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Smart Umbrella

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ABSTRACT

*This paper introduces a **Smart Umbrella** integrated with **five smart features**: rain prediction, GPS tracking, portable charging, UV detection, and a cooling fan. The system predicts rainfall **5–10 minutes in advance** using weather API data and environmental sensors, alerting users through a connected mobile app or notification system. A **GPS module** enables location tracking in case the umbrella is lost or stolen. The umbrella is equipped with a **portable power bank** to charge smartphones and other devices, enhancing convenience. A **UV sensor** monitors harmful radiation levels, warning users of high exposure. Additionally, a **rechargeable cooling fan** is integrated into the umbrella handle to provide comfort in hot climates. This research demonstrates the potential of integrating **IoT and smart technology** into everyday objects, offering **health, safety, and lifestyle benefits**.*

INTRODUCTION

The traditional umbrella has long been used only for protection against rain and sunlight, but with modern technology, it can be transformed into a **multi-functional smart device**. This research proposes a **Smart Umbrella** that integrates **rain prediction (5–10 minutes in advance), GPS tracking, portable charging, UV detection, and a cooling fan** to enhance user safety and convenience. The system uses sensors and weather APIs to predict rainfall, a GPS module to locate the umbrella if lost or

stolen, a built-in power bank to charge mobile devices, a UV sensor to warn against harmful radiation, and a rechargeable fan for comfort in hot weather. By combining these features, the Smart Umbrella demonstrates how **IoT can improve daily life** by turning a common object into a smart lifestyle gadget.

Literature Review

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- Smart wearables and IoT-based weather gadgets.
- Portable power bank and charging devices.
- UV detection for health protection.
- Fan-equipped umbrellas (basic, non-smart).
- Gaps: Lack of a **single integrated solution** that combines rain prediction, UV safety, charging, GPS, and cooling.

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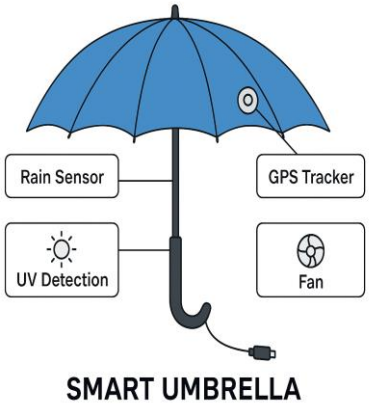
ARCHITECTURE OF Smart Umbrella



Rain Prediction Module – A combination of a **humidity and temperature sensor (DHT22)** and an external **Weather API** helps to forecast rainfall in the next **5–10 minutes**. If rainfall is predicted, the umbrella immediately sends an alert to the user through the mobile application or an inbuilt notification system (buzzer/LED).

GPS Tracking Module – A **GPS module (NEO-6M)** is integrated into the umbrella to track its location in real time. This allows the user to locate the umbrella if it is misplaced or stolen. The GPS coordinates are transmitted via GSM/Wi-Fi to the mobile application.

UV Detection Module – A **UV sensor (ML8511/VEML6075)** monitors ultraviolet radiation levels in the environment. When the detected UV radiation exceeds safe limits, the umbrella alerts the user, helping to reduce harmful exposure to sunlight.

Portable Charging Module – A **rechargeable Li-ion battery (around 5000 mAh)** is installed in the umbrella handle. This battery powers the sensors, GPS, and fan, and also works as a **portable power bank**, allowing users to charge mobile devices using a USB cable.

Fan Module – A **small 5V DC brushless fan** is integrated into the handle of the umbrella. This fan can be turned on during hot weather to provide cooling airflow, powered by the same rechargeable battery.

Communication Module – Using **Bluetooth/Wi-Fi or GSM**, the umbrella communicates with a smartphone application. The app displays **rain alerts, UV warnings, GPS location, and battery status**.

Hardware Component

- **Microcontroller**: ESP32 (supports IoT + Wi-Fi + Bluetooth)
- **Rain Prediction**: DHT22 sensor + Weather API
- **GPS Module**: NEO-6M GPS
- **UV Sensor**: ML8511 / VEML6075
- **Portable Charging**: 5000 mAh Li-ion battery + USB port
- **Fan Motor**: 5V DC brushless fan (mounted in handle with airflow holes)
- **Communication**: GSM/Wi-Fi for alerts

Characteristics of Smart Umbrella

Rain Prediction Module – A combination of a

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Expected Result

Rain Prediction – Ability to alert the user **5–10 minutes before rainfall** using sensor data and weather API.

GPS Tracking – Provides **real-time location tracking** of the umbrella in case it is lost or stolen.

UV Detection – Monitors **ultraviolet radiation levels** and warns users when exposure is harmful.

Portable Charging – Works as a **power bank (approx. 5000 mAh)** with USB charging capability for mobile devices.

Cooling Fan – Integrated **5V DC fan** to provide airflow during hot weather.

Compact & Portable Design – All modules are fitted into the umbrella handle without compromising usability.

Rechargeable Battery – Long-lasting **Li-ion battery** to power sensors, fan, and charging functions.

Smart Connectivity – Communication with a **mobile application** via Bluetooth/Wi-Fi/GSM for alerts and GPS tracking.

User-Friendly Operation – Simple buttons/switches for fan control and USB port for charging.

Multi-Utility Device – Combines **weather protection, health monitoring, personal security, and comfort** in one gadget.

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Multi-Functional Utility – Combines weather protection, personal comfort, health monitoring, and smart tracking in one device.

CONCLUSION

The Smart Umbrella successfully demonstrates how **IoT and sensor technology** can transform a simple daily-use object into a **multi-functional smart gadget**. By integrating **rain prediction, GPS tracking, UV detection, portable charging, and a cooling fan**, the umbrella not only provides protection from weather but also ensures **user safety, comfort, and convenience**. The system offers accurate rainfall alerts, reliable location tracking, effective UV monitoring, and additional lifestyle benefits such as portable charging and cooling. This innovation highlights the potential of combining multiple technologies into a single compact device, making it highly useful for modern urban life. information, entertainment and
communication will open a new dimension to our lives and change our lifestyle

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