Interior Design Advisor (IDA)

Final Year Capstone Project Viva Presentation

Department of Computer Science

Project Code: CS-IDA-2025

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- Final Year Capstone Project

Presentation Overview

- Problem Statement & Motivation
- Objectives and Scope
- System Architecture
- Methodology & Design
- Evaluation Strategy
- Challenges & Future Work

Problem Statement

Interior design is becoming increasingly digital, yet non-experts face major challenges:

- Overwhelming design options
- Lack of professional design knowledge
- Difficulty visualizing outcomes
- High cost of traditional interior design services

These issues lead to confusion, decision fatigue, and poor design outcomes.

Motivation

Growing use of AI in design and visualization

Rising demand for affordable and personalized solutions

Opportunity to combine AI, computer vision, and web technologies

Goal to democratize expert-level interior design guidance

Project Objectives

> Design an AI-powered system that analyzes room images and generates personalized interior design recommendations

Key Goals

- Interior style classification
- Color palette extraction
- Furniture and decor recommendations
- User-friendly web interface

Project Scope

- Image-based style classification
- Color extraction and palette generation
- Recommendation logic design
- Database and system architecture

Semester Contribution

1

Work so far!

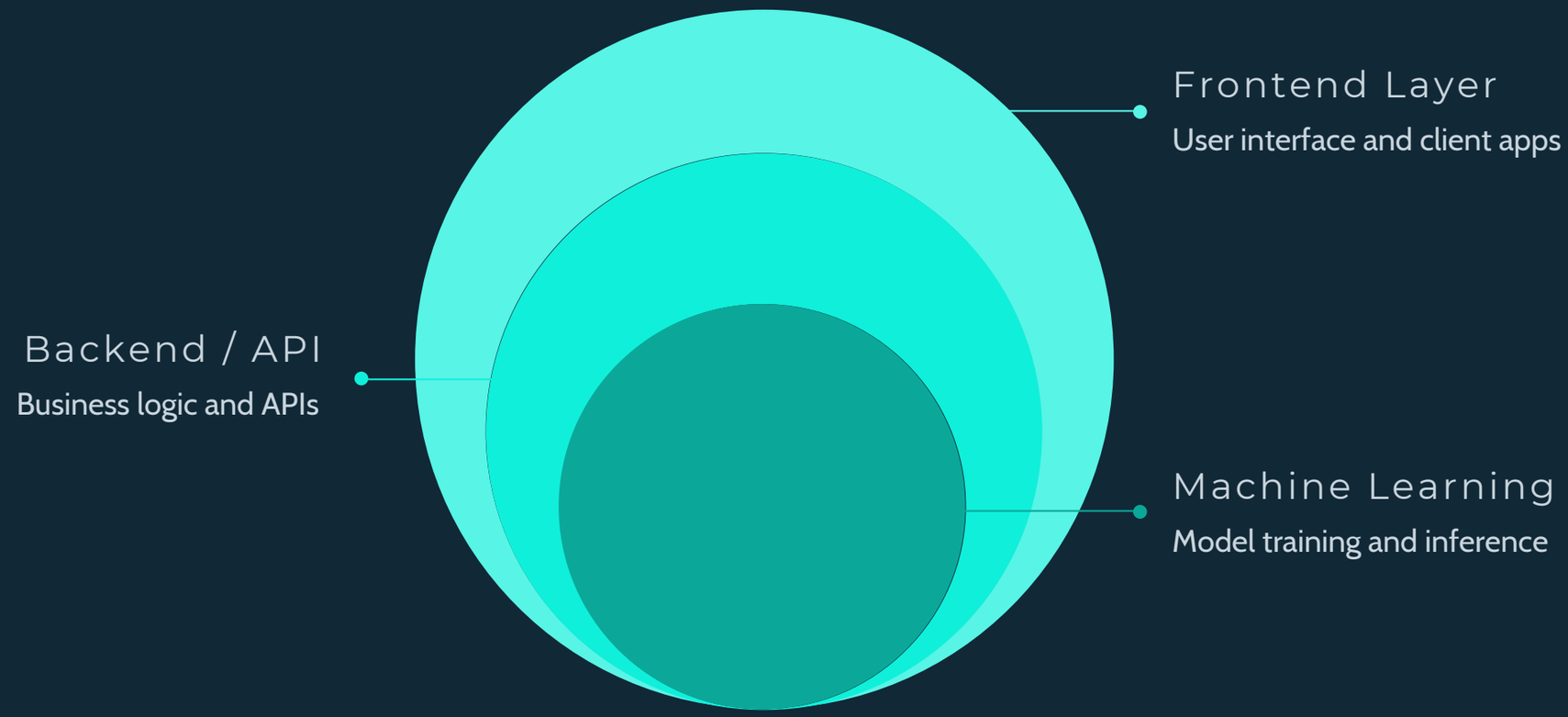
- Problem analysis
- System design and documentation
- Architecture planning
- Model selection and evaluation strategy

2

Next Semester Plan

- Complete software implementation
- Model deployment
- Web application development

System Architecture



- Frontend Layer
- Backend/API Layer
- Machine Learning Engine
- Database Layer

This design ensures scalability, maintainability, and flexibility.

Technology Stack

Frontend	React / Streamlit
Backend	FastAPI
ML Engine	MobileNetV2
Image Processing	OpenCV
Database	SQLite / PostgreSQL

Frontend Design

React

- Component-based architecture
- Suitable for production-level systems
- Rich UI and styling ecosystem

Streamlit

- Rapid prototyping
- Python-based interface
- Ideal for internal testing and demos

Backend Design

FastAPI

- High-performance asynchronous framework
- RESTful API support
- Automatic API documentation
- Seamless integration with ML models and databases

Style Classification Model

MobileNetV2

- Lightweight convolutionalneuralnetwork
- Optimized for fast inference
- Pre-trained on ImageNet
- Supportstransfer learningfornewstyles

Why MobileNetV2

High accuracy with low computational cost

Suitable for real-time applications

Efficient on CPU and edge devices

Scalable for future deployment

Color Extraction Approach

OpenCV-Based Processing

- Conversion ofimages intopixel matrices
- RGB color analysis
- K-means clustering to identify dominant colors
- Color palette generation for design harmony

Image Processing Workflow

1. Image upload
2. Preprocessing (resize, normalization)
3. Style classification
4. Color extraction
5. Recommendation generation

Development Methodology

A structured six-phase approach:

01

Data collection

02

Image preprocessing

03

Style classification

04

Recommendation logic design

05

System architecture development

06

Testing and evaluation

Dataset Strategy

- Publicdatasets(e.g., InteriorNet)
- Web-scraped interior images
- User-contributed images
- Manual labeling by interior style

Data augmentation used to improve robustness.

Evaluation Metrics

- Accuracy
- Precision
- Recall F1-
- Score ROC
- Curve

These metrics ensure balanced and reliable model evaluation.

Model Performance Summary

Metric	Value Range
Accuracy	72395%
Precision	0.7030.85
Recall	0.6630.89
F1-Score	0.6730.85

System Performance

- Imageclassification latency:
  - 0.230.5 seconds (CPU)
  - <0.1 seconds (GPU)
- End-to-end response time under 1 second

Challenges

- Limited labeled datasets for interior styles
- Visual similarity between design styles
- Cultural and regional design variations
- Domain shift in unseen room layouts

Future Enhancements

Augmented Reality for furniture visualization

Virtual Reality design walkthroughs

Emotion-aware design recommendations

Smart home assistant integration

E-commerce product linking

Learning Outcomes

- Application of AI and computer vision
- System architecture and design planning
- Model evaluation and performance analysis
- Real-world problem understanding
- Team-based project coordination

Conclusion

- ID Aaddresses areal-world accessibility gap in interior design
- Integrates AI, computer vision, and system design principles
- Strong foundation for next-semester implementation
- Scalable and extensible architecture

Thank You

Questions & Discussion

References

[1] Project Proposal

[2 Functional Requirements Specifications

[3] OpenCV Documentation

[4] Open Images Dataset

[5] Adobe Color Theory Guide