

METIS

Project Luther:  
Understanding impact of weather on bike commuter traffic across Fremont bridge

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Jan 25<sup>th</sup>, 2019

# SDOT makes excellent traffic data available for easy download

 Seattle

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Fremont Bridge Hourly Bicycle Counts by Month October 2012 to present [Transportation](#)

The Fremont Bridge Bicycle Counter records the number of bikes that cross the bridge using the pedestrian/bicycle pathways. Inductive loops on the east and west pathways count the passing of bicycles regardless of travel direction. The data consists of a date/time field: Date, east pathway count field: Fremont Bridge NB, and west pathway count field: Fremont Bridge SB. The count fields represent the total bicycles detected during the specified one hour period. Direction of travel is not specified, but in general most traffic in the Fremont Bridge NB field is... [More](#)

Updated [January 15, 2019](#)  
Data Provided by [Seattle Department of Transportation](#)

### About this Dataset

Updated <b>January 15, 2019</b>	Data Owner
Date Last Updated January 15, 2019	Department Transportation
Metadata Last Updated January 15, 2019	Owner Department of Transportation
Date Created March 14, 2013	Refresh Frequency
Views <b>15.6K</b>	Frequency Other
Downloads <b>18.6K</b>	Topics



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# Weather data had to be scraped

NOWData - NOAA Online Weather Data      [Enlarge results](#) [Print](#) [X](#)

Climatological Data for Olympia Area, WA (ThreadEx) - December 2018  
Click column heading to sort ascending, click again to sort descending.

Date	Temperature				HDD	CDD	Precipitation	New Snow	Snow Depth
	Maximum	Minimum	Average	Departure					
2018-12-01	47	32	39.5	-0.3	25	0	T	0.0	0
2018-12-02	45	34	39.5	-0.1	25	0	0.00	0.0	0
2018-12-03	46	26	36.0	-3.5	29	0	0.00	0.0	0
2018-12-04	46	21	33.5	-5.8	31	0	0.00	0.0	0
2018-12-05	46	19	32.5	-6.6	32	0	0.00	0.0	0
2018-12-06	44	17	30.5	-8.4	34	0	0.00	0.0	0
2018-12-07	37	17	27.0	-11.8	38	0	T	0.0	0
2018-12-08	43	30	36.5	-2.2	28	0	0.02	0.0	0
2018-12-09	44	31	37.5	-1.0	27	0	0.66	0.0	0
2018-12-10	46	39	42.5	4.1	22	0	0.19	0.0	0
2018-12-11	49	44	46.5	8.2	18	0	1.27	0.0	0
2018-12-12	47	40	43.5	5.3	21	0	0.45	0.0	0
2018-12-13	51	42	46.5	8.4	18	0	0.28	0.0	0
2018-12-14	54	35	44.5	6.4	20	0	0.06	0.0	0
2018-12-15	48	34	41.0	3.0	24	0	0.04	0.0	0
2018-12-16	50	42	46.0	8.0	19	0	0.37	0.0	0
2018-12-17	51	45	48.0	10.1	17	0	0.58	0.0	0
2018-12-18	52	41	46.5	8.6	18	0	0.41	0.0	0
2018-12-19	49	41	45.0	7.1	20	0	0.19	M	0
2018-12-20	56	38	47.0	9.1	18	0	0.14	M	0
2018-12-21	43	31	37.0	-0.9	28	0	0.00	0.0	0
2018-12-22	43	33	38.0	0.1	27	0	0.53	M	0
2018-12-23	49	39	44.0	6.0	21	0	0.79	M	0

← → C https://nowdata.rcc-acis.org/sew/

## NOWData - NOAA Online Weather Data

1. Location » [View map](#)

- Daily data for a month
- Daily almanac
- Monthly summarized data
- Calendar day summaries
- Daily/monthly normals
- Climatology for a day
- First/last dates
- Temperature graphs
- Accumulation graphs

2. Product »

3. Options » Date: **2018-12** [Go](#)

4. View »

**Product Description:**

DAILY DATA FOR A MONTH - daily maximum, minimum and average temperature (degrees F), average temperature departure from normal (degrees F), heating and cooling degree days (base 65), precipitation, snowfall and snow depth (inches) for all days of the selected month. Basic monthly summary statistics are also provided.

- Common questions -  
- Submit a question/comment -

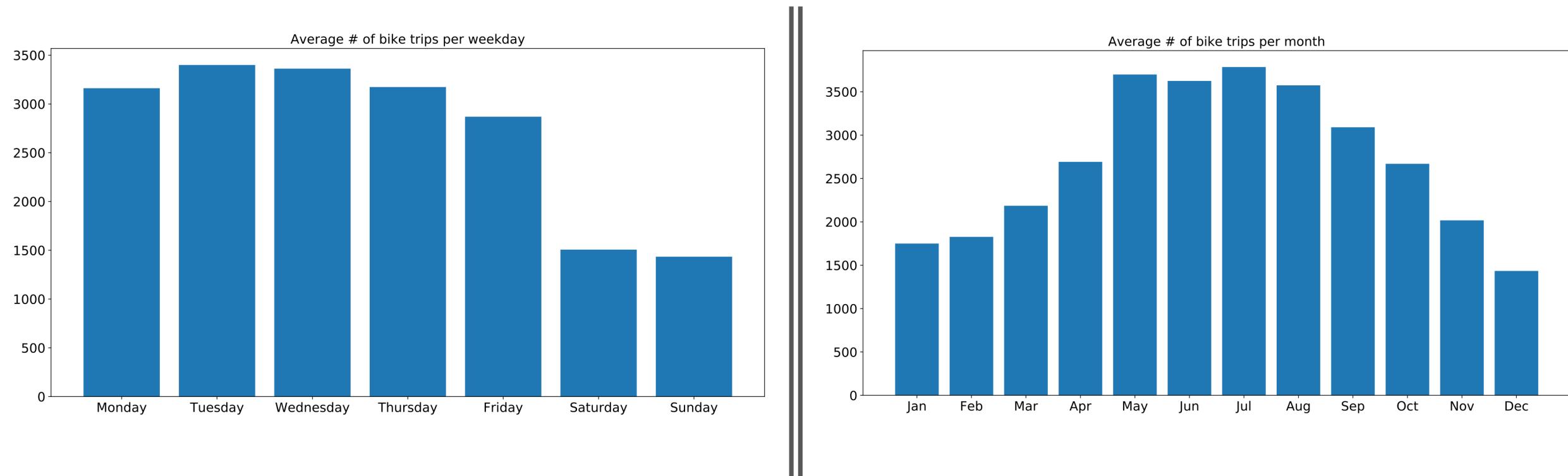
Powered by   
NOAA Regional Climate Centers

The Applied Climate Information System (ACIS) is a joint project of the [Regional Climate Centers](#), the [National Centers for Environmental Information \(NCEI\)](#) and the [National Weather Service](#). Official data and data for additional locations are available from the Regional Climate Centers and NCEI.



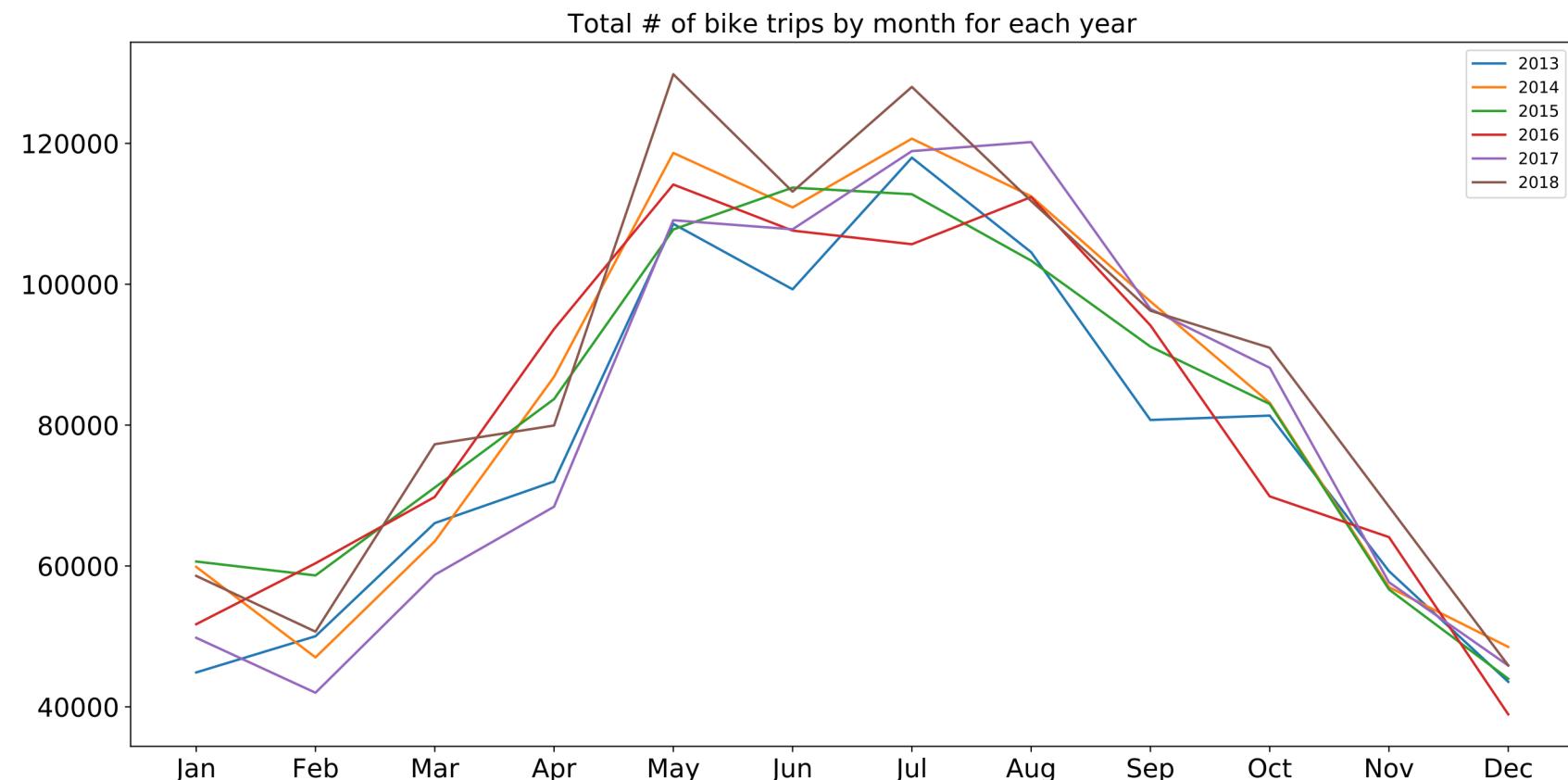
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# The overall traffic flow was predictable and steady



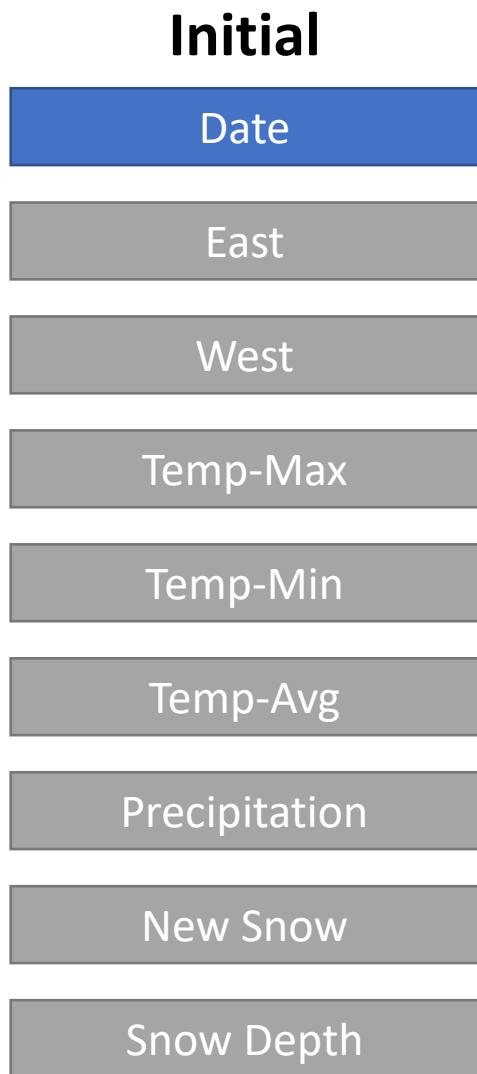
The model was built on 2013-2017 data, with 2018 reserved for testing

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# The dataset changed a lot from start to finish

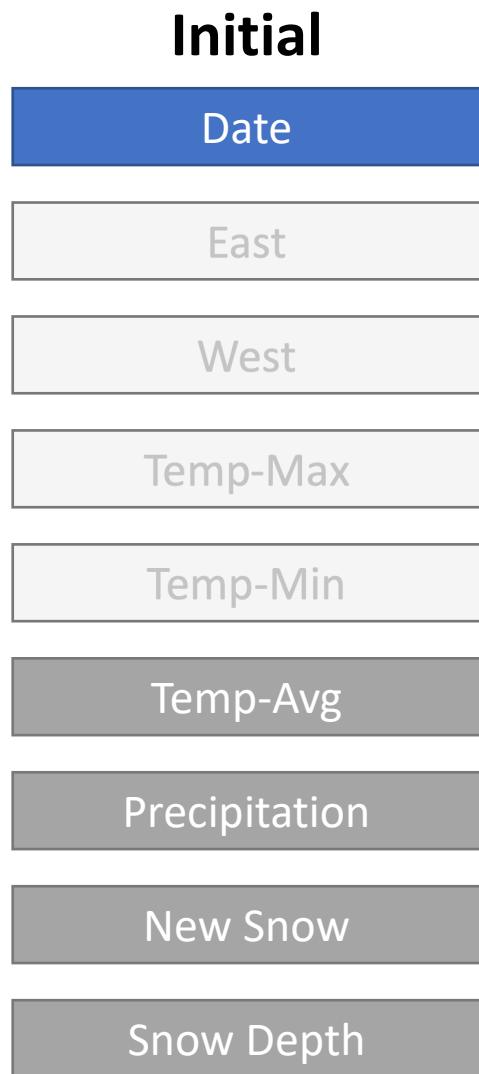


Legend:

- Datetime
- Float/integer
- Categorical
- Boolean



# The dataset changed a lot from start to finish



**Transformed**

**Added**

Legend:
Datetime
Float/integer
Categorical
Boolean



# The dataset changed a lot from start to finish

Initial
Date
East
West
Temp-Max
Temp-Min
Temp-Avg
Precipitation
New Snow
Snow Depth

Added
Weekday
Year
Month
Is holiday
EW
Temp HiLo delta

Transformed
Sin_month
Cos_month
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday

Added	Legend:
	Datetime
	Float/integer
	Categorical
	Boolean



# The dataset changed a lot from start to finish

Initial
Date
East
West
Temp-Max
Temp-Min
Temp-Avg
Precipitation
New Snow
Snow Depth

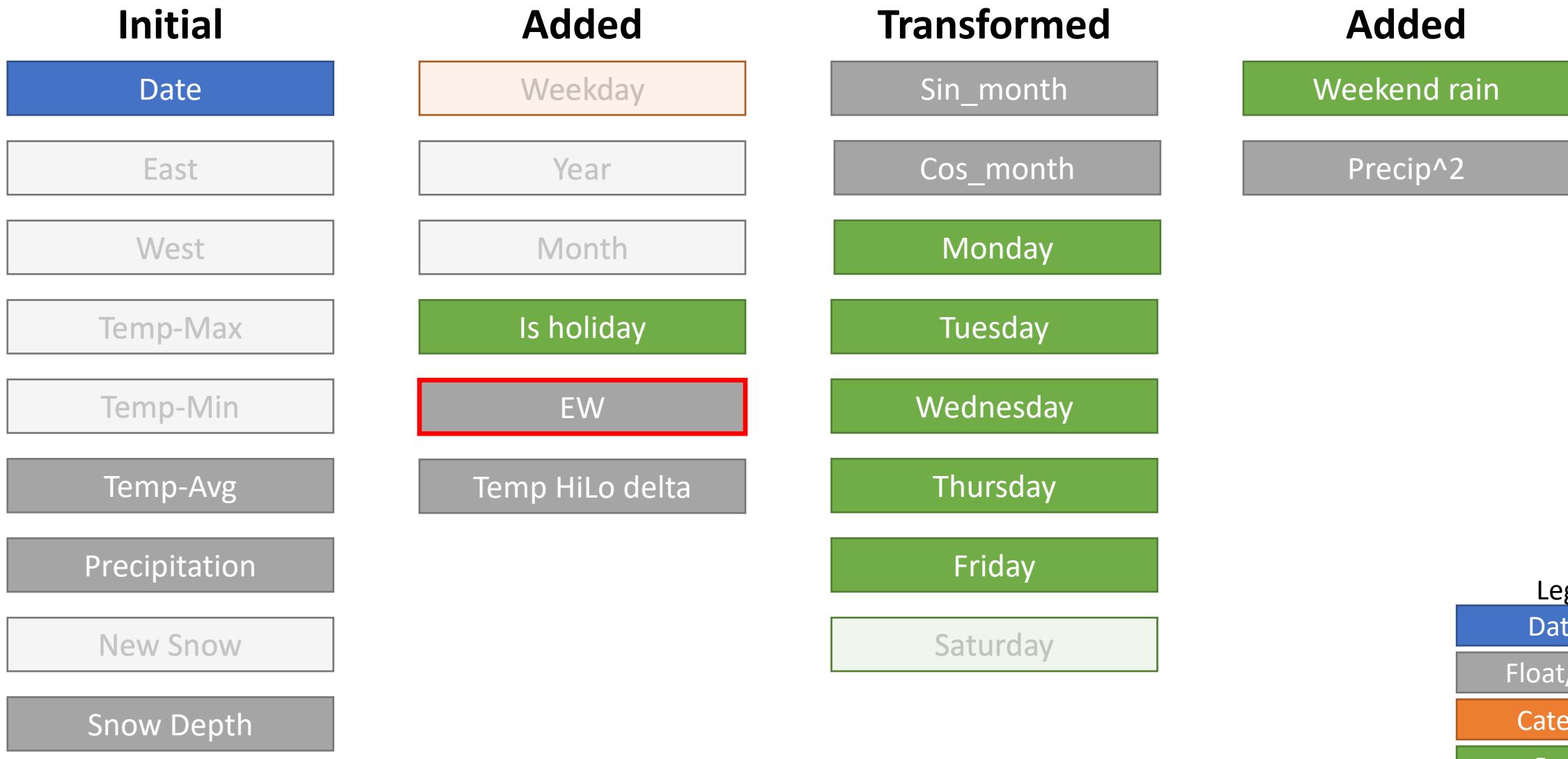
Added
Weekday
Year
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Temp HiLo delta

Transformed
Sin_month
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Added	Legend:
	Datetime
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# The dataset changed a lot from start to finish



# Lasso and OLS performed similarly in 5-fold cross-validation

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OLS

$R^2 = 0.883$

Lasso

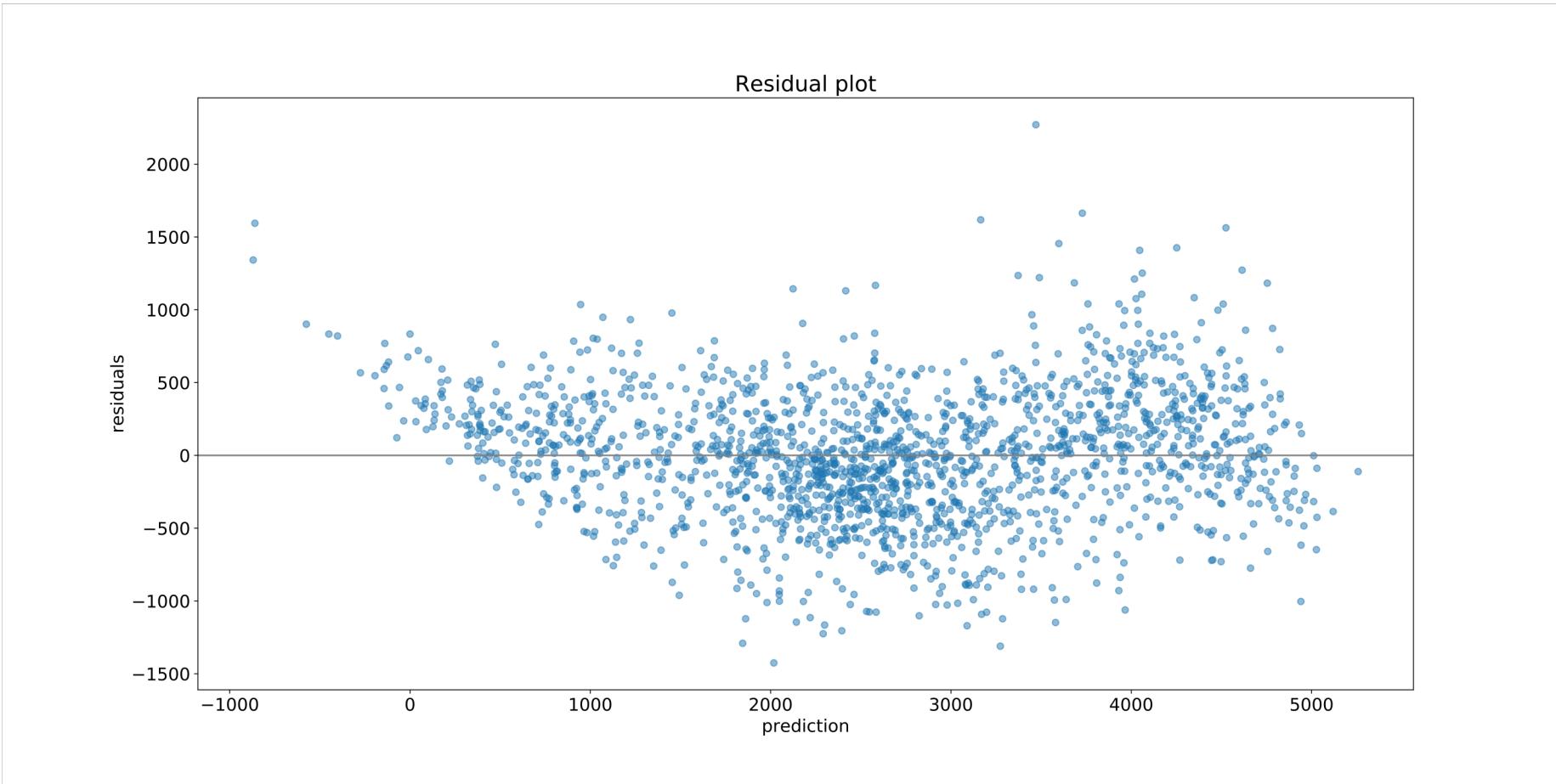
$\lambda = 0.74$

$R^2 = 0.884$

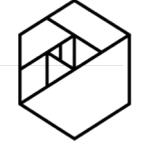


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# Overall residuals looked (mostly) good

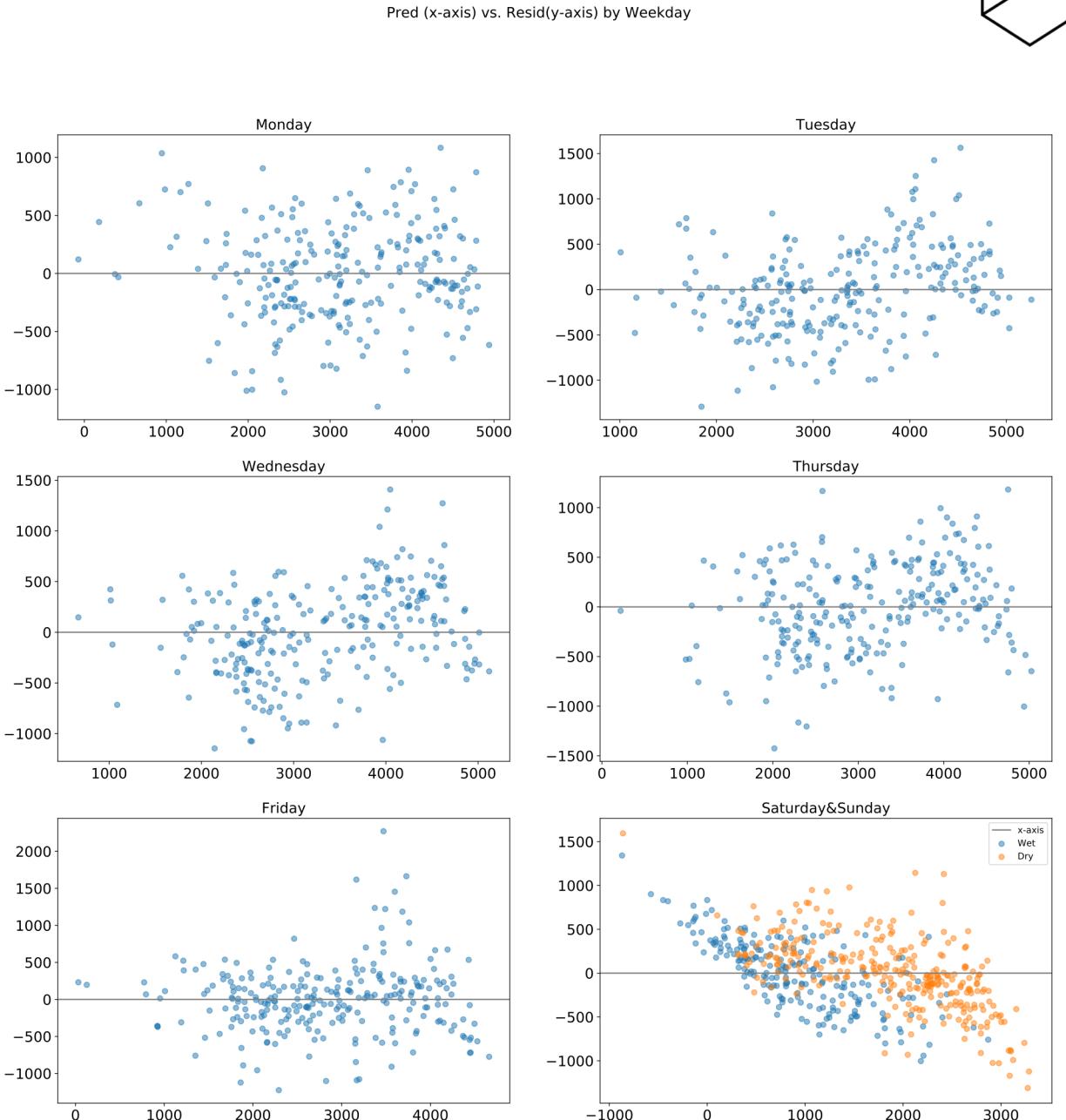


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However, further investigation is needed to fix the pattern in weekend residuals



# Weather data bumps up R<sup>2</sup> by 12 points

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**With weather**

**Without weather**

**R<sup>2</sup> = 0.886**

**Adj R<sup>2</sup> = 0.885**

**R<sup>2</sup> = 0.769**

**Adj R<sup>2</sup> = 0.768**

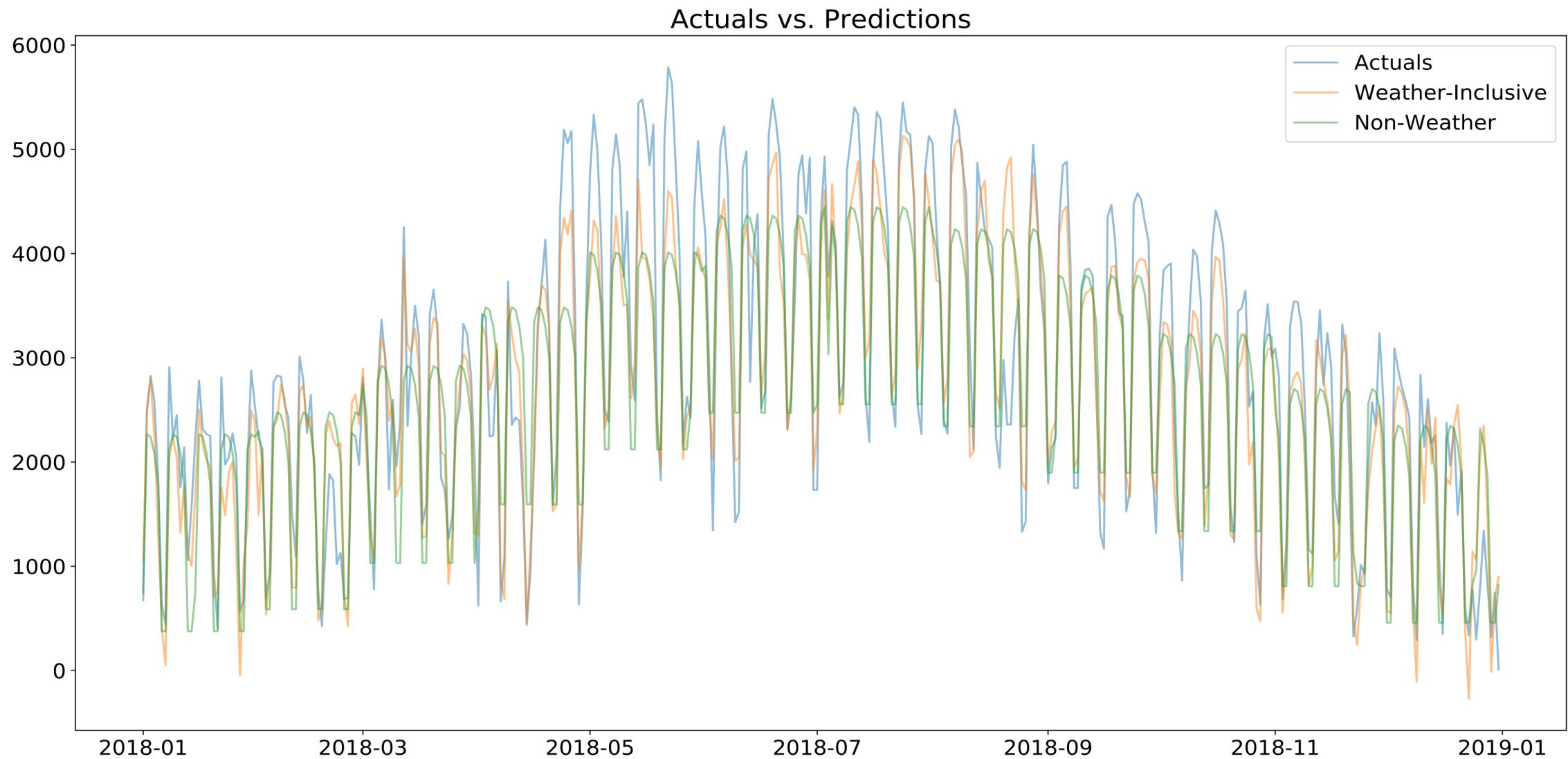


**METIS**



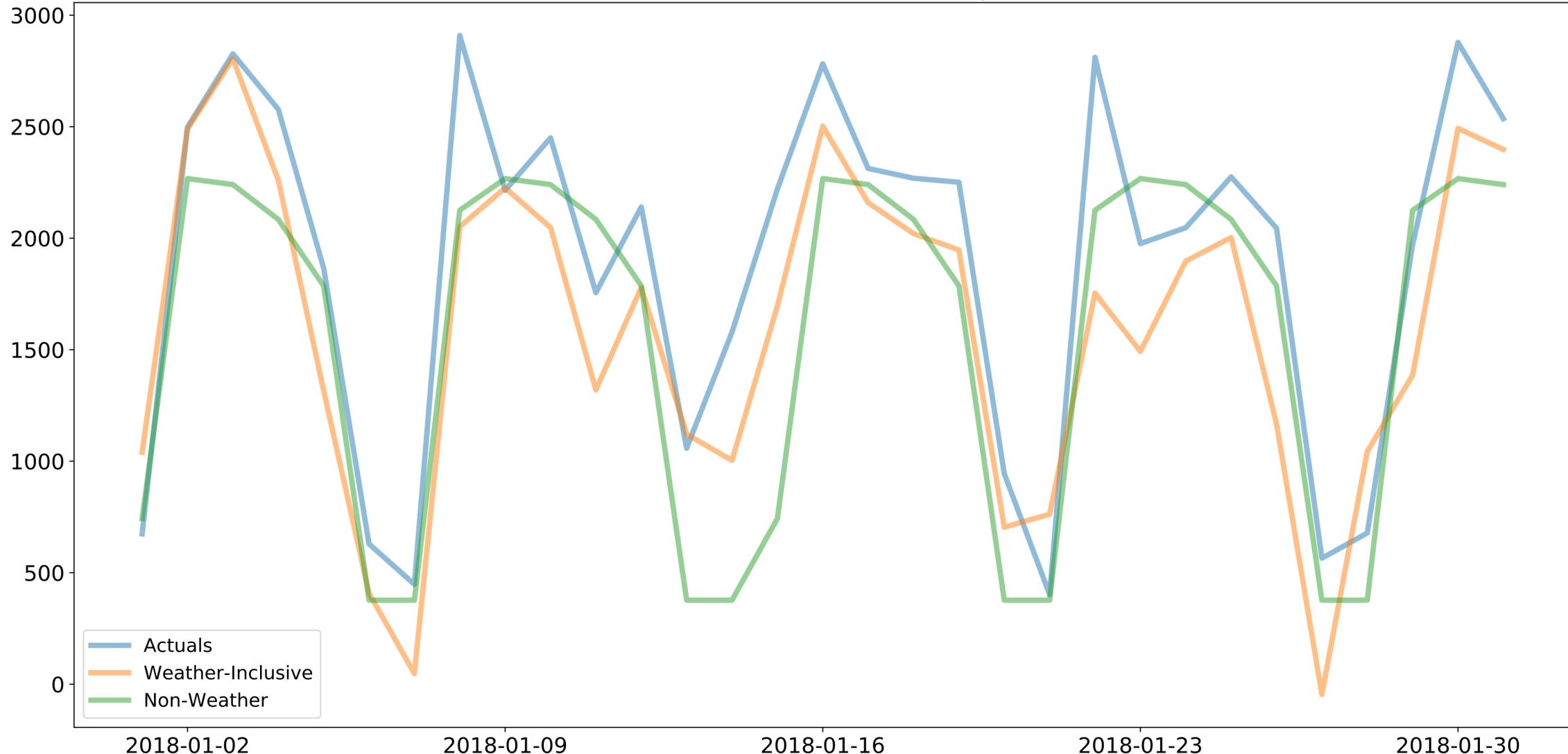
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# Predictions vs. actuals



# Predictions vs. actuals

Actuals vs. Predictions: January 2018





On average, the weather influences the number of bike commuters through Fremont bridge by 10%

# APPENDIX

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# Data sources & tools

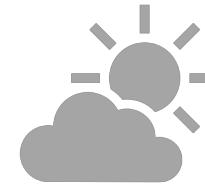


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Hourly bike counts across Fremont bridge, 2012 to present:

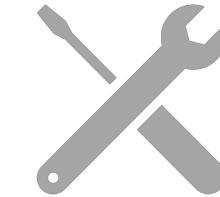
<https://data.seattle.gov/Transportation/Fremont-Bridge-Hourly-Bicycle-Counts-by-Month-Octo/65db-xm6k>



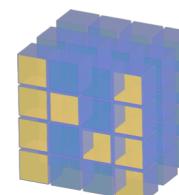
Daily weather data for Washington state stations:

<https://nowdata.rcc-acis.org/sew/>

**matplotlib**



Tools:



**NumPy**

**scikit learn**

**Pandas**





# Full list of columns in the final dataset

Initial	Added	Transformed	Added
Date	Weekday	Sin_month	Weekend rain
East	Year	Cos_month	Precip^2
West	Month	Monday	Pred
Temp-Max	Is holiday	Tuesday	Resid
Temp-Min	EW	Wednesday	Pred_nW
Temp-Avg	Temp HiLo delta	Thursday	Resid_nW
Precipitation		Friday	
New Snow		Saturday	
Snow Depth		Sunday	

Legend:

Datetime

Float/integer

Categorical

Boolean

# Predictions vs. actuals

Actuals vs. Predictions: August 2018

