Spotted!

Web Application using ML to Reunite Lost Pets and Owners

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BACKGROUND

Pets are beloved members of our families, so when one goes unexpectedly missing it can be a frightening and confusing time. Knowing where to look or who to contact isn't always clear. But a similar problem exists for people who spot a lost pet: what should you do and who to contact?

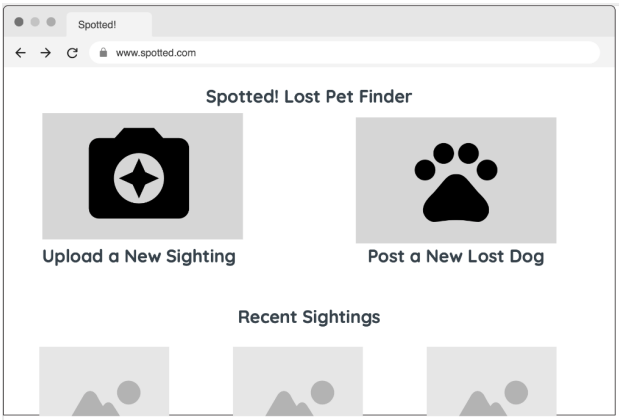
With the prevalence of smartphones and advances in machine learning, we believe an opportunity exists to create a web-based application to collect and organize information about lost and found dogs to make reuniting pets and owners easier and faster.

While other projects have explored using ML for extracting animal characteristics (e.g, breed, size, color) from images[1] or matching animals[2, 3], we believe a novel approach can be applied to linking separate sightings and - when combined with geospatial and temporal data from photo metadata - lead to faster pet recovery.

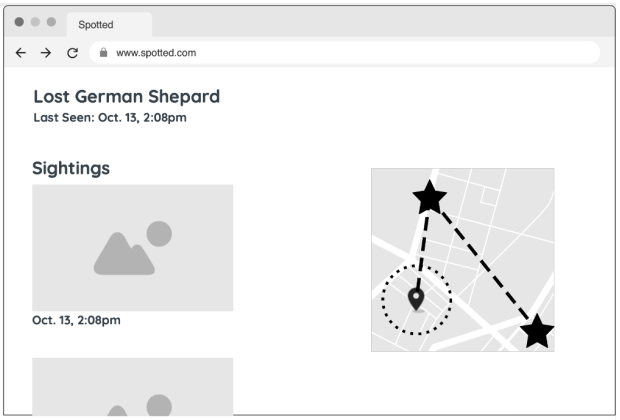
PROBLEM STATEMENT

When a person spots a lost pet, they can take a photo and upload it to our app. Our model will detect where in the photo the dog is and then extract identifying characteristics. The app will see if any other recently spotted dogs match, and if so combine photo metadata information to update the path the lost dog has taken. Otherwise, it will create a new active listing for the lost dog.

For owners who have lost a dog, they can upload photo(s) of their dog which our model will use to check active sightings to find potential matches. If none are found, the app will create a new active listing for the owner so if any future sightings match they will be immediately notified.



Homepage



Example of dog with multiple sightings

DATA SOURCES

There are a number of popular datasets featuring dogs which we will use to train our model to recognize features, including the Stanford Dogs dataset (20,580 images of 120 breeds of dogs)[4] and the Oxford-IIIT pet dataset (5,000 images of 25 breeds)[5]. There are also datasets featuring the same dog taken from different poses which we can use to help improve our model for matching, such as the PetFinder dataset (72,776 images of 18,510 pets)[6]. We may also employ web scraping and field data collection to get additional images.

We may also use transfer learning with an object detection model to first scan uploaded photos to find where in the photo the dog is, as in real-world use cases we would expect a variety of input types (distance from dog, orientation, etc.).

PROJECT OBJECTIVES

Our goal is to build and deploy a useful application leveraging existing ML models which will be scalable and evolvable. In order to achieve this, we envision the following sequence of steps:

- Collect, analyze and pre-process datasets
- Use transfer learning methods to train a two-step hybrid model:
    - Image classification of the input dog (breed, size, color, etc.) potentially using an SVM-based model
    - Image matching to calculate the probability of two photos containing the same dog
- Implement ML pipeline to process inputs as well as scalable backend for increasing load
- Design and develop a web application to allow users to upload picture(s), search listings, provide additional information (notes, contact information, etc.), and receive notifications

LIMITATIONS AND RISKS

For the purpose of this application, we will limit our model to just recognizing and matching dogs. However, we believe our initial framework could be extended in the future to work with other animals (such as cats).

Our initial research has also uncovered the difficulty of recognizing and matching dogs at an individual level[7]. As a result, we feel the application will be more effective if owners verify if the proposed match is their dog or not by viewing the pictures of the candidate dog.

REFERENCES

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7. Yan Mao & Yaqian Liu, 2023. Pet dog facial expression recognition based on convolutional neural network and improved whale optimization algorithm