CPSC 8100 Project Proposal

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1 Project Background

The chosen project is "Right Whale Recognition"[2]. The objective of this project is to develop software that will accept photographic input, and output the identification number associated with the whale as well as the probability that this matching is correct. This will be accomplished using machine learning and facial recognition techniques.

2 Motivation

This project provides a complex challenge for machine learning. The program must be able to learn how to identify a whale in a photograph. The program must be precise enough to differentiate between different whales. It must also be efficient, due to the size of the photographic data set. The hypothesis space for photographs is also much less obvious than a standard text data set. Therefore, the data set introduces real-world performance constraints. In addition, the data set is provided by the National Oceanic and Atmospheric Administration (NOAA) and the New England Aquarium (NEA), so this is a real-world problem that will prove to be sufficiently challenging[2][5][4].

3 Development

3.1 Data Set

The project host has provided a data set[6]. The data set includes 11469 photos. There is also a set of training data, with 4544 training examples. This data set is sufficent for training and testing machine learning algorithms.

3.2 Facial Recognition

For this competition, MathWorks is providing their MatLab software, including their "Training Image Labeler app"[1][3]. This software can be trained and used with different machine learning techniques[1][7]. This will be the primary facial recognition tool used in this project. If time permits, other methods will be investigated and implemented.

3.3 Machine Learning Techniques

A variety of machine learning algorithms covered in class and researched independently will be implemented and the results compared. This is necessary because the most accurate algorithm may not be ideal for this problem. The data set is large and complex, so the complexity of more accurate algorithms may prove to be too computationally expensive. Some algorithms may later have to be ruled out if errors are discovered in the training data.

3.4 Implementation

This project will be written in Java. This is to allow for an object oriented and modular design. This will ease the ability to implement and use multiple machine learning algoirthms and collect statistics. The MathWorks Training Image Labeler App will be utilized through external calls[1]. This will also allow the facial recognition software to be modular to support other approaches to this problem. Multiple implementations using this modular design will provide a multitude of result sets for comparison and analysis.

4 Timeline

First Progress Report

Program will be able to make use of the data set. External facial recognition interface will be functional. Basic machine learning algorithm will be completed.

Second Progress Report

Implementation of more advanced machine learning algorithms. Additional facial recognition or other approaches will be implemented.

Third Progress Report

Any remaining algorithms or approaches will be implemented. Analysis for comparing algorithms will be complete. Ideal algorithm will be chosen for competition submission.

5 Conclusion

Due to the data set being in the form of photographs, the solutions will pull heavily on machine learning theory and topics. This project will also require comparison and analysis work to contrast different solutions. In conclusion, this project is a challenging real-world problem for machine learning.

References

[1] *Creating a "face detector" for whales*. http://www.kaggle.com/c/noaa-right-whale-recognition/details/creating-a-face-detector-for-whales, Accessed: 2015-09-15.

[2] *Identify endangered right whales in aerial photographs*. http://www.kaggle.com/c/noaa-right-whale-recognition, Accessed: 2015-09-15.

[3] *Labeling images for classification model training*. LabelImagesforClassificationModelTraining, Accessed: 2015-09-15.

[4] *New england aquarium*. www.neaq.org/index.php, Accessed: 2015-09-15.

[5] *Noaa fisheres*. www.nmfs.noaa.gov, Accessed: 2015-09-15.

[6] *Right whale recognition data*. http://www.kaggle.com/c/noaa-right-whale-recognition/data, Accessed: 2015-09-15.

[7] *Train a cascade object detector*. www.mathworks.com/help/vision/ug/train-a-cascade-object-detector.html, Accessed: 2015-09-15.