

AI-Driven Diffusion and LoRA Models for Customizable 3D Room Visualization and Design Enhancement

Guided by

Mersha Spelly C

Presented by

Mohammed Naism.P,

Vijay Martin

Abishik Amal.A

Thanush.S

Abstract

The rapid advancement of Artificial Intelligence (AI) has significantly impacted various domains, including architectural design and 3D visualization. Traditional 3D modeling is often time-consuming and requires technical expertise. This project introduces an AI-powered 3D modeling tool that leverages **diffusion models** and **LoRA (Low-Rank Adaptation) models** to generate highly customizable 3D room designs from user inputs such as text descriptions, sketches, or mood boards.

By integrating AI-driven techniques, this project aims to enhance architectural design efficiency, enabling users to create high-quality room visualizations with minimal effort. Diffusion models generate high-resolution images from noise, while LoRA fine-tunes AI models to personalize and improve design accuracy. This approach not only reduces computational costs but also ensures adaptability to diverse styles and user preferences. The proposed system is expected to revolutionize room visualization and interior design, making it accessible and efficient for architects, designers, and homeowners.

Introduction

Background

Designing and visualizing interior spaces require expertise, creativity, and considerable time investment. Traditional 3D modeling software, such as Blender and AutoCAD, demands extensive manual effort, limiting accessibility to professionals with technical knowledge. With the rise of AI, particularly **diffusion models** and **LoRA**, automated and intuitive room customization is now possible, making high-quality 3D visualization accessible to a broader audience.

Problem Statement

Despite advancements in 3D modeling software, creating detailed and customizable room designs remains a challenge due to:

- The complexity of professional design tools.
- The significant time and effort required for high-quality results.
- The lack of AI-driven automation for design enhancements.

There is a need for an AI-powered solution that simplifies the design process while offering high-quality and realistic room visualizations. By utilizing **diffusion models and LoRA fine-tuning**, this project seeks to bridge the gap between AI-generated content and real-world design needs.

Proposed Solution

This project presents an AI-driven system that:

- Uses **diffusion models** to generate high-quality 3D room visualizations from textual descriptions, sketches, or predefined templates.
- Implements **LoRA fine-tuning** to adapt the model for specific user preferences, improving customization and efficiency.
- Allows users, including architects and interior designers, to rapidly generate, modify, and visualize rooms without extensive manual intervention.

Significance of the Project

The impact of this project extends across various domains:

- **Architectural and Interior Design** – Enhances the efficiency of designers by automating room visualization.
- **User-Friendly AI Design** – Enables individuals with little to no experience in 3D modeling to generate high-quality designs.
- **Customization and Personalization** – Provides AI-powered solutions tailored to user preferences, improving creative workflows.