Waterfowl Travel: Team Iteration 6 Report

5/5/2025

Prepared by the students of CSC 4615 – Spring 2025

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Stories Identified:

Authors: Revel Etheridge, Drew Burkhalter
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During this iteration, developers focused on user interface and model refinement with Kenny and Revel enhancing the GNN's dual edge weighting system for location clustering and finalization of data exportation. Additionally, Jacob, Tania, Drew, and Breanna focused on user-facing, quality of life improvements as well as backend automation so that the client will have a consistent, approachable, and professional platform to use after handoff. Model output was shifted from a CSV to an Arrow format to allow for smoother modeling on the front-end, and Geo JSON functionality was also implemented on the back end to show the client's desired regions only. Overall, model finalization and user interface cleaning allowed for an accurate and easy to understand prediction system for both users and stakeholders.

- **Stories completed**
    - As a developer, I want to make machine learning models that successfully predict the migration movements of mallards so that the client is given a fully functional app. (Kenny Adams, Revel Etheridge) [13 pts]
    - As a developer, I want a fleshed-out webpage so that it is completed for the client and for public usage. (Jacob Sullivan, Tania Perdomo Flores, Drew Burkhalter) [5 pts]
    - As a client I want to change the map heat using a Geo JSON file to reflect a gradient cloud and shapefile of the Mississippi Flyway so that it generalizes the duck's movement in a certain area. (Jacob Sullivan) [13 pts]
    - SPIKE: As a developer, I want to finalize the model of choice so that we have the preferred model for this type of data handling. (Jacob Sullivan, Kenny Adams, Tania Perdomo Flores, Drew Burkhalter, Revel Etheridge, Breanna Woosley) [3 pts]
    - As a developer, I want to create a client package so that the client will know the implementation and directions needed so that it can be handled after hand-off. (Breanna Woosley) [5 pts]
    - As a developer, I want to change the function of the Movebank pull script so that it can specifically pick the months or days non-chronologically. (Jacob Sullivan, Revel Etheridge) [5 pts]
    - As a developer, I want to be able to run a large amount of data and automate it with the HPC to push to Git Pages so that we know it can handle the dataset without the client intervening. (Jacob Sullivan, Revel Etheridge) [13 pts]
    - As a developer, I want to convert the output of our model to an Arrow instead of a CSV so that it does not weigh down the front-end. (Kenny Adams, Revel Etheridge) [8 pts]

- **Stories Dropped**
    - As a user, I want to finalize the LSTM model and integrate the k-d tree, data vectorization, and OpenWeather weather parameter verification so that I can generate accurate, location-aware predictions of duck migration patterns. (Tania Perdomo Flores, Breanna Woosley) [13pts]

Potential Future Work:

Author: Kenny Adams, Drew Burkhalter
Contributors: Revel Etheridge, Drew Burkhalter, Jacob Sullivan, Kenny Adams, Breanna Woosley, Tania Perdomo Flores

We have completed our planned production of our website with all of our planned goals achieved. Therefore, we list possible enhancements for our migration application outside of the original scope. Firstly, during the development of this project, we were told that we only needed to concern ourselves with the Mississippi Flyway, but we could potentially increase it to encompass all of America, or even the globe if we received access to more data. We could also allow for more filtering of the data, such as only having certain species of ducks show up or only displaying ducks moving in a certain direction. We were instructed to only present clusters of ducks in order to prevent the tagged ducks from being hunted, but since we are talking in the realm of theoretical, we are open to exploring that. Near the end of coding, we discovered we could not predict the erratic movements of ducks but only their planned endpoint. This had no effect on our result of an app but could be an interesting challenge to tackle in the realm of possibility. Since we are already pulling weather data, we could implement a way to show that on the map. Another possibility is making it more phone friendly by making it an actual app, not a website, or including push notifications.

- **Theoretical Stories Planned**
    - As a developer, I want to expand the geographic scope of the migration application beyond the Mississippi Flyway to cover all North America or the globe, so that the tool is more universally useful and applicable if additional data becomes available. (Jacob Sullivan) [5pts]
    - As a developer, I want to implement filtering options that allow users to select specific duck species or filter by migration direction, so that the app provides more targeted and relevant insights. (Jacob Sullivan, Drew Burkhalter) [5pts]
    - As a developer, I want to build a machine learning model that predicts more dynamic and erratic movement patterns in ducks so that we can increase the accuracy and realism of our migration simulations. (Kenny Adams, Revel Etheridge, Breanna Woosley, Tania Perdomo Flores) [13pts]
    - As a developer, I want to overlay weather data on the migration map so that users can see environmental factors influencing duck movements in real time. (Kenny Adams, Jacob Sullivan) [8pts]

Burnup Chart:

Author: Jacob Sullivan
Contributors: Revel Etheridge, Drew Burkhalter, Jacob Sullivan, Kenny Adams, Breanna Woosley, Tania Perdomo Flores
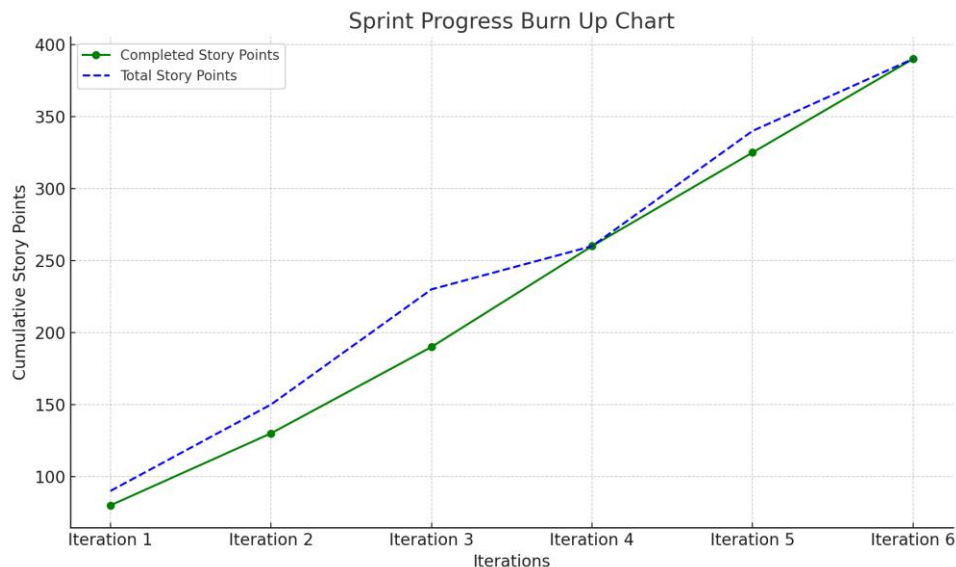
As we wrapped development in iteration 6, we successfully delivered a product that the client was beyond satisfied with. During this iteration, we focused on finalizing the website, ensuring the mapping styles met the client's preferences, and validating that the machine learning model was accurately predicting and pulling the correct data. In finalizing the model, we coordinated with the HPC to confirm it could be automated and reliably deployed to the website each week. This included creating scripts to run the ML model and executing the necessary Git commands. Additionally, we prioritized website performance, which involved cleaning up the code and converting file outputs to an arrow file format, making them easier to handle on the front end. Overall, this project had a challenging start, especially as we recognized the scope and complexity further into the development process. Despite these hurdles, we successfully developed a machine learning model that accurately predicts the migration patterns of mallards.

Retrospective Summary:

Author: Breanna Woosley
Contributors: Revel Etheridge, Drew Burkhalter, Jacob Sullivan, Kenny Adams, Breanna Woosley, Tania Perdomo Flores

What Has Gone Well?

- **Project Completion**
  We successfully completed development of our migration visualization website, achieving all originally planned goals. The application is fully functional and aligns with our design, performance, and ethical constraints.

- **Frontend and Visualization Improvements**
  The final version includes an intuitive interface with clear visual clustering, which both protects sensitive tracking data and provides meaningful insights into migration patterns.

- **HPC and Model Integration**
  Model training using HPC resources stabilized this iteration, with improved queue management and debugging practices. The pipeline reliably outputs predictions for endpoint locations based on initial duck coordinates.

- **Team Coordination and Communication**
  Consistent communication and retrospectives allowed us to stay on track. Challenges were addressed quickly, and workloads remained balanced during the final stretch.

What Could Be Improved?

- **Phone Responsiveness**
  The current website works on mobile browsers but could be improved for smaller screens or packaged as a native app for better usability.

- **Limited Filter Options**
  Currently, the user experience is limited to viewing overall clusters. More advanced filtering options (e.g., by species or direction) would enhance interactivity and specificity.

What Questions Do You Have About the Project or Process?

- How could we have validated model assumptions earlier in the process to reduce late-stage surprises?
- Were there ways we could have structured our iteration planning to allow more frequent model experimentation?
- How did time estimation compare to actual effort — and where did we under- or over-estimate?

Team Temperature:

Author: Tania Perdomo Flores
Contributors: Revel Etheridge, Drew Burkhalter, Jacob Sullivan, Kenny Adams, Breanna Woosley, Tania Perdomo Flores

Spider chart along with a description and summary of our team's temperature.

Summary:

Completing our last iteration of this project, our spider diagram reflects a well-rounded and high-performing team dynamic. The chart clearly highlights three standout areas: team collaboration, stakeholder engagement, and project progress, all peaking at the maximum score of 5. This consistency at the top tier illustrates that the team operated with a unified vision, strong synergy, and proactive communication with stakeholders. The momentum was carried through to project execution, where deadlines were met and deliverables were achieved with precision—an undeniable sign of alignment and shared accountability across the board.

While team communication and workload management landed slightly under the perfect mark at 4.8, the slight dip is easily attributed to external factors. Balancing heavy academic demands from other courses and managing personal commitments outside of school added a realistic strain on bandwidth. Despite this, a 4.8 in both areas still signals exceptional performance. The team adapted well under pressure, maintained clarity in task ownership, and supported one another through crunch time.

Showcase:

Author: Tania Perdomo Flores

Contributors: Revel Etheridge, Drew Burkhalter, Jacob Sullivan, Kenny Adams, Breanna Woosley, Tania Perdomo Flores

At the end of this iteration, our team prepared a showcase of the effort completed. The showcase demonstrates the specific user stories completed during the iteration.

https://youtu.be/qD83cJDrrFI

Appendix:

Author: Jacob Sullivan
Contributors: Revel Etheridge, Drew Burkhalter, Jacob Sullivan, Kenny Adams, Breanna Woosley, Tania Perdomo Flores

- o Kanban Board and GitHub
  - https://github.com/users/JakeSul1023/projects/1/views/1 (Kanban Board GitHub)
  - https://github.com/JakeSul1023/Team-7_Waterfowl (Repository GitHub)
  - https://github.com/JakeSul1023/duck-data-web (New Web App Page)
  - https://github.com/JakeSul1023/DuckData-WebApp (Web-Page Repo) (Archived)
- o Project Webpage
  - www.moveduck.com