**📄 Bird Observation Dashboard – Documentation**

**✅ Project Objective**

To analyze bird observation data across forest and grassland units, understand species distribution, identify patterns based on environmental and temporal conditions, and draw insights to support ecological research and conservation efforts.

**1. Data Cleaning & Preprocessing**

* Handled missing or inconsistent values across key fields.
* Filtered relevant columns (e.g., Scientific\_Name, Location\_Type, Temperature, Start\_Time, etc.).
* Merged forest and grassland datasets into a unified, standardized format to ensure comparable analysis.

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

Performed multi-dimensional analysis across the following axes:

* **Temporal**: Date, Year, Month, Season
* **Spatial**: Plot, Location Type
* **Species**: Scientific Name, Activity Type
* **Environmental**: Temperature, Humidity, Wind, Sky
* **Behavioral**: Distance, Flyover Observed
* **Observer**: Visit number, Observer Name
* **Conservation**: PIF Watchlist, AOU Codes

**📊 Types of Analysis & Visualizations**

**1. Temporal Analysis**

* **Visualizations**: Bar charts for Sightings per Month, Sightings per Season, Start Hour Distribution.
* **Insights**:
  + Seasonal trends showed increased bird activity in early summer and early mornings.
  + Month-wise breakdown revealed peaks during migratory seasons.

**2. Spatial Analysis**

* **Visualizations**: Histograms by Location\_Type and Plot\_Name.
* **Insights**:
  + Grassland plots had higher species diversity.
  + Certain plots consistently reported high activity, indicating possible hotspots.

**3. Species Analysis**

* **Visualizations**: Bar charts for Unique Species by Location, stacked bars for ID\_Method vs. Interval\_Length, Observer-wise histograms.
* **Insights**:
  + Singing was the most common identification method.
  + Variation observed in species richness between different observers and sites.

**4. Environmental Conditions**

* **Visualizations**: Scatter plots (e.g., Temperature vs. Bird Count), Pie charts (e.g., Disturbance, Sky, Wind conditions).
* **Insights**:
  + Clear skies and calm winds were associated with higher bird sightings.
  + Disturbance levels showed moderate negative impact on sightings.

**5. Distance & Behavior**

* **Visualizations**: Bar charts showing common species at close and far distances.
* **Insights**:
  + Some species were consistently seen at closer distances.
  + Flyover observations were more frequent in open habitats.

**6. Observer Trends**

* **Visualizations**: Histograms by Observer, Box plot of Species Count per Visit.
* **Insights**:
  + A few observers reported significantly higher sightings—possibly due to skill or effort.
  + Later visits sometimes saw reduced species count, possibly due to seasonal decline or observer fatigue.

**7. Conservation Insights**

* **Visualizations**: Pie charts and bar graphs for PIF Watchlist, AOU\_Code distribution.
* **Insights**:
  + Several at-risk species were observed; useful for targeted conservation.
  + Regional stewardship species formed a sizable portion of observations.

**📌 Key Findings**

* **Morning and seasonal timing** strongly influence observation success.
* **Grasslands** reported greater biodiversity and are potential conservation hotspots.
* **Environmental conditions** (clear sky, mild temperatures) positively impact visibility and bird activity.
* **Observer variance** can influence reported metrics; standardization is recommended