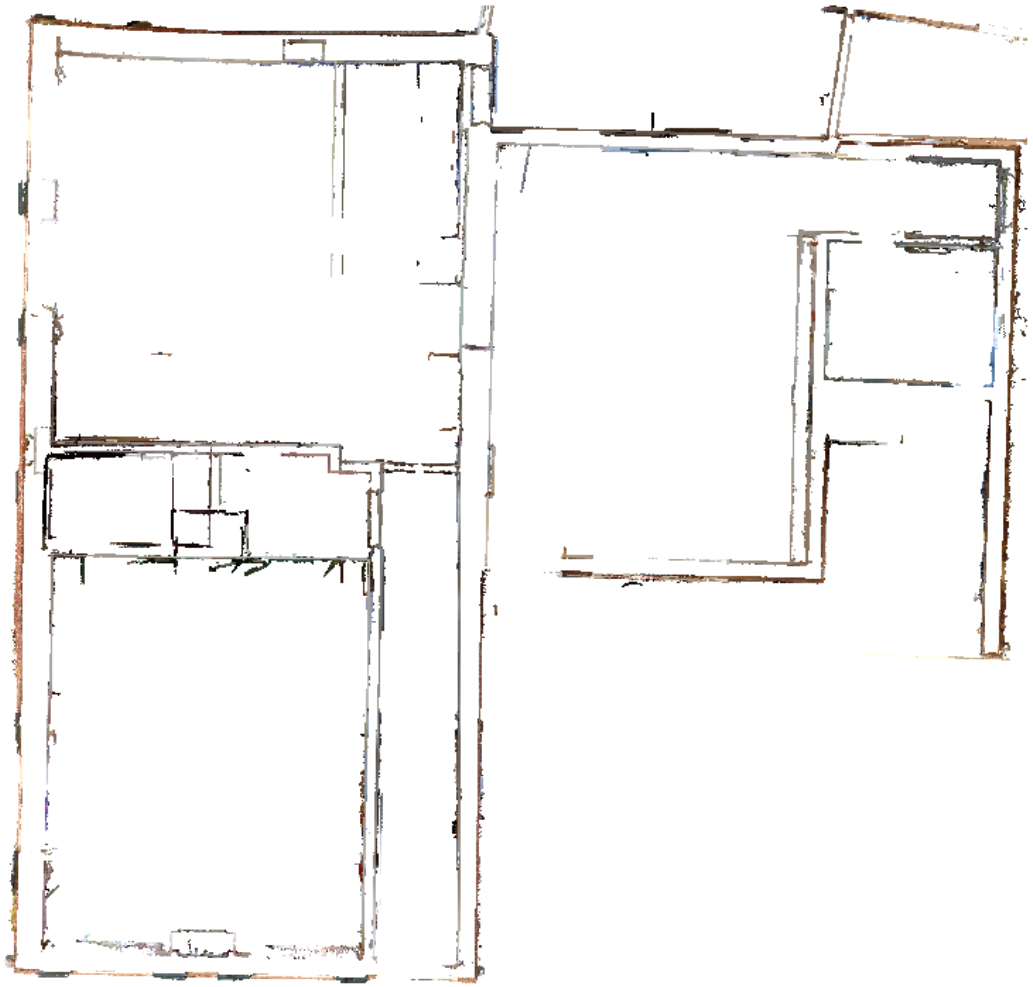
Floor

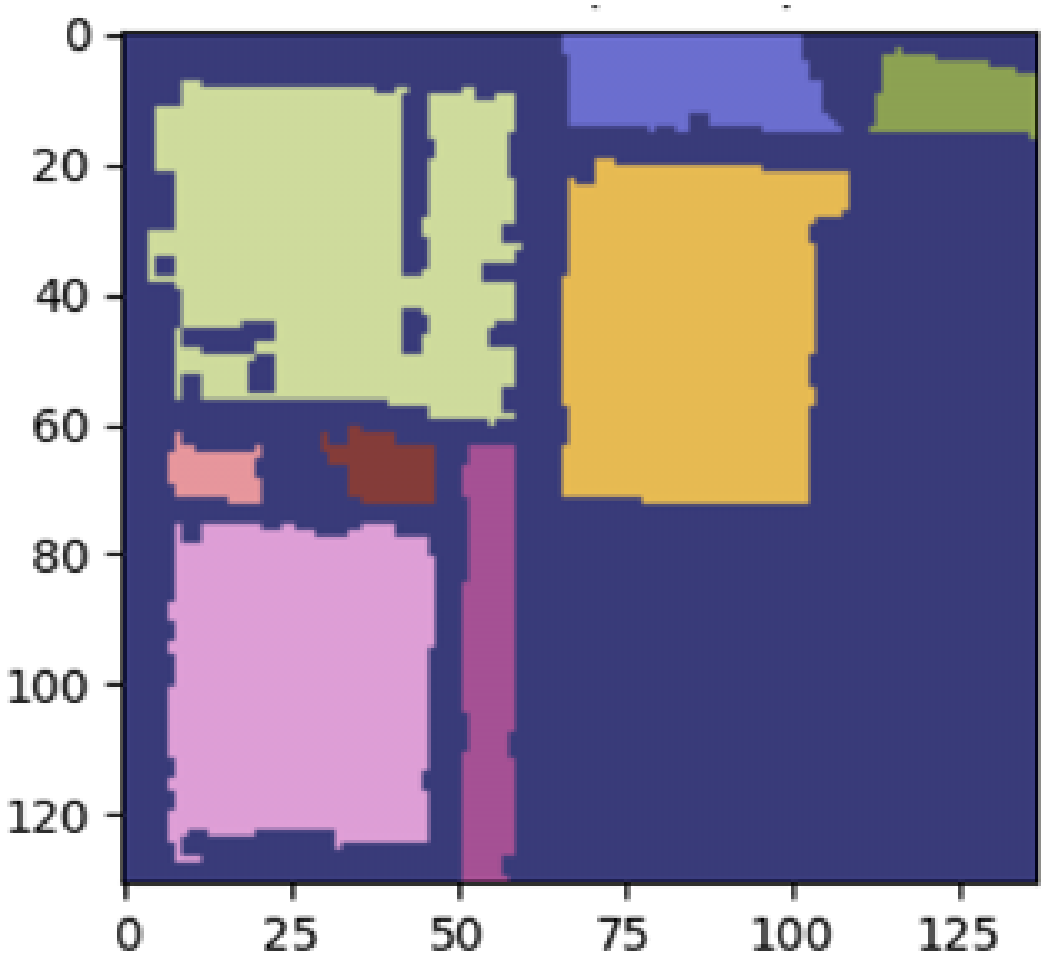
↓

Rooms

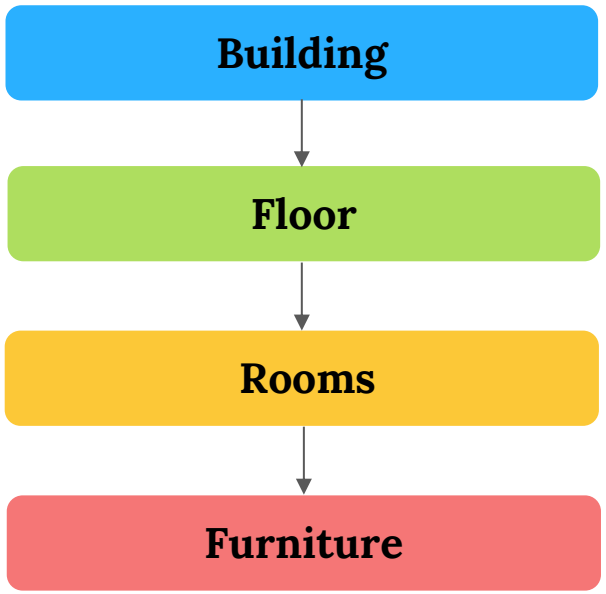


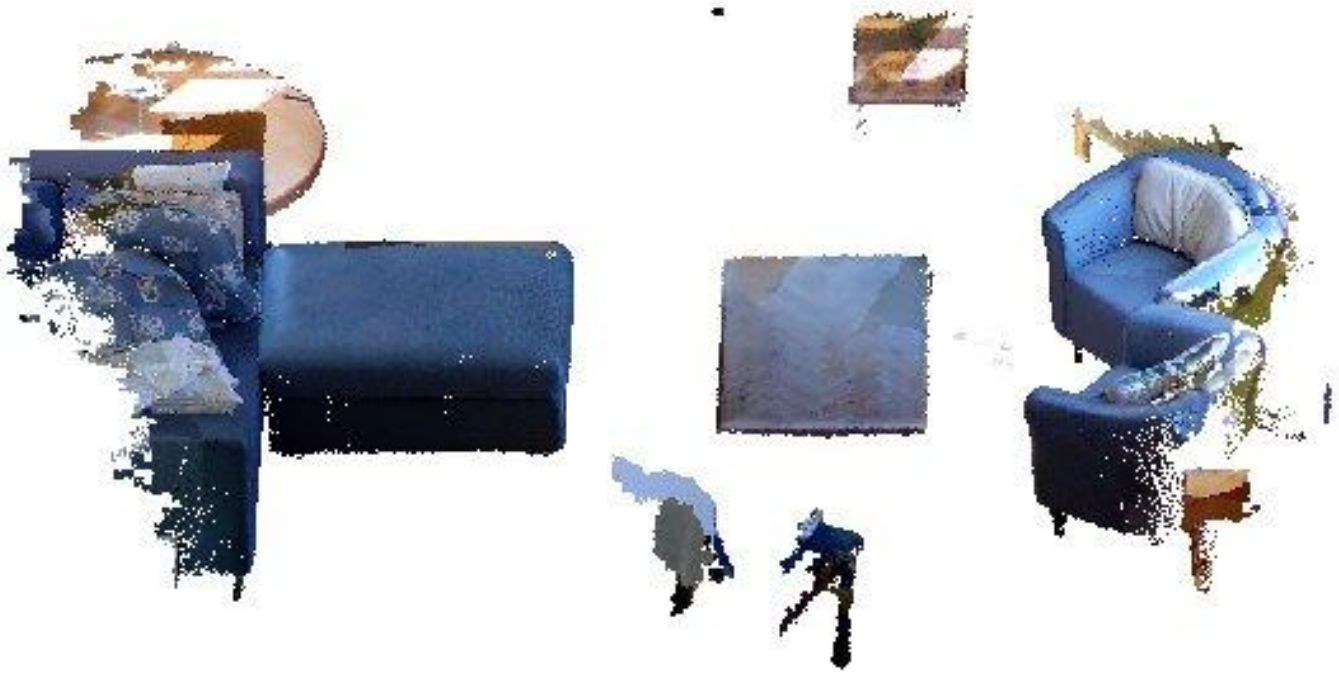
Floor plan





Room reconstruction


Building
Floor
Rooms
Furniture



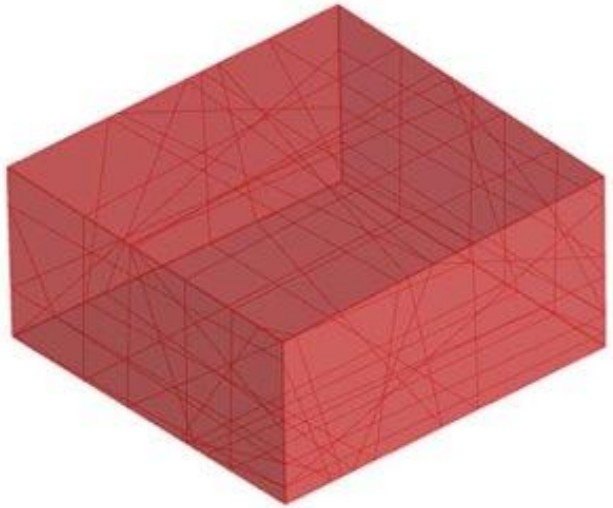
Furniture reconstruction

Clustering

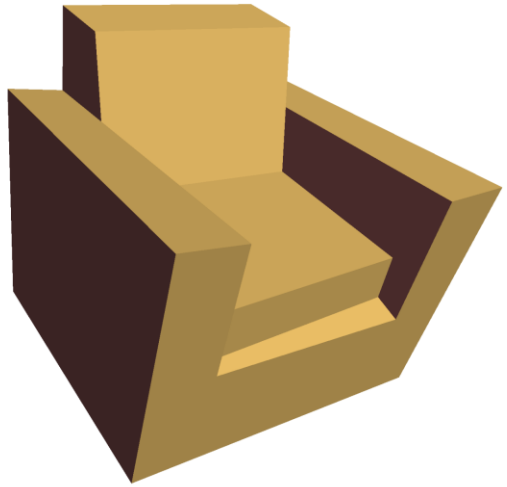
Window_001

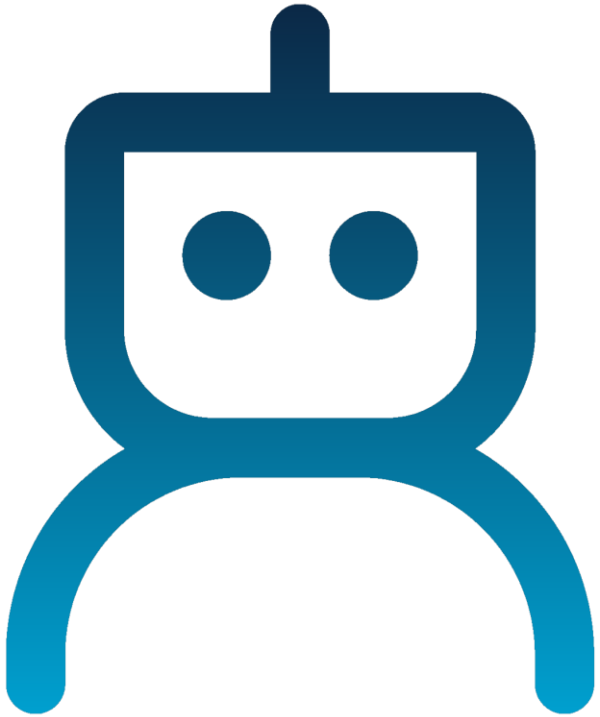
Window_002

PolyFit



Surface reconstruction





Building
Database

Floor
Defines Building Levels

Rooms
Stores rooms data and links to floor

Objects
Stores all 3D objects of a room

Planes
Stores walls, floors and ceiling

Images
Stores panoramas to rooms

Images

Stores panoramas to rooms

Room type = unknown

Get room panorama image

Ask LLM semantic meaning

LLM response: "This is a kitchen"

Room type = kitchen

"What does it cost to repaint all the walls in the living room?"

1. Scope classification

2. Retrieve data from database

3. Use tool functions

4. Augment and generate answer

"It costs ... euros to paint all the walls in the living room"

Images

Stores panoramas to rooms

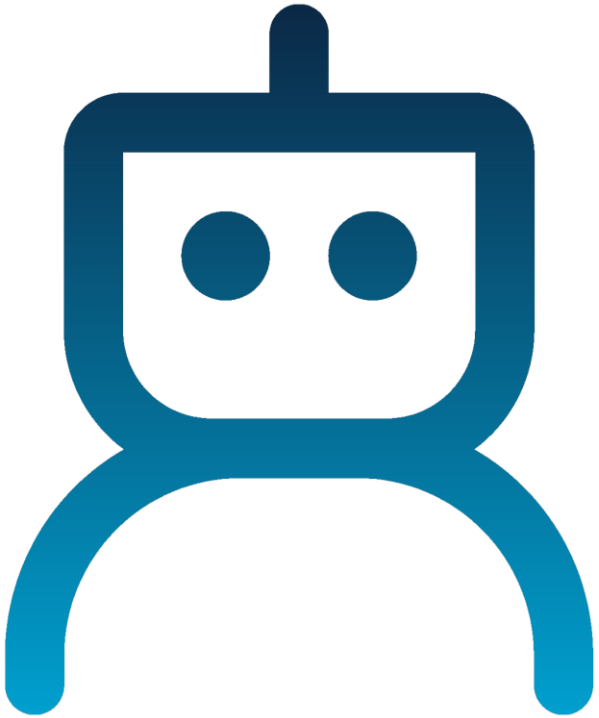
Room type = unknown

Get room panorama image

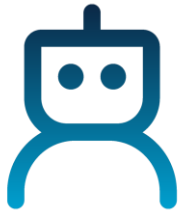
Ask LLM semantic meaning

LLM response: "This is a kitchen"

Room type = kitchen



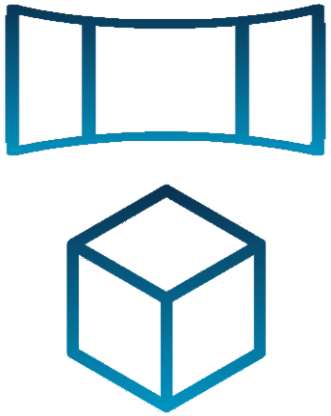
User Interface



Chatbot

Panorama viewer

3D viewer



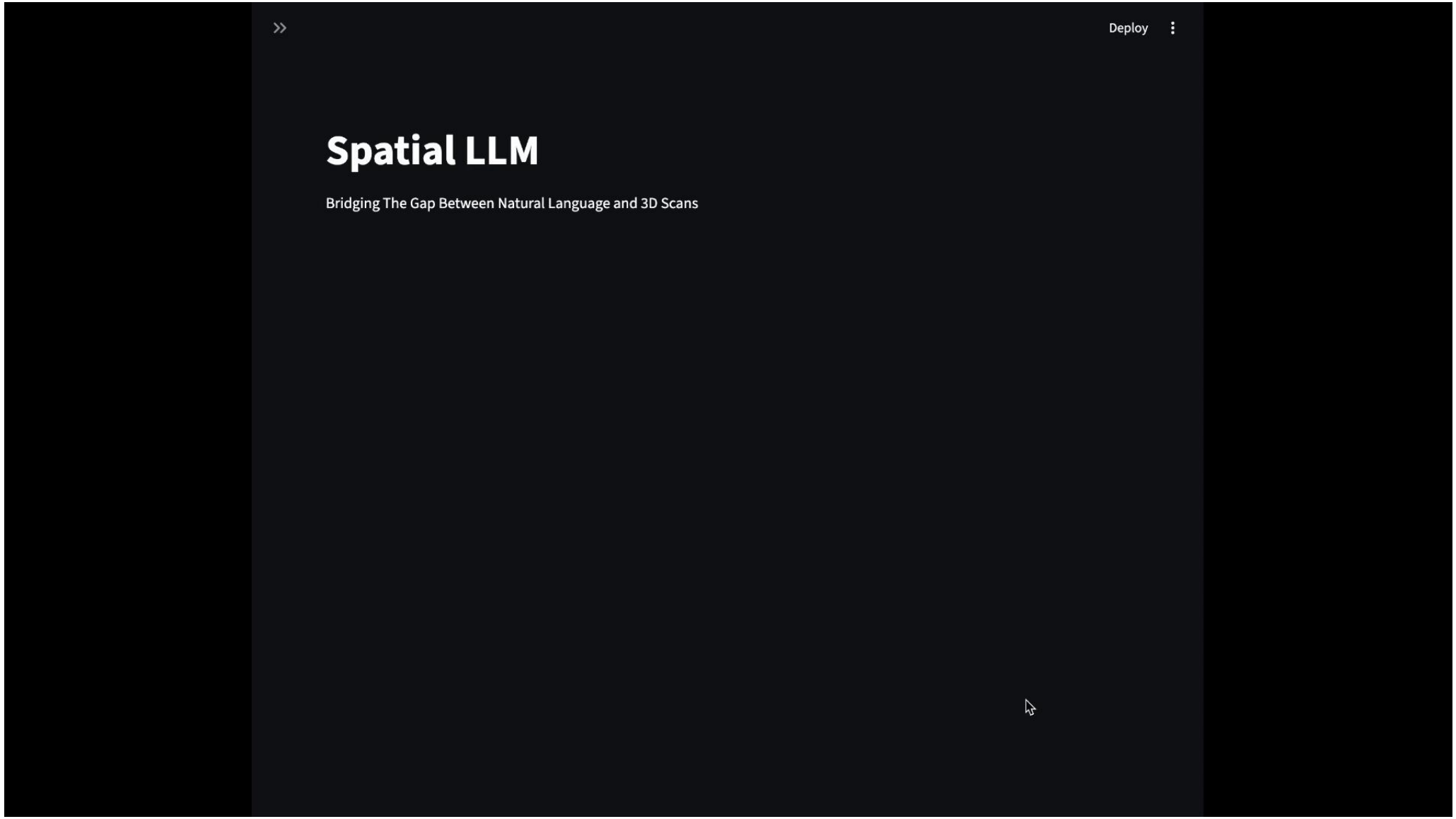
2D-to-3D workflow

2D-to-3D workflow

2D-to-3D workflow

2D-to-3D workflow

2D-to-3D workflow


Deploy
Spatial LLM
Bridging The Gap Between Natural Language and 3D Scans

- Overall structure works as intended.
- Application is not perfect.
- Performance vary between different environments.
- Improve product based on input different stakeholders.
- Hard to verify the accuracy of results from the chatbot.

Bridged some gaps between natural language and spatial reasoning.