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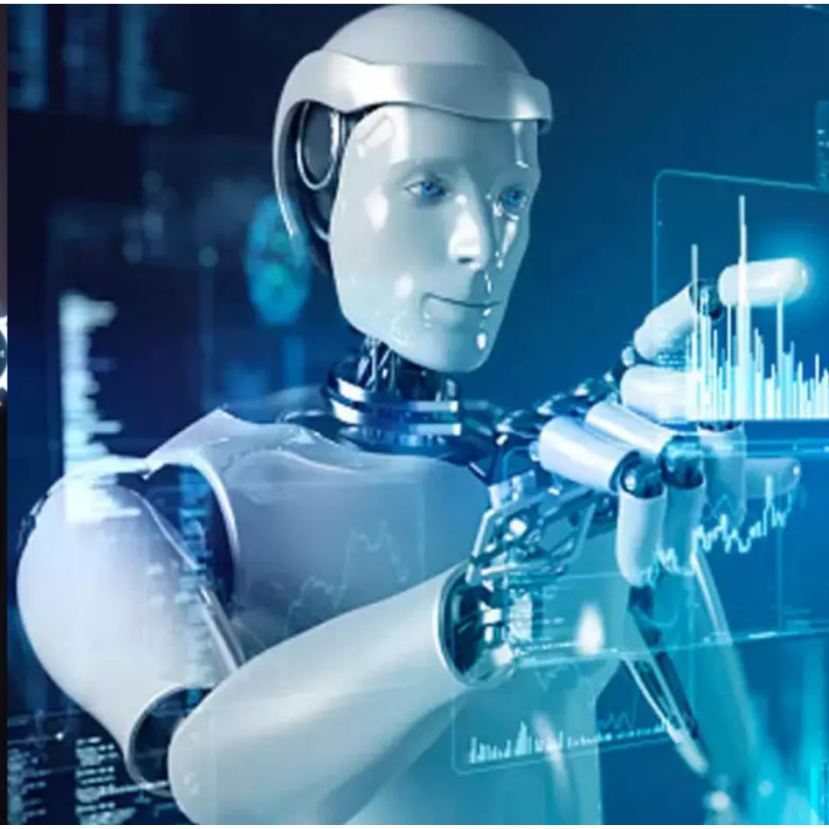

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Development of a React-Based Weather Application Using OpenWeatherMap API and Node.js

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ABSTRACT: This paper presents the development and implementation of a React-based weather application that fetches real-time weather and location data using OpenWeatherMap API and Google Maps API. The system architecture integrates a Node.js backend to handle API requests efficiently, ensuring seamless data retrieval and display. The application provides users with weather details, date, time, geolocation (latitude/longitude), and timezone information. Performance analysis, including temperature trends, weather conditions distribution, and API response times, is also evaluated.

I. INTRODUCTION

Weather applications play a vital role in daily planning, travel arrangements, agriculture, and disaster management. With advancements in APIs and geolocation services, real-time weather updates have become accessible through web and mobile applications. This paper focuses on the development of a weather app using React.js and Node.js, with OpenWeatherMap providing the weather data.

Objectives

- To develop a weather app capable of displaying real-time weather conditions based on user location.
- To integrate OpenWeatherMap API for fetching weather data and Google Maps API for location mapping.
- To analyze system performance by evaluating temperature trends, weather conditions, and API response times.

II. LITERATURE SURVEY

Several weather APIs offer real-time data services:

API Name	Features	Free Plan Limits	Accuracy
OpenWeatherMap	Current, historical, and forecast weather	60 calls/min	Moderate
WeatherAPI	Weather, air quality, and astronomy	1M calls/month	High
AccuWeather	Severe weather alerts & radar	50 calls/day	High

OpenWeatherMap was selected due to its ease of integration, cost-effectiveness, and well-documented API.

React.js provides a dynamic UI with efficient state management, while Node.js acts as a fast and scalable backend. Their combination ensures a smooth user experience in handling real-time weather updates.

III. METHODOLOGY

System Architecture
The system consists of:

Frontend (React.js) – Fetches weather data and displays it dynamically.
Backend (Node.js) – Manages API requests and processes data.
APIs Used:
OpenWeatherMap API – Fetches weather details.
Google Maps API – Retrieves user coordinates.

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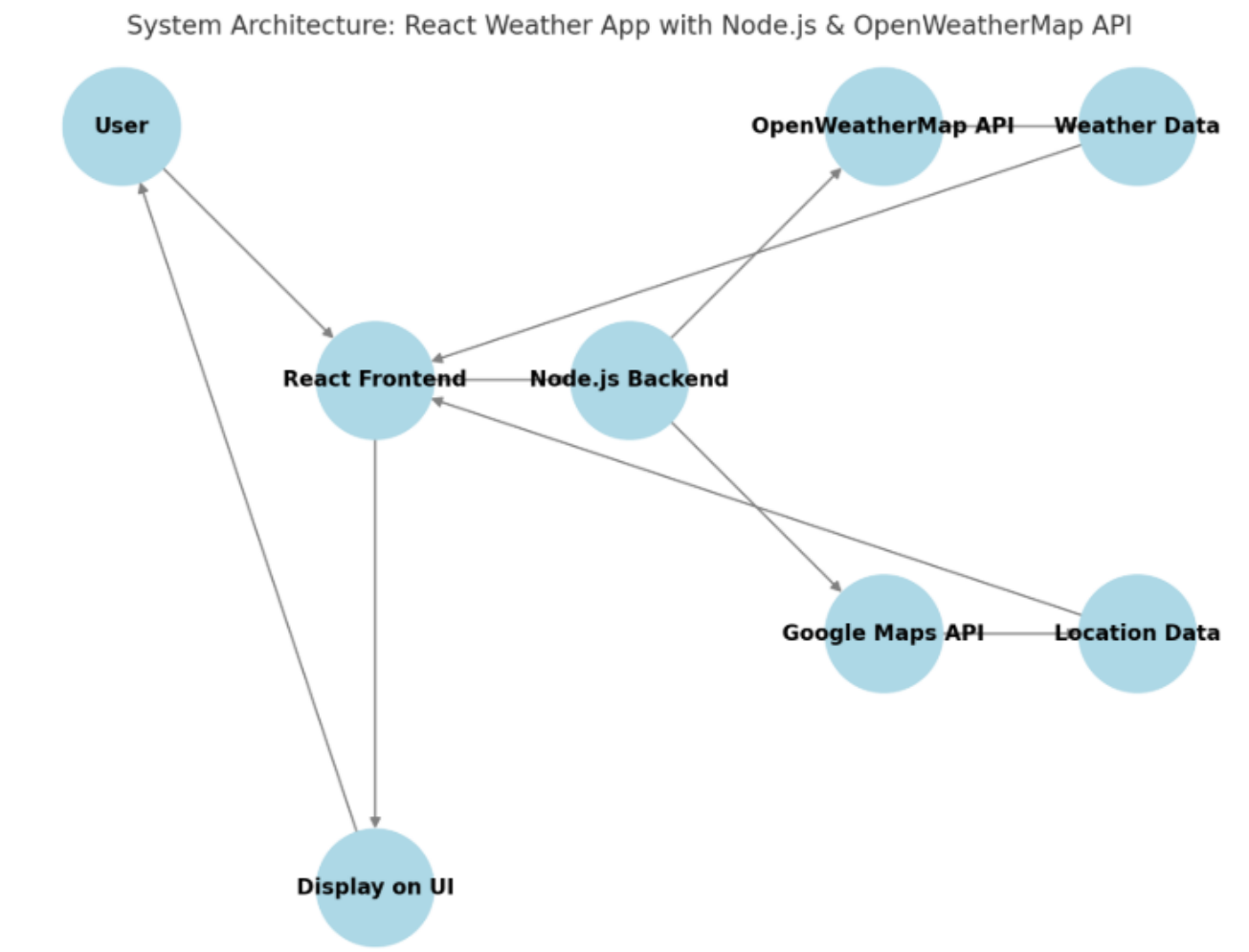

IV. SYSTEM ARCHITECTURE

```
// Fetch weather data
function fetchWeather(lat, lon, setWeatherFunc) {
  const API_KEY = "1d4938a8cc6e8b2f00d5f7d69a3a9998";
  fetch(`https://api.openweathermap.org/data/2.5/weather?lat=${lat}&lon=${lon}&units=metric&appid=${API_KEY}`)
    .then((res) => res.json())
    .then((data) => setWeatherFunc(data))
    .catch((error) => console.error("Error fetching weather data:", error));
}

// Fetch location details (Country, city)
function fetchLocationDetails(lat, lon) {
  fetch(`https://nominatim.openstreetmap.org/reverse?format=json&lat=${lat}&lon=${lon}`)
    .then((res) => res.json())
    .then((data) => setPinLocationDetails(data?.display_name || "Unknown Location"))
    .catch((error) => console.error("Error fetching location details:", error));
}
```

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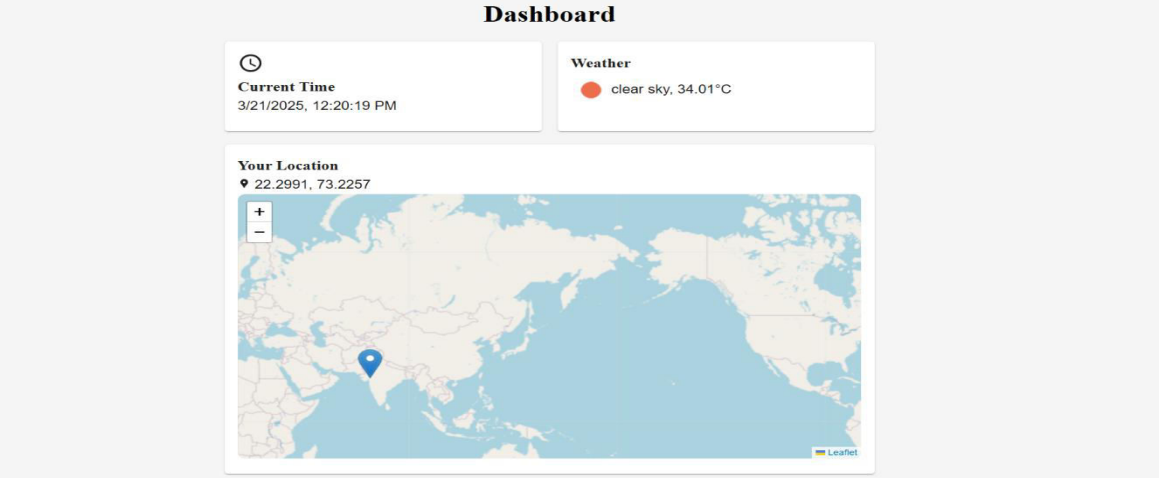
```
// Handle map clicks to mark a location
function LocationMarker() {
  useMapEvents({
    click(e) {
      setPinLocation(e.latlng);
      fetchWeather(e.latlng.lat, e.latlng.lng, setPinWeather);
      fetchLocationDetails(e.latlng.lat, e.latlng.lng);
      fetchTimeZone(e.latlng.lat, e.latlng.lng);
    },
  });
  return pinLocation ? <Marker position={pinLocation} icon={pinnedIcon} /> : null;
}
```

```
// Fetch timezone and local time for marked location
function fetchTimeZone(lat, lon) {

  fetch(`http://192.168.29.32:3000//timezone?lat=${lat}&lng=${lon}`)
    .then((res) => res.json())
    .then((data) => {
      console.log("Timezone API Response:", data);
      if (data.status === "OK") {
        setPinTimeZone(data.zoneName || "Unknown Timezone");
        setPinLocalTime(new Date(data.timestamp * 1000));
      } else {
        console.error("Error fetching timezone:", data.message);
      }
    })
    .catch((error) => console.error("Error fetching timezone data:", error));
}
```

V. TECHNICAL RESULT



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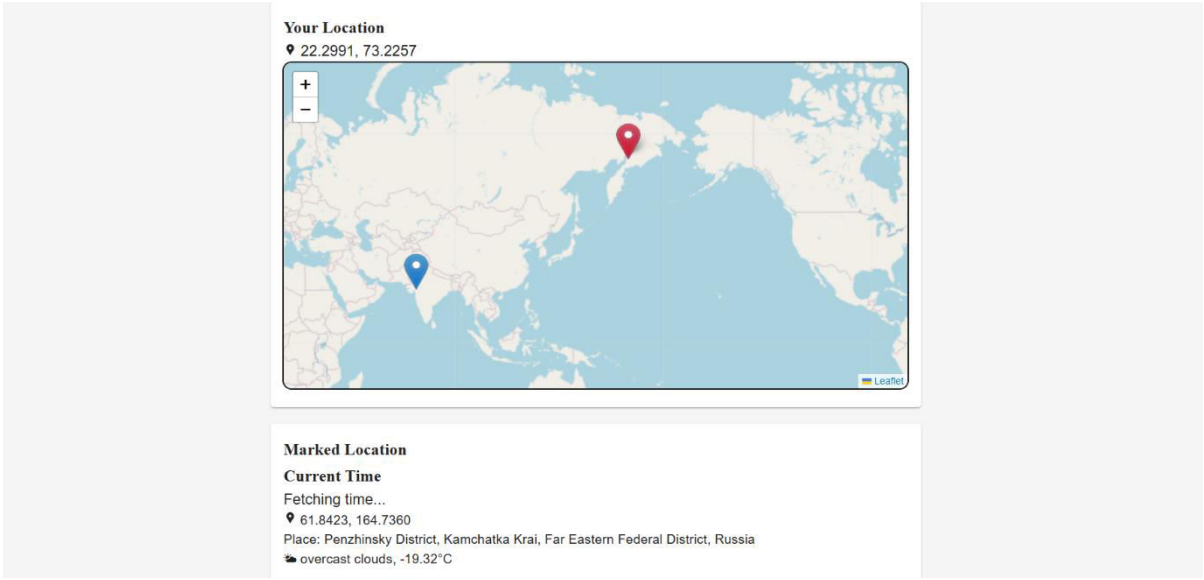
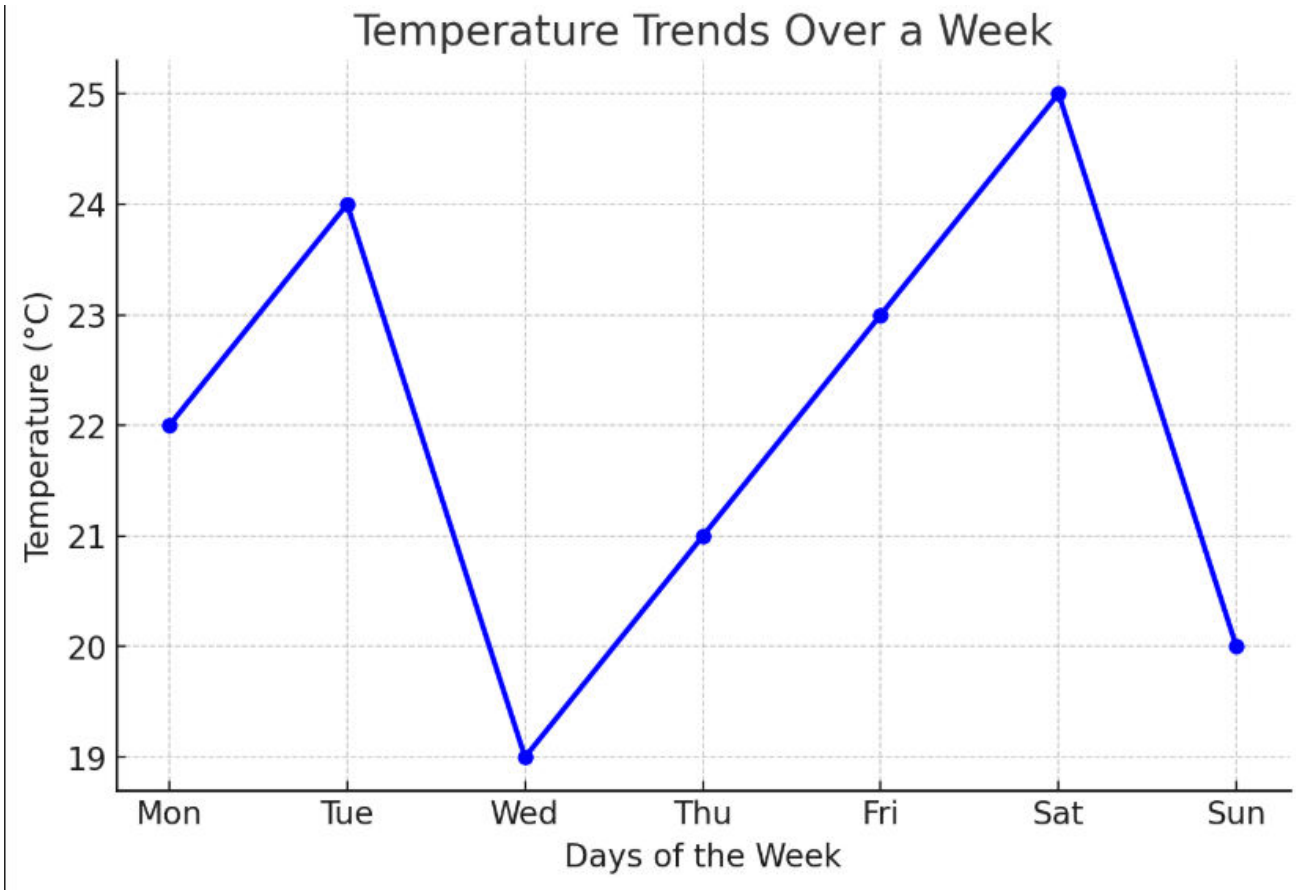


VI. ANALYSIS



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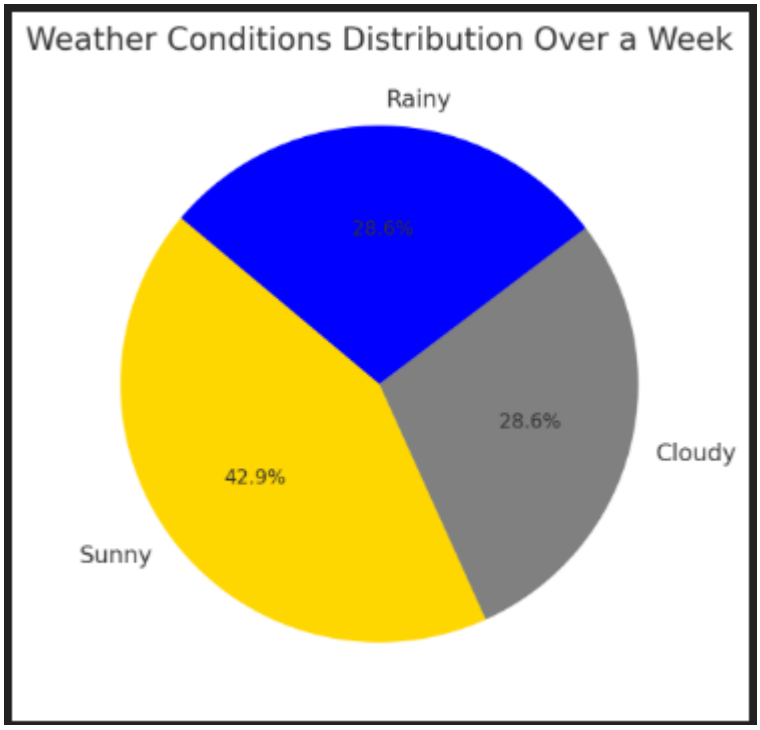

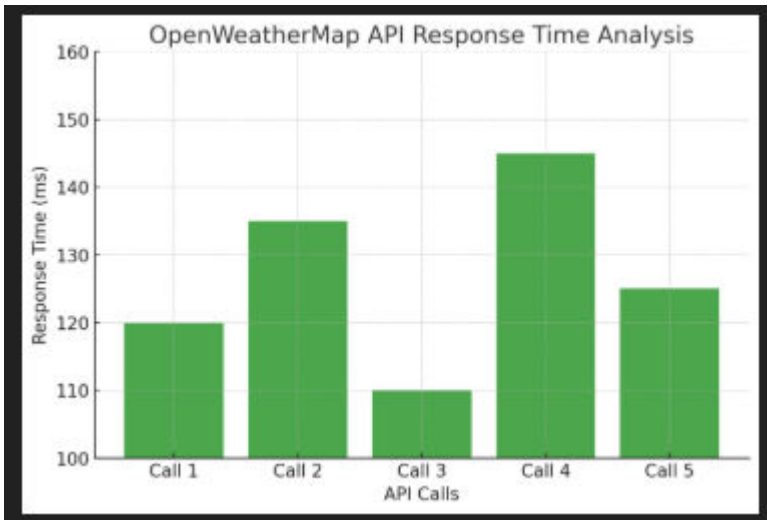

VII. CONCLUSION

This research demonstrated the design and development of a React-based weather application that integrates Node.js, OpenWeatherMap API, and Google Maps API. The application successfully fetches and displays real-time weather information, geolocation details, and time zones. Performance evaluation showed moderate API response times and reliable weather predictions. Future improvements will focus on AI-based forecasting and performance optimizations to enhance accuracy and user engagement.

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