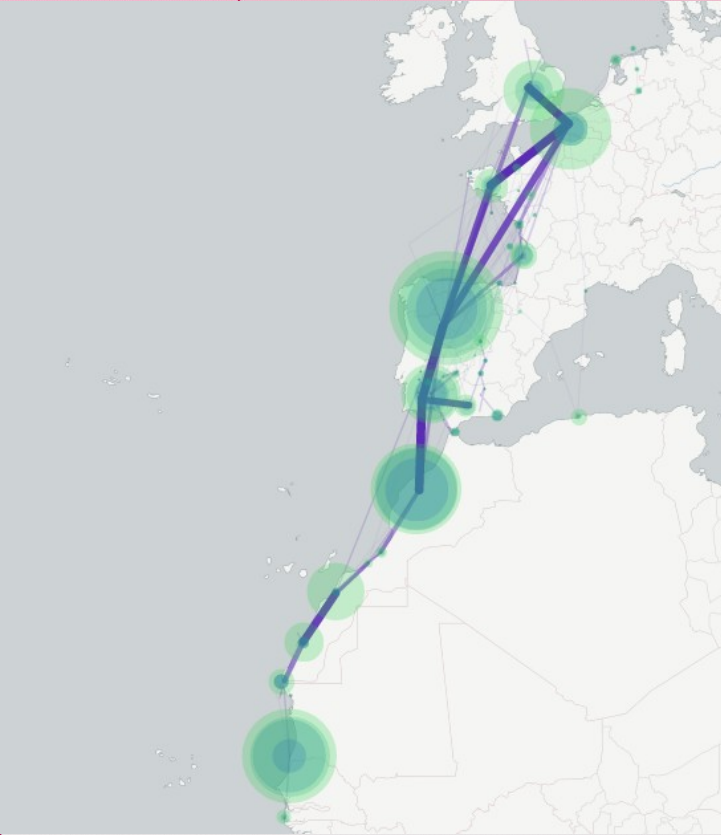


# Visual Exploration of Migration Patterns in Gull Data

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Where innovation starts

# Data Set: 72 Lesser Black Backed Gulls

- **85 MB after preprocessing**
  - Time stamps correspond to different time zones
  - All mapped to one time zone
- **29 herring gulls without migration flights**
- **Location is accurate**
  - Altitude somewhat unreliable
  - Use only longitude and latitude

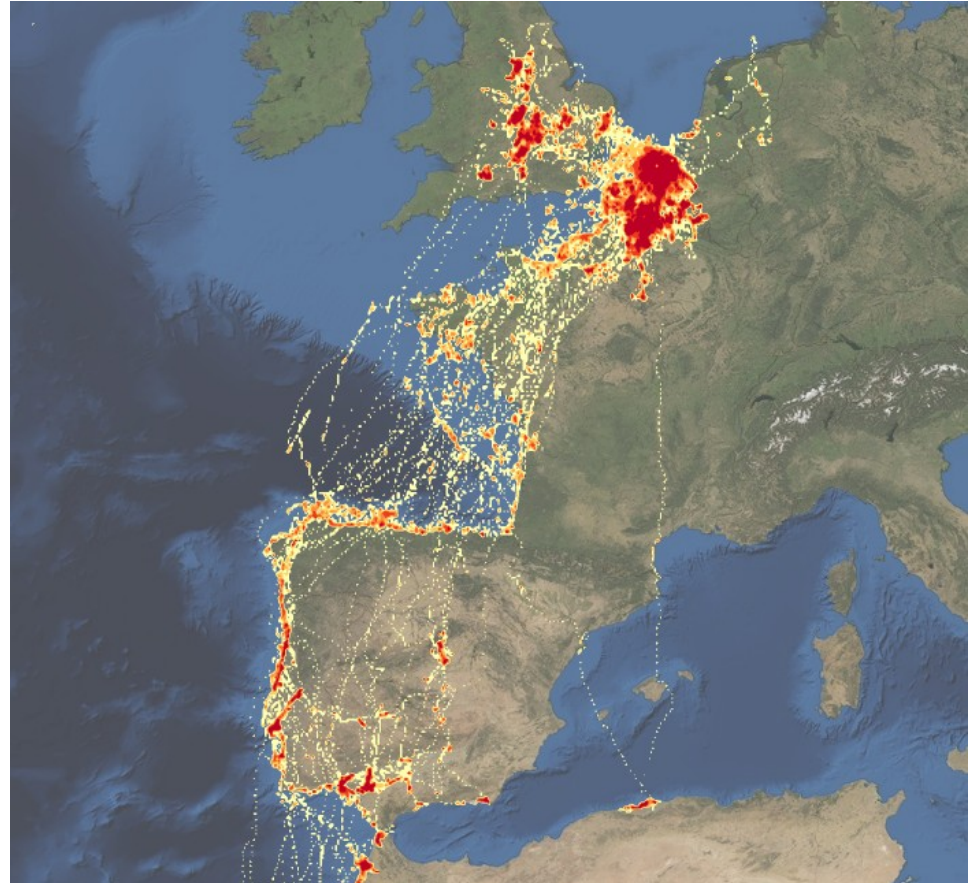


# Task 1: Identify Spatial Patterns

- Understand and compare spatial patterns
- Deviation of an individual from the group's migration strategy

## Trajectory Density Map

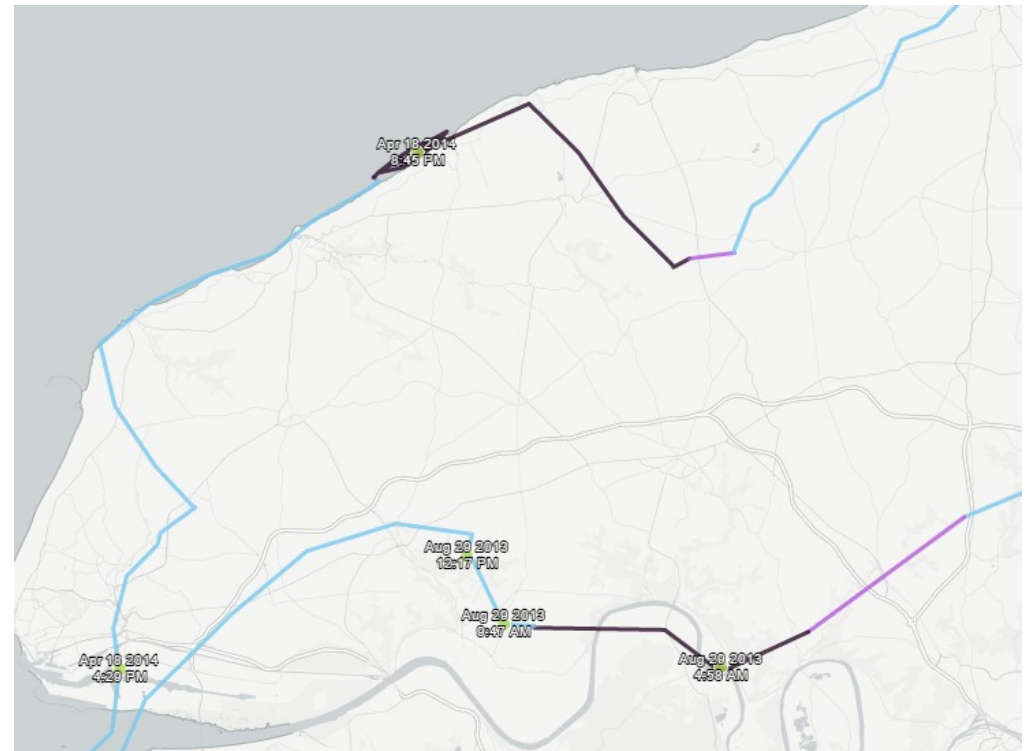
- a) Interpolation
- b) Count values in a grid
- c) Bin values to color scheme from yellow to red



# Task 2: Identify Temporal Patterns

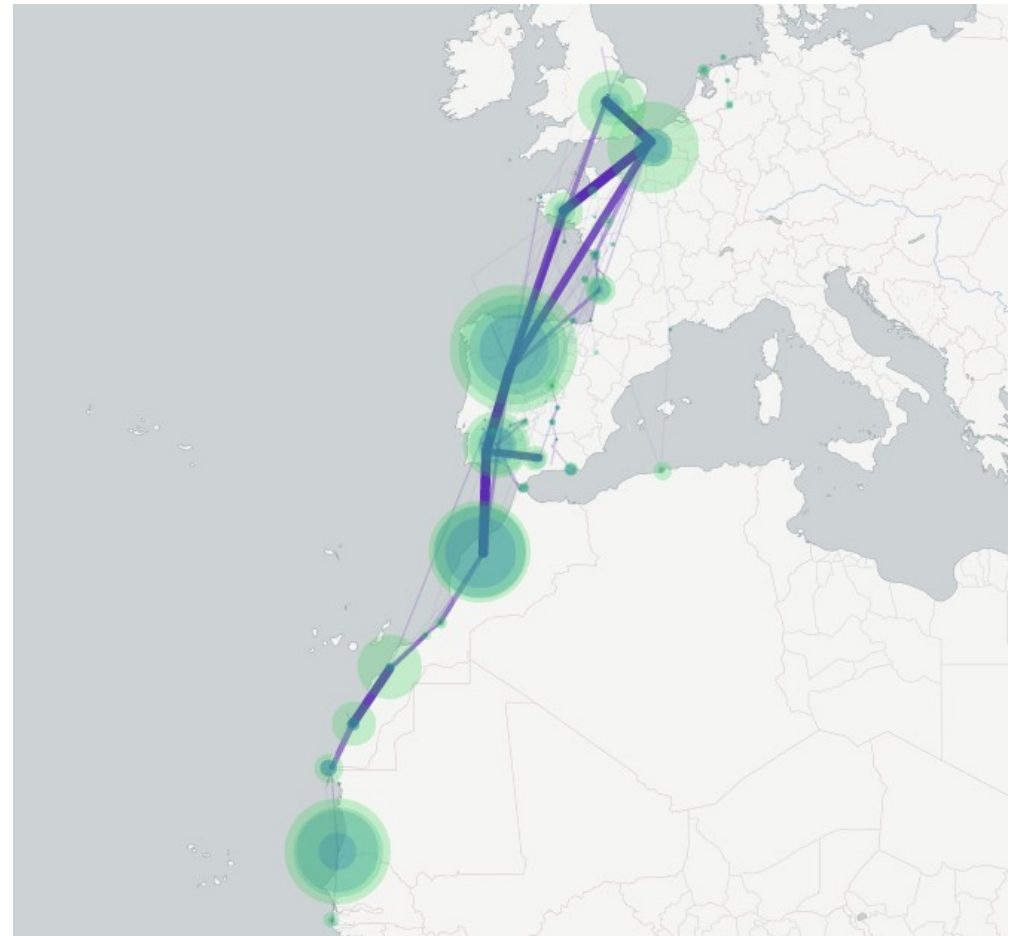
- Temporal migration strategy of an individual gull
- Ranging from day/night patterns over days to seasonal patterns

1. Day in light blue
2. Night in black
3. Twilight in purple



# Task 3: Identify Stopovers

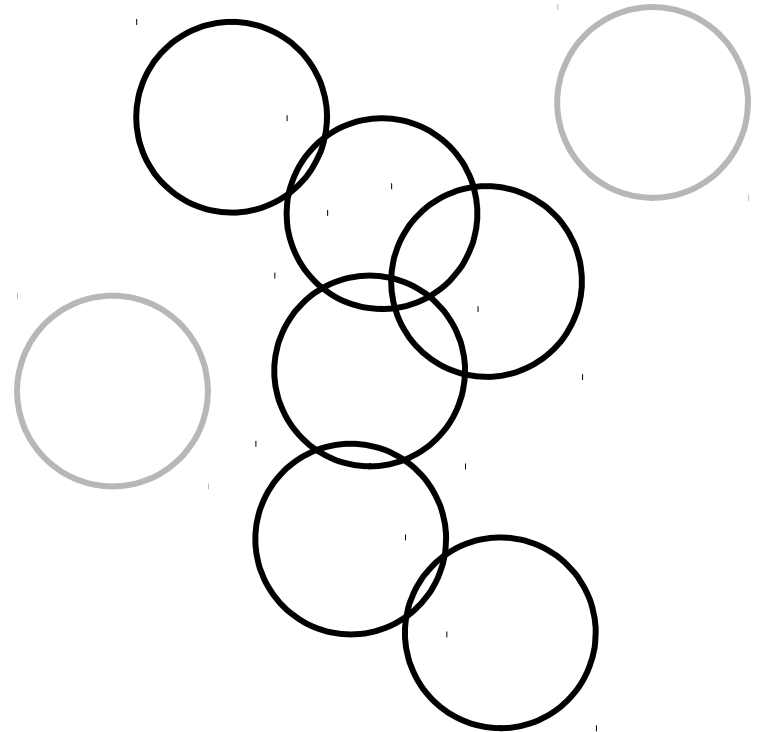
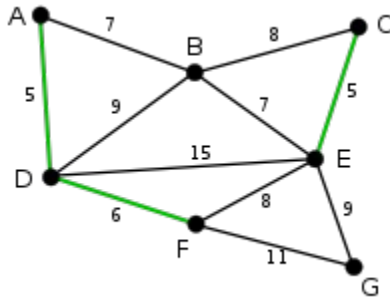
- **Idea of segmentation: identify different homogeneous movement episodes**
- **Helps to summarize and visualize large trajectory data sets interactively**
- **Criterion for stops on multiple trajectories**



# Task 3: Identify Stopovers

Steps to compute the stopovers:

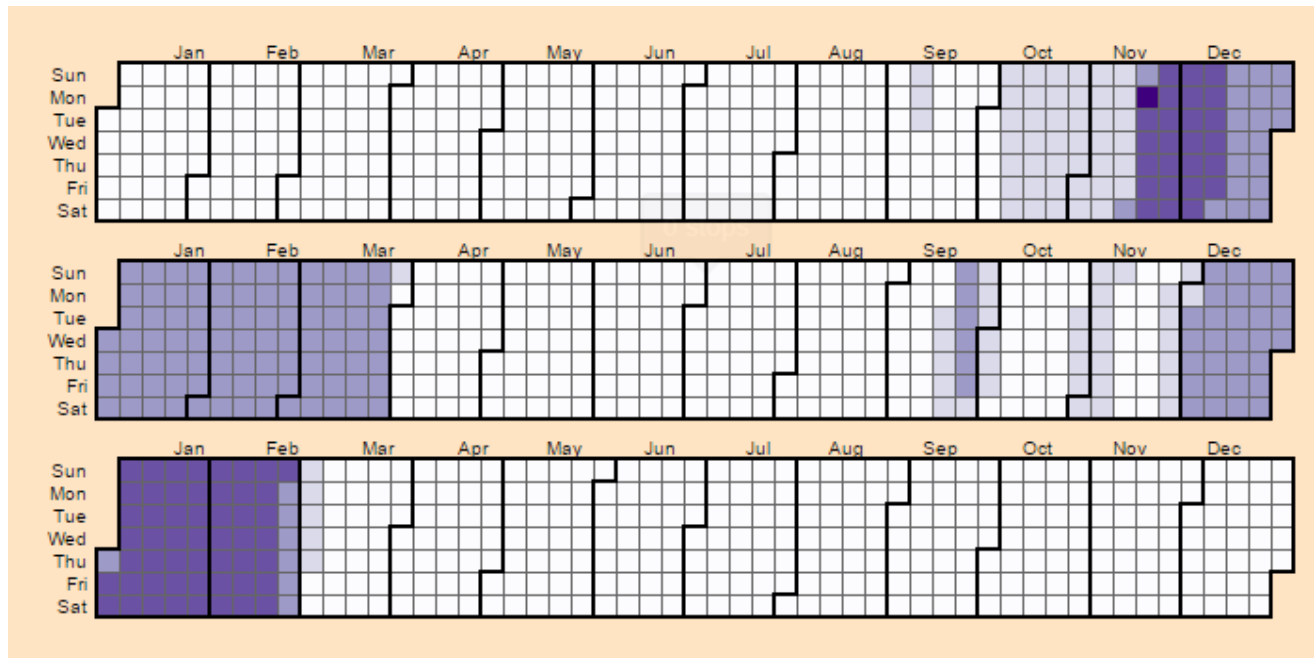
1. **Classify idle points:** speed of a point wrt. the previous point below a given threshold
2. **Compute stops:** smallest disk containing the corresponding idle points
3. **Triangulation** on stop centers



4. **Aggregate stops** on the scale of analysis

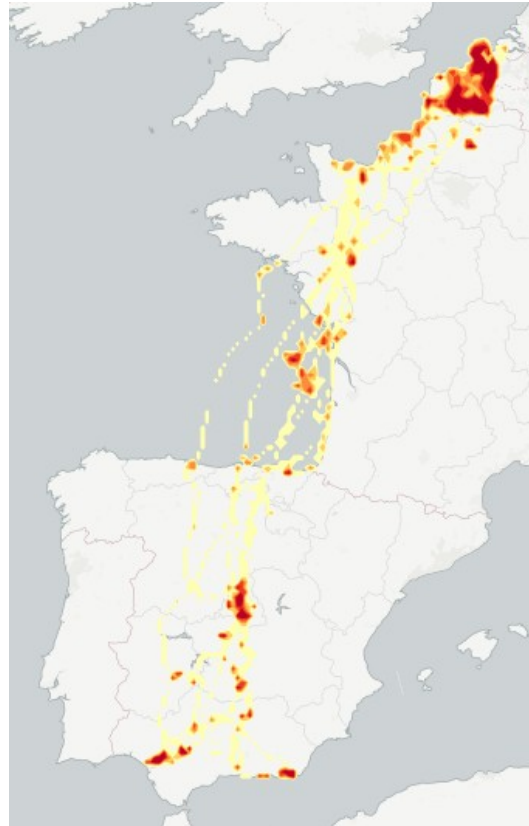
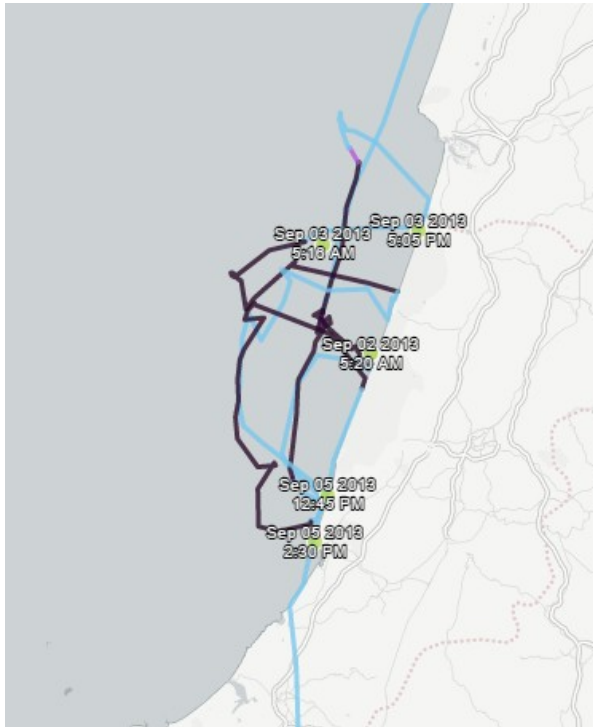
# Task 4: Compare Groups and Individuals

- Overview of gulls with similar migration strategy
- Calendar view by selecting a stopover or an individual gull
- Insight into temporal information on stops
- Count of stops per day in a saturation of purple



# Findings

1. Night activity of gulls
2. Inland migration: gulls stay over winter in Europe
3. Gulls stopping in England and migrating to Africa do not stay in Europe in the winter





# Thank you for your attention



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