ESTIMATING ANNUAL AVERAGE DAILY BICYCLE TRAFFIC WITHOUT PERMANENT COUNTER STATIONS

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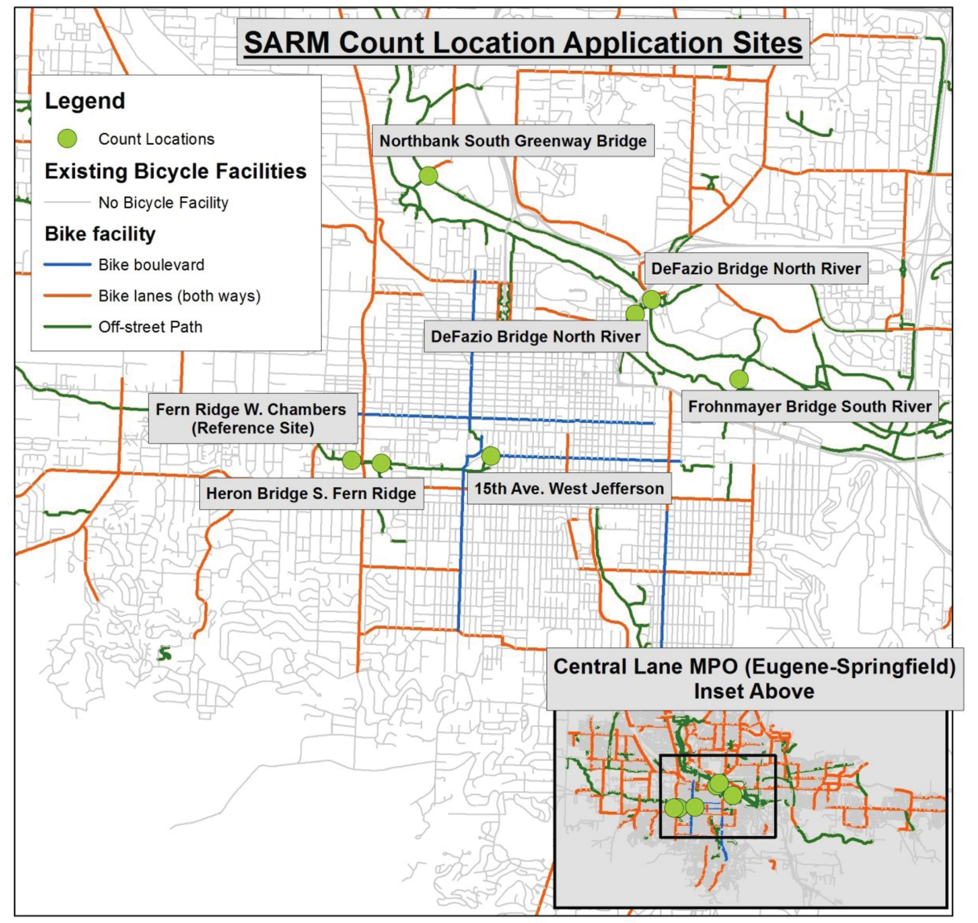
Motivation

- Many communities want Annual Average Daily Bicycle Traffic (AADBT) estimates.
- Standard approaches for AADBT estimation with short counts require permanent count data, which not all communities have.
- Goal: Adjust short-duration counts to account for seasonal effects without a permanent counter.

Data Sources

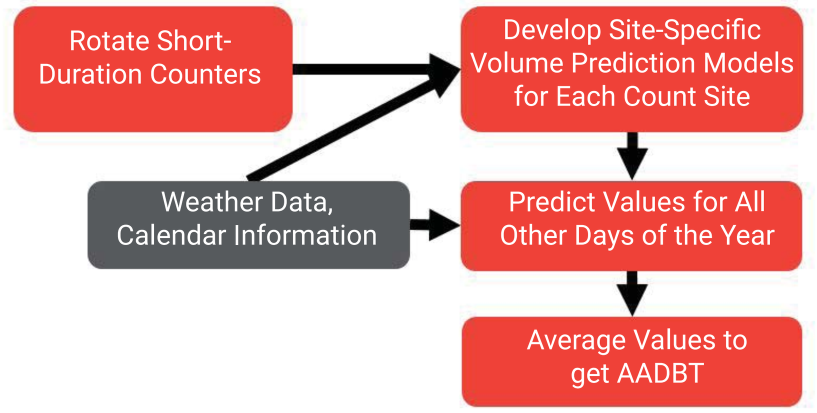
Two datasets were used in this study. These include a set of six permanent counters from throughout the Pacific Northwest, which were used to develop and validate the method, and a set of short-duration counts from the Eugene-Springfield, OR region, which were used to demonstrate the method.



PERMANENT COUNT SITES

Location	Year							
	2013		2014		2015		2016	
	AADBT	N	AADBT	N	AADBT	N	AADBT	N
Fern Ridge West Chambers (Eugene, OR)	605	308	426	201	557	354	539	324
Fremont Bridge West Sidewalk (Seattle, WA)	1,311	364	1,414	364	1,372	363	1,283	365
Fremont Bridge East Sidewalk (Seattle, WA)	1,230	364	1,347	364	1,331	363	1,408	365
Spokane Street Bridge (Seattle, WA)	NA	NA	777	363	821	364	815	365
Hawthorne Bridge (Portland, OR)	4,670	365	4,706	364	4,620	363	3,321	346
Ashland Dog Park (Ashland, OR)	142	361	192	365	148	365	140	366

Seasonal Adjustment Regression Method



This flowchart describes the model process. Negative-Binomial regression models are developed to predict daily bicycle volumes at each location where short-duration counts have been taken, based on weather information and other temporal details (e.g. day of week, minutes of daylight). All variables are included in each site's model, unless no observations of the relevant conditions are available.

OPTIMAL DATA COLLECTION STRATEGY

We conducted tests to determine how best to structure the data collection plan, based on predictive accuracy when the method is applied. This resulted in the following recommendations to achieve improved accuracy:

- Collect data across multiple years.
- Install counters at the same site at multiple times of year. The highest accuracy is achieved with data collection periods spread between seasons.
- Collect data for a minimum of two weeks per year at each location.

VALIDATION

To validate the SARM, we applied the technique to the permanent count dataset. We experimented with varying the quantity of data used and the sampling strategy using Monte Carlo cross-validation with 500 iterations. Evaluations were conducted using the Average Percentage Error, calculated as:

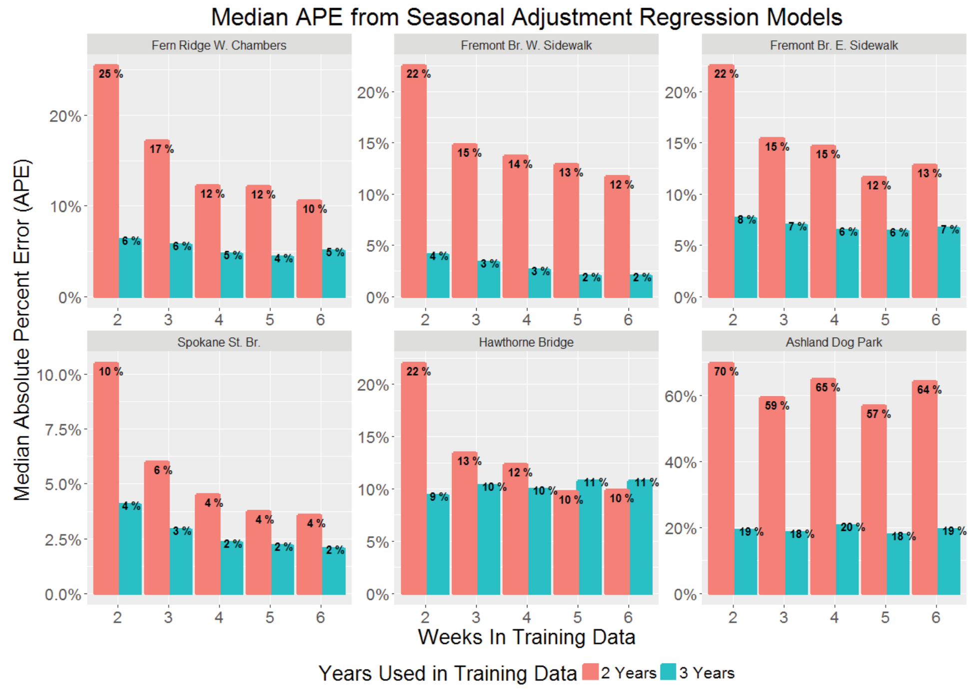
$$APE = \left| \frac{AADBT_{obs} - AADBT_{est}}{AADBT_{obs}} \right|$$

Where:

$AADBT_{obs}$ = Observed AADBT for the count location

$AADBT_{est}$ = Model-predicted AADBT for the count location

Based on this testing process, we discovered that sampling data from weeks spread throughout the year yields the best performance. The tests described in the following figure used this sampling technique.



As can be seen in this figure, error rates were generally much lower if data from three separate years was used, which is likely due to a greater degree of variation in the conditions observed. Additionally, using six weeks of data resulted in the lowest prediction error. The Ashland Dog park had noticeably worse performance, overall than the other sites, which is likely due to the heavily recreational nature of this site.

COMPARISON OF TRADITIONAL EXPANSION FACTOR AND SARM ESTIMATES OF AADBT

Location	AADBT Estimate			Days Used in Estimate		Monthly Factor Information	
	Traditional	SARM	APE	Traditional	SARM	Factor	Month
Heron Bridge South Fern Ridge	398	415	4.3%	7	45	0.984	April
DeFazio Br. South River	484	457	5.6%	7	33	0.83	September
DeFazio Br. North River	445	453	1.9%	7	25	0.83	September
15th Ave. West Jefferson St.	556	513	7.8%	7	34	1.29	February
Frohnmayer South River	749	741	1.1%	7	47	0.835	May
North bank South Greenway Bridge	464	471	1.6%	8	43	1.479	November

In addition to testing the method at the continuous count sites, we applied SARM to six short-duration count sites in Eugene-Springfield, OR. We developed extrapolation factors from the single continuous counter in Eugene, using the Traffic Monitoring Guide method. The above table shows a comparison between the predicted values using these two techniques, which reveals that the predictions overall are fairly similar between these two techniques. However, these sites were selected because they have similar hourly patterns to the continuous counter, which could be biasing the apparent performance of the TMG method.

Limitations

This method is best suited to communities who have not been able to install a permanent counter, but have extensive sets of short-duration bicycle counts. As developed, this method does not allow for predictions to account for weather factors at locations where the observations don't include the relevant weather conditions.

Acknowledgements

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