PROJECT TITLE: Hummingbird Classification

PROJECT SUMMARY (Brief description of the goal, key analysis plan, key data feature- especially if the data is complex)

The purpose of this project is to build a hummingbird species classification model. During this project I will collect hummingbird images, create image pre-processing code for the data set, create a binary (male/female) bird classifier, create a species classifier, and use the classifier to predict future bird images.

MILESTONES (Bullet point STEPs in your project. You can tag “DONE” for things are done)

Project Timeline:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Task Week | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Initial Project Proposal | | |  |  |  |  |  |  |  |  |
| Collect/classify photos from the web and my camera | | |  |  |  |  |  |  |  |  |
| Build data cleaning / hummingbird image processing tool | | |  |  |  |  |  |  |  |  |
| Create binary ~~male/female~~ bird finder classification model | | |  |  |  |  |  |  |  |  |
| Create multi-categorical species classification model | | |  |  |  |  |  |  |  |  |
| Draft Final paper / GitHub repository / Kaggle uploads | | |  |  |  |  |  |  |  |  |
|  | | | | | | | | | | |
|  |  | Done/In-progress |  | Overdue | | |  | Planned | | |

PROPOSED ‘TO DO’ FROM THE LAST WEEK (Copy & Paste from your previous week’s TO DO)

1. During week 4, I will focus on populating my images in the directories for each bird species/gender. With the tools created it should go much more quickly but I have compiled several 1000 – 10 second video clips and a few 100 bird images that need to be pre-processed/cleaned. – In progress
2. As time allows, I will try to optimize my binary bird detector model now that I have more birds from my camera and with a consistent background. – In progress

THIS WEEK’S PROGRESS (Give bullet points and briefly explain what you accomplished or dealt with some of the milestones during the week)

1. I was able to go through my video clips and Identify videos with bird images. I have roughly 400 videos with birds and I’m roughly 10% through classifying the birds in each video. The male classes that I have are rufous, ruby throat, broadtail, and black chinned. I have only seen a few female birds and am beginning to think they only feed at night. My camera does not get great photos in the low light – mainly silhouettes, and turns to black and white during the night, so these are almost impossibly to classify and would make for a poor model comparison to my color images. I may try a fully black and white model. I need color to classify the birds correctly, but the computer may pickup on nuances that I can not discern.
2. I added the following information to my github repository:
   1. No github updates this week. Although, I have some modified code that needs to be finalized and uploaded.
   2. Here is the link: <https://github.com/amandakkimball/Hummingbird-Data-Collection-Classification>

ISSUES AND DISCUSSION (Bring up any difficulties and things to discuss. Also, send me a reminder if you want to discuss sooner)

The results for the images pulled by my ‘motion’ detection and which of those my binary model classified as birds varied significantly. From each test dataset, I removed images with only wingtips or blurred unrecognizable images as unclassifiable. At least the CNN model had no false positives, but neither was consistently good at finding birds in the video streams. Confusion Matrix for 5 video tests are shown below:

Dense Model

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Test 1 | | |  | Test 2 | | |  | | Test 3 | | | |
|  | bird | no\_bird |  |  | bird | no\_bird |  |  | | bird | no\_bird |
| bird | 10 | 16 |  | Bird | 0 | 72 |  | bird | | 119 | 37 |
| no\_bird | 0 | 0 |  | no\_bird | 0 | 0 |  | no\_bird | | 0 | 0 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Test 4 | | |  | Test 5 | | |  | | All data | | | |
|  | bird | no\_bird |  |  | bird | no\_bird |  |  | | bird | no\_bird |
| bird | 35 | 43 |  | Bird | 0 | 7 |  | bird | | 164 | 175 |
| no\_bird | 154 | 211 |  | no\_bird | 6 | 39 |  | no\_bird | | 160 | 250 |

CNN Model

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Test 1 | | |  | Test 2 | | |  | | Test 3 | | | |
|  | bird | no\_bird |  |  | bird | no\_bird |  |  | | bird | no\_bird |
| bird | 26 | 0 |  | Bird | 0 | 72 |  | bird | | 3 | 153 |
| no\_bird | 0 | 0 |  | no\_bird | 0 | 0 |  | no\_bird | | 0 | 0 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Test 4 | | |  | Test 5 | | |  | | All data | | | |
|  | bird | no\_bird |  |  | bird | no\_bird |  |  | | bird | no\_bird |
| bird | 0 | 78 |  | Bird | 0 | 7 |  | bird | | 29 | 310 |
| no\_bird | 0 | 365 |  | no\_bird | 0 | 39 |  | no\_bird | | 0 | 404 |

I note that test 1 video above was one of my first videos and was used as part of the training set for the models discussed above. This week I am going to use the images from these 5 tests to retrain a binary bird finder model. I also noted that the ‘motion’ detection method I am using to initially take images is rarely looking at the birds in the photos, so I will be tweaking that algorithm so that I capture more birds and less things blowing in the wind.

I’ll note here that the bird / no\_bird detection algorithm has become more important than a male/female classification, so I did change my project plan to reflect this change in scope.

TO DO (Give bullet points and briefly explain your plans for the next week)

1. Finalize a binary bird finder classification model.
2. Finalize video species classification.
3. Run video’s through the image processing tools I have created and remove any non-bird or incomplete bird images.

RESOURCE (Optional: list resource or links you want to share with me)

[1] <https://github.com/amandakkimball/Hummingbird-Data-Collection-Classification>