Real-Time Weather ForecastingDashboard

By Akriti Soni

A Power BI Project for Guwahati

GitHub Repository

Project Overview & Objectives

A comprehensive real-time weather analytics dashboard for Guwahati, providing instant meteorological insights through an intuitive Power BI interface. This project combines data visualization with API integration to deliver accurate and actionable weather information.

Project Objectives

- Integrate live weather data using APIs to provide real-time forecasting
- Visualize current and forecasted conditions with intuitive graphical elements
- Display comprehensive air quality metrics for health awareness
- Create an all-in-one dashboard for critical meteorological data
- Demonstrate real-time data refresh capabilities in Power BI

Real-Time Weather Analytics Dashboard

Temperature

Air Quality Monitoring

Precipitation Forecasts

Dashboard Feature Showcase

The Real-Time Weather Forecasting Dashboard delivers comprehensive meteorological data through an intuitive interface. Below are the key features that provide actionable weather insights for Guwahati.

Key Dashboard Components

Current Conditions

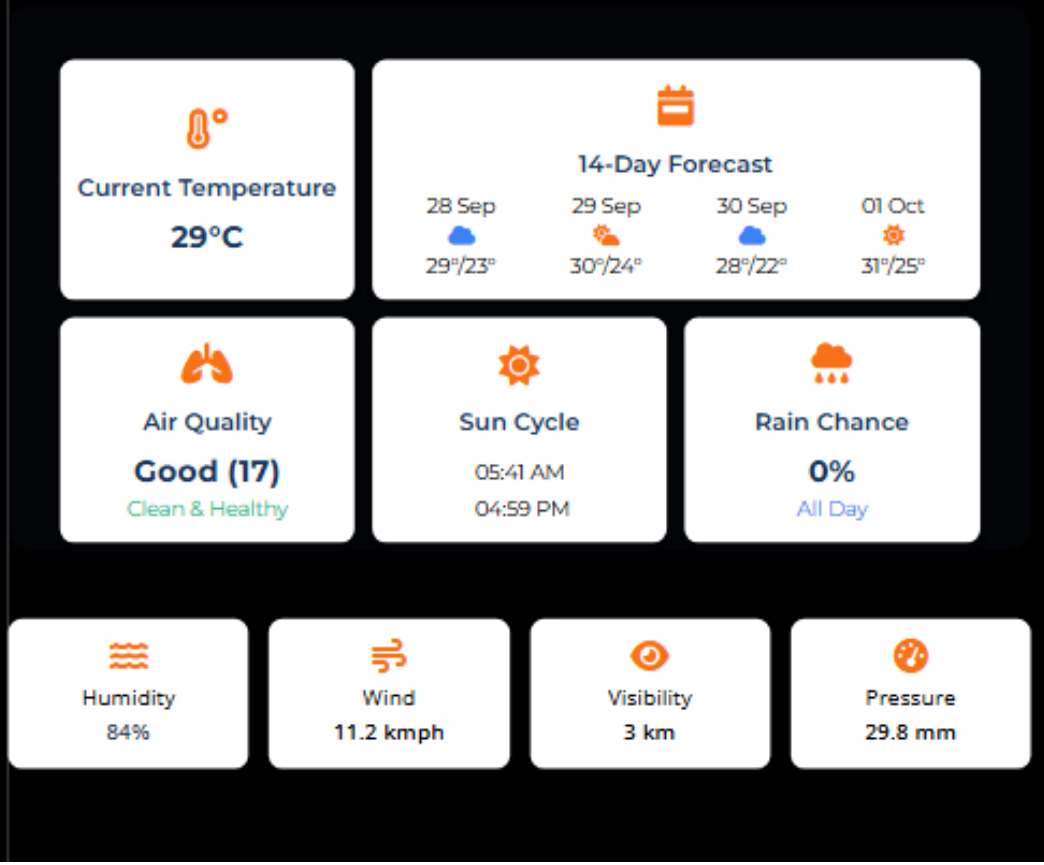
- Temperature: 29°C
- Humidity: 84%
- Condition: Mist
- Wind: 11.2 kmph
- Visibility: 3 km
- Pressure: 29.8 mm

Forecast & Analysis

- 14-Day Forecast
- Rain Probability
- Air Quality Index
- Sunrise/Sunset Times

Air Quality Metrics

- AQI Status: Good (17)
- PM10: 17
- PM2.5: 5
- SO: 11 | NO: 16



Technical Architecture

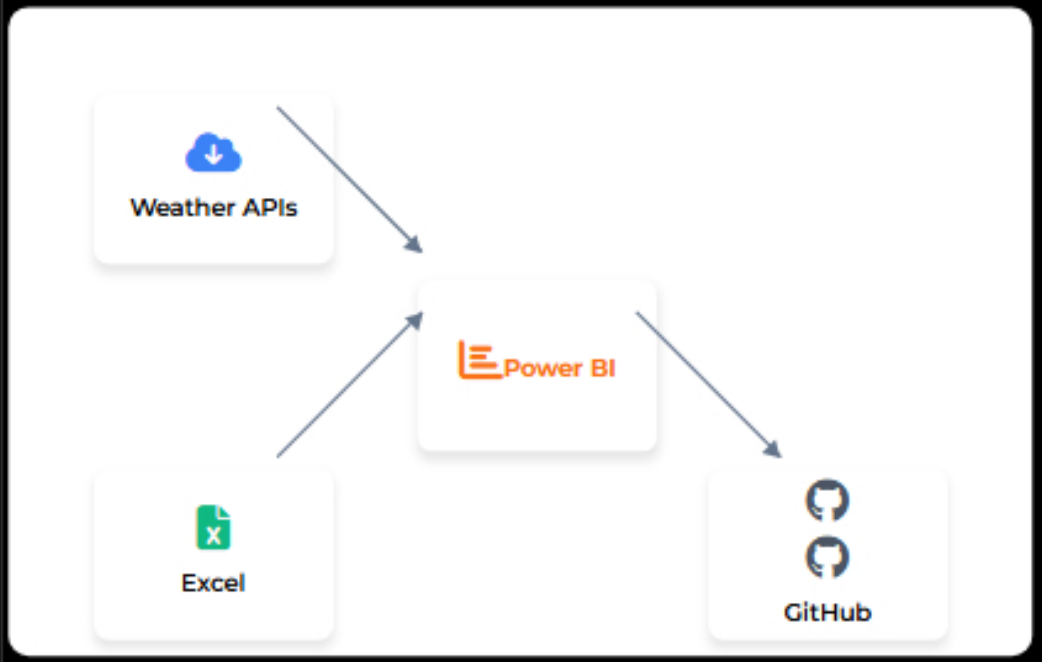
The real-time weather forecasting dashboard is built on a robust technical stack that enables seamless data integration, processing, and visualization. The architecture focuses on real-time data fetching, efficient processing, and interactive visualization.

Technical Stack

- **Power BI Desktop:** Core dashboard creation tool with data visualization capabilities and refresh functionalities
- **Weather APIs:** External data sources providing real-time weather and environmental metrics for Guwahati
- **Advanced Excel:** Used for data preprocessing, calculations, and shape transformations before integration
- **GitHub:** Version control system for collaboration and code management

Data Flow

- API calls fetch real-time weather data on schedule
- Data undergoes preprocessing in Excel for formatting
- Power BI processes and visualizes the cleaned data
- Final dashboard presents metrics in user-friendly interface



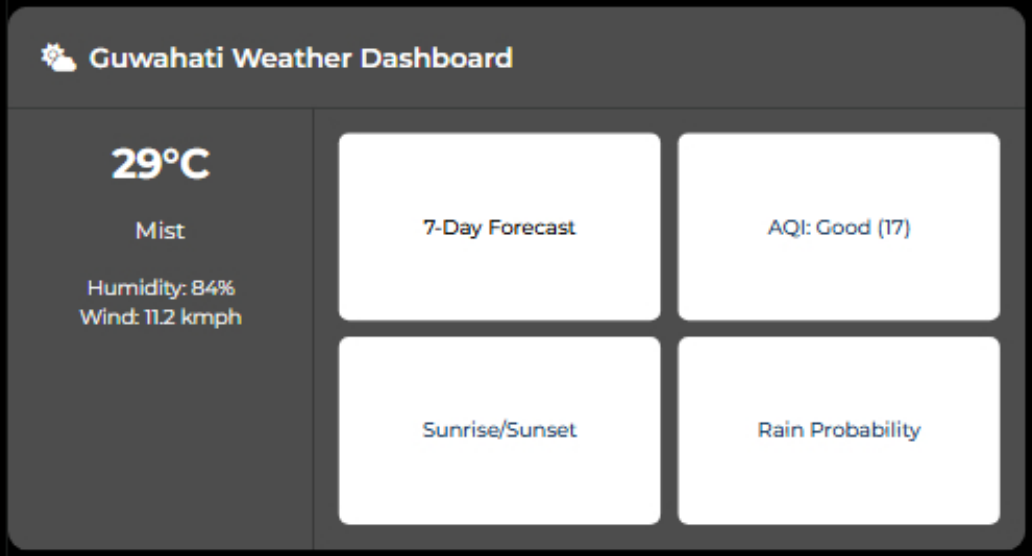
Real-Time Updates | Data Storage | Data Processing | Visual Rendering

Dashboard Walkthrough

The Weather Dashboard features an intuitive interface designed for optimal user experience. Each component is strategically positioned to provide immediate access to critical weather information for Guwahati.

Key UI Components

- **Current Conditions Panel:** Prominently displays temperature (29°C), weather condition (Mist), and main metrics for at-a-glance information
- **7-Day Forecast Strip:** Horizontal scrollable panel showing daily high/low temperatures with intuitive weather icons
- **Air Quality Widget:** Color-coded AQI display with clear "Good" status indicator and detailed pollutant breakdown
- **Sunrise/Sunset Visualizer:** Visual timeline showing 05:41 AM sunrise and 04:59 PM sunset with animated horizon
- **Environmental Metrics:** Humidity (84%), wind (11.2 kmph), visibility (3 km), and other key readings in easy-to-scan card format



Interactive Elements
Hover states, tooltips, and interactive graphs enhance data exploration

Color Psychology
Blue tones for temperature, orange accents for alerts and key metrics

Responsive Design
Layout adapts to different screen sizes while maintaining readability

Data Visualization Components

The weather forecasting dashboard uses a variety of data visualization techniques to present meteorological data in an intuitive, actionable format. Each component is carefully designed to maximize information clarity while maintaining visual appeal.

Line Charts

Tracks temperature trends over 7-day forecast period, showing high and low temperature variations with clear day/night differentiation.

Gauge Visualizations

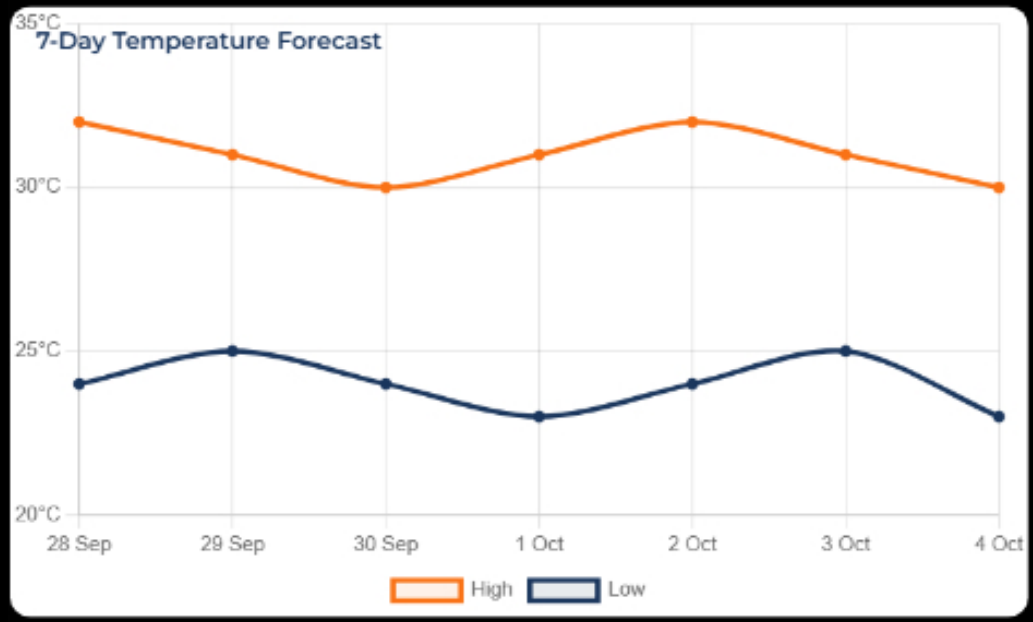
Displays UV index, humidity percentage, and air quality metrics with intuitive color-coding (green, yellow, orange, red) for instant status assessment.

Weather Icons

Custom iconography for weather conditions (sun, clouds, rain, mist) with consistent styling for improved recognition and user experience.

Data Cards

Compact information displays for sunrise/sunset times, visibility, and pressure readings with minimalist design for quick scanning.



Temperature Display
Current: 29°C with color gradient

Wind Speed
Directional arrow + km/h value

AQI Gauge
0-500 scale with color zones

Precipitation Chart
Hourly probability visualization

Air Quality Monitoring Focus

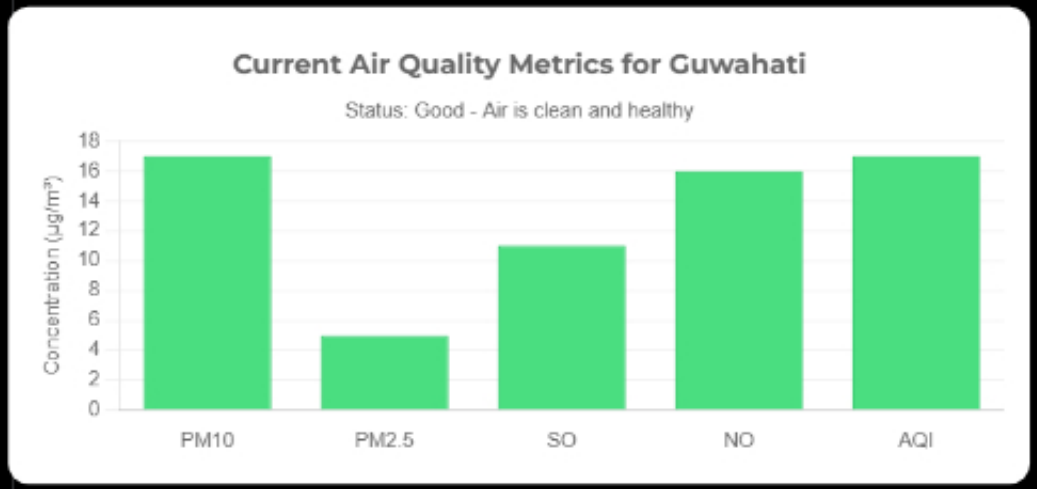
The dashboard provides comprehensive real-time air quality monitoring for Guwahati, with detailed AQI metrics that enable users to make informed decisions about outdoor activities and health precautions.

AQI Components Tracked

- **Current AQI Value:** 17 (Good) - Clean and healthy air conditions
- **PM10:** 17 µg/m³ - Particulate matter 10 micrometers or less
- **PM2.5:** 5 µg/m³ - Fine particulate matter 2.5 micrometers or less
- **SO:** 11 µg/m³ - Sulfur dioxide concentration
- **NO:** 16 µg/m³ - Nitrogen oxide concentration

Health Implications

> The current "Good" AQI indicates minimal to no risk for the general population. Air quality is considered satisfactory, and air pollution poses little or no risk. Residents can safely engage in outdoor activities without health concerns related to air quality.



Good	Moderate	Unhealthy for Sensitive	Unhealthy	Very Unhealthy
0-50	51-100	101-150	151-200	201+

Implementation Details

API Integration

Weather data is fetched through RESTful API calls in Power BI using Power Query M functions. Authentication is handled via API keys with scheduled refresh tokens to maintain secure connections.

Data Refresh Setup

Configured for automated 3-hour refresh intervals with on-demand manual refresh option. Data gateway ensures smooth flow between API sources and Power BI service with minimal latency.

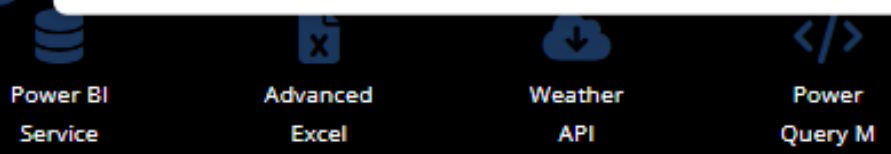
Excel Data Preprocessing

Advanced Excel formulas normalize raw API data, standardize units of measurement, and prepare data structures. Power Query transformations clean and reshape data before visualization.

Edge Case Handling

Implemented error handling for API timeouts, missing data points, and extreme weather values. Fallback mechanisms ensure dashboard continues to display reliable information even during connection issues.

1. API connection established via Power BI Data Source configuration
2. JSON/XML responses transformed using Power Query Editor
3. Data model relationships created for forecast & current conditions
4. DAX measures calculate derived metrics (feels-like, trends)
5. Gateway configured for scheduled refresh & real-time updates



Future Enhancements Roadmap

Taking our weather dashboard to the next level with innovative features and expanded capabilities

- Multi-City Comparison
- Severe Weather Alerts
- Hourly Breakdowns
- Mobile Optimization
- Advanced Analytics

Conclusion & Contact

The Real-Time Weather Forecasting Dashboard provides comprehensive meteorological data visualization for Guwahati, empowering users with actionable insights for travel planning, public safety, and health awareness through an intuitive Power BI interface.

Project Highlights

- Complete weather analytics with 14-day forecast and real-time updates
- Comprehensive air quality monitoring with health impact assessment
- API integration with Power BI for automated data refreshing
- MIT License - open-source and free to use with attribution

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Real-time-Weather_forecasting

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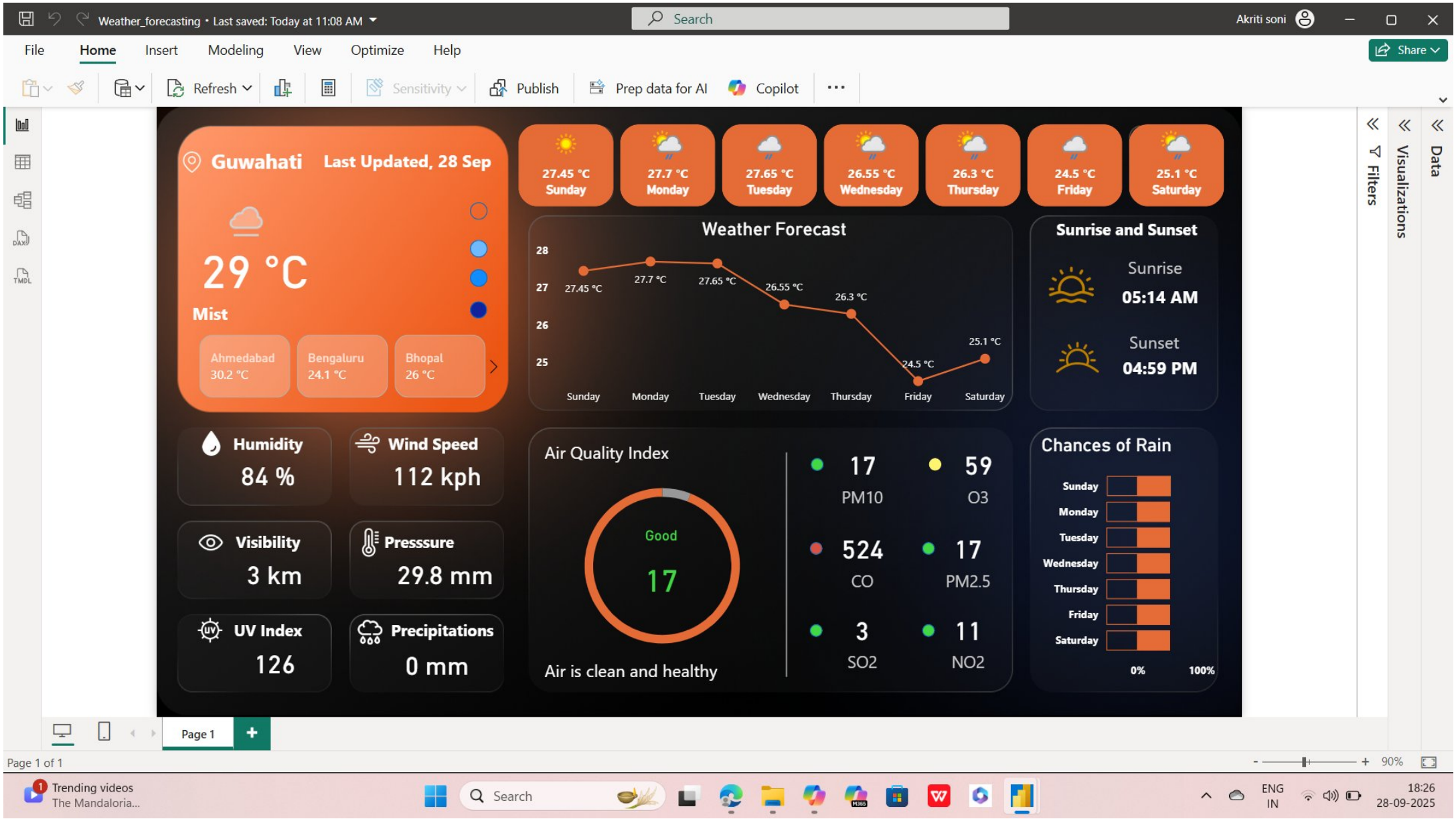
29°C	17	84%
Temperature	AQI Value	Humidity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Sunday
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Sunrise and Sunset
Sunrise
05:14 AM
Sunset
04:59 PM
Humidity
84 %
Wind Speed
112 kph
Visibility
3 km
Presssure
29.8 mm
UV Index
126
Precipitations
0 mm
Air Quality Index
Good
17
Air is clean and healthy
17
PM10
59
O3
524
CO
17
PM2.5
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NO2
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