Brandenburg
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Wind Energy Forecasting Project
Interactive Dashboard Report

Executive Summary

This report documents the interactive Streamlit dashboard developed for the Wind Energy Forecasting project. The dashboard provides a comprehensive interface for data exploration, model training status, prediction visualization, and performance comparison. It serves as the primary user interface for interacting with the forecasting system.

Dashboard Overview

Attribute	Value
Framework	Streamlit
Visualization Library	Plotly
Port	8501
Host	localhost
Theme	dark
Total Pages	6

Dashboard Pages

■ Data Overview

Comprehensive view of the dataset with time series visualizations, statistics, and raw data exploration
Features:
• Total records and date range metrics
• Interactive time series plots (All variables, Wind Generation, Wind Capacity, Temperature)

• Statistical summary table
• Raw data table with expandable view

■ Data Analysis

Deep dive into data patterns, correlations, and distributions
Features:
• Correlation matrix heatmap
• Distribution histograms for key variables
• Seasonal pattern analysis by month
• Statistical distribution metrics

■ Model Training

Interface for model training and status monitoring
Features:
• Model selection for training
• Training status indicators
• Model availability checker
• Training instructions and guidance

■ Predictions

Visualize model predictions and performance metrics
Features:
• Model selection dropdown
• Interactive predictions vs actual plots
• Residual analysis charts
• Performance metrics display (RMSE, MAE, MAPE, R^2)
• Download predictions as CSV

■ Future Forecast

Generate and visualize future wind energy forecasts
Features:
• Model selection for forecasting
• Customizable forecast period (1-365 days)
• Interactive forecast visualization
• Historical context overlay
• Forecast statistics and insights
• Download forecast data

■ Model Comparison

Compare performance across all models
Features:
• Comprehensive metrics comparison table
• RMSE comparison bar chart
• R^2 score comparison bar chart
• Best model identification
• Side-by-side performance visualization

Technical Implementation

- Built with Streamlit framework for rapid web app development
- Uses Plotly for interactive, publication-quality visualizations
- Implements data caching for improved performance
- Modular design with reusable plotting functions
- Responsive layout with wide page configuration
- Dark theme template for better visualization
- Session state management for user interactions
- File-based model loading and prediction generation

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