A

Project Based Learning

SMART MIRROR

Submitted

In Partial Fulfilments of the Requirements for the Award of Degree

BACHELOR OF TECHNOLOGY
IN
COMPUTER SCIENCE AND ENGINEERING
(DATA SCIENCE)

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SCHOOL OF ENGINEERING
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(DATA SCIENCE)

CERTIFICATE

This is to certify that the project report titled "SMART MIRROR" is being submitted by CH.Akshitha (237Z1A6729)in Partial fulfilment for the award of Bachelor of technology in Computer Science & Engineering (DATA SCIENCE) is a record bonafide work carried out by them. The results embodied in this report have not been submitted to any other University for the award of any degree.

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Submission Date:

DECLARATION

I CH.Akshitha,K.Radhika student of Bachelor of Technology in Computer Science and Engineering(Data Science), Nalla Narasimha Reddy Education Society's Group Of Institutions, Hyderabad, Telangana, hereby declare that the work presented in this project work entitled SMART MIRROR is the outcome of my bonafide work and is correct to the best of my knowledge .This work has been undertaken taking care of engineering ethics. It contains no material previously published or written by another person nor material which has been accepted for the award of any other degree or diploma of the university or other institute of higher learning.

CH.Akshitha(237Z1A6729)

Date:

Signature:

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ABSTRACT

A Smart Mirror is an innovative device that combines the functionality of a conventional mirror with the capabilities of modern smart technology. It integrates a reflective surface with an embedded digital display, typically powered by a microcontroller or a single-board computer such as a Raspberry Pi. The Smart Mirror provides real-time information such as date, time, weather updates, calendar events, news headlines, and personal notifications, all while maintaining the appearance of a traditional mirror. Using sensors and voice recognition, the mirror can interact with the user, offering a hands-free and personalized experience. Advanced models may include features such as facial recognition for user-specific data display, health monitoring through embedded sensors, and integration with Internet of Things (IoT) devices for smart home control. The system employs a two-way mirror, display screen, and connectivity modules like Wi-Fi or Bluetooth. Designed with both utility and aesthetics in mind, the Smart Mirror enhances daily routines by delivering essential information seamlessly and efficiently. This project demonstrates the convergence of hardware, software, and IoT to create a smart, interactive, and futuristic household device.

1.INTRODUCTION

A Smart Mirror is an advanced technological device that merges the functionality of a traditional mirror with the features of a digital display and smart technology. It is designed to provide users with real-time information such as time, date, weather updates, calendar events, and news feeds while maintaining the reflective property of a standard mirror. The system typically consists of a twoway mirror, a display screen (LCD or LED), and a microcontroller or singleboard computer such as a Raspberry Pi or Arduino. These components work together to present digital data on the mirror's surface without compromising its reflective quality.

The Smart Mirror connects to the internet via Wi-Fi or Bluetooth, enabling it to access live data and integrate with Internet of Things (IoT) devices for smart home automation. Features such as voice recognition, facial recognition, and touch control allow for interactive and personalized user experiences. Some advanced versions can even monitor health parameters or provide fitness tracking data.

By combining hardware, software, and artificial intelligence, the Smart Mirror enhances daily life by offering convenience, efficiency, and modern functionality. It exemplifies how digital innovation can transform ordinary household items into intelligent, interactive systems for a smarter lifestyle.

1.1 Problem Defination

In today's fast-paced world, people often struggle to manage time efficiently while keeping track of essential daily information such as weather updates, schedules, and notifications. Conventional mirrors serve only a reflective purpose and do not provide any interactive or informative features. This creates a gap between routine activities and access to real-time data. The Smart Mirror aims to solve this problem by integrating smart technology with a traditional mirror, allowing users to receive important information instantly while performing daily tasks, thereby enhancing convenience, productivity, and connectivity in everyday life.

1.2 OBJECTIVES

1.Real-Time Information Display:

To provide users with instant access to time,date, weather updates, and notifications.

2. Smart Home Integration:

To enable control of IoT-connected devices directly through the mirror interface.

3. Personalization:

To implement facial and voice recognition for customized user experiences.

4.Health and Fitness Monitoring:

To track basic health parameters and display Related data

5. User Convenience:

To assist users in managing daily tasks efficiently while performing routine activities.

6.Modern Aesthetic Design:

To create a visually appealing, interactive device that blends technology with everyday use.

2.SYSTEM ANALYSIS

2.1 Existing System

Smart Mirrors primarily focus on integrating digital displays behind two-way mirrors to show basic real-time information such as time, date, and weather. These systems often use Raspberry Pi or Arduino microcontrollers along with open-source platforms like MagicMirror², which allows developers to add customizable modules for news, calendars, and reminders. However, most existing models have limited interactivity, relying on static information displays without advanced features such as voice recognition, facial recognition, or IoT integration.

2.2 Software Requriements

1.Operating System (OS):

- Raspberry Pi OS (Raspbian) or Linux-based OS for running the mirror software.
- Alternatively, Windows IoT can be used for compatibility with certain applications.

2. Programming Languages:

- Python: For controlling hardware components, sensors, and logic.
- JavaScript / Node.js: For building interactive modules and front-end display.
- HTML/CSS: For designing the user interface on the mirror display.

3. Frameworks / Platforms:

- MagicMirror²: Open-source modular platform for smart mirror development.
- Electron.js / React.js: Optional frameworks for advanced UI development.

4.APIs / Web Services:

- Weather API (e.g., OpenWeatherMap) for real-time weather updates.
- News API for fetching live news headlines.
- Google Calendar API for schedule and reminders.

5. Speech and Facial Recognition Software:

- Google Assistant SDK or Amazon Alexa API for voice commands.
- OpenCV for facial recognition or gesture-based interaction.

6. Database:

- SQLite or Firebase for storing user preferences, profiles, and historical data.

2.3 Hardware Requirements

1.Two-Way Mirror:

- Serves as the reflective surface while allowing the digital display to be visible behind it.

2. Display Screen (LCD/LED Monitor):

- Positioned behind the mirror to show real-time information like time, weather, news, and notifications.

- Houses and protects all components while maintaining aesthetic appeal.

2.4 Functional Requirements: 1.Real-Time

Information Display:

- Show time, date, weather, news, and calendar events on the mirror surface.

2.User Interaction:

- Enable voice commands for hands-free operation. o Support gesture or touch control (if equipped with sensors or touchscreen).

3.Personalization:

- Recognize users through facial recognition to display personalized information.

4.IoT Integration:

- Connect and control smart home devices (lights, thermostat, etc.) through the mirror interface.

5.Health and Fitness Monitoring (Optional):

- Display basic health metrics such as weight, BMI, or step count if integrated with sensors or apps.

6.Alerts and Notifications:

- Provide reminders for appointments, messages, or system notifications.

Non-Functional Requirements:

1.Performance: Must update and display real-time information without noticeable lag.

2.Reliability:System should run continuously without frequent crashes or errors.

3.Scalability:Should allow addition of new modules or features in the future.

4.Usability:Interface must be intuitive and easy to interact with for all users.

5.Security:Protect user data, including personal information and IoT device controls.

6.Aesthetics:Maintain a sleek and modern look suitable for home or office environments

7.Energy Efficiency:Consume minimal power when idle, activating only when the user is present.

3.IMPLEMENTATION

3.1 Method of Implementation

The Smart Mirror project is implemented as an intelligent system that recommends suitable clothing based on real-time weather conditions.

It integrates a software module that takes a city name as input, connects to a current weather , retrieves current temperature and weather status, and outputs clothing suggestions accordingly.

The implementation follows a modular approach, combining:

1. User Input Module – accepts the city name.

2. current module – weather data fetching module.

3. Decision Module – applies temperature-based logic.

4. Display Module – shows the weather and recommended clothing.

This method ensures real-time data analysis and dynamic recommendation output based on actual environmental conditions.

3.11 Technologies Used

1. Programming Language

Python – used as the core programming language for backend logic.

Libraries Used:

requests – to fetch live weather data from the OpenWeatherMap .

json – to parse current responses. tkinter (optional) – for GUI-

based user input and display. time – to update or refresh weather

information periodically.

2. current weather and Internet Connectivity

Open Current Weather:

Used to fetch real-time weather details such as temperature, humidity, and weather conditions based on the city entered by the user.

weather returns data in JSON format, which is processed by the Python program.

3. Software Tools

IDE: Python,Streamlit ,VS Code (for code development).

Operating System: Windows.

Network: Internet connectivity required for current weather.

3.2 Algorithmic Approach

The algorithm behind the Smart Mirror's weather-based clothing recommendation is simple and efficient, involving real-time data retrieval and conditional decision-making.

Linear Regression

Linear Regression is a machine learning algorithm that shows how one variable affects another.
It draws a straight line through data points to predict values.

Multiple Linear Regression

Multiple Linear Regression is like Linear Regression, but it uses more than one factor to make predictions.
Instead of only temperature, it can also use humidity, wind, or weather condition.

In the Smart Mirror

- Linear Regression → predicts comfort using one factor (temperature).
- Multiple Linear Regression → predicts comfort using many factors (temperature, humidity, weather).
- Helps the mirror suggest the best fabric type (like cotton, Linen, or Chamber) based on live weather.

Algorithm Steps:

1. Start the System.

2. Input the City Name.

The user enters a city (e.g., “Hyderabad”,”Kolkata”).

3. Fetch Weather Data.

Connect to the Current Weather using the provided live Weather

Retrieve current temperature and weather condition.

4. Process and Analyze Data.

Extract key parameters: temperature (°C) and condition (sunny, cloudy, rainy).

5. Apply Clothing Logic.

Based on the temperature range, suggest suitable clothing:

Above 30°C: Recommend “Light cotton or linen fabrics.”

20°C – 30°C: Recommend “Comfortable casual wear like jeans and T-shirts.”

15°C – 20°C: Recommend “Light jackets or full-sleeve shirts.”

Below 15°C: Recommend “Woolen or warm clothing.”

6. Display Output.

Show current temperature and clothing recommendation on the mirror.

7. Repeat / Refresh Data.

Optionally refresh weather details every few minutes.

8. End Prog

4. GITHUB INTEGRATION

GitHub integration allows developers to manage, version, and collaborate on the Smart Mirror project's software efficiently. It ensures code backup, version control, collaboration with multiple contributors, and smooth deployment of updates.

4.1 Registration:

.Visit https://github.com and sign up using your email.

.Once the account is created,install Git from https://git-scm.com.

.After installation,configure Git on your local system using the following terminal commands:

git config-global user.name "your Name" git config-

global user.emailYour.email@example.com

4.2 How To Put A Project Into Github:

Once your project is developed locally,follow these steps to push it to remote GitHub repository:

Intilize Git inside your project folder:

git init

Add all files to the staging area: git

add

Commit the added files:

git commit -m :”Intial commit”

Create a new repository on GitHub.

Example:https://github.com/yourusername/portfolio-site

Link your lolcal repository to GitHub:

git remote add origin https://github.com/yourusername/portfolio-site.git

push the code to GitHub: git branch -M main git push -u origin main

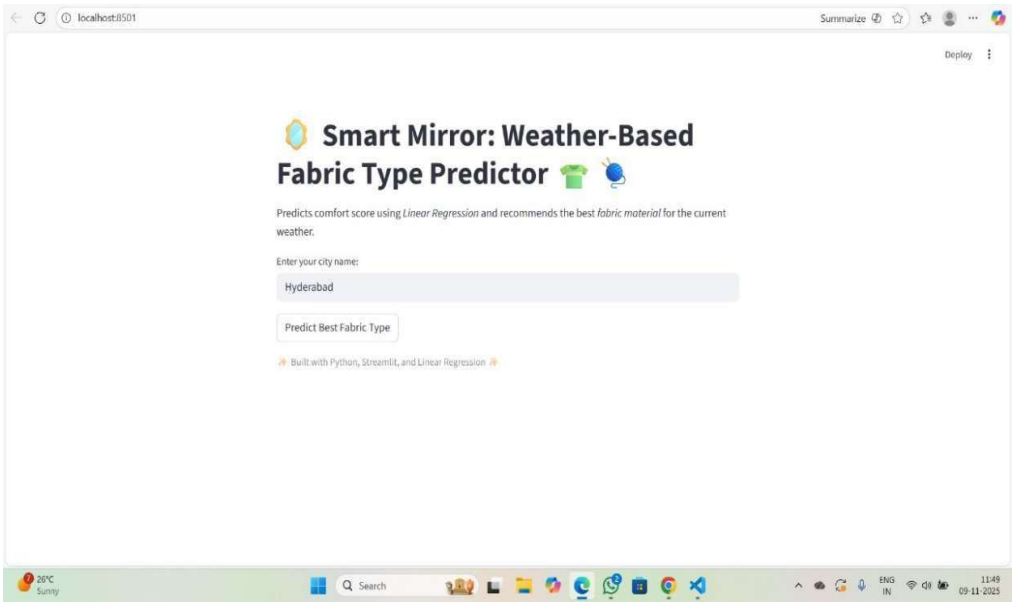
All changes made locally can be synced to GitHub using just:

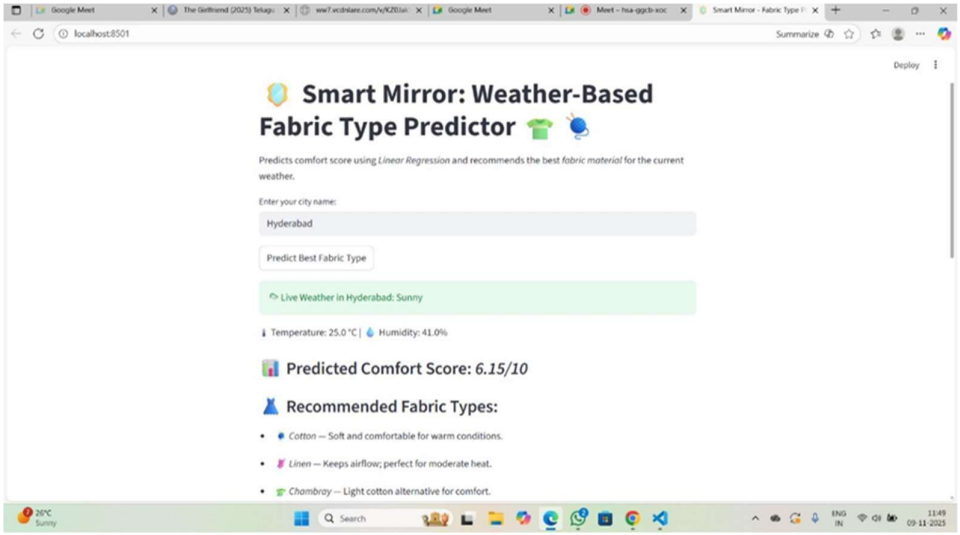
git add

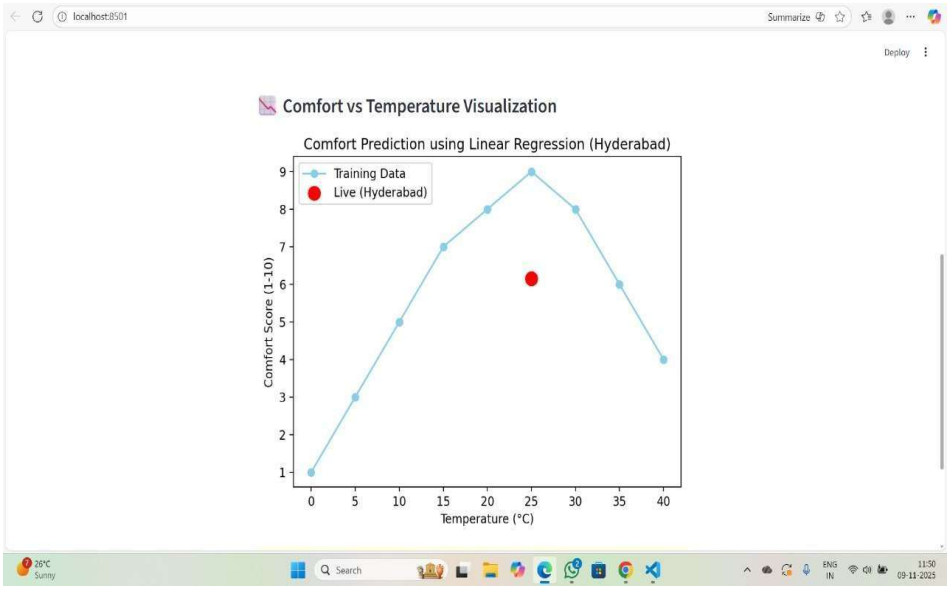
Git commit -m “message” git

push

5.OUTPUT SCREENSHOTS




localhost:8501
Summarize
Deploy
Smart Mirror: Weather-Based Fabric Type Predictor
Predicts comfort score using Linear Regression and recommends the best fabric material for the current weather.
Enter your city name:
Hyderabad
Predict Best Fabric Type
Live Weather in Hyderabad: Sunny
Temperature: 25.0 °C | Humidity: 41.0%
Predicted Comfort Score: 6.15/10
Recommended Fabric Types:
Cotton — Soft and comfortable for warm conditions.
Linen — Keeps airflow; perfect for moderate heat.
Chambray — Light cotton alternative for comfort.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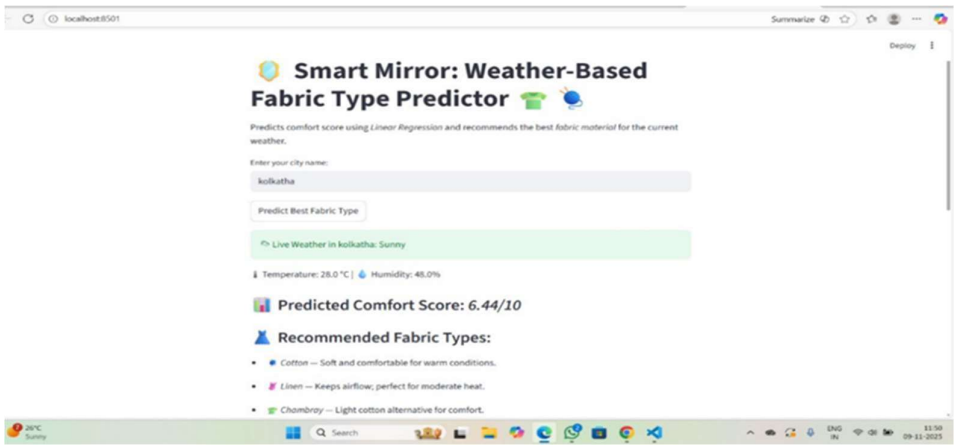
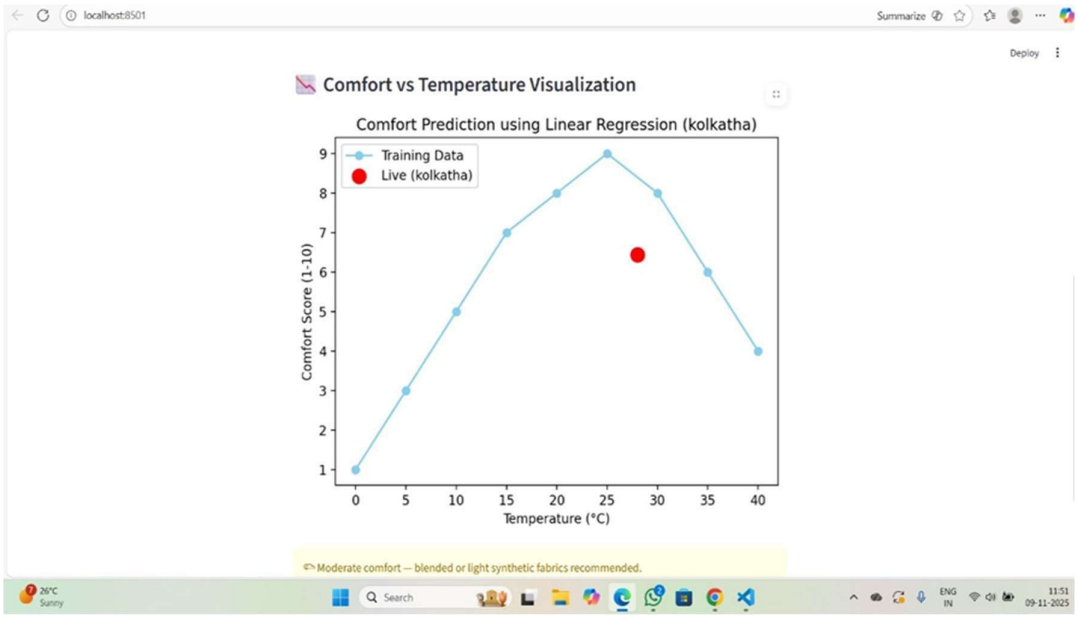
Summarize
Deploy
Comfort vs Temperature Visualization
Comfort Prediction using Linear Regression (Hyderabad)
Training Data
Live (Hyderabad)
Comfort Score (1-10)
Temperature (°C)


localhost:8501
Summarize
Deploy
Smart Mirror: Weather-Based Fabric Type Predictor
Predicts comfort score using Linear Regression and recommends the best fabric material for the current weather.
Enter your city name:
kolkatha
Predict Best Fabric Type
Live Weather in kolkatha: Sunny
Temperature: 28.0 °C | Humidity: 48.0%
Predicted Comfort Score: 6.44/10
Recommended Fabric Types:
Cotton — Soft and comfortable for warm conditions.
Linen — Keeps airflow; perfect for moderate heat.
Chambray — Light cotton alternative for comfort.


localhost:8501
Summarize
Deploy
Comfort vs Temperature Visualization
Comfort Prediction using Linear Regression (kolkatha)
Training Data
Live (kolkatha)
Comfort Score (1-10)
Temperature (°C)
Moderate comfort — blended or light synthetic fabrics recommended.

6.CONCLUSION AND FUTURE ENHANCEMENT

6.1 Conclusion:

In conclusion, the Smart Mirror not only fulfills basic reflective functions but also serves as a dynamic, intelligent assistant for home or office environments, improving efficiency, user experience, and convenience. As technology advances, Smart Mirrors are poised to become more sophisticated, costeffective, and widely accessible, redefining the concept of smart living. The Smart Mirror transforms a conventional mirror into an intelligent, interactive device that provides real-time information such as time, weather, news, calendar events, and personalized notifications. By integrating sensors, microcontrollers, and software capabilities like voice and facial recognition, it enhances user convenience and productivity

6.2 Future Enhancement:

1.Advanced AI Integration:

- Smarter personal assistants capable of understanding context, routines, and preferences for highly personalized interactions.

2. Augmented Reality (AR) Features:

- Virtual try-on for clothing, accessories, and makeup, allowing users to visualize changes in real time.

3. Health Monitoring:

- Integration with advanced sensors to track vital signs, sleep patterns, heart rate, and posture analysis for fitness and medical purposes.

4. Enhanced IoT Connectivity:
   - Seamless control of home automation systems, including lighting, security, appliances, and climate control, with predictive automation based on user habits.

5.Gesture and Touchless Controls:
   - Improved hand or eye-tracking interfaces for a fully touchless experience, reducing dependency on physical interaction.

6. Energy Efficiency and Sustainability:
   - Solar-powered displays or adaptive brightness to reduce power consumption while maintaining functionality.

7.Cloud-Based Data & Analytics:
   - Storing user preferences and analytics in the cloud for cross-device synchronization and smarter recommendations.

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