Kodiak Island Borough School District & NOAA Kodiak Lab

Executive Summary

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Background

This project is done in partnership between the Kodiak Island Borough School District and the NOAA Kodiak Lab. The Kodiak Island Borough School District is a public school district made up of four elementary schools, one middle school, one high school, and one home school education program in Kodiak, Alaska. The Kodiak Lab is part of NOAA's Shellfish Assessment Program, which seeks to assess the distribution and abundance of commercially important crab resources in the eastern Bering Sea. Shellfish Assessment scientists collect data which are used to aid in the fishing industry in locating productive fishing grounds and help Crab Fisheries Management regulate takes to improve the viability of future crab stocks.

Project Description

Project Opportunity

Each year, the Kodiak Lab brings back 400-800 crabs from the Bering Sea and researchers at the lab are tasked with a tedious process of analyzing 4000-8000 samples of these crabs' oocytes. Researchers use a microscope to take multiple images of a crab's oocytes. They manually trace a circle around the oocytes using an ImagePro software to get the area and input that area into an excel sheet. The Kodiak Lab is looking for ways to crowdsource this process so their researchers can utilize their skills more efficiently, while the school district is looking to for opportunities for their students to get a one of a kind educational experience contributing to marine science research.

Project Vision

Taking advantage of this project opportunity, our team worked closely with the client to devise a solution in the form of a crowdsourcing game that would leverage the partnership between the school district and the Kodiak Lab. This game will allow students themselves to engage in the crab analysis process and therefore reduce the time researchers spend on this task.

Project Outcomes

Following our team's proposed project vision, we met with a CMU computer vision professor to discuss various ways to perform image analysis on these oocyte images. We decided to binarize each image and apply morphological filtering, which automatically detects all of the potential oocytes within an image. These images then get placed into our Django web app, where students can analyze these images by clicking on what they think is a "good" oocyte. At the end of each game, students are able to evaluate their contribution to research by seeing exactly which parts of the Bering Sea the crabs they analyzed in the game were collected from.

Project Deliverables

Our deliverable is a Django web application hosted on Heroku (https://blooming-earth-30436.herokuapp.com/crabgame/). This web app can read in image files from the Kodiak Lab folder directory, place the images in the game for students to analyze, and push the collected data to a Socrata API that can be accessed by NOAA and the Kodiak Lab. We have also transferred ownership of the code to NOAA and provided documentation for future maintenance of the project.

Recommendations

Our major recommendation going forward is to transition the solution to be run internally inside of NOAA. Having the solution hosted on a NOAA server will make it more sustainable and easier to maintain as opposed to having it hosted externally. On the software development side, there are several pieces of feedback from user testing that we were unable to implement as they were out of scope. For example, adding social media integration and individual rankings would improve the experience for students as they played the game. With internal hosting, improved gameplay features, and better image analysis, our developed solution will be a more sustainable, fun, and efficient tool for both students and researchers.

Student Development Team

Connor Fitzgibbon served as the client relationship manager. He is a senior majoring in Information Systems and with a double major in Philosophy. He will be working at Accenture in Philadelphia after graduating from CMU.

Hera Miao was the project manager of the team. She is a third-year student majoring in Information Systems with a minor in Business Administration and Media Design. She will be interning at the Federal Home Loan Bank of Chicago this summer doing application development and is looking to do application or web design and development in the future.

Rich Zhu was the quality assurance manager for our team. He is a junior majoring in Information Systems with a double major in HCI and a minor in CS. He will be at LinkedIn this summer as a data science intern. He is looking to do data science or product management in the future.