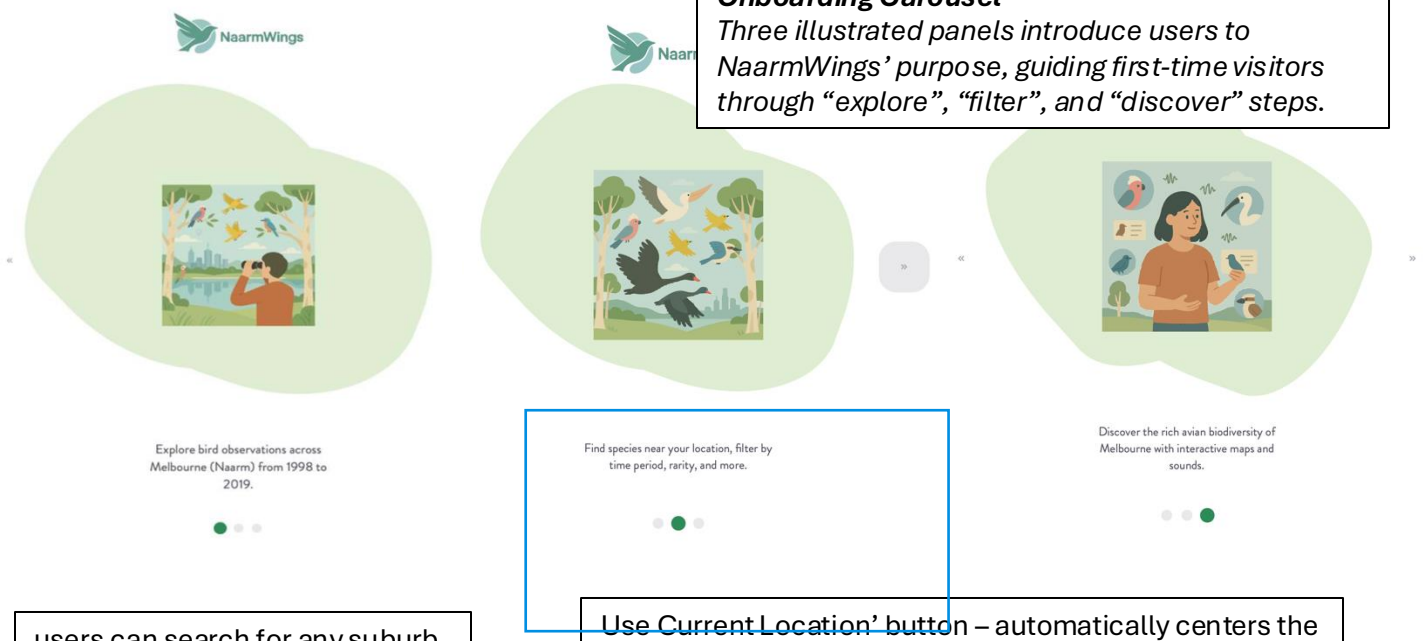
Design Summary

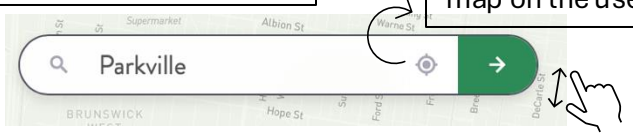
NaarmWings: Interactive Bird Biodiversity Explorer



Onboarding Carousel
Three illustrated panels introduce users to NaarmWings' purpose, guiding first-time visitors through "explore", "filter", and "discover" steps.

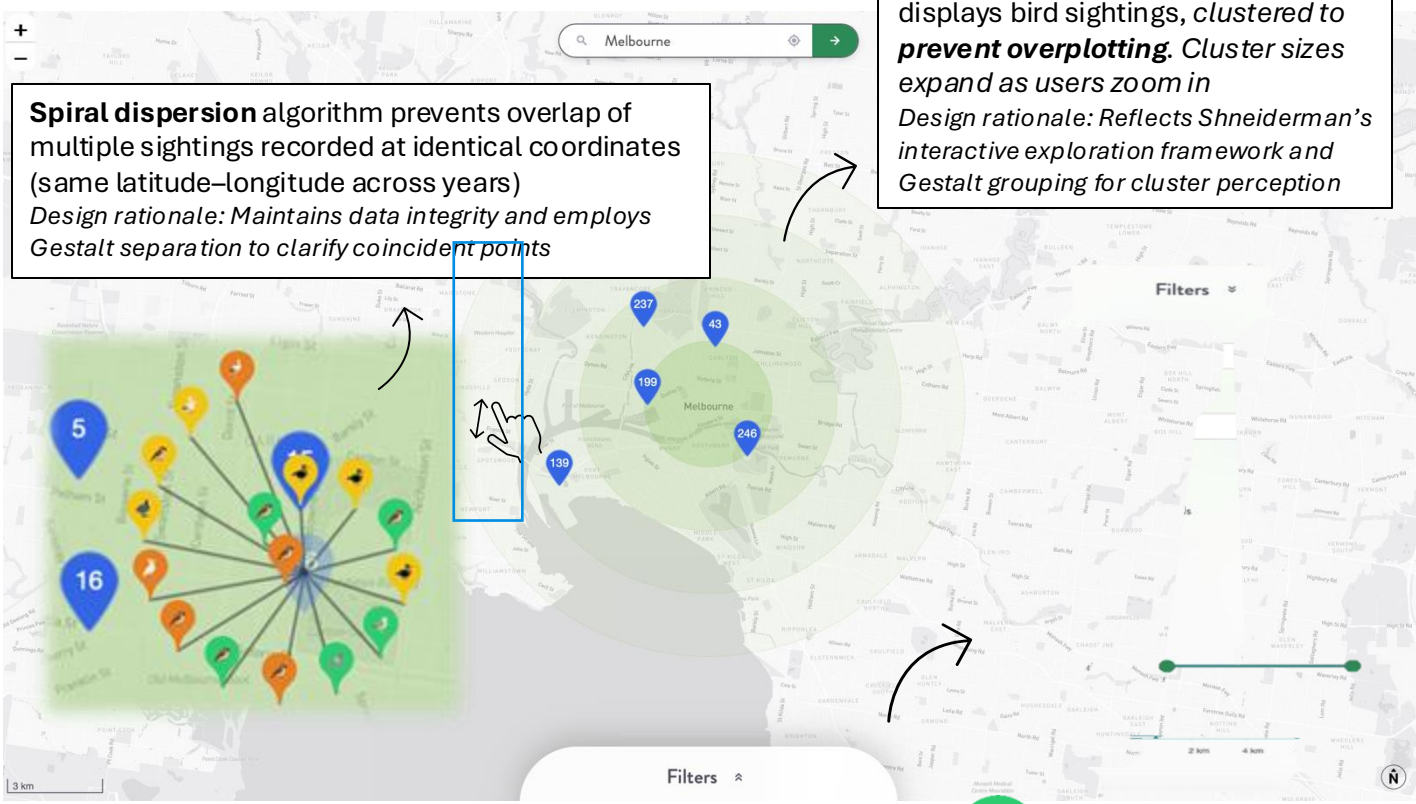
users can search for any suburb

Use Current Location' button – automatically centers the map on the user's live GPS location for faster exploration

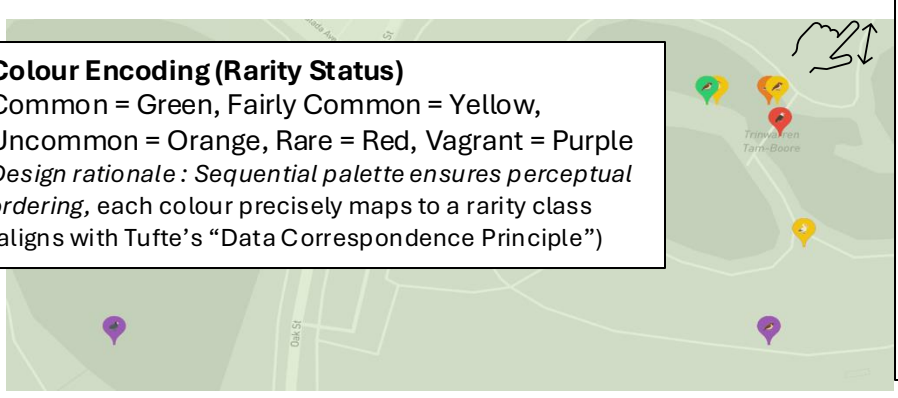


The **central Leaflet map** dynamically displays bird sightings, *clustered to* ***prevent overplotting****. Cluster sizes expand as users zoom in*
Design rationale: Reflects Shneiderman's interactive exploration framework and Gestalt grouping for cluster perception

Spiral dispersion algorithm prevents overlap of multiple sightings recorded at identical coordinates (same latitude–longitude across years)
Design rationale: Maintains data integrity and employs Gestalt separation to clarify coincident points



Species-Level Map (Zoomed-in View)



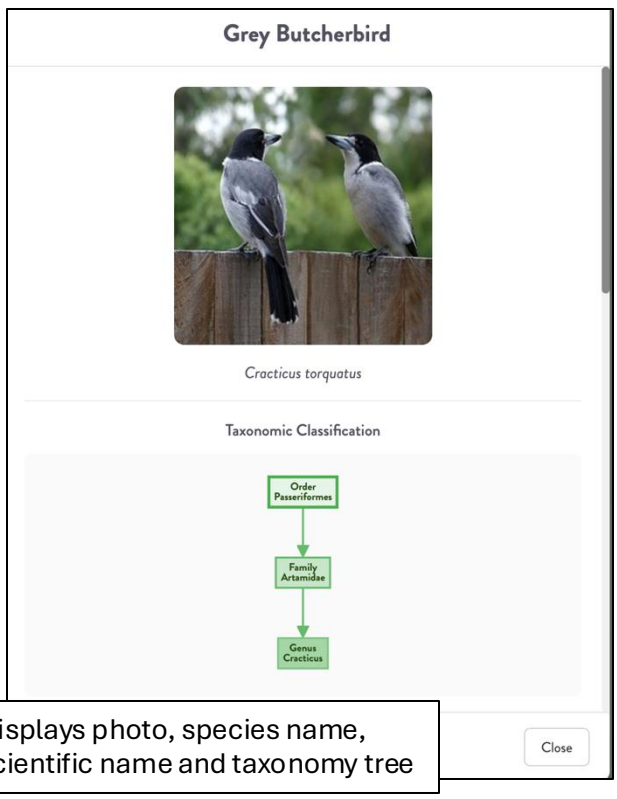
Colour Encoding (Rarity Status)
Common = Green, Fairly Common = Yellow, Uncommon = Orange, Rare = Red, Vagrant = Purple
Design rationale : Sequential palette ensures perceptual ordering, each colour precisely maps to a rarity class (aligns with Tufte's "Data Correspondence Principle")

Icon Encoding (Taxonomic Order)
Icon inside each marker indicates bird order (17 distinct icons = 17 orders, e.g., Anseriformes = duck icon)
Design rationale: Uses shape as an extra pre-attentive cue; Gestalt similarity helps link same orders, distinct shapes differentiate others

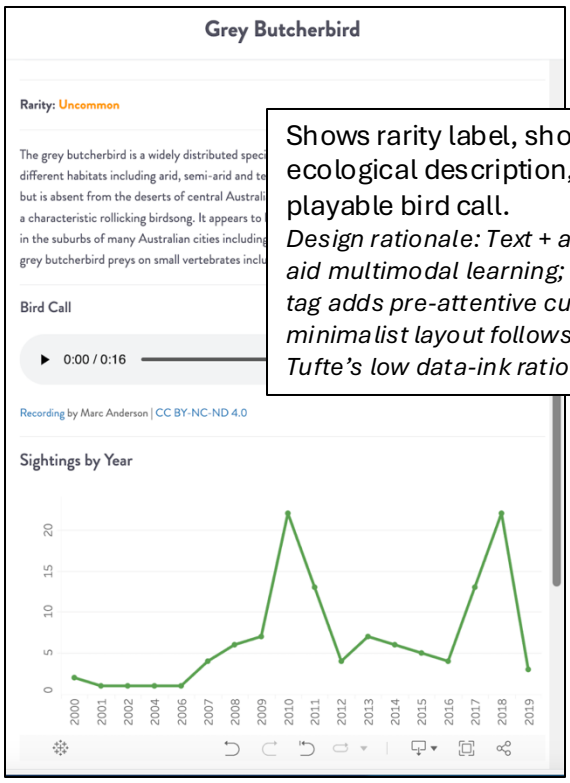
The design integrates colour, symbol, and interaction principles from lectures, balancing visual hierarchy, perceptual efficiency, and data integrity. Each design choice, from colour palettes to clustering, embodies Tufte's minimalist ethos and MacEachren's exploratory geovisualisation framework

means zoomed in view

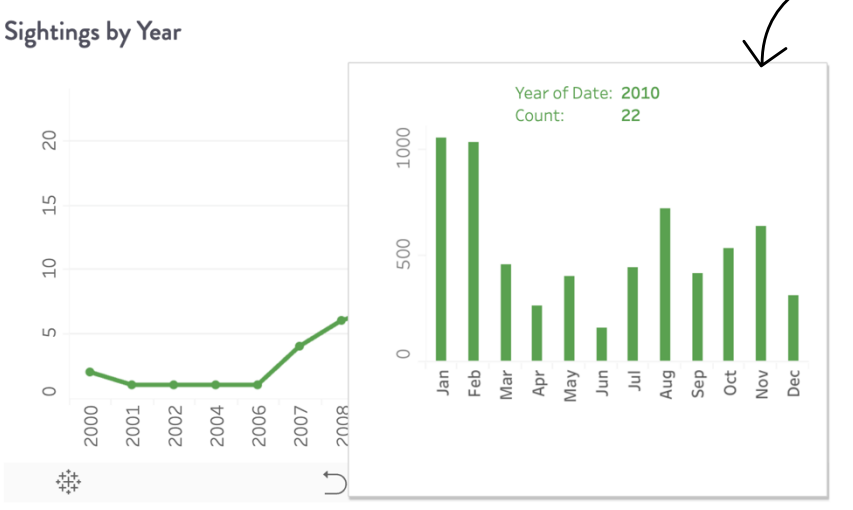
Bird Species Detail View (After Clicking Map Pinpoint)



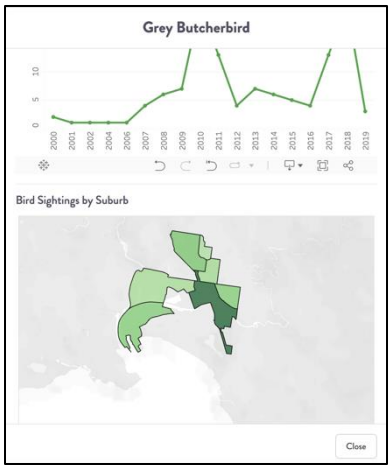
Displays photo, species name, scientific name and taxonomy tree

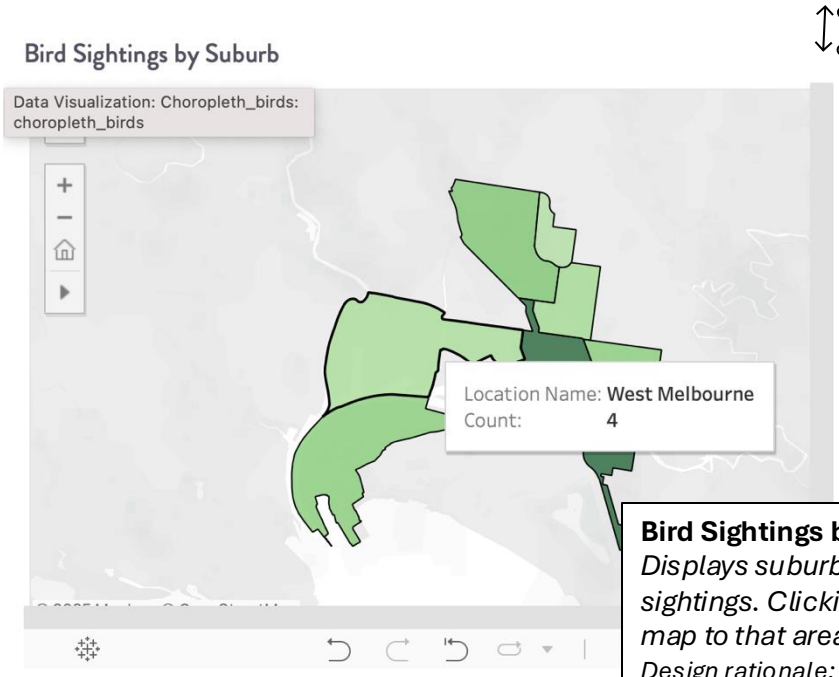


Shows rarity label, short ecological description, and playable bird call.
Design rationale: Text + audio aid multimodal learning; rarity tag adds pre-attentive cue; minimalist layout follows Tufte's low data-ink ratio



Sightings by Year & Month: Tableau Chart
Interactive line graph shows annual sightings of the selected species (2000–2019); hover reveals counts along with monthly breakdown
Design rationale: Uses position for perceptual accuracy; minimal gridlines improve readability. Trend + category pairing aids comparison , uniform green hue maintains ecological harmony





Bird Sightings by Suburb : Tableau Choropleth Map
Displays suburb-wise counts; darker greens = higher sightings. Clicking a suburb zooms the main Leaflet map to that area.
Design rationale: Sequential ColorBrewer palette ensures perceptual ordering and accessibility Interaction creates bidirectional linkage between Tableau and Shiny views

Tableau element (line chart) dynamically update with filters chosen on the main dashboard: species, rarity, or year range + there's bidirectional linkage b/w choropleth map and leaflet map

Pattern and Use case summary

NaarmWings: Interactive Bird Biodiversity Explorer

NaarmWings transforms static biodiversity records into a living map of Naarm's (Melbourne) birdlife. By integrating **temporal, spatial, and taxonomic layers**, it allows users (**urban citizens, birdwatchers, and ecology students in Melbourne)** to move seamlessly between *where*, *when*, and *what,* revealing ecological patterns that are impossible to see in spreadsheets or reports.

Each feature in the interface contributes to discovery:

- **Clustered and spiral markers** reveal density and variety without clutter
- **Colour-coded rarity** (from green to purple) conveys the ecological status at a glance
- **Taxonomic icons** add shape cues that let users notice dominance of certain bird families in different regions.
- **The linked Tableau charts** show yearly and monthly fluctuations, translating long-term data into intuitive trends.
- **The choropleth map** turns the city into a biodiversity heatmap, where darker greens represent suburbs with higher sighting likelihoods for the selected bird

Persona-Based Use Cases

Persona 1 : Ava, Urban Birdwatcher

Goal: Discover nearby hotspots and seasons to find rare or uncommon birds around Bouverie Street, Carlton

Using the **"Current Location"** tool, Ava views an 8 km radius centred on Parkville. A dense **41-point cluster** appears over the **University of Melbourne / Royal Park**, filled with orange and red markers (Uncommon + Rare species).

She infers that open, vegetated parks attract higher species diversity than built-up zones, planning her weekend birding around Royal Park

Why the Design Helped:

- Cluster expansion + spiral dispersion reveal hotspots
- Colour-coded rarity enables immediate visual distinction
- Observation radius overlay defines spatial context and supports intuitive exploration
- Minimalist interface and visual hierarchy direct her focus to meaningful data first

Persona 2 : Liam, Ecology Student

Goal: Study how sightings of a specific species change over time and across Melbourne suburbs for his ecology coursework

Liam opens the **Grey Butcherbird** view. The **2014 peak** in the "Sightings by Year" chart and **May–August spike** in the bar chart show seasonal abundance. The linked **choropleth map** highlights **West Melbourne and Carlton** as dense green areas (signifying the most sightings in these suburbs); clicking West Melbourne recentres the Leaflet map, confirming strong suburban activity near green corridors.

He infers that the species is more frequently sighted near large green parks compared to built-up areas, suggesting that increase in population may link to changes in vegetation cover and local reporting efforts during that period.

Why the Design Helped:

- Species-specific Tableau charts allow fine-grained trend analysis
- Pre-attentive colour gradients on the choropleth convey density at a glance
- Linked interactivity between map and chart establishes multiple coordinated views, helping Liam move between *temporal* and *spatial* reasoning
- Minimal visual hierarchy (image → taxonomy → line chart → map) maintains clarity

Persona 3 : Nina, Conservation Planner

Goal: Identify long-term biodiversity hotspots and temporal population changes across Melbourne suburbs to guide policy and habitat restoration strategies

Nina filters **rare/vagrant species (1998–2019)** within 8 km of the CBD. Both Tableau and Leaflet views update together, exposing persistent clusters across **Royal Park, Princes Park, and Carlton Gardens**. Clicking *Parkville* in the choropleth zooms the main Leaflet map to that suburb, letting her explore which specific species contribute to its biodiversity. The **2008–2014 peaks** in the Sightings chart indicate cyclical population rebounds, guiding her to strengthen ecological corridors connecting those parks.

She concludes that **large, vegetated corridors like Royal and Princes Parks sustain long-term bird diversity**, while denser built-up areas show sporadic sightings. This insight guides her decision to prioritise **corridor-based conservation initiatives,** connecting existing parklands and funding targeted habitat restoration across the Parkville–Carlton–North Melbourne zone

Why the Design Helped:

- Bidirectional linkage synchronises filters + navigation
- clustered + colour-ordered markers preserve data integrity
- Sequential colour palette enhances perceptual ordering of rarity
- Observation period slider + radius control follow Shneiderman's *overview–zoom–filter–details-on-demand* model
- Tufte's *low data-ink ratio* ensures visual clarity

Collective Insight

Together, these personas illustrate three complementary use modes : **exploration** (Ava), **analysis** (Liam), and **policy insight** (Nina). The interface bridges **visual clarity, interactivity, and ecological reasoning**, enabling discovery that supports both personal learning and evidence-based urban planning.

Sources/References used

NaarmWings: Interactive Bird Biodiversity Explorer

We got our bird sighting data from **BirdLife Australia's Birdata** database through the **Atlas of Living Australia**. The dataset has over 32,000 bird observation records within the **City of Melbourne (LGA: Melbourne)**.

We gratefully acknowledge **BirdLife Australia** and the **Atlas of Living Australia** for making these data openly available for educational purposes.

Data Citation

Atlas of Living Australia occurrence download at https://biocache.ala.org.au/occurrences/search accessed on 20 October 2025. Descriptive and Image content retrieved via the Wikipedia REST API accessed on 20 October 2025. Audio content accessed via the Xeno-Canto API on 20 October 2025 for academic, non-commercial use. Morphological trait data derived from the AVONET global bird dataset and merged with species occurrence records using the scientific name field accessed on 22 October 2025. Spatial boundary and locality shapefiles obtained from the City of Melbourne Open Data Portal and Geoscape Administrative Boundaries accessed on 25 October 2025.
DOIs:

- Atlas of Living Australia: https://doi.org/10.26197/ala.aaf6d193-fcff-4c92-9f10-607c1fbda846

Data sources:

- **BirdLife Australia (2019).** *Birdata* (http://www.birdata.com.au).
  Accessed via the ALA on (01/03/2019).
  For more information: https://collections.ala.org.au/public/show/dr359

- **Records provided by BirdLife Australia**, accessed through ALA website.
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- **Wikipedia contributors (2025).** *Species descriptions and representative images retrieved via the Wikipedia REST API.*
  API endpoint: https://en.wikipedia.org/api/rest_v1/
  Documentation: https://www.mediawiki.org/wiki/API:REST_API

- **City of Melbourne (Open Data Portal).** *Municipal Boundary Dataset* (City of Melbourne shapefile).
  Downloaded from https://data.melbourne.vic.gov.au/explore/dataset/municipal-boundary/export/

- **Geoscape Australia / Commonwealth of Australia (2025).**
  VIC Suburb/Locality Boundaries – Geoscape Administrative Boundaries (GDA2020).
  Downloaded from https://data.gov.au/data/dataset/vic-suburb-locality-boundaries-geoscape-administrative-boundaries/resource/14a2bec8-cb31-428c-a5eb-c298f466c46d
  Licensed under **CC BY 4.0**.

- **Tobias, J.A., et al. (2022).** *AVONET: Morphological, ecological and geographical data for all birds.*
  Downloaded from https://figshare.com/s/b990722d72a26b5bfead.
  Merged with pre-processed occurrence data using the scientific name field.

- **Xeno-Canto Foundation.** *Xeno-Canto — Bird sounds from around the world* [Dataset].
  Includes bird call recordings displayed with per-track attribution.
  Global Biodiversity Information Facility (GBIF) DOI: https://doi.org/10.15468/qv0ksn.
  Licensed under **CC BY-NC-ND 4.0** and **CC BY-NC-SA 4.0**.
  Terms of Use: https://xeno-canto.org/about/terms

Group member contribution table

NaarmWings: Interactive Bird Biodiversity Explorer

Name	Contribution to Project	Quality of Participation	% Contribution
Sarathi Thirumalai Soundararajan	Developed the data pre-processing pipeline integrating sightings, audio, image, and morphological datasets. Implemented advanced filtering features (species, order, rarity, time, and radius) and designed custom composite map markers. Co-authored report sections on data integration and filtering, and helped prepare technical presentation slides.	Reliable and detail-oriented contributor across coding, documentation, and presentation. Actively engaged in technical discussions and ensured consistent quality of implementation and reporting throughout the project.	25
Eby Thomas	Implemented interactive components including bird detail modals with taxonomy diagrams, clustering logic, and nearby grouping features. Contributed to the report sections on visualization design and interactivity. Supported slide preparation, focusing on clear representation of visual features and data workflows.	Technically skilled and dependable. Worked collaboratively on coding, reporting, and presentation tasks. Contributed valuable feedback during design discussions and ensured robust testing of interactive elements.	25

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Name	Contribution to Project	Quality of Participation	% Contribution
Harish Kannan	Developed Tableau visualizations, including the choropleth map and time-series chart. Supported dashboard integration with backend data and Python-generated suburb layers. Co-authored report sections on design summary and visualization methods. Contributed to presentation slides and ensured visual consistency across deliverables.	Balanced contributor in both technical and documentation work. Maintained high standards in visualization accuracy, team coordination, and presentation delivery.	25
Mahek Jain	Implemented OpenStreetMap search integration and contributed to the code for frontend build setup. Authored report sections on design summary, use cases, and documentation. Designed and formatted presentation slides to maintain clarity and consistency across all visual materials.	Organized and collaborative team member. Contributed effectively across coding, documentation, and presentation. Ensured project outputs met academic and visual quality standards through consistent review and coordination.	25