Efficacy of Toronto's Automated Speed Enforcement Cameras

Birmadu Wakessa

January 23, 2024

Automated Speed Enforcement (ASE) charges laid across the City of Toronto in 2023. Based on the surface-level analysis on the number of charges laid per month, no systematic trends or unusual patterns were uncovered. The number of charges laid per month was approximately uniform, with a sharp increase starting in July due to the city implementing new cameras at multiple new sites.

Table of contents

1 Task Formulation & Approach

The City of Toronto is avid on regulating and enforcing traffic laws, especially speeding laws. The city first introduced the Automated Speed Enforcement (ASE) system in 2019, and saw the first 50 ASE cameras being installed in July of 2020.

Drivers who are caught speeding by a camera are tagged by their carplates, and are charged at different rates depending on their speed. As per the Ontario Court of Justice (Cheif of Justice (2024)), the charges are as shown in the following table:

Table 1: Penalty Rates by amount of speed above limit

Speed Over Limit	Penalty
1-19 km/h above speed limit	$5.00/km
20-29 km/h above speed limit	$7.50/km
30-49 km/h above speed limit	$12.00/km
50+ km/h above speed limit	Court Settled

In this paper, we will investigate the efficacy of the ASE system in Toronto in 2023. We will take a look at how many charges were laid by ASE cameras per month, and compute interesting statistics and values like potential revenue using Table 1.

2 Data

Data used in this paper are gathered from Open Data Toronto through the `opendatatoronto` library (Gelfand (2022)). One dataset, `Automated Speed Enforcement (ASE) Charges` (Data (2024)), was used to analyze speeding charges enfored by the new ASE system across Toronto. Data was cleaned, transformed and analyzed using `R` (R Core Team (2023)), using functionalities from packages including `tidyverse` (Wickham et al. (2019)), `dplyr` (Wickham et al. (2023a)), `ggplot2` (Wickham et al. (2023b)), and `janitor` (Firke (2023)). Details of the data cleaning process and analysis are detailed below.

2.1 Preliminary Planning

The dataset we're interested in is very simple. The only feature it needs to contain is the number of ASE charges. We can delimit this feature in many ways, but we will do it by months. For example, the final cleaned & transformed dataset could look something like this:

Table 2: Example Dataset

Month	Number of Charges
January 2023	974
February 2023	1294
March 2023	1106

Table 2: Example Dataset

Month	Number of Charges
...	...

The exact shape of the dataset can vary, but it must somehow communicate the total number of ASE charges per month in the city of Toronto.

2.2 Automated Speed Enforcement (ASE) Charges

The dataset published by Transportation Services, Toronto (Data (2024)) captures the number charges that each uniquely-identified ASE camera has accumulated across the city. It uses columns to split the accumulated charges by month, for each individual camera. The data we will use for analysis in this paper will capture January 2023 onwards. Note that the retrieved data only covers up to November 2023, so December 2023 cannot be included in our analysis. Below is a sample of the cleaned data with the relevant features:

Table 3: Sample of cleaned ASE charge data

Site Code	Location*	Jan 2023	Feb 2023	Mar 2023	Apr 2023	May 2023	Jun 2023	Jul 2023	Aug 2023	Sep 2023	Oct 2023	Nov 2023
A007	Jameson Ave. South of Laxton Ave.	0	0	0	0	0	0	164	572	486	940	664
A215	Dufferin St. South of Claver Ave.	58	0	0	0	0	0	0	0	0	0	0
A016	Ridge Hill Dr. Westbound West of Old Park Rd.	0	0	0	0	0	0	537	504	359	134	305
A017	Caledonia Rd. Southbound North of Rogers Rd.	0	0	0	0	0	0	0	640	519	310	349
A018	Gladstone Ave. Southbound South of Cross St.	0	62	587	496	424	228	835	821	576	484	598
A037	Main St. Northbound South of Swanwick Ave.	0	12	65	38	60	54	95	71	66	67	218

We can sum each row by column to achieve a structure that satisfies what we planned in Section 2.1.

Table 4: Final dataset ready for analysis

	Total	Jan 2023	Feb 2023	Mar 2023	Apr 2023	May 2023	Jun 2023	Jul 2023	Aug 2023	Sep 2023	Oct 2023	Nov 2023
NUMBER OF CHARGES	345908	20955	19752	29888	22721	29800	25557	38605	41553	40968	38638	37471

3 Results

3.1 ASE Charge Statistics

Between January and November 2023, there were a total of 345908 charges laid by ASE cameras across Toronto (Table 4). On average, there were 31446 charges per month, with a standard deviation of 7948. The months with the highest number of charges are: August (41553), September (40968), and October (38638). The months with the lowest number of charges are: February (19752), January (20955), and April (22721). Using the values on Table 1, the minimum amount of money the city could have made in 2023 is \$5/km * 1km * 345908 = \$1,729,540, while the maximum amount of money the city could have made in 2023 is \$12/km * 49km * 345908 = 203,393,904.

3.2 Data Trends & Behaviours

Based on Figure 1, we can see a sharp rise in July for the number of charges laid per month. This is due to the city implementing cameras at new sites, as seen in Table 3 at sites like A007, A016, and A017. Splitting the graph into the first and 2nd half of 2023, we can see in Figure 2 that they each follow their own uniform distribution, with the first half having 2 peaks in March and May.

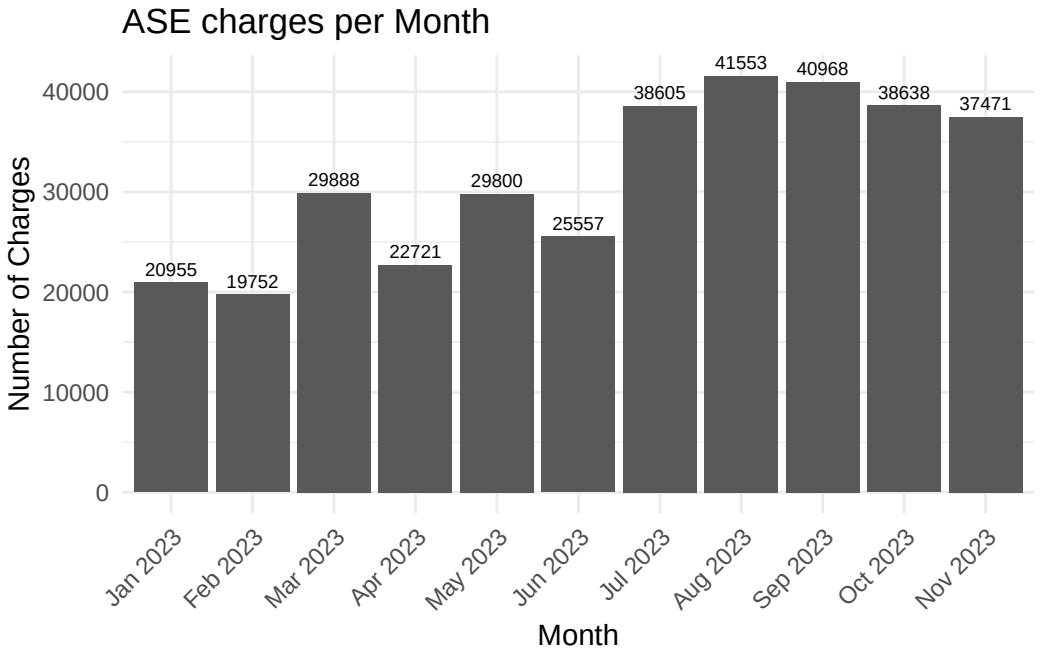
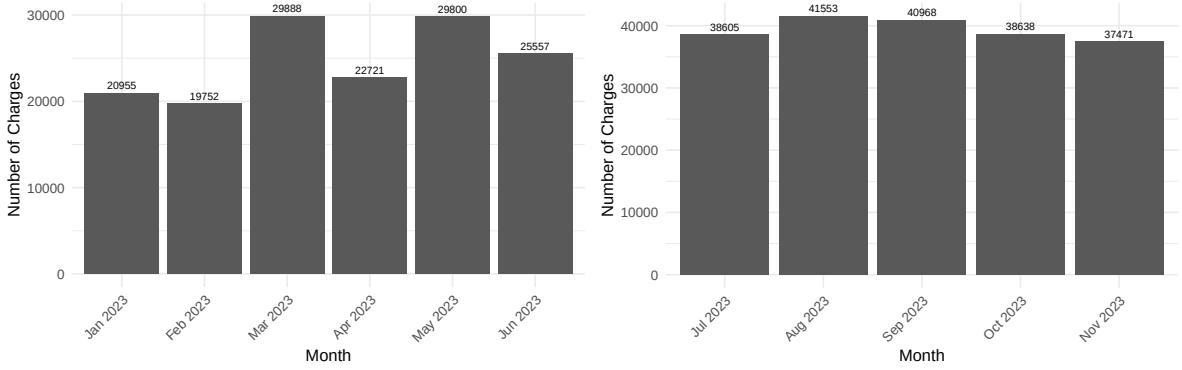


Figure 1: Number of ASE charges per month in Toronto



(a) January to June

(b) July to November

Figure 2: Number of ASE charges per month in Toronto

References

Cheif of Justice, Office of the. 2024. "Schedule d Highway Traffic Act Speeding – Community Safety Zone." https://www.ontariocourts.ca/ocj/provincial-offences/set-fines/set-fines-i/schedule-43/.

Data, Toronto Open. 2024. "Automated Speed Enforcement (ASE) Charges." https://open.toronto.ca/dataset/automated-speed-enforcement-ase-charges/.

Firke, Sam. 2023. *Janitor: Simple Tools for Examining and Cleaning Dirty Data*. https://github.com/sfirke/janitor.

Gelfand, Sharla. 2022. *Opendatatoronto: Access the City of Toronto Open Data Portal*. https://sharlagelfand.github.io/opendatatoronto/.

R Core Team. 2023. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

Wickham, Hadley, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D'Agostino McGowan, Romain François, Garrett Grolemund, et al. 2019. "Welcome to the tidyverse." *Journal of Open Source Software* 4 (43): 1686. https://doi.org/10.21105/joss.01686.

Wickham, Hadley, Romain François, Lionel Henry, Kirill Müller, and Davis Vaughan. 2023a. "Dplyr: A Grammar of Data Manipulation." https://CRAN.R-project.org/package=dplyr.

———. 2023b. *Ggplot2: Elegant Graphics for Data Analysis*. Springer-Verlag New York. https://CRAN.R-project.org/package=dplyr.