Traffic Collisions : Montgomery Dataset Analysis

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*Abstract*—Traffic safety is becoming a major concern for all the communities throughout the world, including Montgomery County in Maryland state of the USA. To give a thorough picture of the traffic collisions, the study examines the effectiveness of considering and analyzing three main datasets of an Automated Crash reporting System – ACRS used by Montgomery County to track the details about day-to-day traffic incidents within the county. The study presents an in-depth analysis of traffic collision data of Montgomery County. This analysis uses an Extract, Transform and Load (ETL) pipeline, following which the study does Exploratory Data Analysis and visualizations to inform and conclude urban planners on to develop targeted strategies for minimizing the impact of traffic collisions, and thus enhancing public safety and transportation facilities.

The Integrated analysis of the ACRS datasets utilizes MySQL as the source database, Python Pandas as the Staging area, and MongoDB as the destination. After the ETL pipeline, the study does the visualizations with Python’s pandas’ library and other visualization tools like matplotlib and seaborn. The study aims to find some insights into traffic collisions into aspects such as weather conditions, drivers characteristics and road conditions.

Keywords—Traffic Collisions, Montgomery County, Python, ETL, Visualizations, API, Automation, ACRS

# Introduction

Traffic incidents are the major public health and safety concern around the world, resulting in injuries, deaths and financial damages. With developments in vehicle safety and traffic control systems, incidents continue to happen at an disturbing rate. Solving this problem needs an innovative strategy based on thorough data analysis and rational decision-making.

The Montgomery County’s datasets which are obtained from the Automated Crash Reporting System (ACRS) provided by the county’s government offers to be a valuable resource for studying the incidents in-depth. The datasets provides plenty of information on incidents, those involved as well as the contributing factors. With this datasets, studies can obtain the understanding of the occurrence of the collisions and foster specific measures to improve road safety.

To help the study, an ETL meaning Extract, Transform and Load pipeline that uses a relational database- MySQL as the source database followed by Pandas as the staging area for the transformations and MongoDB as the destination database. The overall flow of the pipeline provides a seamless integration of direct data obtained from APIs and direct files, including manipulation of the data ensuring data integrity and consistency throughout the process of analysis.

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# methodolgy

## Dataset Selection

This study’s datasets comes from the official government site of Montgomery County which maintains the data collected by the Automated Crash Reporting System (ACRS) within the county. These datasets have been selected as those covers all the traffic

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1. G. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955. *(references)*
2. J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.
3. I. S. Jacobs and C. P. Bean, “Fine particles, thin films and exchange anisotropy,” in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.
4. K. Elissa, “Title of paper if known,” unpublished.
5. R. Nicole, “Title of paper with only first word capitalized,” J. Name Stand. Abbrev., in press.
6. Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, “Electron spectroscopy studies on magneto-optical media and plastic substrate interface,” IEEE Transl. J. Magn. Japan, vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].
7. M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989.

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