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Rush Hour Crashes and Speeding Analysis with Traffic Big Data

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I. INTRODUCTION

The Montgomery County, Maryland, surrounds the busiest capital of Washington, D.C., and the traffic in the county is notorious during rush hours. With better positioning of police resources, vehicle crashes and traffic jams may be alleviated, promoting better traffic flows. The goal of this study is to compare speeding ticket locations with crash locations to get an insight about how policing affects vehicle crashes.

II. DATA AND METHODOLOGY

We used the Montgomery County's Traffic Violation data (1.7 million records from 2012 to 2020). AADT (Annual Average Daily Traffic) and GIS road vector data were obtained from the MDOT SHA (Maryland Department of Transportation State Highway Administration).

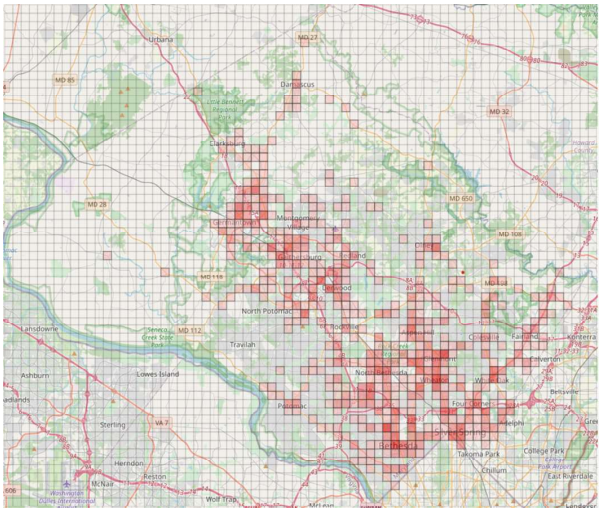

Figure 1: Crashes during rush hours

A vector grid network was constructed to sample crashes and speeding violations. The cell size of the grid was set to 990 m by 990 m to be matched with the U.S. land cover dataset. The number of violation events in each grid cell was calculated using the point-in-polygon analysis with QGIS. Road density was also calculated for each cell with the number of lanes considered. Finally, spatial analyses were performed with Python and QGIS to analyze the distributions and correlations among crashes, speeding violations, and road density.

III. RESULTS

Results show that speeding violation locations do not match well with crash locations. Figure 1 shows that crashes occur not only major highways, but also more frequently at artery and local roads. Figure 2 shows that speeding violations appear frequently along highways and major roads. The result implies significant police resources along major roads, while crashes are frequent at arterial and local roads. This is an ongoing research, and an estimation model be constructed with machine learning techniques.

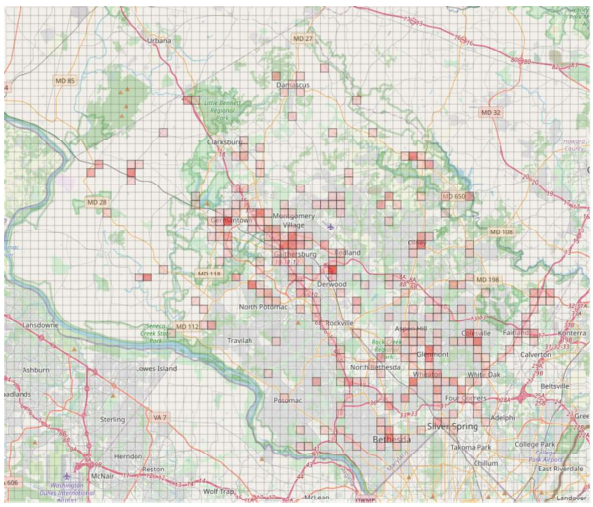

Figure 2. Speeding violations during rush hours

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