Smart Thermostat Simulation: Adaptive and Energy-Efficient

This presentation introduces our innovative smart thermostat, designed for adaptive and energy-efficient climate control in any environment. It dynamically adjusts to ensure comfort while optimizing energy use.

Project Overview

Adaptive Temperature

Simulates dynamic temperature adjustments.

Occupancy Response

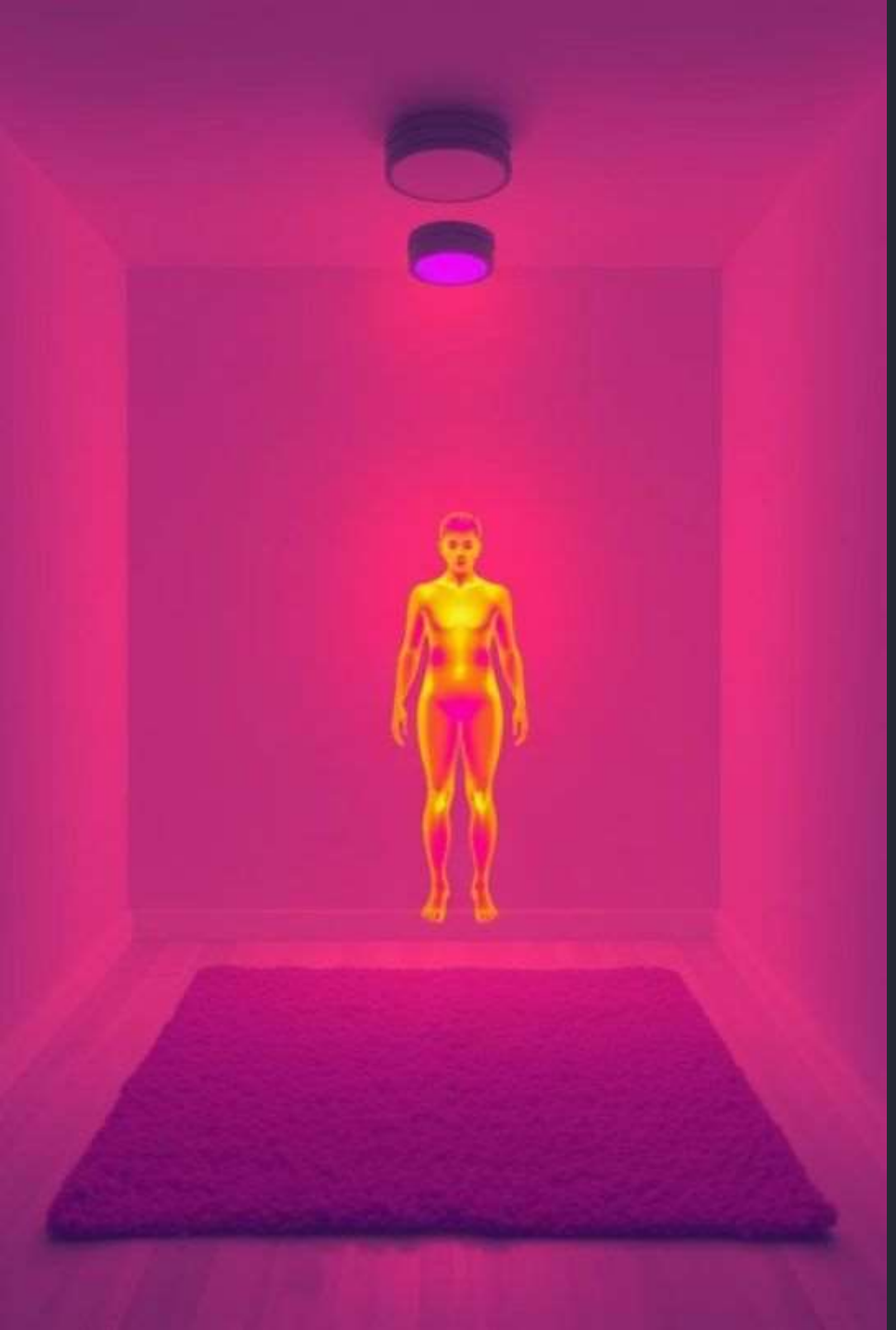
Reacts to environmental changes and occupancy.

Energy Analytics

Calculates real-time power consumption and costs.

Visual Dashboard

Offers intuitive monitoring of key metrics.



Adaptive Temperature Control

1

Occupancy Detection

Simulates sensors detecting presence/absence.

2

Temperature Adjustment

Dynamically adjusts setpoints based on occupancy.

3

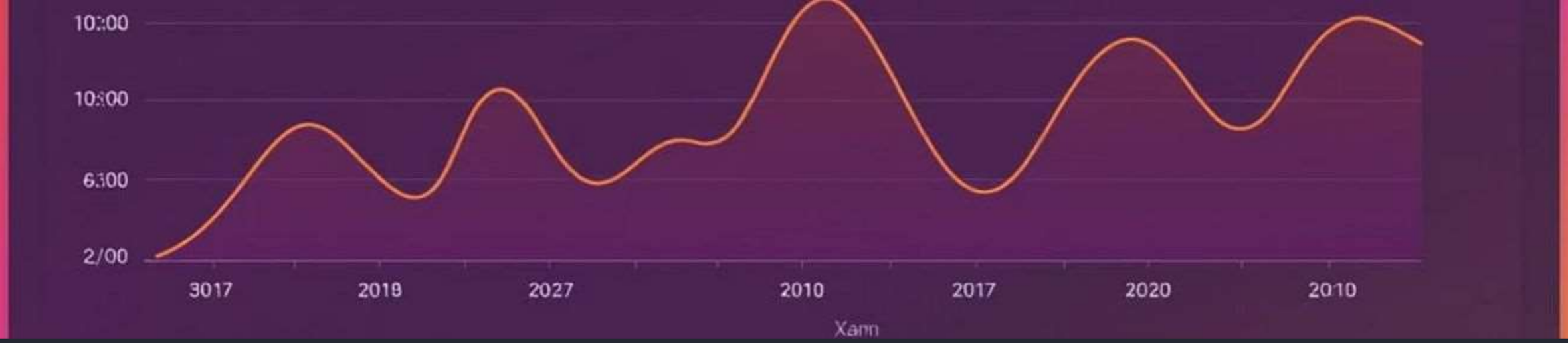
Historical Data

Stores temperature history for analysis.

4

Example Scenario

Sets to 72°F when occupied, 68°F when vacant for savings.



Energy Analytics

$0.15

Avg. Utility Rate

Per kWh for cost estimation.

1.2

Usage Factor

For consumption calculations.

20%

Projected Savings

Potential energy cost reduction.

Our system provides real-time energy consumption and cost analysis. It uses a formula to estimate usage, generating reports on savings and usage patterns. This data helps users understand and optimize their energy consumption effectively.

Visual Dashboard

Temperature Display

Shows current and target temperatures.

Humidity Monitoring

Displays current humidity levels.

Device Usage

Tracks thermostat activity and consumption.

Interactive Interface

Allows users to adjust settings and view reports.

Scalability and Architecture

1 Java Foundation:

Java (Core Java + Swing) provides a robust and portable platform, ensuring broad system compatibility.

2 Modular Design:

Applies **Object-Oriented Programming** for clear, modular classes, supporting easy expansion and maintenance.

3 Data Persistence:

Employs **File Handling** to log all operational data, creating a complete historical record.

4 Live Visualization:

Implements a **GUI via Java Swing** for dynamic graphs, providing real-time system insights.

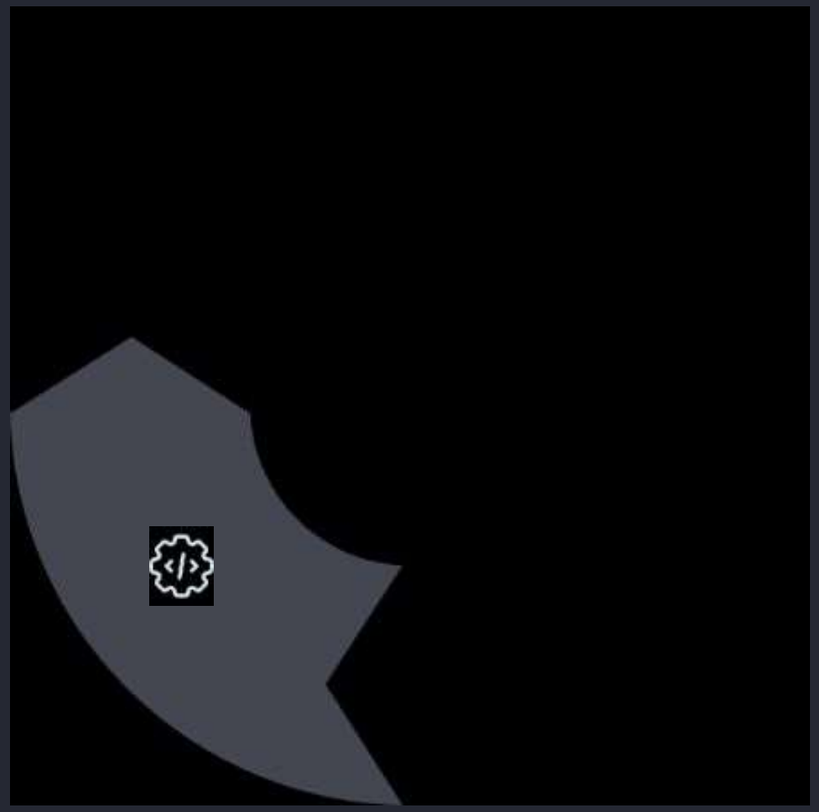
Scalability and Architecture

Object-Oriented Design

Modular classes for components.

Large-Scale Deployment

Supports minimal performance impact.



Decoupled Components

Independent modules for easy expansion.

Data Storage

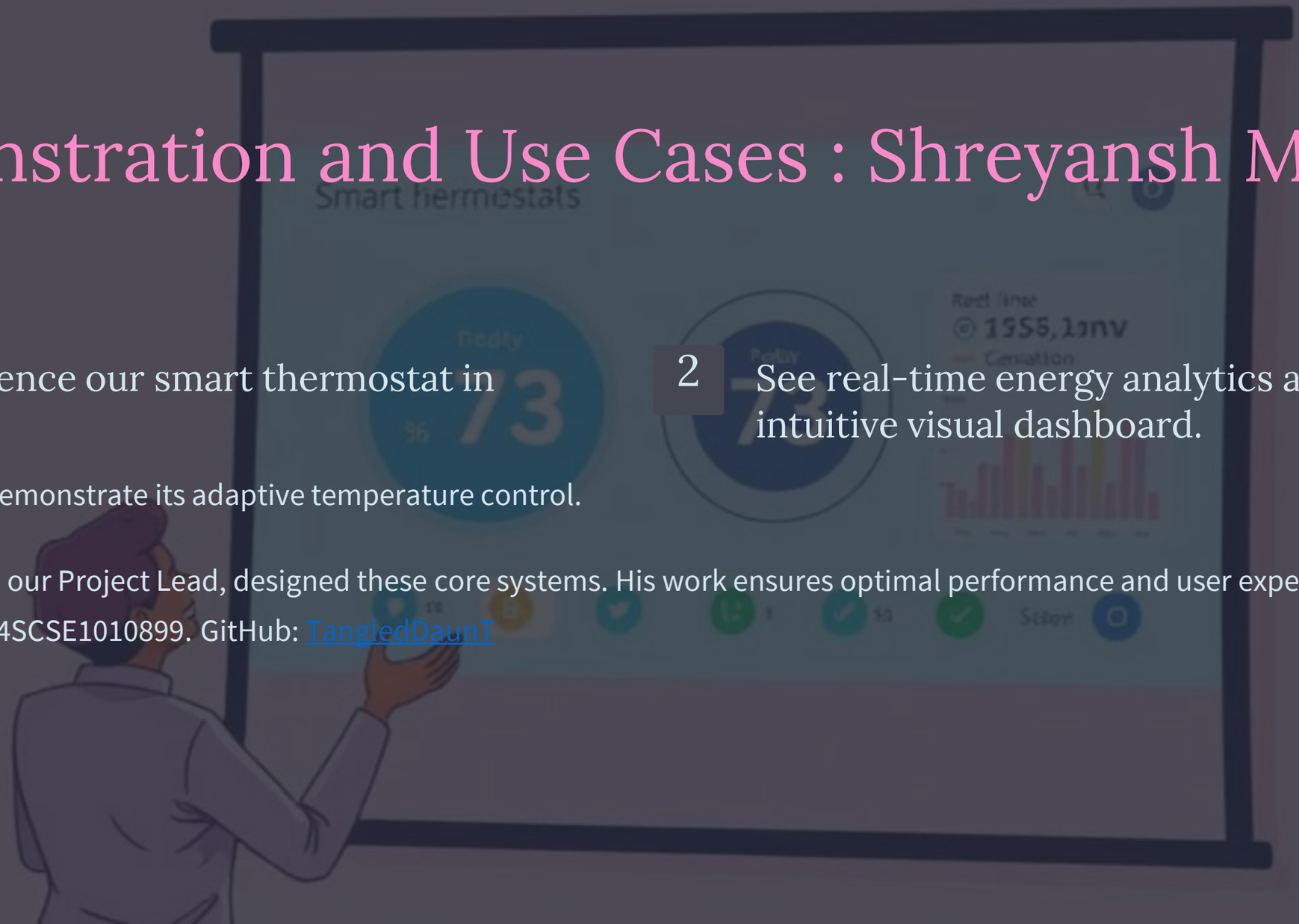
Utilizes a database for historical data.

Demonstration and Use Cases : Shreyansh Mishra

1 Experience our smart thermostat in action.

We will demonstrate its adaptive temperature control.

2 See real-time energy analytics and the intuitive visual dashboard.



Shreyansh Misra, our Project Lead, designed these core systems. His work ensures optimal performance and user experience.

Admission No.: 24SCSE1010899. GitHub: TangledDaunT

Demonstration and Use Cases : Virat Bhatt

Core Function Optimization

Virat Bhatt, our Device Logic Handler, optimized core system functions. He developed the AC/humidifier power algorithms.

Energy Management

His work ensures efficient energy management for the thermostat. This maximizes user comfort and savings.

Admission No.: 24SCSE1011494

GitHub: Virat011

Demonstration and Use Cases : Tanmay Jaiswal

GUI Developer

Tanmay Jaiswal, our GUI Developer, crafted the user interface.

Dashboard & Graphs

He built the Swing dashboard and integrated live data graphs.

Data Accessibility

His work makes complex data accessible and easy to understand.

GitHub

Admission No.: 24SCSE1011312. See his contributions on GitHub.

Demonstration and Use Cases: Aryan Tomar

Role

Data Logger, ensuring system data integrity.

Key Contribution

Integrated robust file handling and critical alert systems.

Impact

Guarantees accurate data capture and timely system notifications.

Admission No.: 24SCSE1010707

GitHub: Explore contributions at tomar018.

Demonstration and Use Cases

Real-time Simulation

Shows dynamic temperature adjustments and energy changes. The simulation provides immediate feedback on system behavior.

Household Savings

Highlights typical household energy cost reductions. Users can see the direct financial benefits of using the smart thermostat.

Dashboard Ease of Use

Demonstrates intuitive interface for settings and reports. The design focuses on user-friendliness for everyday control.

Occupancy Responsiveness

Showcases quick adaptation to presence changes. Test cases validate the thermostat's ability to react efficiently.

Conclusion and Future Enhancements

Key Features Summary

Recap of adaptive control and energy analytics.

Weather Integration

Future plans include connecting with forecasts.

Advanced Optimization

More sensor data and machine learning for efficiency.

Future Innovations

Scalable and adaptable design for smart home technology.