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Introduction

- Estimation of diversion rate during incident is an important parameter to support the performance management of transportation systems.
- This study focuses on the development of a method to estimate diversion due to incidents
- Freeway detector data combined with incident data using a combination of clustering, cumulative volume analysis, and regression analysis is utilized in this study.

Diversion Rate Calculation

Diversion Rate is calculated as
$$\frac{\text{Cumulative Volume of No incident day} - \text{Cumulative Volume of incident day}}{\text{Cumulative volume of No incident day}}$$

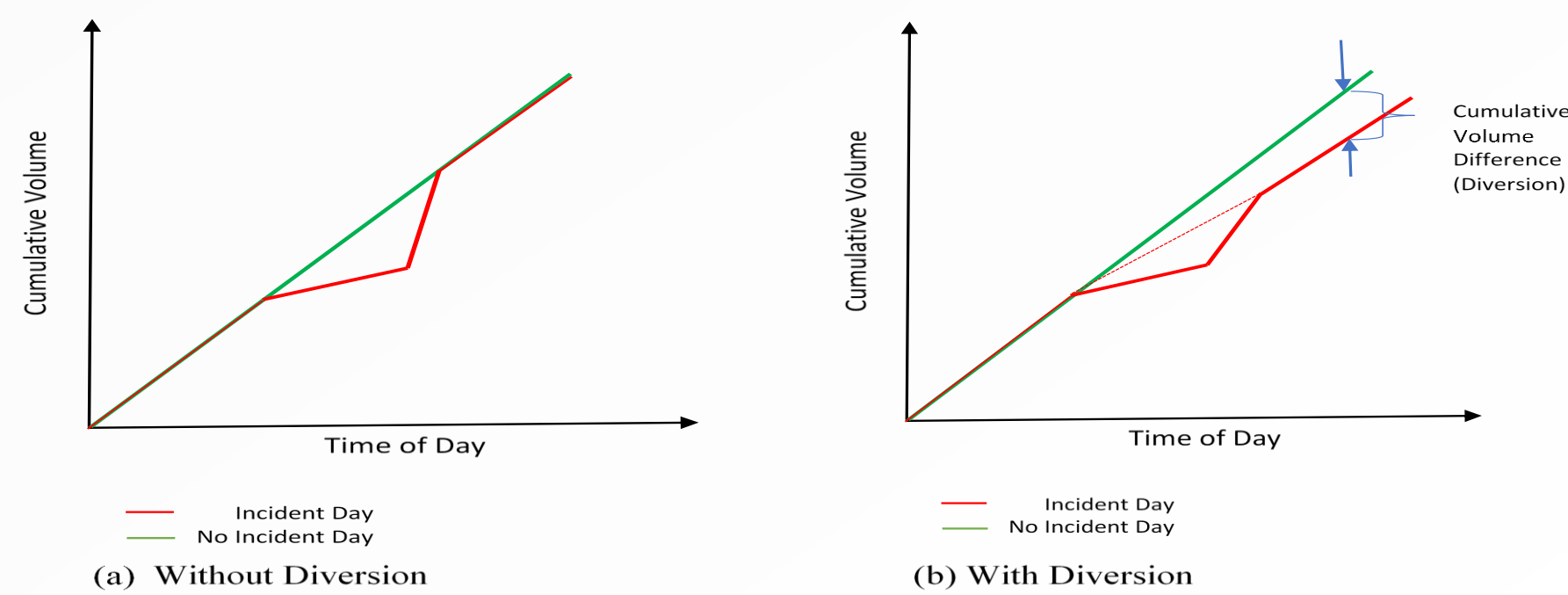


FIGURE 1 Cumulative Analysis

Clustering Analysis

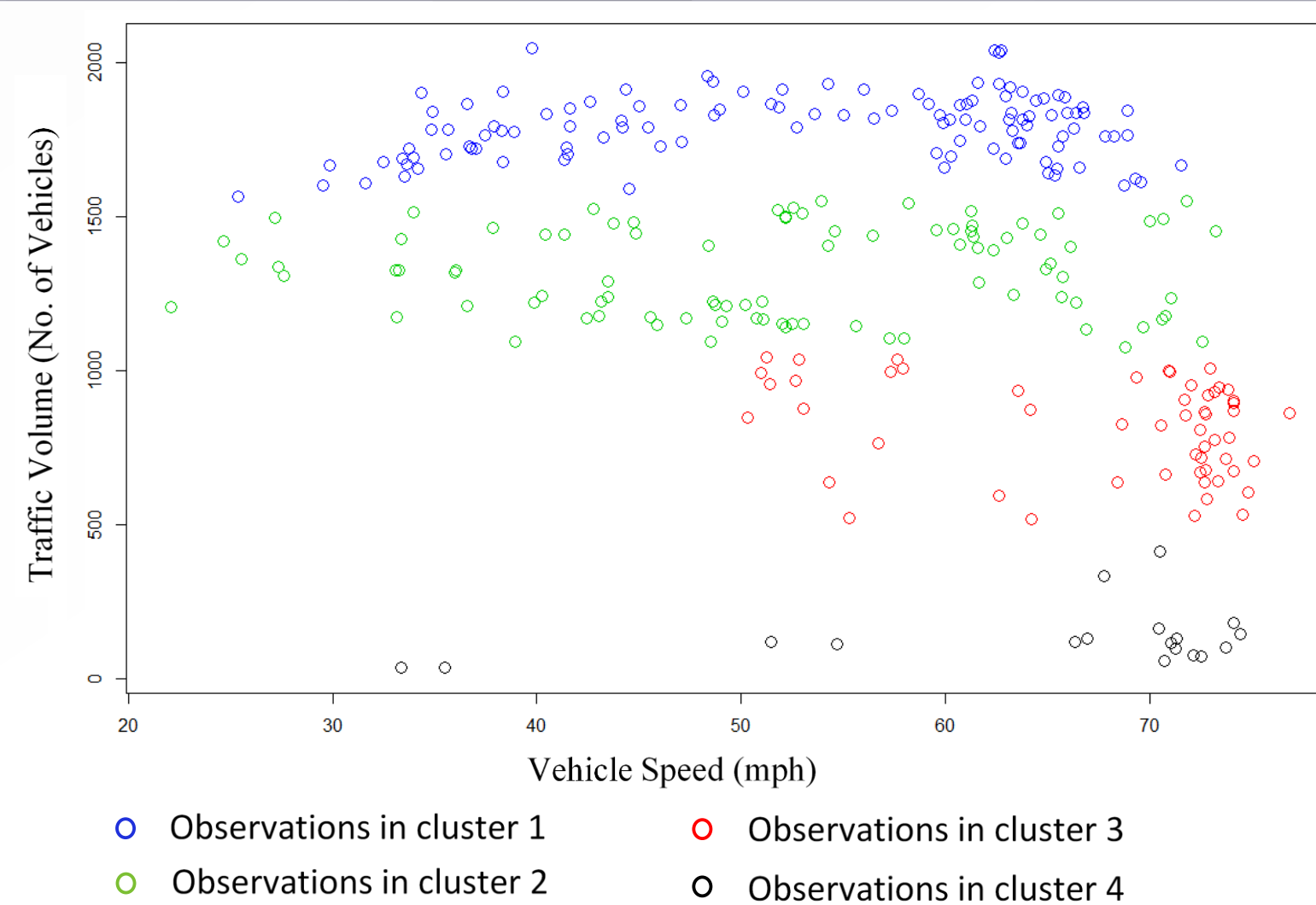


FIGURE 2 Plot of the volume vs. speed from 7:00 AM to 7:30 AM period in the fall season

Descriptive Statistics

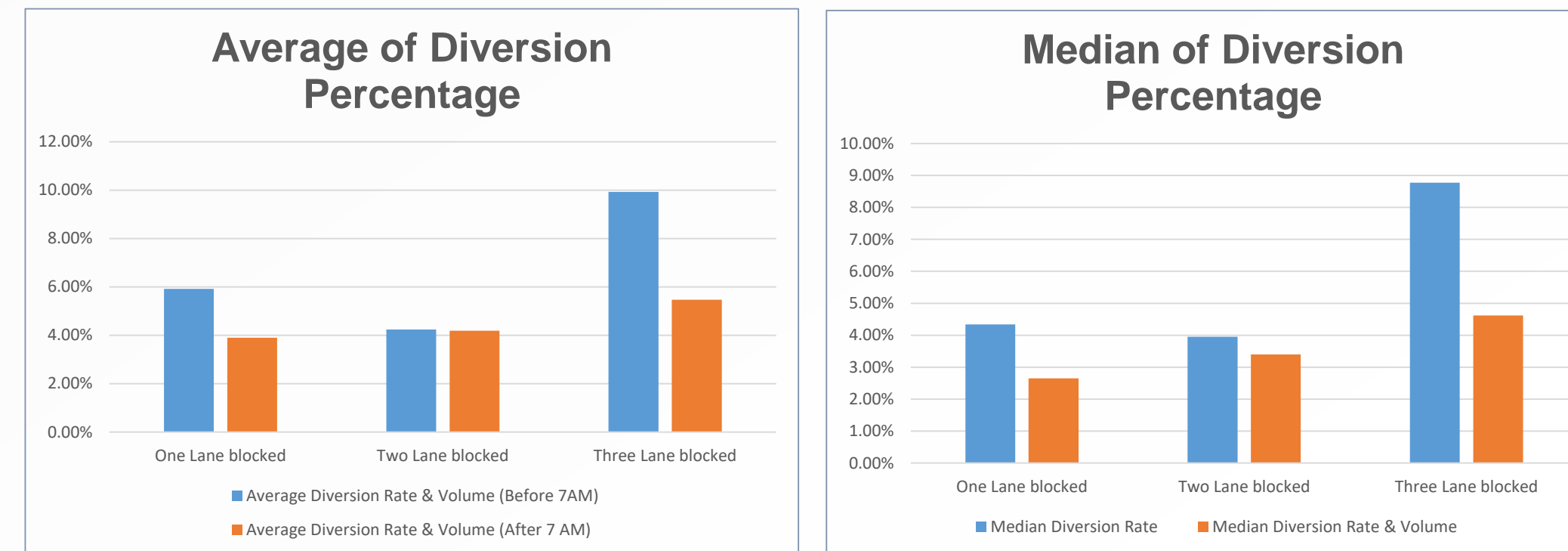
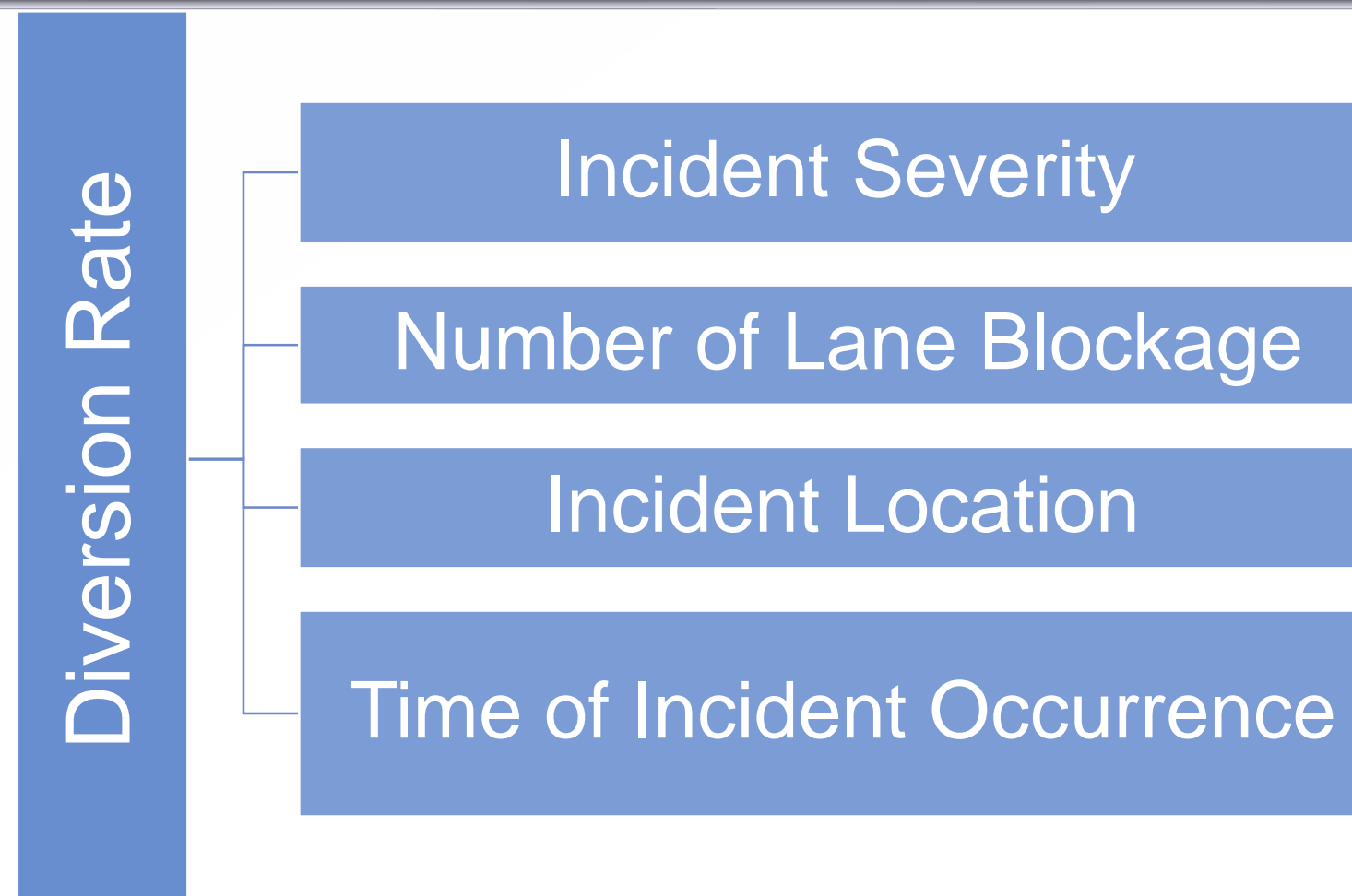


FIGURE 3 Diversion Rate before and after 7 AM

Variable Selection



Regression Analysis

TABLE 1 Regression Analysis Results

Regression Model		
Variables	Coefficient	Pr(> t)
Lane Blockage	1.7089****	0.000392
Incident Severity	2.2655***	0.006277
Incident Location	0.4242**	0.033404
Log _e (Time slice of Incident Occurrence)	-2.6621**	0.010086
Multiple R-squared:		0.614
Adjusted R-squared:		0.6025
p-value:		2.2e-16
Absolute Mean Error		3.204357%
Significant codes: 0= '****' 0.001= '***' 0.01= '**' 0.05= '*'		

Model Verification

TABLE 2 Verification of the Estimation of the Diversion Rate Using the Develop Model

Incident detection time	Time Slice	Incident Severity	Incident Location	Blocked Lane Number	Diverted Volume			Diversion Rate (%) from I-95		Diverted percentage	
					From I-95	To Saw-grass	To Turn-pike	Actual Rate	Model Prediction	To Saw-grass	To Turn-pike
7:45AM	11	1	1	1	499	413	157	1.85	1.63	1.53	0.58
6:45AM	7	1	4	1	1138	980	427	3.06	3.42	2.63	1.15
6:45AM	7	1	2.5	2	572	259	182	4.6	4.49	2.08	1.46
5:30AM	2	2	5	3	991	453	539	13.89	10.98	6.35	7.55
6:30AM	6	1	6	3	578	264	314	7.63	7.87	3.49	4.15
6:30AM	6	1	5.5	3	740	601	NA	4.83	7.65	3.92	NA
6:45AM	7	3	5	3	1804	359	NA	13.88	11.79	2.76	NA
7:45AM	11	1	3	2	809	464	NA	2.84	4.18	1.82	NA

Conclusion

- A direct method is developed to estimate the diversion of individual incident.
- Diversion rate can range from about 4% to 22%, depending on the severity, lane blockage and the time of incident occurrence.
- Diversion is constrained by the capacity of the signals at of the off-ramps.
- Special signal control plans is required during incidents to increase the capacity of the off-ramps and adjacent signals leading to the main parallel routes.

Acknowledgement

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