COLLEGE OF ENGINEERING AND COMPUTER SCIENCE
FLORIDA ATLANTIC UNIVERSITY

Announces the Ph.D. Dissertation Defense of

Debojit Biswas

for the degree of Doctor of Philosophy (Ph.D.)

"Real Time Traffic Monitoring System from a UAV Platform"

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Engineering West, Room 231B
777 Glades Road
Boca Raton, FL

DEPARTMENT:
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ABSTRACT OF DISSERTATION

Today transportation systems are facing big transitions all over the world. We created fly overs, roads under the ground, bridges over the river and ocean to get efficient access and to increase the road connectivity. Our transportation system is more intelligent than ever. Our traffic signaling system became adaptive. Our vehicles equipped with new gadgets and we developed new tools for more efficient analysis of traffic. Our research relies on existing traffic infrastructure to generate better understanding of traffic. More specifically, this research focused on traffic and UAV cameras to extract information about the traffic.

Our first goal was to create an automatic system to count the cars using traffic cameras. To achieve this goal, we implemented Background Subtraction Method (BSM) and OverFeat Framework. BSM compares consecutive frames to detect the moving objects. Because BSM only works for ideal lab conditions, therefor we implemented a Convolutional Neural Network (CNN) based classification algorithm called OverFeat Framework. We created different segments on the road in various lanes to tabulate the number of passing cars. We achieved 96.55% accuracy for car counting irrespective of different visibility conditions of the day and night.

Our second goal was to find out traffic density. We implemented two CNN based algorithms: Single Shot Detection (SSD) and MobileNet-SSD for vehicle detection. These algorithms are object detection algorithms. We used traffic cameras to detect vehicles on the roads. We utilized road markers and light pole distances to determine distances on the road. Using the distance and count information we calculated density. SSD is a more

resource intense algorithm and it achieved 92.97% accuracy. MobileNet-SSD is a lighter algorithm and it achieved 79.30% accuracy.

Finally, from a moving platform we estimated the velocity of multiple vehicles. There are a lot of roads where traffic cameras are not available, also traffic monitoring is necessary for special events. We implemented Faster R-CNN as a detection algorithm and Discriminative Correlation Filter (with Channel and Spatial Reliability Tracking) for tracking. We calculated the speed information from the tracking information in our study. Our framework achieved 96.80% speed accuracy compared to manual observation of speeds.

BIOGRAPHICAL SKETCH
Born in Kolkata, India
B.Tech 2009, West Bengal University of Technology, Kolkata, India
M.Tech. 2011, Indian Institute of Technology, Roorkee, India
Ph.D. 2019, Florida Atlantic University, Boca Raton, Florida

CONCERNING PERIOD OF PREPARATION
& QUALIFYING EXAMINATION

Time in Preparation: 2016 - 2019

Qualifying Examination Passed: Summer 2016

Published Papers:

Biswas, D., Su, H., Wang, C., Blankenship, J., Stevanovic, A., 2017. An automatic car counting system using OverFeat framework. Sensors 17, 1535.

Biswas, D., Su H., Wang, C., Stevanovic, A., Wang, W., 2018. An automatic traffic density estimation using Single Shot Detection (SSD) and MobileNet-SSD, Physics and Chemistry of the Earth, Parts A/B/C, ISSN 1474-7065.