Data Fusion to Improve the Accuracy of Traffic Counts

Technology Transfer Activities

by

Robert Mullen and Nathan Huynh
rlm@sc.edu, 803-777-0524, 300 Main St. C230
University of South Carolina

July 2023

Center for Connected Multimodal Mobility (C²M²)

200 Lowry Hall, Clemson University
Clemson, SC 29634
DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the information presented herein. This document is disseminated in the interest of information exchange. The report is funded, partially or entirely, by the Center for Connected Multimodal Mobility (C²M²) (Tier 1 University Transportation Center) Grant, which is headquartered at Clemson University, Clemson, South Carolina, USA, from the U.S. Department of Transportation’s University Transportation Centers Program. However, the U.S. Government assumes no liability for the contents or use thereof.

Non-exclusive rights are retained by the U.S. DOT.
ACKNOWLEDGMENT

The authors would like to acknowledge the Center for Connected Multimodal Mobility (C2M2), which is a Tier 1 University Transportation Center, for supporting this research. The authors acknowledge the Research Computing Center at the University of South Carolina for providing computing resources that contributed to the results of this project. We also would like to acknowledge the South Carolina Department of Transportation for providing field access as well as the MetroCount equipment.
# Table of Contents

DISCLAIMER........................................................................................................................................... ii  
ACKNOWLEDGMENT................................................................................................................................... iii  
  1 Outputs.................................................................................................................................................. 1  
  2 Outcomes.............................................................................................................................................. 1  
  3 Impacts................................................................................................................................................... 2
## TECHNOLOGY TRANSFER ACTIVITIES

### 1 Outputs

The project outputs include one dissertation, one poster session, and thousands of vehicle images used to train the convolutional neural network (CNN).

#### 1.1 Output #1


#### 1.1 Output #2

Poster entitled “Construction of a Large Dataset for Daytime and Nighttime Vehicle Classification” presented at the C2M2 3rd Annual Fall Conference, Clemson, SC (October 18, 2019).

#### 1.1 Output #3

Labeled vehicle images based on their classifications. These images can be used by the research community to train their CNN models. They can be made available upon request.

### 2 Outcomes

The project outcomes include the training of a Ph.D. and a M.S. student in developing image processing algorithms to classify vehicles from video data, the use of thermal imaging data to enhance the classification of vehicles at night, and the data fusion approach to enhance counting and classification accuracy.

#### 2.1 Outcome #1

Training of Ph.D. student Xianshan Qu and M.S. student Quentin Eloise.

#### 2.2 Outcome #2

Thermal imaging data (samples shown below) are demonstrated to enhance vehicle classification at night.
2.3 Outcome #3
Development of data fusion method involving thermal imaging data and pneumatic tube data to provide more accurate classification compared to either method when used by itself.

3 Impacts
The project impacts include the potential adoption of collecting thermal data for vehicle classification at night by the South Carolina Department of Transportation (SCDOT).

3.1 Impact
The SCDOT purchased a trailer to support the deployment of a thermal imaging video recorder for use in future vehicle classification efforts.