

# Computer vision in Interactive Architecture

Locating and identifying furniture elements using computer vision

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Robotic Building | TU Delft

This project presents a new furniture system designed specifically for the TU Delft library, incorporating a range of unique and flexible work and relaxation spaces inside three-dimensional voronoi cells. The orange colored cells are removable and can be placed throughout the library space, offering users a variety of different settings to work and relax in. To reattach the cells to the main structure, their shapes need to be identified. To facilitate this process, we developed an object detection model that uses computer vision to identify and locate the removable cells in real-time.

The model was trained using rendered images, where both the camera position

and the position of all cells was randomized for every training image. We based our model on the YOLOv5 open source model. The YOLOv5 model is a state-of-the-art computer vision system that provides real-time object detection and tracking capabilities. The resulting model is intended to be used by users on their smartphones, enabling them to walk through the library space and use the camera of their phone to identify the removable cells and show the user where they should be placed back into the structure.

We created an accompanying video that shows a realtime preview of the model.

## Structure

One of the structures to be placed in the library, with all cells attached.



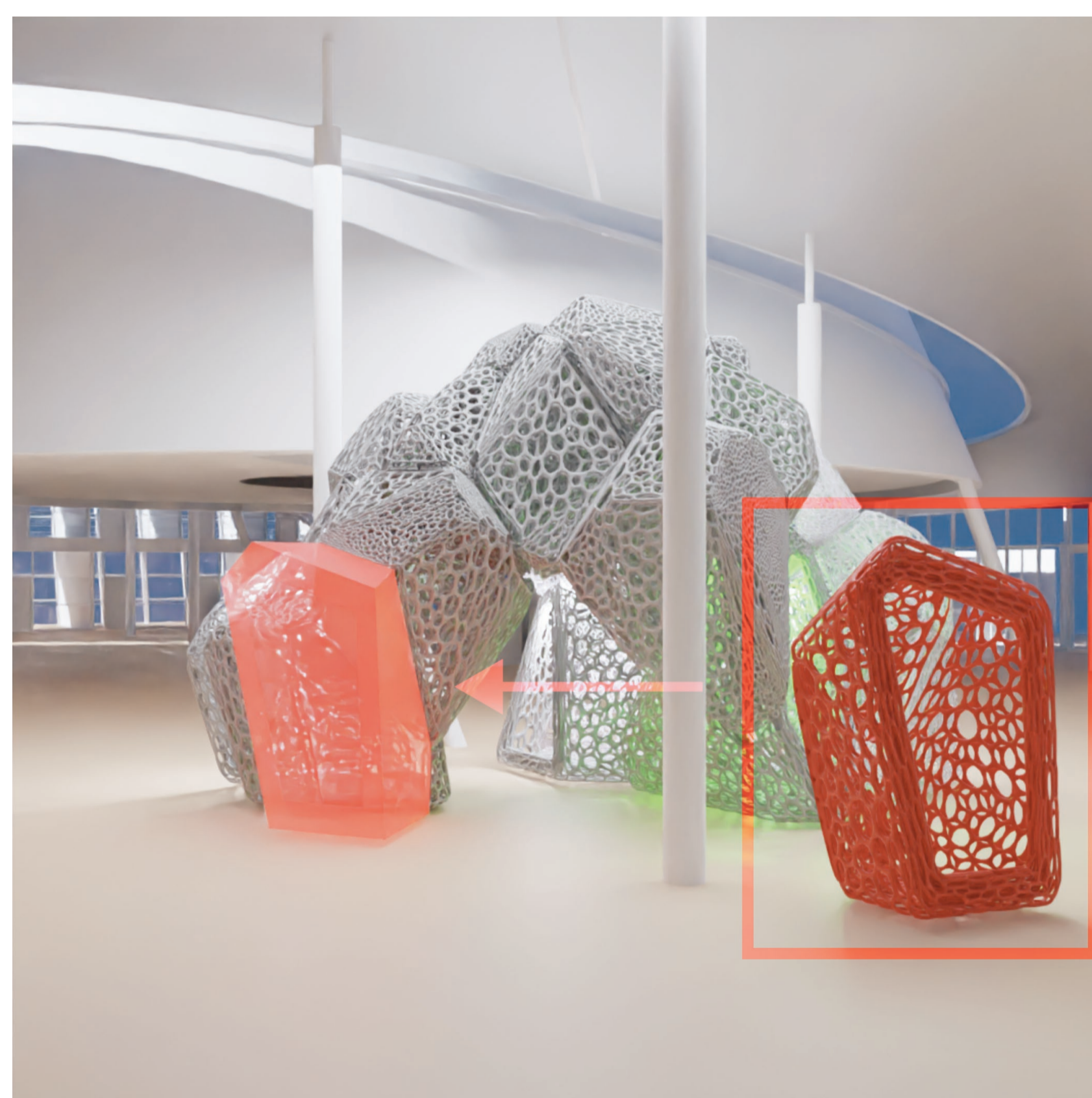
## Detached

Example of detachable cells placed throughout the library space.



## Computer vision

Diagram showing the task of the computer vision model. Identify the cell and show where to place it back.



## Dataset

Examples of training images. Annotated with bounding boxes with color identifying unique cells.

