A logo on a black background

Description automatically generated

**Weather Forecasting and Analysis**

By: **Abdulrahman Hisham Kamel Mahmoud**

**Report Outline**

This report provides an in-depth analysis of weather data, leveraging various forecasting models and data science techniques. Below is an outline to guide you through the report:

**1. Introduction**

* Overview of the project’s goals and objectives.
* Description of the dataset, including its source, key features, and scope.

**2. Data Preprocessing**

* Data cleaning steps, including handling missing values and outliers.
* Feature engineering, including the creation of new features such as daytime and nighttime.
* Methods of data normalization and transformation.

**3. Exploratory Data Analysis (EDA)**

* Summary statistics and trends for key variables (temperature, pressure, humidity).
* Visualization of correlations and patterns in the data.
* Identification and treatment of anomalies or outliers.

**4. Forecasting Models**

* Overview of the models used:
  + LSTM (Long Short-Term Memory Network)
  + ARIMA (AutoRegressive Integrated Moving Average)
  + VAR (Vector AutoRegression)
* Detailed analysis of model parameters, training, and evaluation metrics.
* Comparative performance of models using metrics such as MSE, MAE, and R².

**5. Advanced Analyses**

* Decomposition of seasonal and trend components.
* Analysis of air quality indices and their relationship with weather parameters.
* Insights into the environmental and climate impacts derived from the data.

**6. Insights and Recommendations**

* Summary of key findings from the models and analyses.
* Recommendations for potential applications of the results.

**7. Conclusion and Future Work**

* Summary of the project’s outcomes.
* Areas for improvement and future exploration.

**Appendices**

* Additional charts, tables, and technical details.
* References to datasets, tools, and libraries used.