

# 3D Deep Learning-based Sensor Placement Optimization For Personalized Ageing-in-place

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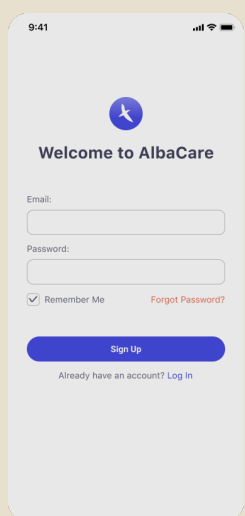
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## Project Objectives:

This project aims to implement a sensor placement optimization model for the self-designed ageing-in-place system. By processing the user-scanned living environment model, key furniture are identified to calculate appropriate position for each type of sensor to maximize their effect.

### System Overview

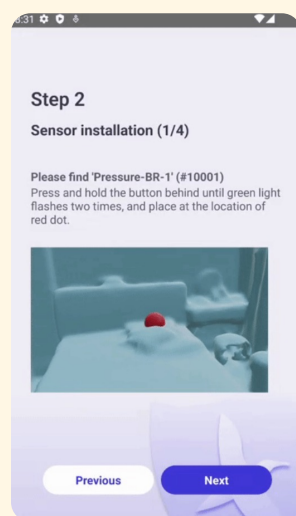
1. Become a user



2. Scan the house



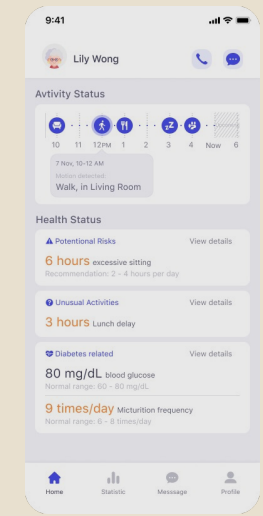
3. Purchase and install sensors following instructions



4. Behaviour data collection from daily activities



5. Check out weekly health report

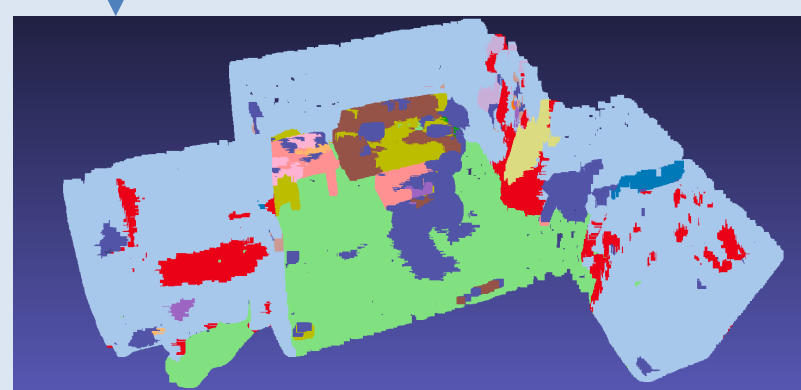
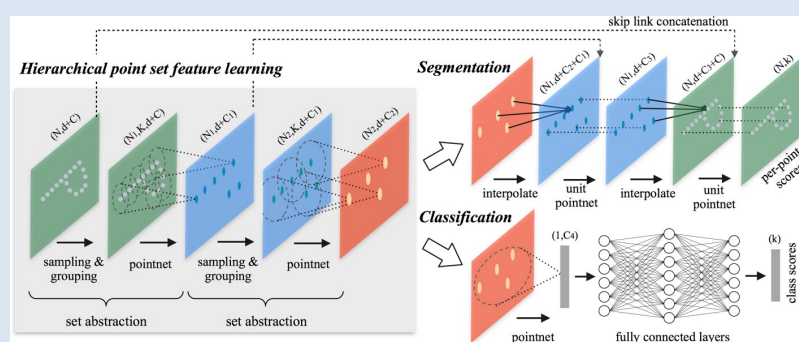


## 3D Semantic Segmentation - PointNet++

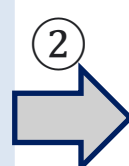


Model generated from video taken by user

PointNet++



Segmented point cloud indicating key furniture



## Sensor Placement

Coverage-based



Passive Infrared sensor (PIR)  
Sensing range: 7m  
Sensing Angle:  $\leq 120^\circ$  cone angle



Location-based

Examples:



Pressure sensor

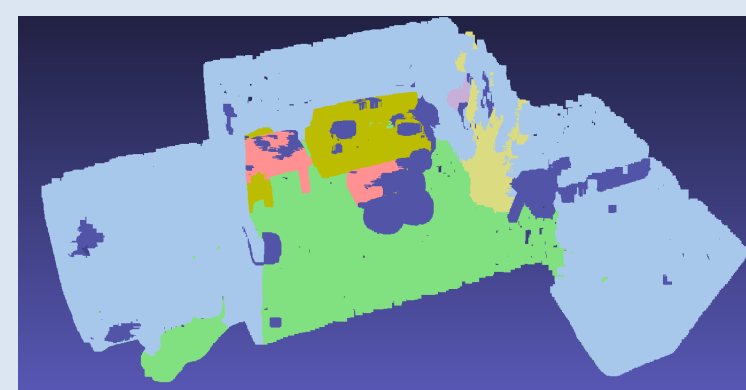


Door Contact sensor

Maximize coverage of that cannot pass through obstacles



## Post-processing – label grouping and DBSCAN



Group similar labels (e.g., table and desk)  
Re-classify or remove outlier clusters