📘 Wall Detection Assignment

Objective

Given a 3D point cloud (`.pcd` file) of an indoor or outdoor scene, your task is to detect vertical planar surfaces (i.e., walls) and visualize the results. This test is designed to evaluate your skills in working with point cloud data, plane segmentation, and geometric reasoning. The aim is to check your understanding of the problem and the approach and effort you take to come up with solutions.

What You'll Be Provided

- A `.pcd` file containing a 3D scan of a scene.
- Any metadata if necessary (e.g., scale or coordinate system information).

🔧 Requirements

You are expected to:

1. **Read** the provided `.pcd` file.
2. **Segment** the point cloud and detect **walls** (vertical planes).
3. **Visualize** the result:
    - Clearly highlight or annotate the detected wall planes.
    - Optionally show bounding boxes, normals, or plane equations.
4. **Output** a cleaned-up `.pcd` or mesh file showing detected walls, or a rendered image/animation.

Deliverables

- A Python script or Jupyter notebook with:
    - Clear steps and code.
    - Comments explaining your logic.
- (Optional) A short README explaining your approach.
- A visualization (static image or 3D viewer code) showing the wall detection result.

Allowed Tools

You can use any of the following libraries:

- Open3D
- PCL (via Python bindings or C++)
- NumPy, Matplotlib
- Any visualization tool (Open3D, Vedo, Matplotlib 3D, etc.)

Estimated Time

2–4 hours