Identifying Car Brands in Noisy Images Using Convolutional Neural Networks

Rohit Amarnath, Aravind Kumar, Mugdhesh Pandkar

Project Proposal

1 Problem Statement

In this project, we aim to classify car brands in noisy images using convolutional neural networks (ResNet). In the field of intelligent transportation systems, most existing artificial intelligence models are trained on clear car images. While this may result in more accurate results under perfect conditions, choosing test data in this manner is unrepresentative of real world road conditions that include inclement weather, illumination effects and motion blur. To counteract the over-fitting of such systems, we will be training a ResNet model on clear, rotated, and blurred car images from the Stanford Cars Dataset [1] and the VeRi Dataset [2]. The Stanford Cars Dataset consists of 16,185 images of 196 classes of solely cars. Each class refers to the make, model, and year of a specific vehicle. The VeRi Dataset contains over 50,000 images that have been categorized into six classes of vehicles. While the dataset consists of six vehicle classes (car, van, truck, motorbike, rickshaw, mini-van), we will only be examining the car and mini-van portions of the dataset.

2 Objectives

Our overall objective is to more accurately classify passenger vehicle brands. This objective will be useful in aiding various aspects of intelligent transportation systems. For instance, classification of cars will help improve functions such as toll collection technologies as well as traffic monitoring mechanisms involving speed and law enforcement. We seek to enhance the robustness of vehicle classification technology to serve the purpose of improving these and other real-time classification applications.

3 Preliminary Literature Review

The work done in this project intends to expand on the research done by Muhammad Butt and his colleagues on classifying vehicles by type through classifying vehicles by brand [3]. Additionally, through utilizing the Stanford cars dataset, we may utilize many of the techniques suggested by Krause and colleagues in handling vehicle datasets and potentially converting 2D images into 3D scans that may offer more insight into brand localization [4]. If time permits, we may also attempt to expand the research done by Xinchen Liu and colleagues on a deep learning approach for urban surveillance that utilizes a two pass process of coarse-to-fine and near-to-distant search techniques [5].

4 Methodology

We seek to augment a new dataset comprising of clear, blurred, and noisy car images from the Stanford Cars Dataset as well as the VeRi dataset. Then, utilizing a ResNet architecture such as the one used in Muhammad Butt's paper, we hope to train a similar model on partitioned training, validation, and testing sets. By doing so we hope to achieve an overall accuracy of at least 70% on our test set.

Submitted to Rutgers University-New Brunswick Deep Learning 01:198:462 (2022). Do not distribute.

References

[1] http://ai.stanford.edu/~jkrause/cars/car_dataset.html

[2] https://vehiclereid.github.io/VeRi/

[3] Muhammad Atif Butt, Asad Masood Khattak, Sarmad Shafique, Bashir Hayat, Saima Abid, Ki-Il Kim, Muhammad Waqas Ayub, Ahthasham Sajid, Awais Adnan, "Convolutional Neural Network Based Vehicle Classification in Adverse Illuminous Conditions for Intelligent Transportation Systems", Complexity, vol. 2021, Article ID 6644861, 11 pages, 2021. https://doi.org/10.1155/2021/6644861

[4] 3D Object Representations for Fine-Grained Categorization Jonathan Krause, Michael Stark, Jia Deng, Li Fei-Fei 4th IEEE Workshop on 3D Representation and Recognition, at ICCV 2013 (3dRR-13). Sydney, Australia. Dec. 8, 2013.http://vision.stanford.edu/pdf/3drr13.pdf

[5] Xinchen Liu, Wu Liu, Tao Mei, Huadong Ma: A Deep Learning-Based Approach to Progressive Vehicle Re-identification for Urban Surveillance. ECCV (2) 2016: 869-884 (Citation=126)http://xinchenliu.com/papers/2016_ECCV_PVID.pdf