

Project: Moth Classifier

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The general goal of the visual portion of our project is to create a mobile application which is focused on simplifying the submission and analysis of data to the Discover Life research project. Discover Life, an ecological organization that classifies species of insects, manually reviews each image submitted. Our goal is to classify species of moths through a high-trained machine learning model. Through machine learning, unclassified images will be pulled from Discover Life's database to be classified by our model. Additionally, users will be able to submit and classify images with our mobile application. It will give users the option to submit their own pictures to be classified with the same machine learning model. By automating moth classification, we will save researchers precious labor hours which will allow them to focus on other important aspects of their research. Through the mobile application portion of the project, we will present a simple interface through which any user can submit images to the system for classification or through which researchers can individually classify images to improve data accuracy. In addition, by making moth classification simpler with an easy to use mobile application, we will be able to attract new users outside of the Discover Life community. These new users will be able to collect more data for researchers which will allow them to have a variety of data to make more informed conclusions.

One of the main focuses in the design of the application is to ensure that the tool we are creating is well suited to provide the functionality needed to solve the problems that Discover Life currently faces. The main activities that will be done using our application are: submitting and tagging photos of moths, classifying photos of moths (if the user is a researcher), and viewing their previous submissions or clarifications and any associated information. In order to achieve this goal, we will be implementing a simple to use, three screen application structure with a different page for each aspect of the system. The main page will be solely dedicated to the submission of images and information regarding the image origin as well as the person who took the picture in order to make it clear that that is the core purpose of the application. A secondary page, only viewable by researchers, will be a list of images which need classification. This gives our app utility because it will provide a way for users to filter by the type of image that they are most suited to classify, as well as providing a simple interface with which to assign image classifications. The third page will be dedicated to only showing a feed of updates pertaining to a specific user's previous submissions. It is the goal of this page to make staying informed about the status of previous projects simple so that users will be able to consistently use the app for the main purpose of advancing the Discover Life research project. The combination of the three screens, each focusing on a specific aspect of the overall goal of the project, will provide utility to our application in the most efficient and user friendly way possible.

The transition of by-hand species classification to an automated, machine-learning driven classification will allow for a more usable, efficient method of ecological research. Previously, ecologists from Discover Life would classify images one-by-one. The image classification process takes around 35 seconds for each picture. Our user interface will remove the manual

input of image characteristics (e.g. location, date of capture). Instead, the user will only be required to submit an image from their camera or image gallery. The metadata from the picture submitted will be automatically pulled from the picture, resulting in less time needed for image submission and classification. If the image classification model's accuracy grade is not exceptional, the picture will be added to a list of images that could not be classified autonomously. Our application includes a "researcher" account, that allows professionals to log in to our application and confirm or edit the classification of images that did not meet the accuracy requirement. Once the "researcher" confirms or edits the species name of that picture, the user that submitted the picture will receive a notification that his or her image has been classified. The combined usage of our machine learning classification and the confirmation of low-accuracy images with the "researcher" role will increase the efficiency of species classification.

Due to the accessibility and efficiency our mobile application will provide to Discover Life researchers, our application will be effective in eliminating the need for manual classification and will provide a suitable alternative to the current Discover Life website. Currently, the Discover Life website requires a user to navigate around to find, submit, and classify pictures, and it can be quite difficult to navigate to the necessary page. This increases the barrier to entry and allows only people who know the website really well to use it. Thus, the application is designed to be as simple and user-friendly as possible so researchers can navigate through the application without confusion and can do what they need to do without having to go through a multitude of screens. In addition, the simplicity of the application will attract non-researchers who can upload pictures and provide more data to the Discover Life community which will help them further their research. In addition, the REST API, or the backbone of our application, allows for potential, new interfaces. If researchers are not satisfied with a mobile application, our project is still effective in fulfilling their requirements. The API we designed allows the collected data to be displayed in other kinds of interfaces such as a web application, or even a desktop client. By having the potential to create other interfaces, we are broadening the usability of our application which will in turn attract more users to create an effective and commonly used system. As a result of having a simpler and easy to use interface, the application will be widely accepted, and the Discover Life researchers will have access to more data which in turn will help them further their research significantly.