



Travel Time Reliability Measure Using GPS Data

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Travel time reliability

- Travel time reliability is defined as a measure of trip consistency during a specific time period in a specific location.



- Travel time reliability has been identified as the most important factor affecting ridership satisfaction

Common Measures

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- Standard Deviation
- Coefficient of Variation
- Percentile Travel time
- Buffer Time Index
- Planning Time Index



Parametric Measures

- Standard Deviation, Coefficient of Variation

$$\text{Sample SD} = \sqrt{\frac{\sum_{i=1}^N (X - \bar{X})^2}{N-1}}$$



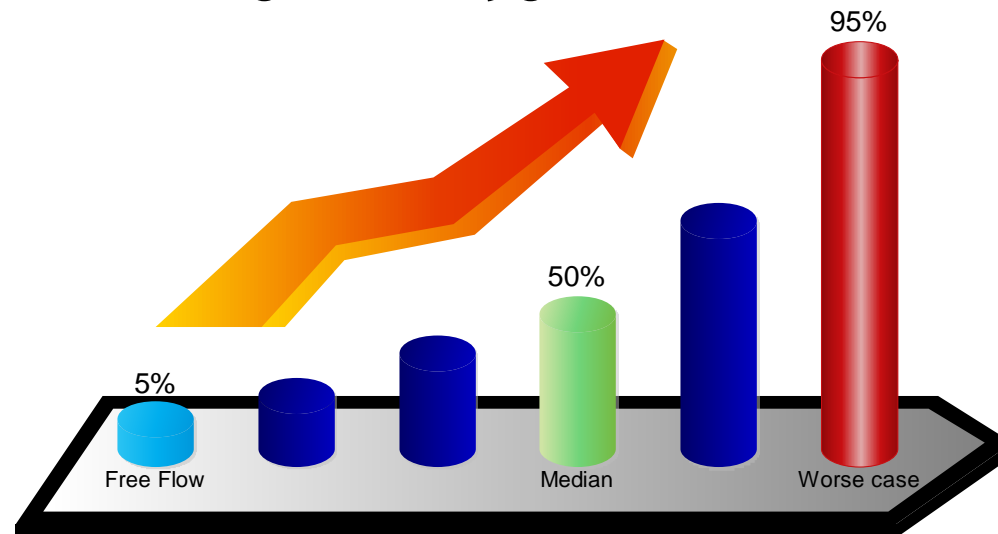
Central Limit Theory



They are not readily understood by nontechnical audiences nor easily related to everyday commuting experiences

Percentile Travel Time

- The simplest alternative method to report travel time reliability is the 90th and 95th percentile travel time.
- 50th percentile (equal to the median)
- Differences between 5th and 95th percentile

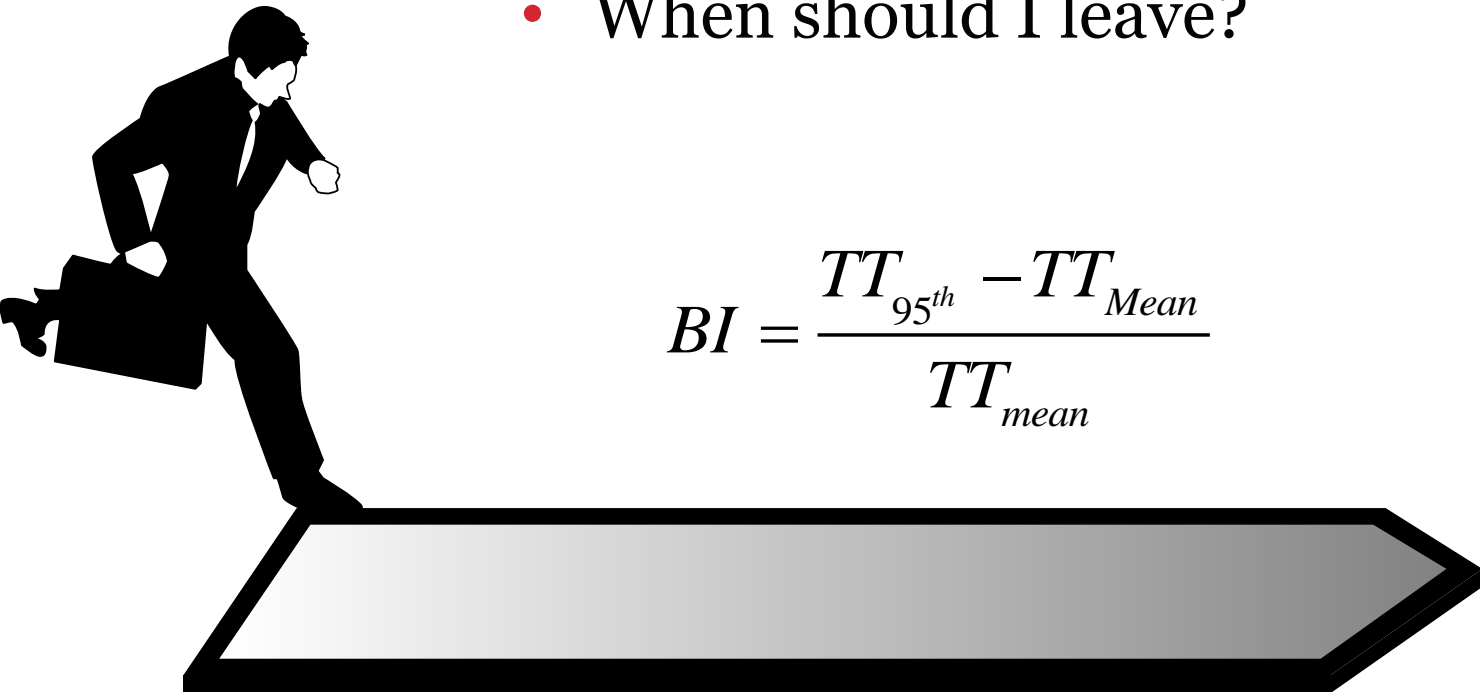


Buffer Time Index

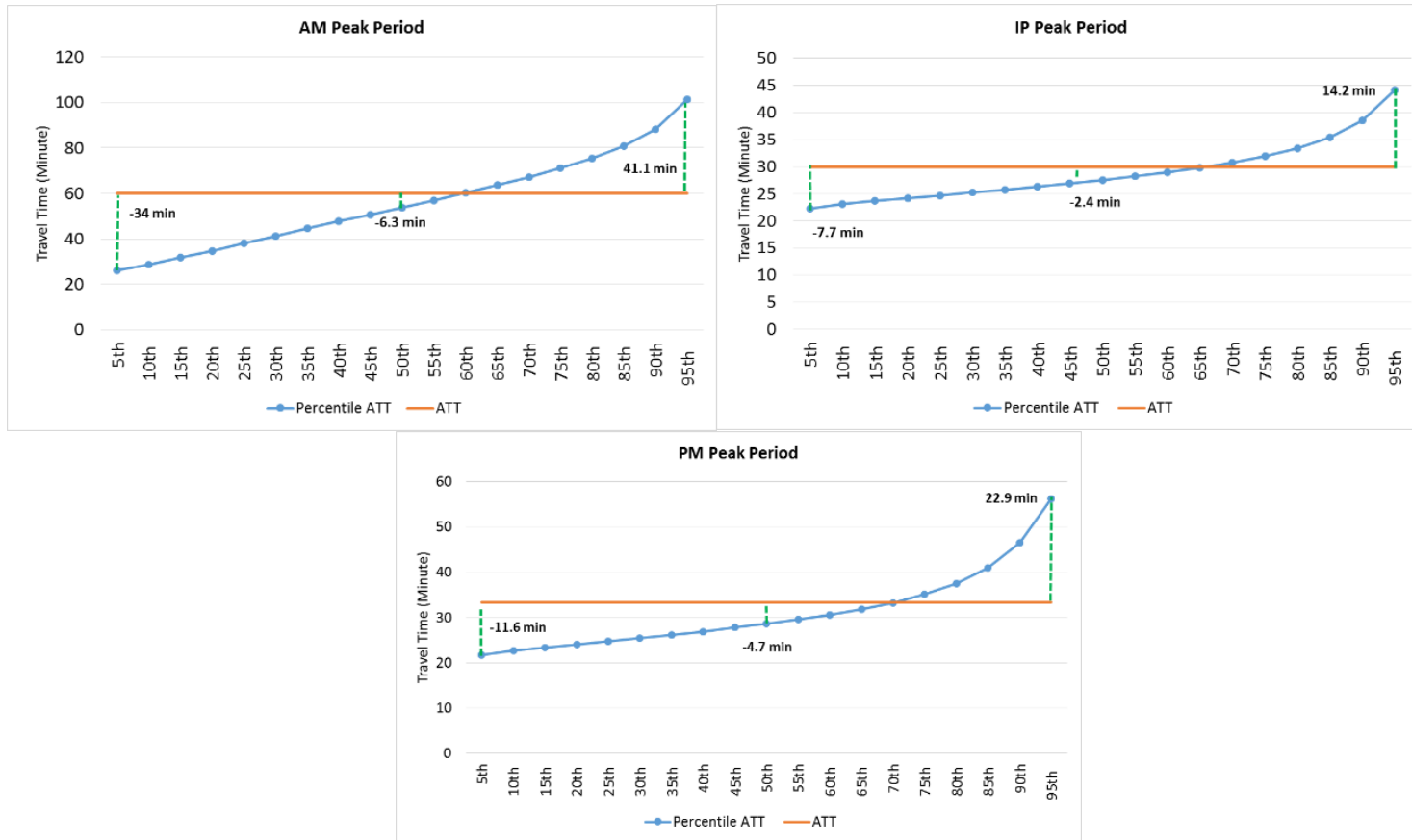


Extra Time

- When do I need to arrive?
- How bad is the traffic likely to be?
- How much time do I need to allow?
- When should I leave?

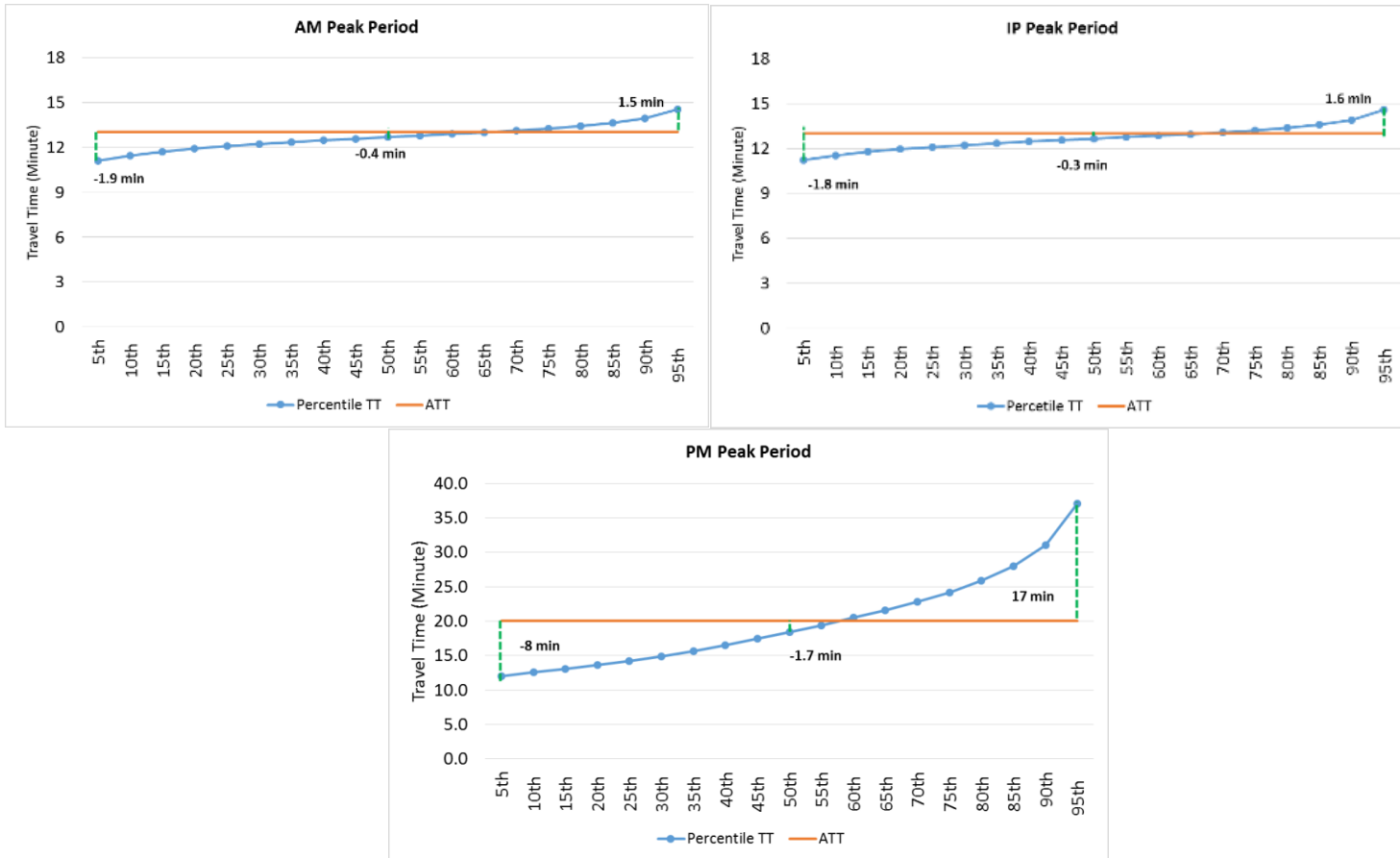

$$BI = \frac{TT_{95^{th}} - TT_{Mean}}{TT_{mean}}$$

Results



















































SH1 travel time

Results



SH16 travel time

Results

AM Peak	SH1		SH 16		IP Peak	SH1		SH 16		PM Peak	SH1		SH 16	
	BI	status	BT	status		BI	status	BI	status		BI	status	BI	status
2008	98%		8%		2008	34%		17%		2008	104%		85%	
2009	88%		9%		2009	46%		12%		2009	87%		80%	
2010	79%		14%		2010	54%		13%		2010	88%		78%	
2011	76%		12%		2011	37%		13%		2011	126%		86%	
2012	84%		14%		2012	34%		13%		2012	86%		80%	
2013	76%		17%		2013	24%		15%		2013	72%		83%	
2014	82%		20%		2014	33%		16%		2014	80%		75%	
2015	68%		11%		2015	47%		12%		2015	69%		85%	



Reliable



Moderately Reliable



Unreliable



Conclusion

- BTI and PTT are easy to understand for non-technical audiences and are capturing the variability of data more accurately.
- It is recommended to use these models instead of standard deviation and coefficient of variation, which are restricted by the assumption of normality and are sensitive to skewed observations.
- It was also deduced that BT alone ignores the relative typical travel time for different routes. The Buffer Index takes into account an average travel time and allows comparisons to be made between routes of different length.
- PTT was found to be the easiest method to report travel time reliability.

