Project F

3D Shape Classification and Reconstruction using Deep Learning

Overview

Understanding and reconstructing 3D shapes from data is a fundamental challenge in fields such as robotics, virtual reality, and computer vision. This project will introduce you to deep learning techniques for 3D shape classification and reconstruction using the ModelNet10 dataset[1], one of the most widely used benchmarks for point cloud analysis. You will develop and evaluate models for object classification and explore methods for reconstructing incomplete 3D shapes from limited or occluded data. By the end of the project, you will have gained hands-on experience in 3D deep learning, understanding the challenges and techniques involved in recognizing and reconstructing 3D objects from partial information.

[1] 3D ShapeNets: A Deep Representation for Volumetric Shapes, https://arxiv.org/abs/1406.5670

Project Objective

Develop and compare deep learning models for 3D shape classification to assess their performance in identifying objects accurately. Furthermore, design a deep learning model capable of completing missing parts of the 3D objects when given incomplete point-cloud data. This can be achieved by deliberately removing sections of the data, or playing around with the views of the object.

Dataset

The ModelNet dataset is widely available from various sources, and in this study, we will focus on its smaller variant, ModelNet10, containing 10 different object classes.
https://3dshapenets.cs.princeton.edu/
https://modelnet.cs.princeton.edu/
https://www.kaggle.com/datasets/balraj98/modelnet10-princeton-3d-object-dataset/data

Data Example: