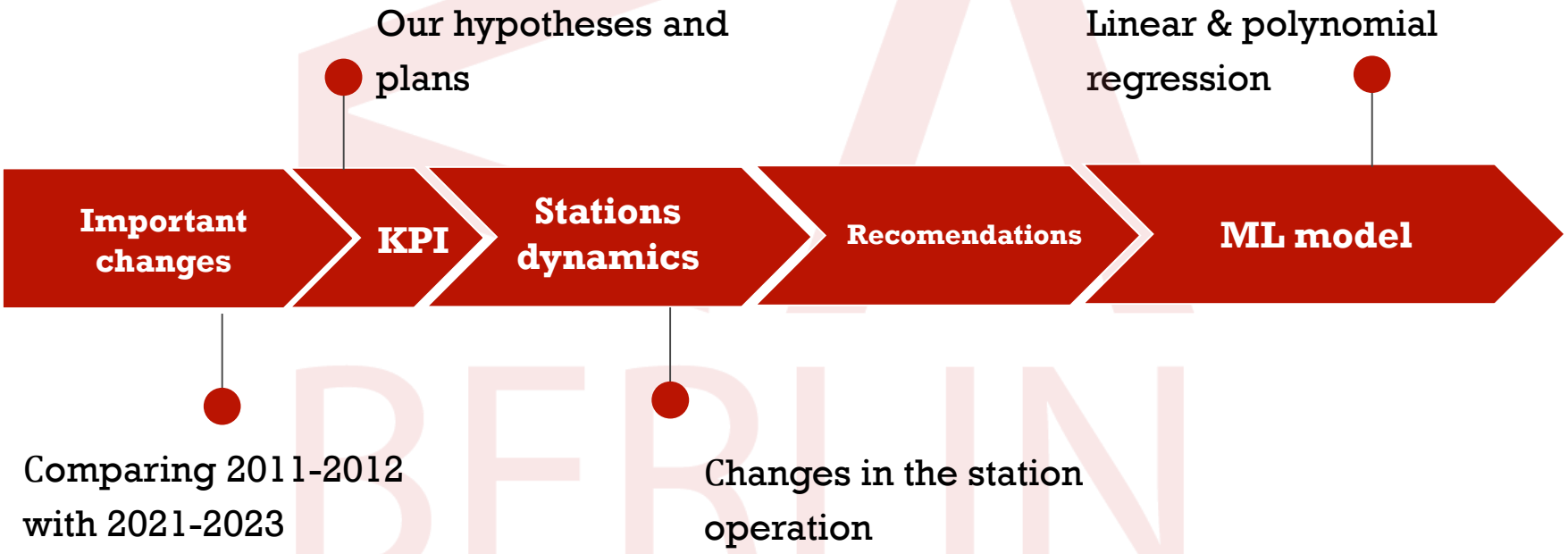
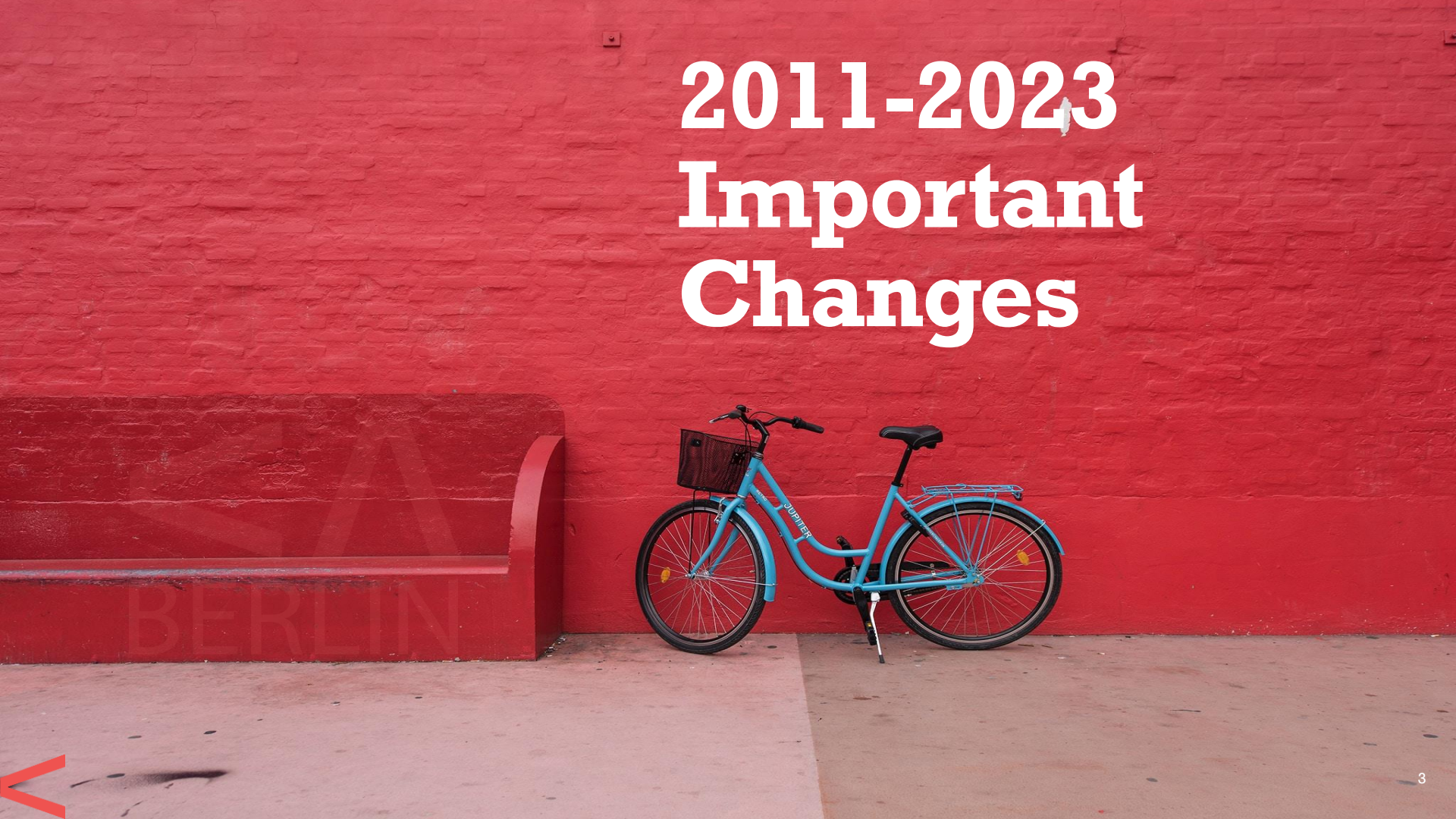
Capital Bike Share: a decade of changes and growth

Yurii Novachynskyi • 09.11.2023

Agenda


Our hypotheses and plans
Linear & polynomial regression
Important changes
KPI
Stations dynamics
Recomendations
ML model
Comparing 2011-2012 with 2021-2023
Changes in the station operation

2011-2023 Important Changes



MORE bikes

Classic

(2011)

Classic +Electro*

(2019)

*Not included in the analysis

MORE stations

749
(2023)

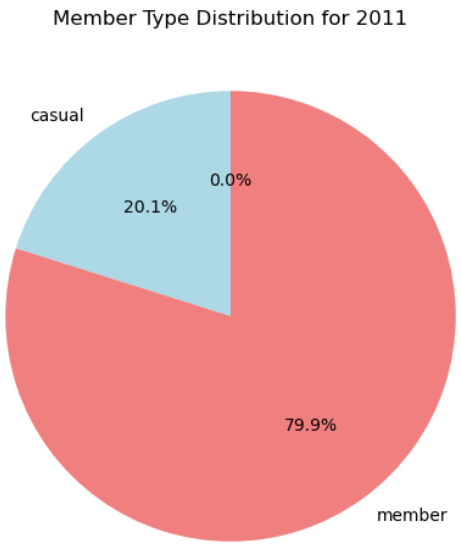
697
(2021)

144
(2011)

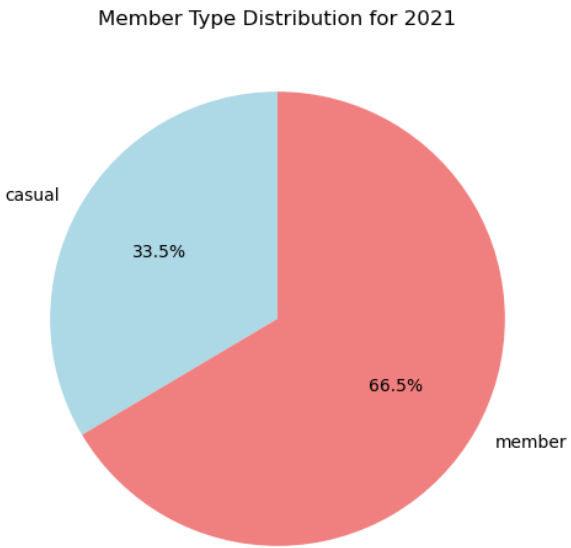
MORE members

Member Type Distribution

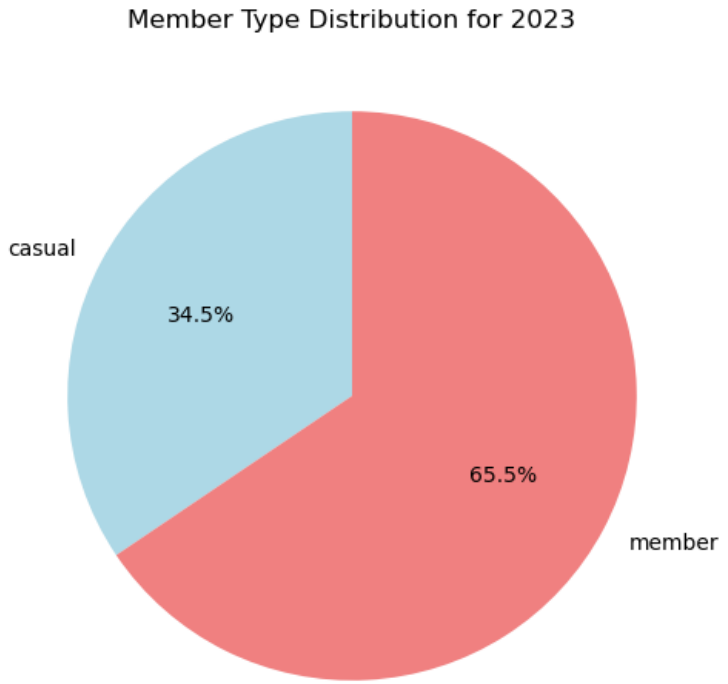
2011



2021



2023

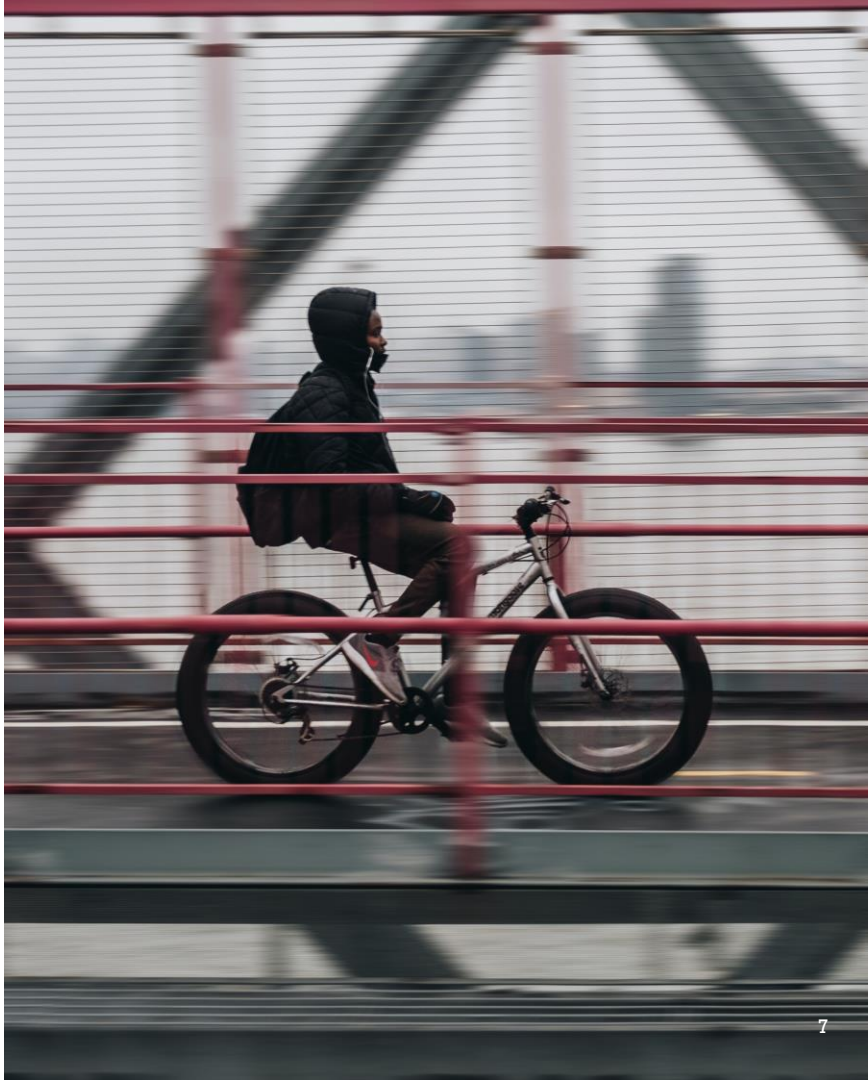


MORE free time for members

30 min
(2011)

45 min
(2023)

60 min
(2023 for qualified residents)



Total amount of rides

1.4m
(01-06/2023)

2.7m
(2022)

2.0m
(2021)

2.0m
(2012)

1.2m
(2011)

Total amount of rides

1.4m
(01-06/2023)

≈2-3%

2.7m
(2022)

+34,81%

2.0m
(2021)

-0,15%

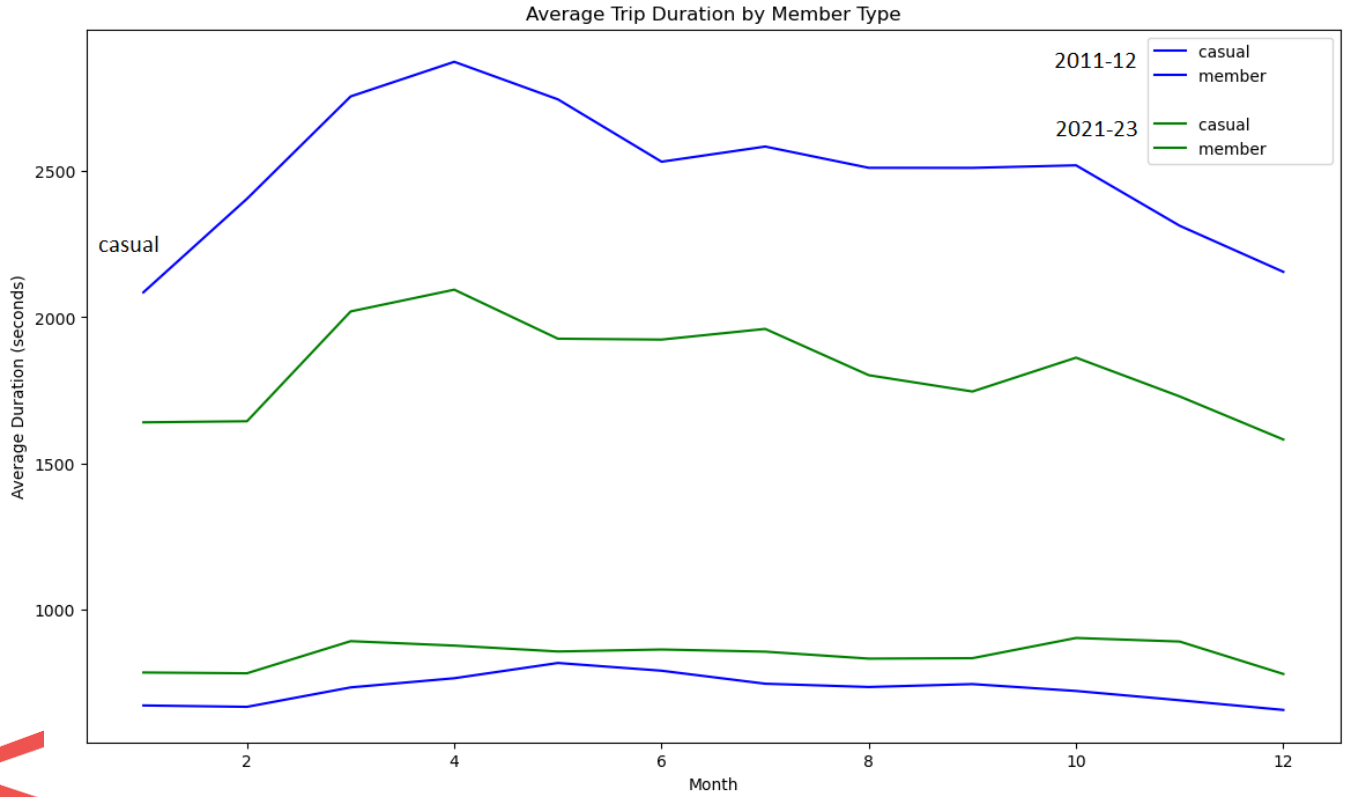
2.0m
(2012)

+65,39%

1.2m
(2011)

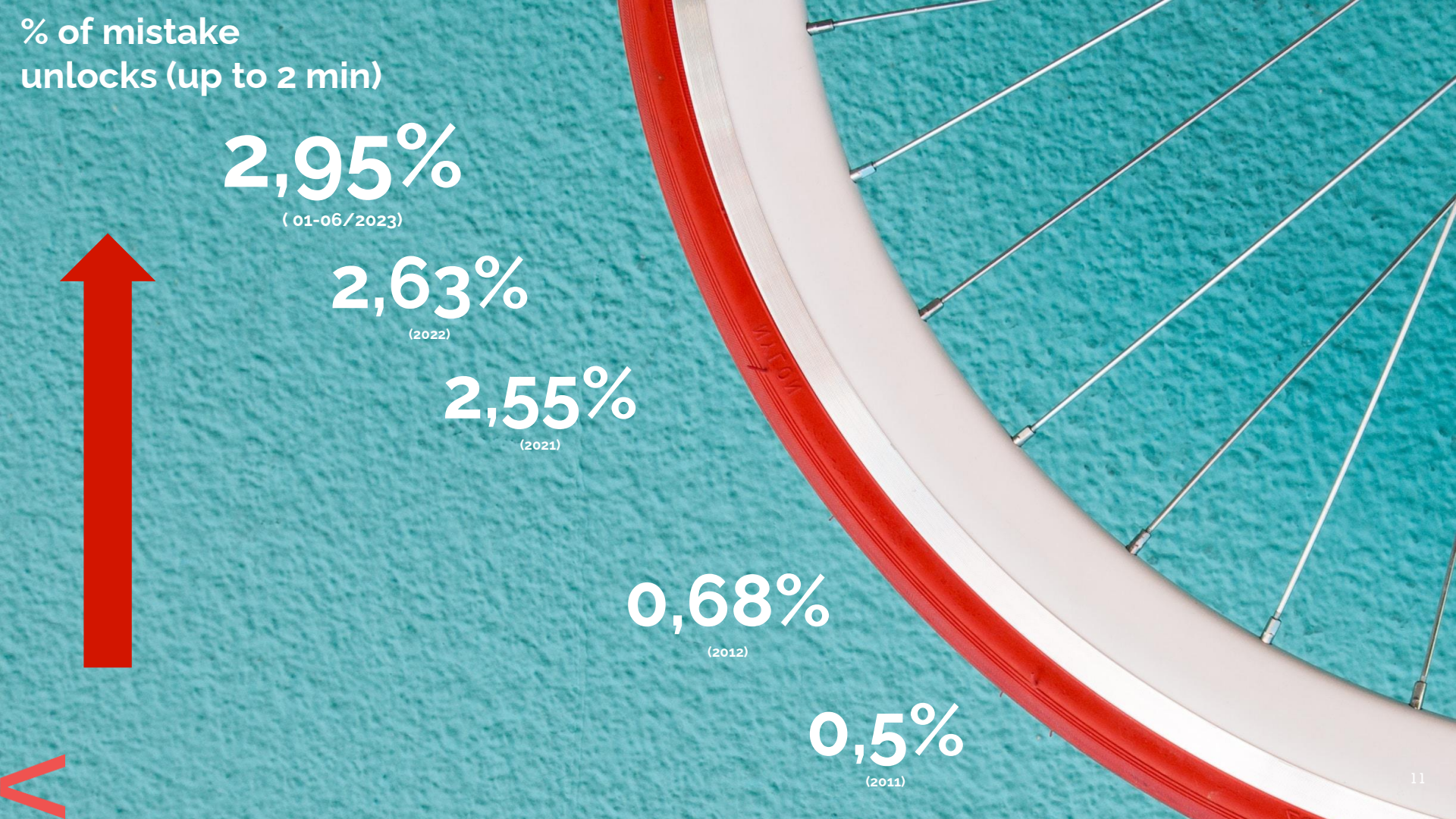
Average Ride Duration

Duration of member rides is getting longer while of casual participants is shrinking.



Casual

Members


% of mistake unlocks (up to 2 min)
2,95%
(01-06/2023)
2,63%
(2022)
2,55%
(2021)
0,68%
(2012)
0,5%
(2011)

% of mistake unlocks (up to 2 min)

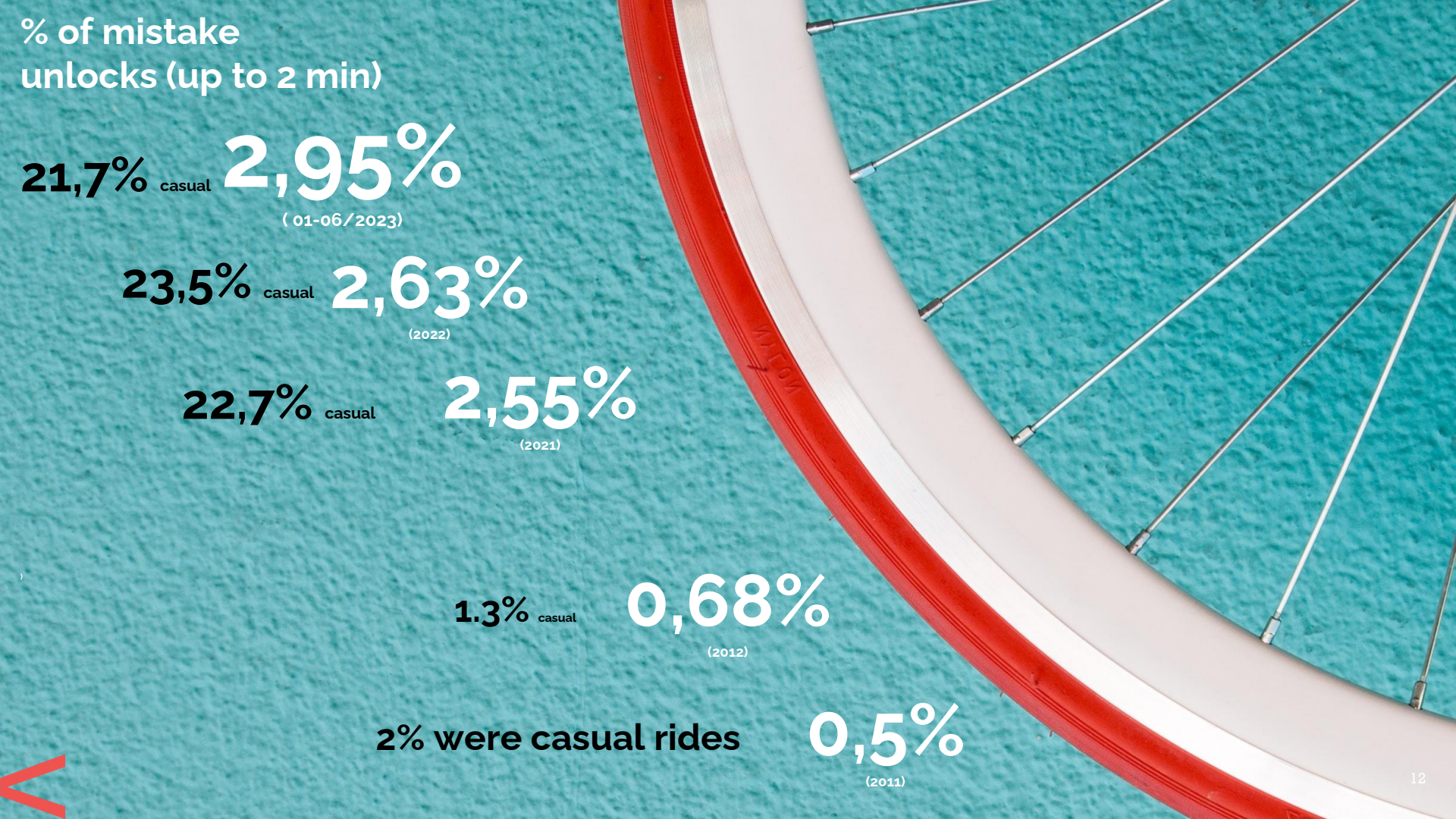
21,7% casual **2,95%** (01-06/2023)

23,5% casual **2,63%** (2022)

22,7% casual **2,55%** (2021)

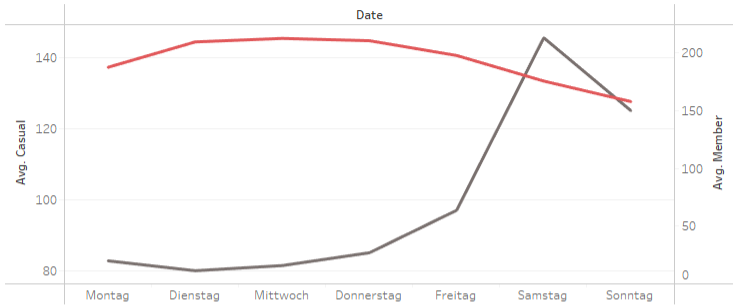
1.3% casual **0,68%** (2012)

2% were casual rides **0,5%** (2011)

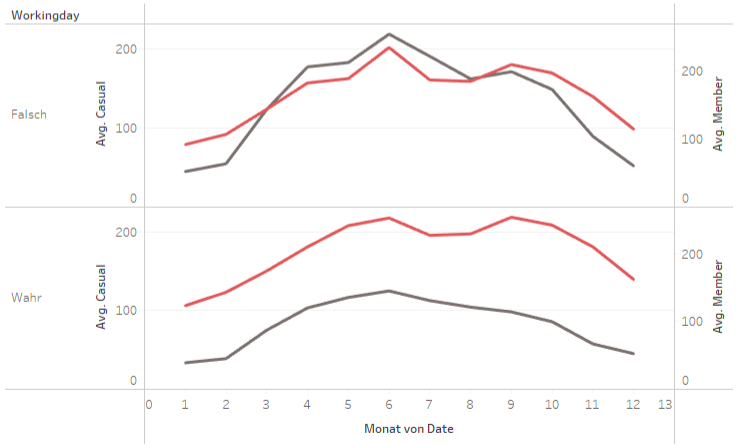


Summary

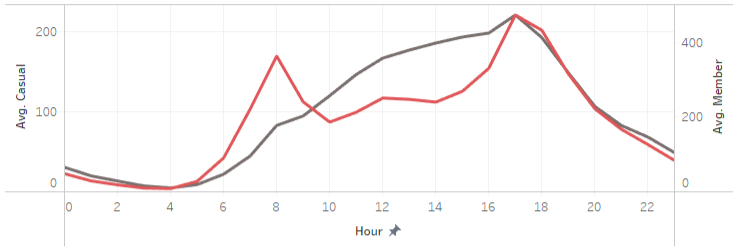
Weekday



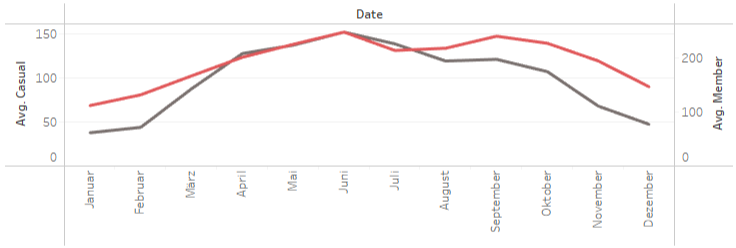
Workingday



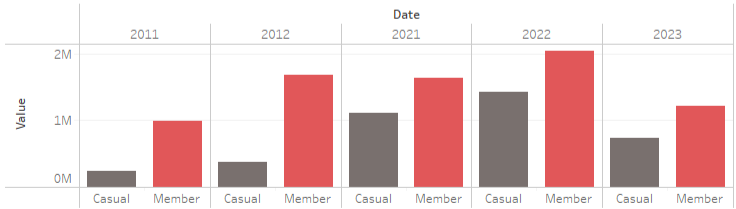
Hours

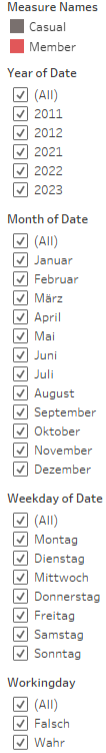


Month_AVG



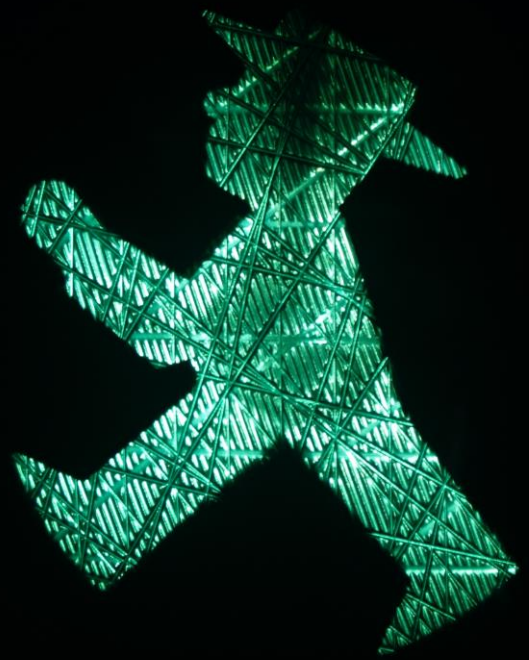
Years





Night “wrong rides”*

*duration >2h and ended on next day



1.7k
(2011)

1.2k
(2012)

5.2k
(2021)

7.5k
(2022)

3.8k
(01-06/2023)

Key Performance Indicators

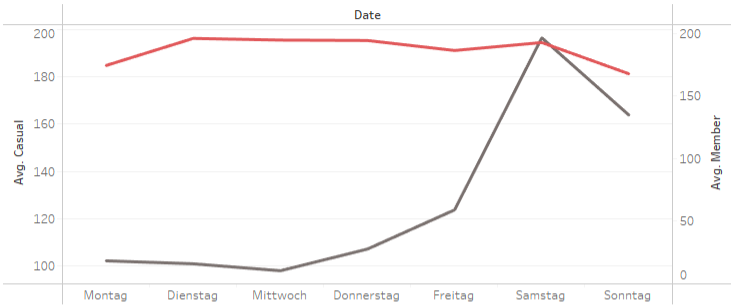
KPI

Implement 3 marketing activities to achieve a 10% increase in the use of bicycles by regular users on weekends by the end of 2024

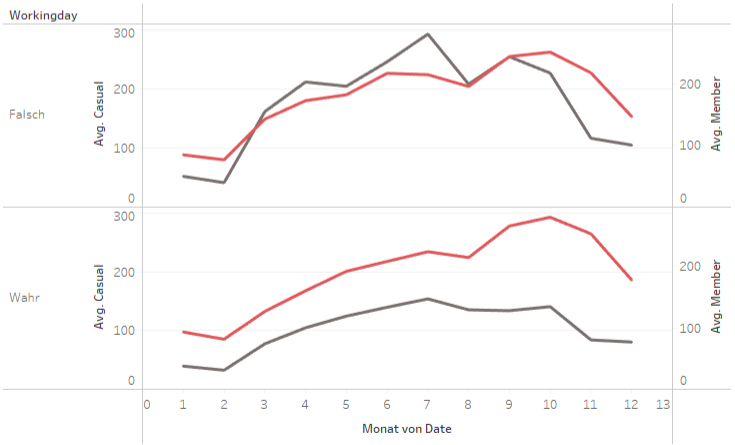
Specific Measurable Attainable Relevant Time-bound

2021

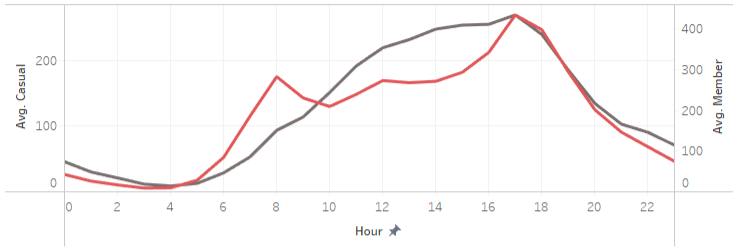
Weekday



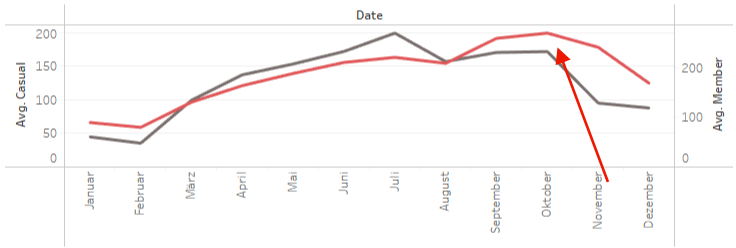
Workingday



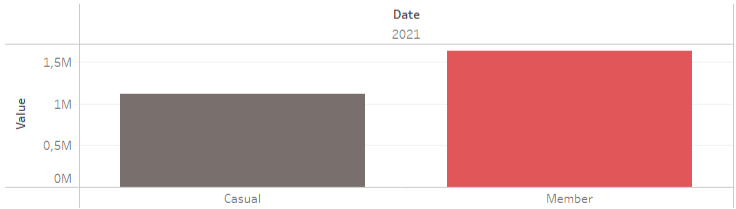
Hours



Month_AVG



Years



Measure Names
- Casual
- Member

Year of Date
- (All)
- 2011
- 2012
- 2021
- 2022
- 2023

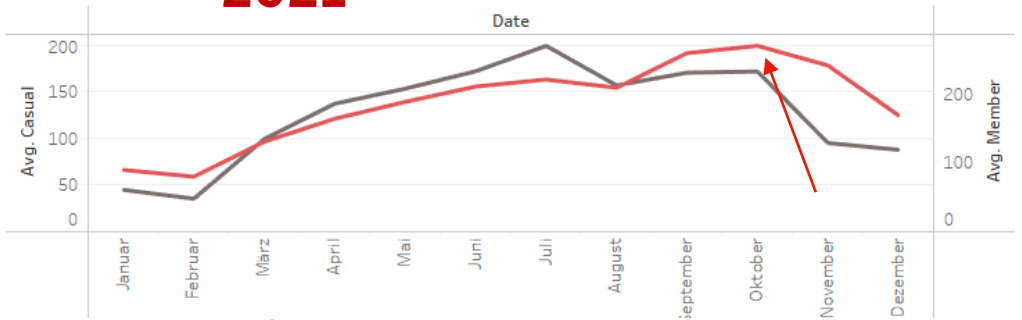
Month of Date
- (All)
- Januar
- Februar
- März
- April
- Mai
- Juni
- Juli
- August
- September
- Oktober
- November
- Dezember

Weekday of Date
- (All)
- Montag
- Dienstag
- Mittwoch
- Donnerstag
- Freitag
- Samstag
- Sonntag

Workingday
- (All)
- Falsch
- Wahr

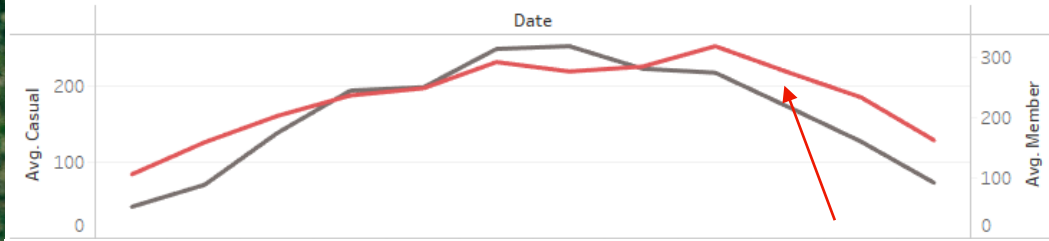
Month_AVG

2021



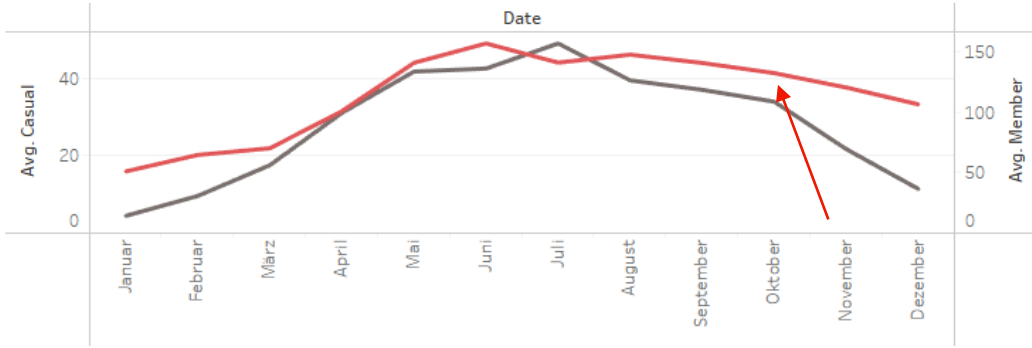
Month_AVG

2022



Month_AVG

2011



NEWS & POLITICS

DC Residents Can Get a Free 30-Day Membership to Capital Bikeshare

The offer is meant to help alleviate some travel issues caused by reductions in Metro service

WRITTEN BY JANE RECKER | PUBLISHED ON OCTOBER 25, 2021

TWEET SHARE

Photograph by ablokhin/via iStock.

In light of significant reductions in Metro service, DC has partnered with Lyft to offer a free 30-day Capital Bikeshare membership to all DC residents. To sign up, residents should go to the "Ride Plans" section of the Capital Bikeshare or Lyft apps, or the "Pricing" section of the Capital Bikeshare website.

Those who take advantage of the membership will get unlimited free 45-minute rides

Most Popular in News & Politics

1  Best of Washington 2023: Things to Eat, Drink, Do, and Know Right Now

2  "Shattered Glass": An Oral History of the Media-Movie Cult Classic

Washingtonian Magazine

November 2023: Top Doctors

VIEW ISSUE

SUBSCRIBE

Follow Us on Social

WE'LL HELP YOU LIVE YOUR BEST #DCLIFE EVERY DAY

Source: https://www.washingtonian.com/2021/10/25/dc-residents-can-get-a-free-30-day-membership-to-capital-bikeshare/

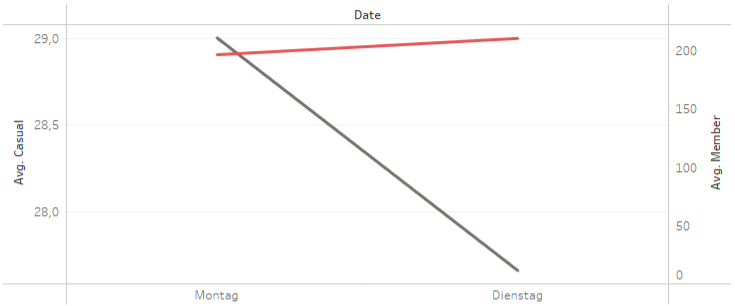
KPI

Increase by 3% the use of bicycles by regular users on Mondays and Tuesdays in May by increasing notifications in the App.

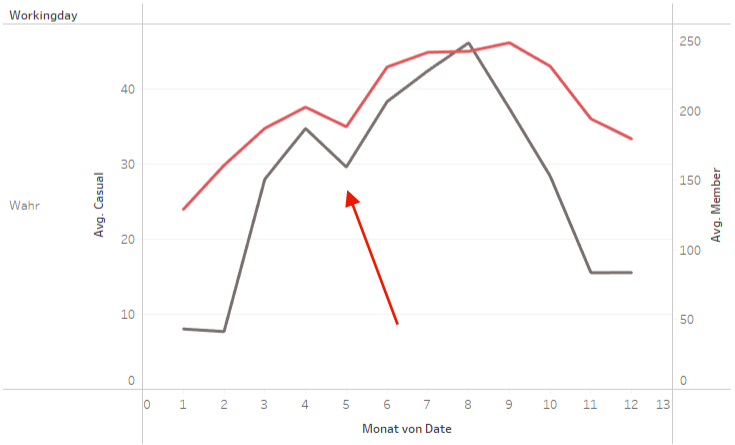
Specific Measurable Attainable Relevant Time-bound

May Weekdays

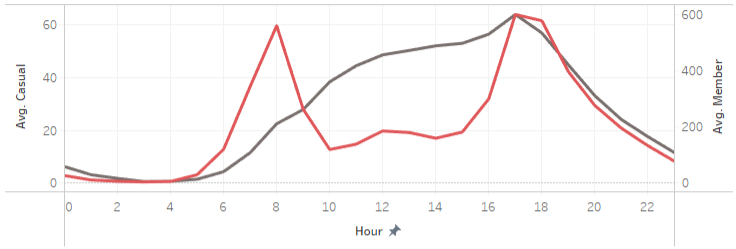
Weekday



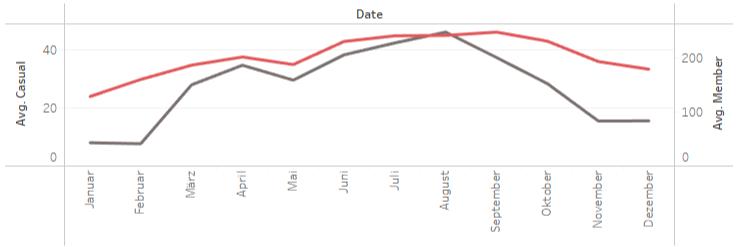
Workingday



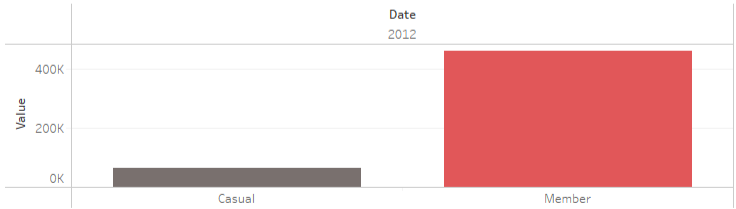
Hours



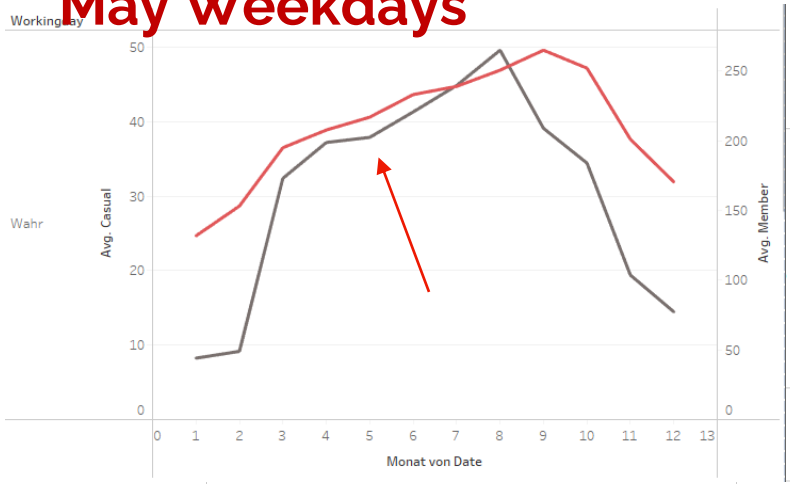
Month_AVG

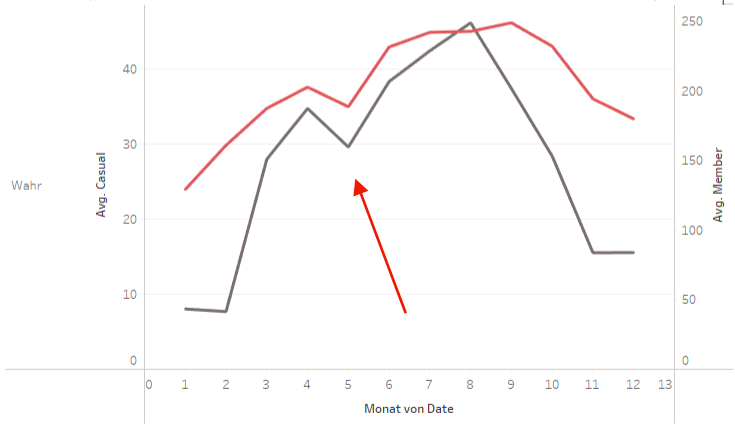


Years



May Weekdays





All weekdays

Only Mondays&Tuesdays

Stations Dynamics

Approximate stations distribution

2011 (194)

91	21
51	18

13 not identified*
(mostly from SE)

2021 (697)

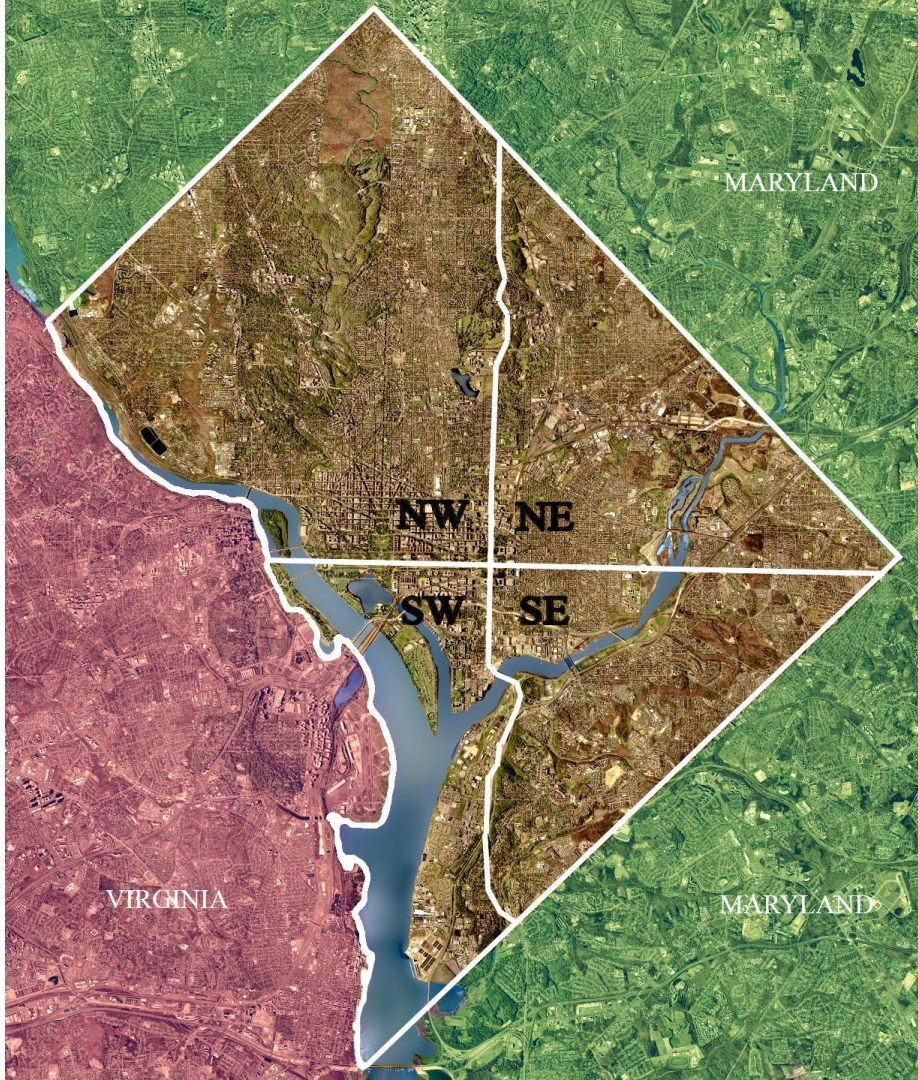
234	90
147	45

181 not identified

2023 (749)

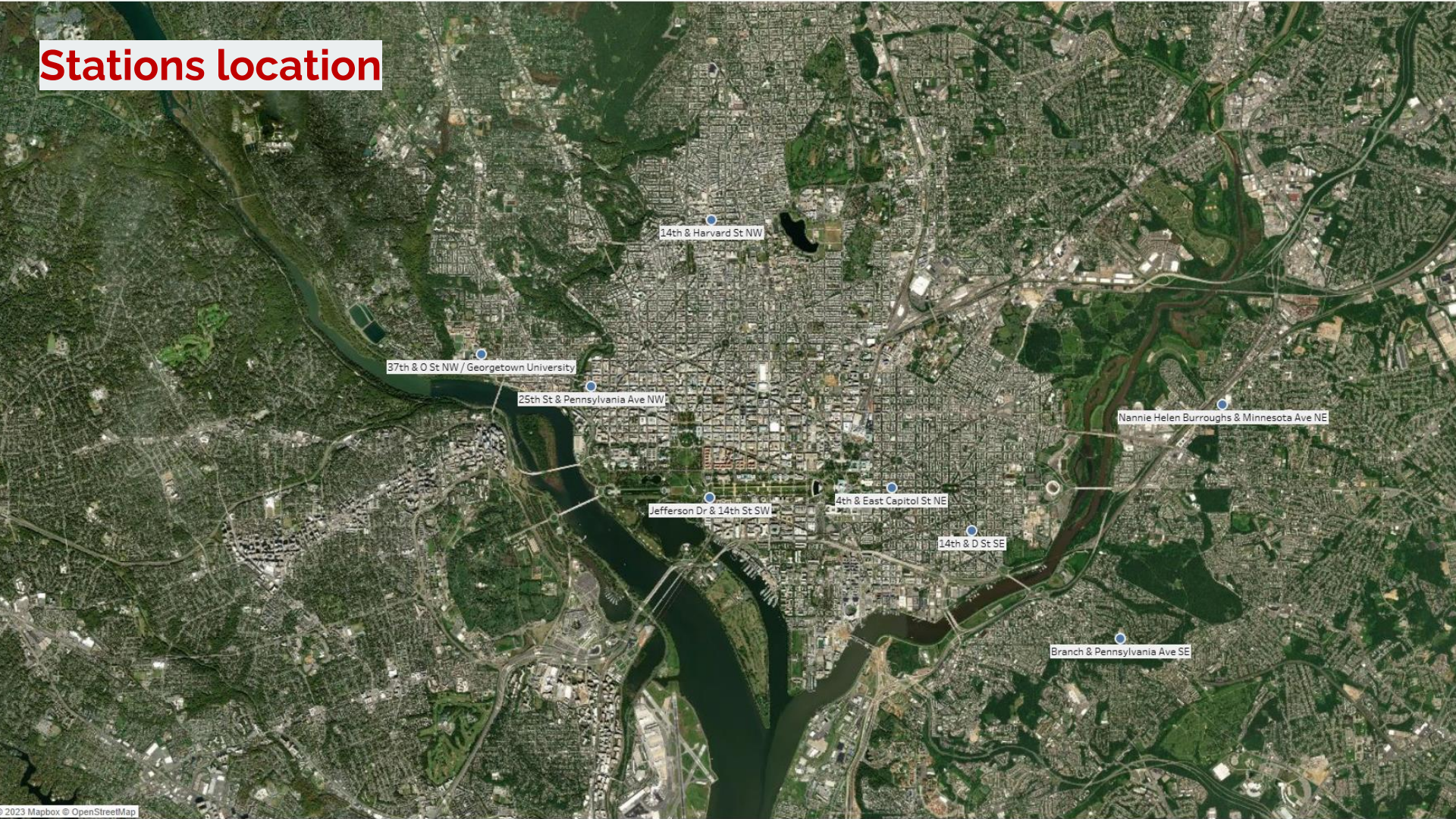
240	103
154	49

202 not identified



*Identification was automated in Python using 2 algorithms:
station name analysis and coordinate analysis

Stations location

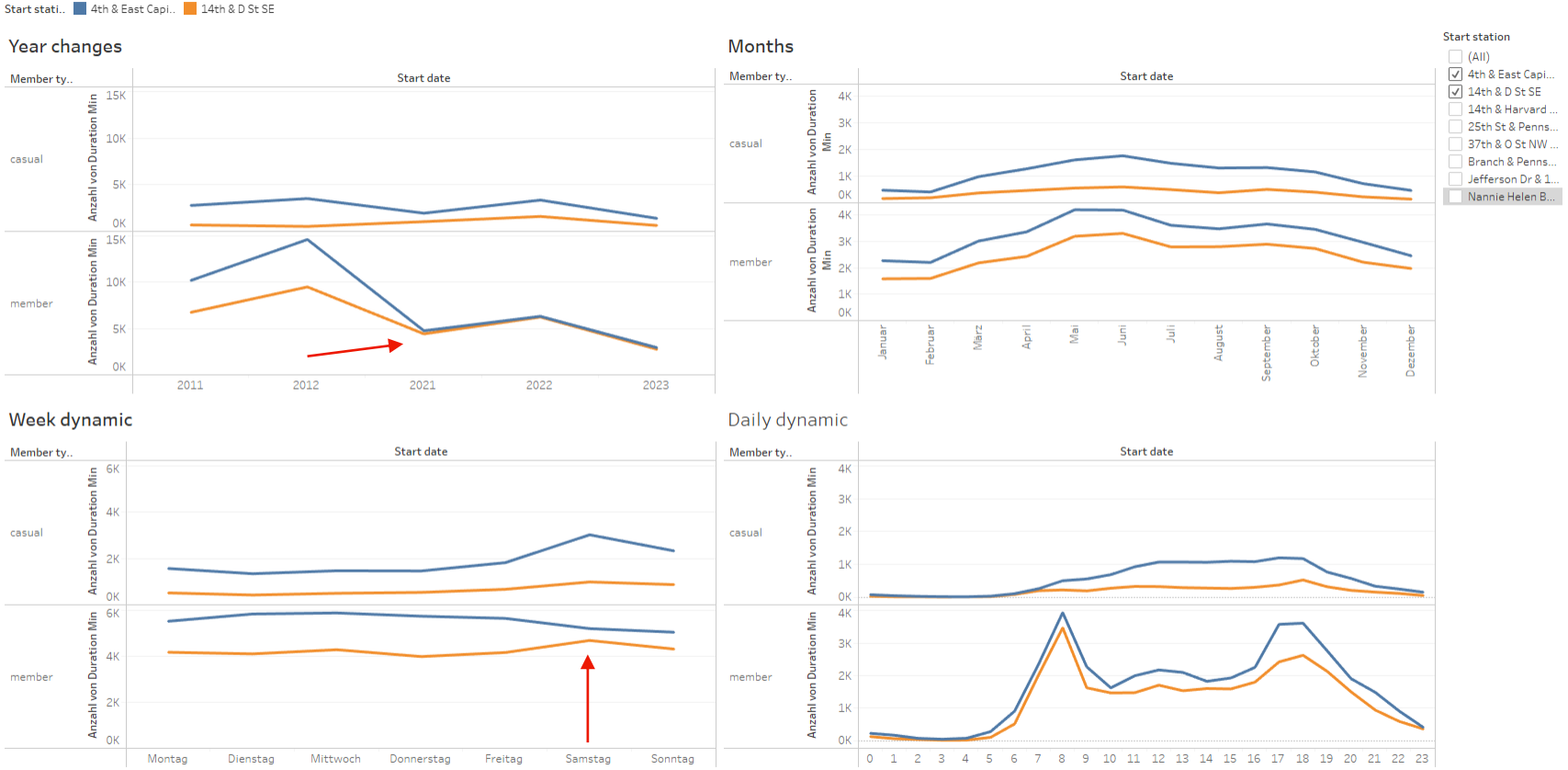


4th & East Capitol St NE	touristic spot
14th & D St SE	center
14th & Harvard St NW	residential area
25th St & Pennsylvania Ave NW	between residential area and center
37th & O St NW / Georgetown University	Students
Jefferson Dr & 14th St SW	touristic spot
Branch & Pennsylvania Ave SE	residential area
Nannie Helen Burroughs & Minnesota Ave NE	transport hub

4th & East Capitol St NE

14th & D St SE

TC

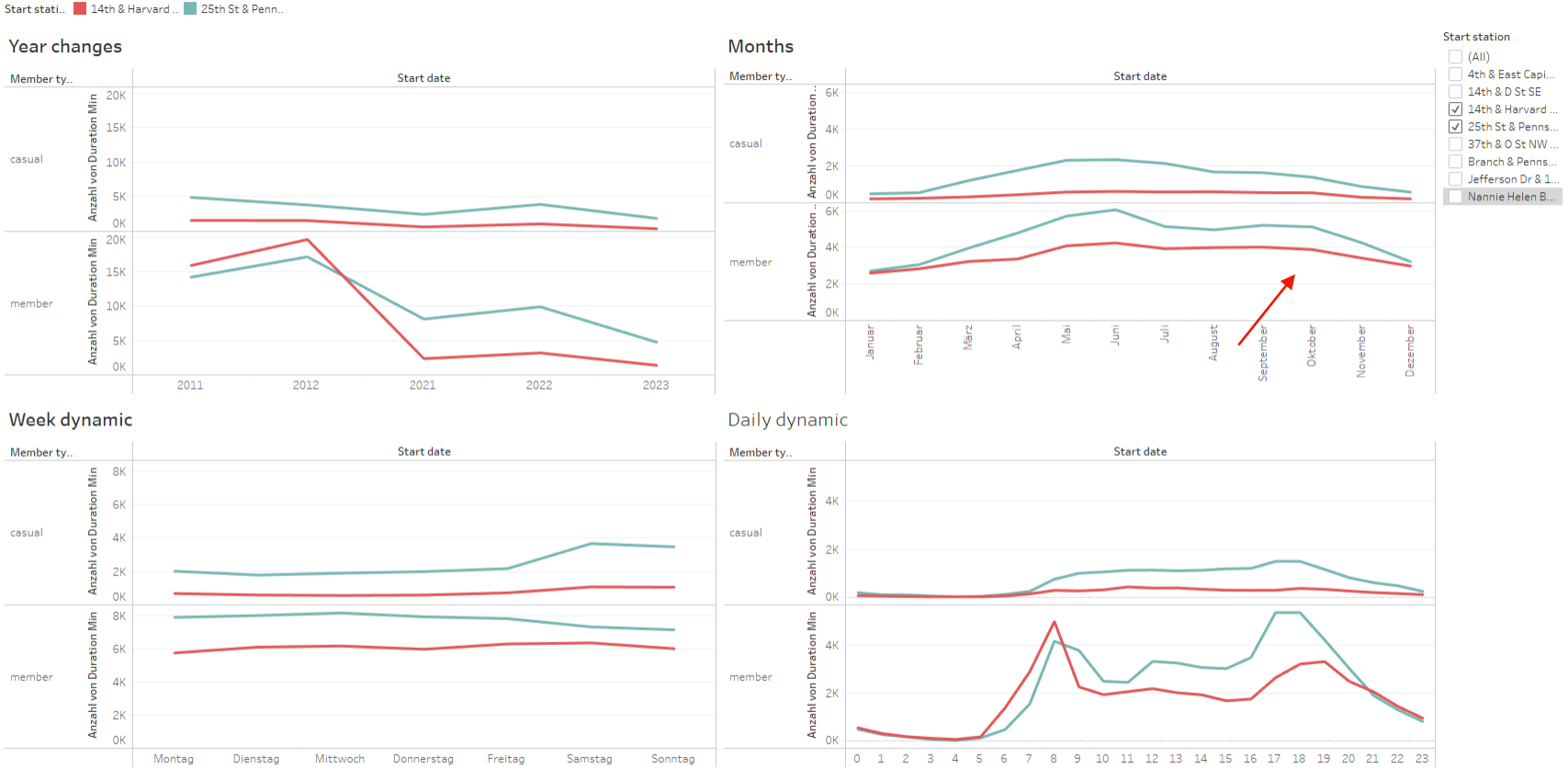


year weerday hour Dashboard

14th & Harvard St NW

25th St & Pennsylvania Ave NW

RB



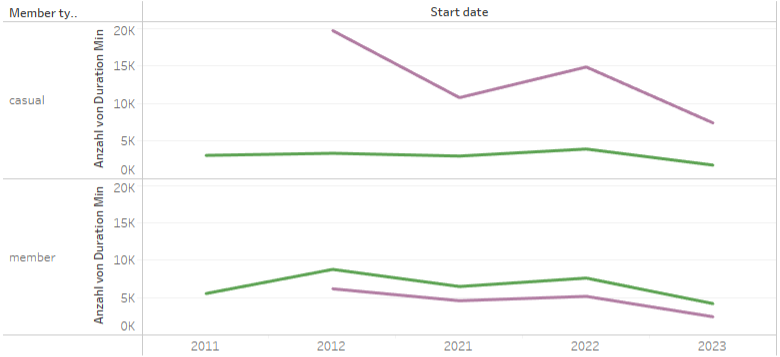
37th & O St NW / Georgetown University

Jefferson Dr & 14th St SW

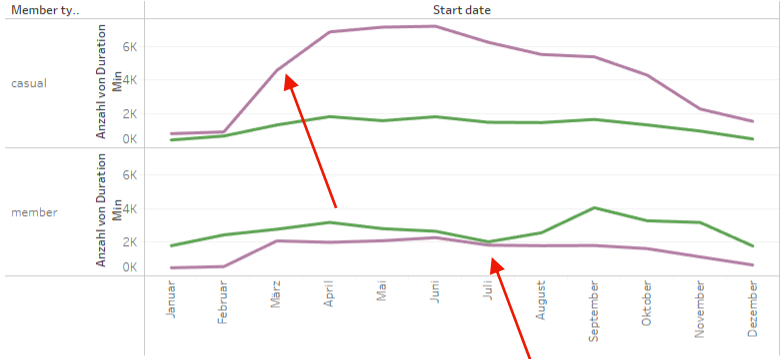
ST

Start stati.. 37th & O St NW.. Jefferson Dr & ..

Year changes



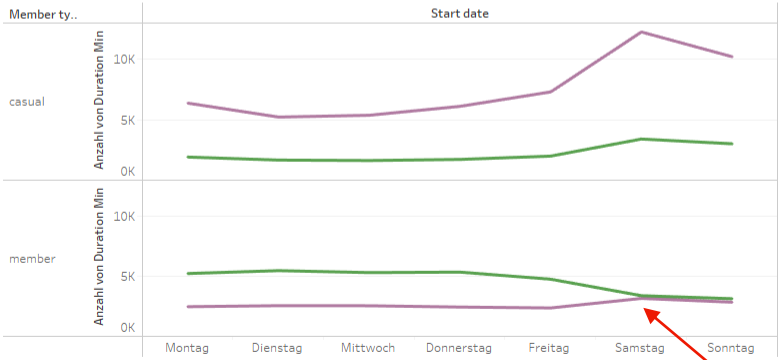
Months



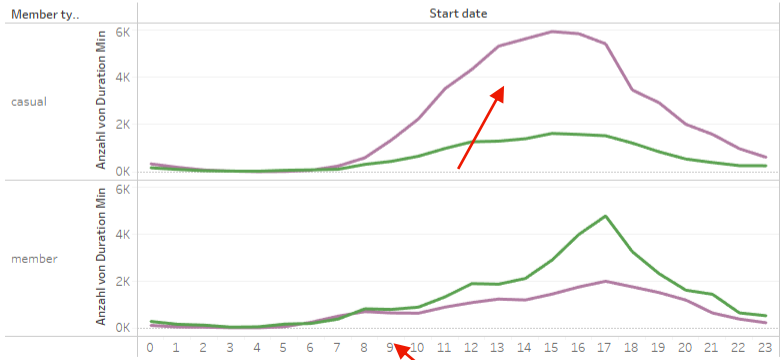
Start station

- (All)
- 4th & East Capi...
- 14th & D St SE
- 14th & Harvard ...
- 25th St & Penns...
- 37th & O St NW ...
- Branch & Penns...
- Jefferson Dr & 1...
- Nannie Helen B...

Week dynamic



Daily dynamic



year weerday hour Dashboard

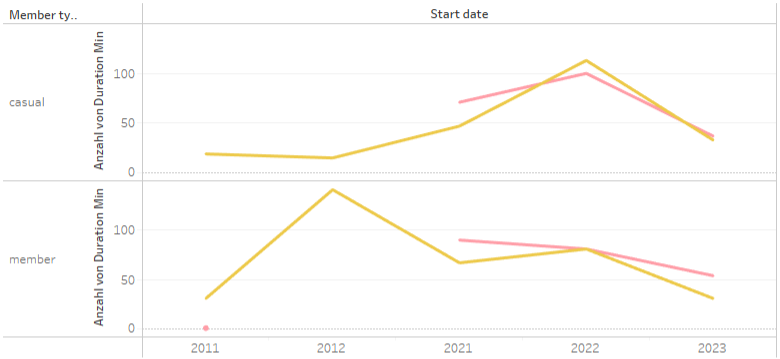
Branch & Pennsylvania Ave SE

Nannie Helen Burroughs & Minnesota Ave NE

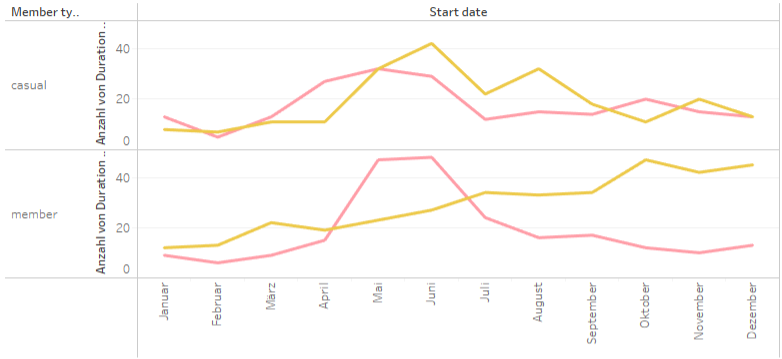
RH

Start stati.. Branch & Penns.. Nannie Helen B..

Year changes



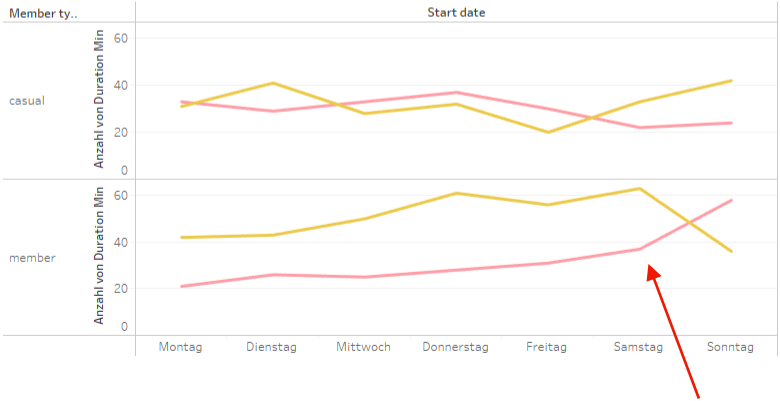
Months



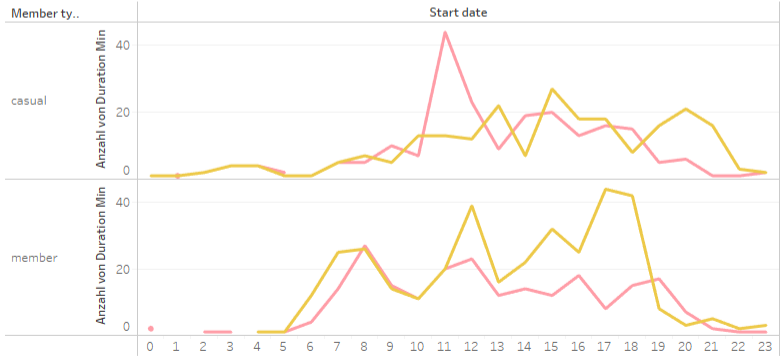
Start station

- (All)
- 4th & East Capi...
- 14th & D St SE
- 14th & Harvard ...
- 25th St & Penns...
- 37th & O St NW ...
- Branch & Penns...
- Jefferson Dr & 1...
- Nannie Helen B...

Week dynamic



Daily dynamic



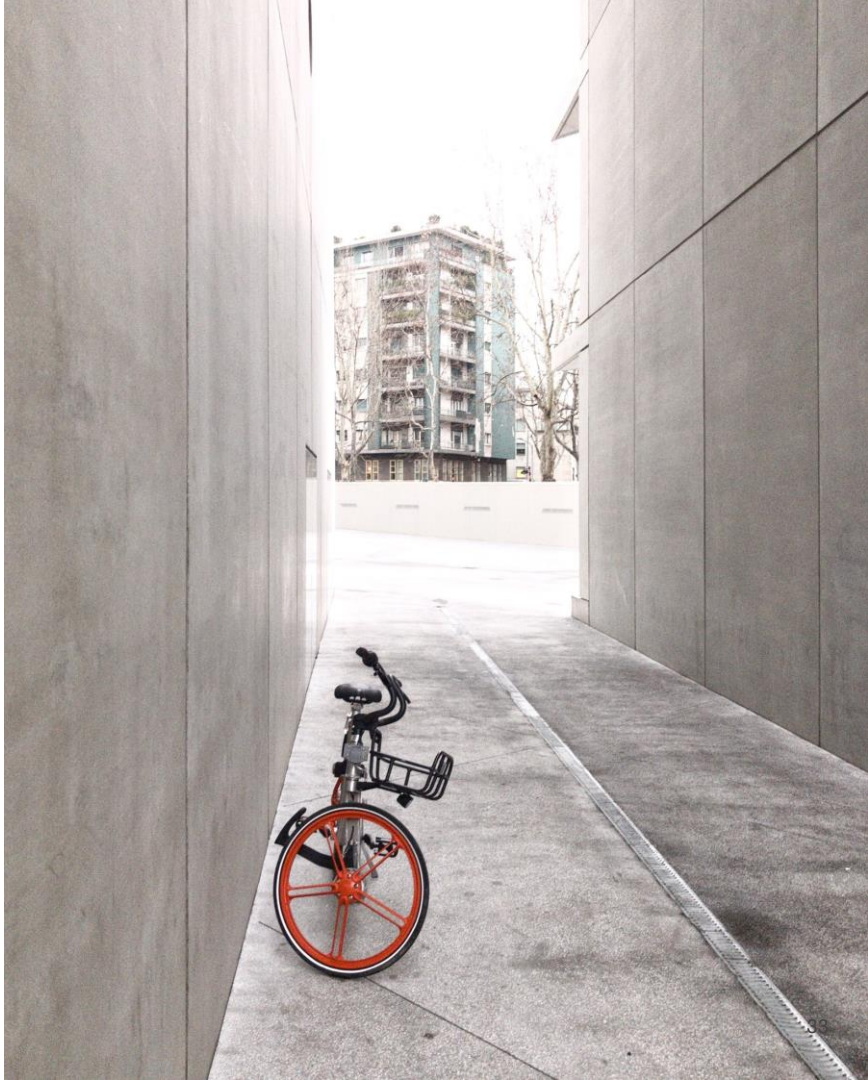
year weerday hour Dashboard

Recommendations

Recommendations

Changing the formats of user interaction with the service (**through the application**) creates opportunities for personalising offers for regular users.

Increasing the number of **regular users** has the potential to improve service quality monitoring.



Recommendations

Taking into account not only general seasonal fluctuations in demand, but also individual station data offers the potential to optimise bicycle services.

Recommendations

The blocking system needs to be improved.
The statistics of false unlocks and incorrect locks are growing faster than overall growth.

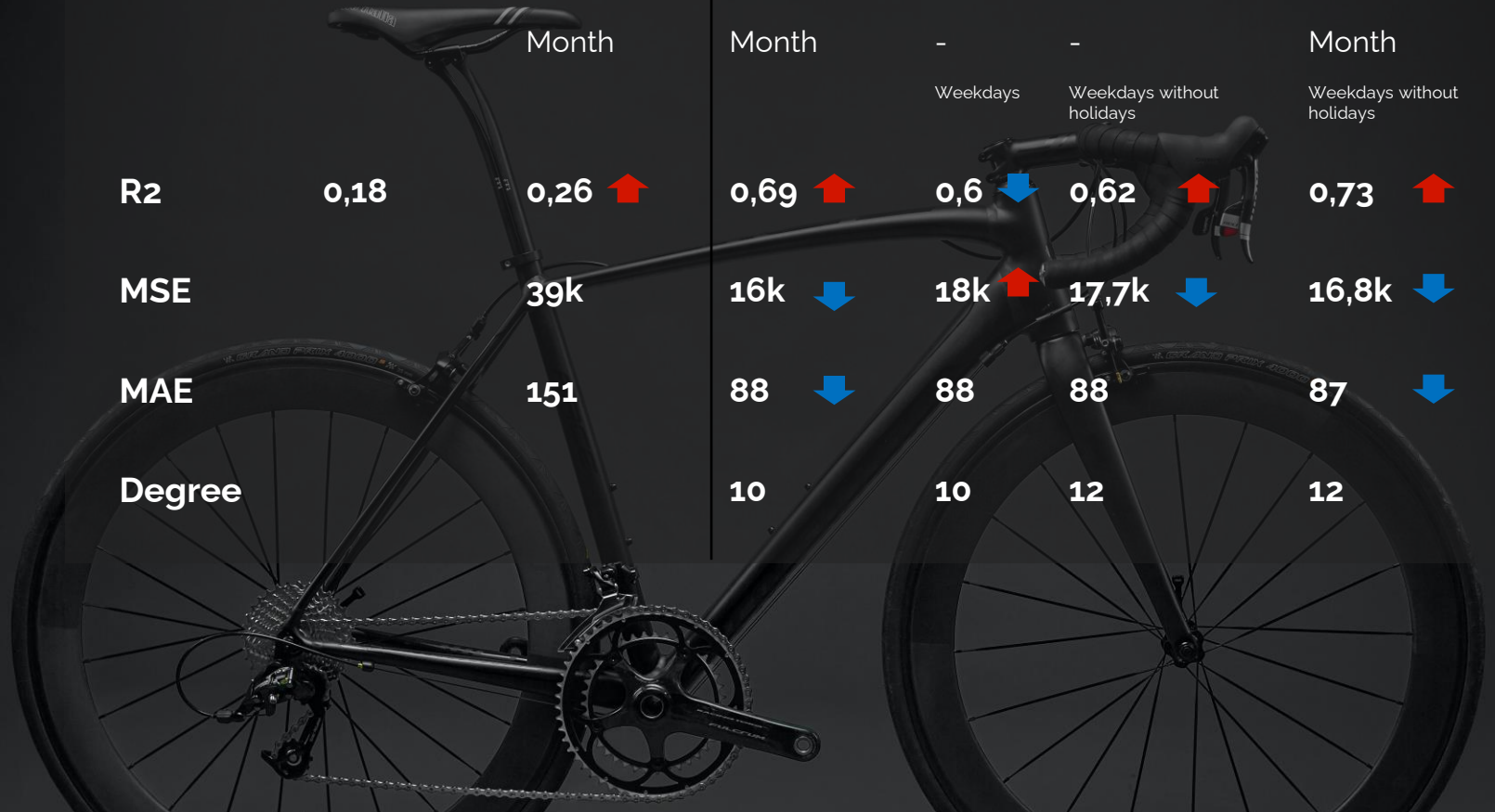
Recommendations

Data to analyse the hourly load of each station would be useful.
How many bicycles or free spots are available etc.

Maschine Learning model

Comparison of results

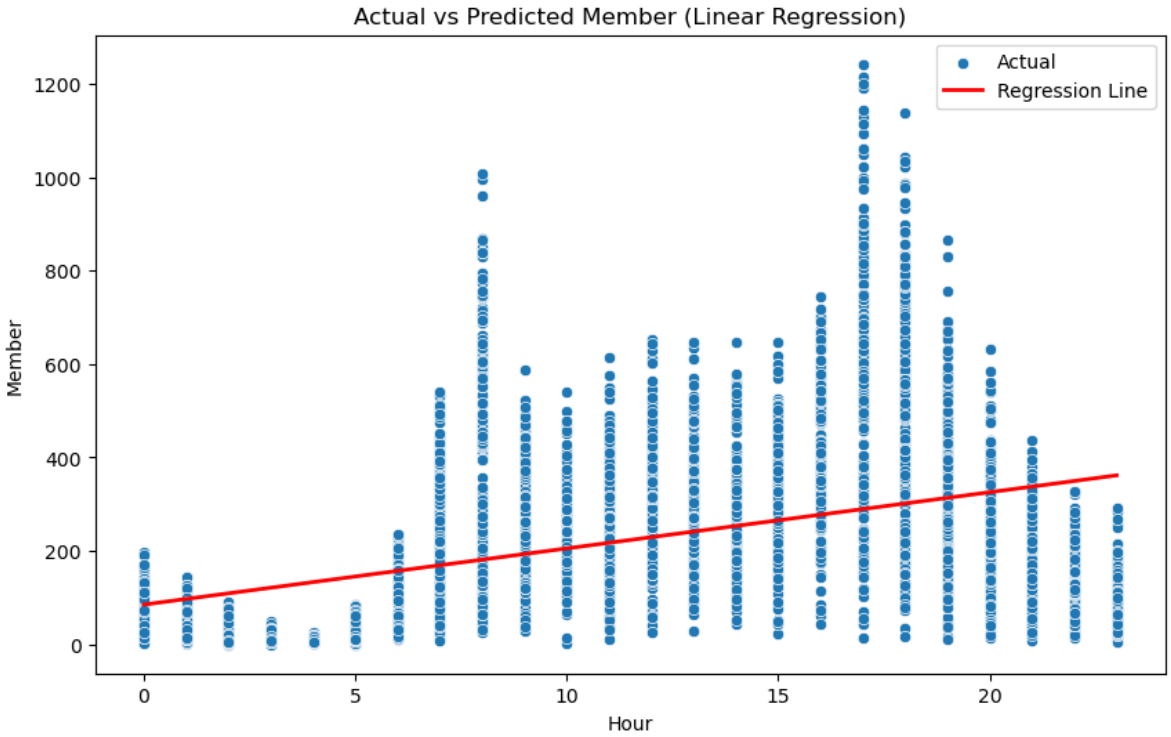
	Linear Regression		Polynomial Regression			
		Month	Month	- Weekdays	- Weekdays without holidays	Month Weekdays without holidays
R2	0,18	0,26 ↑	0,69 ↑	0,6 ↓	0,62 ↑	0,73 ↑
MSE		39k	16k ↓	18k ↑	17,7k ↓	16,8k ↓
MAE		151	88 ↓	88	88	87 ↓
Degree			10	10	12	12



R2

0,18

Linear Regression forecasting member rides demand by hours



Linear Regression
forecasting member rides demand by hours and month (in this case June)

R2

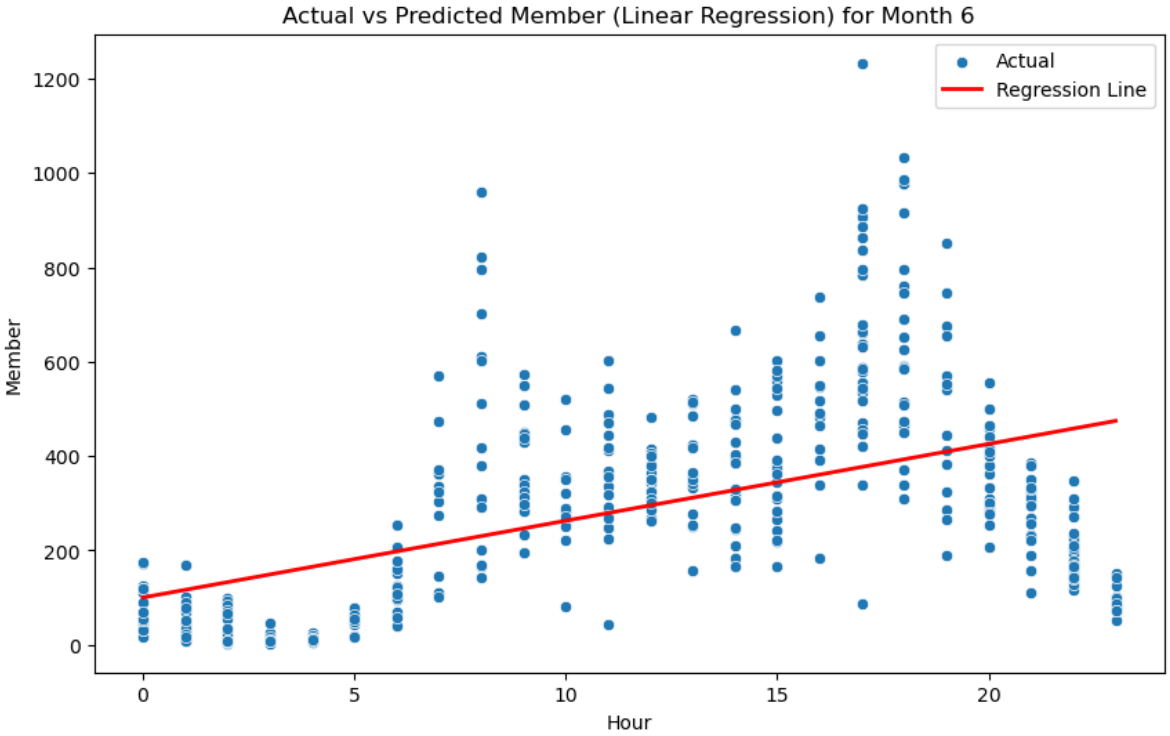
0,26

MSE

39k

MAE

151



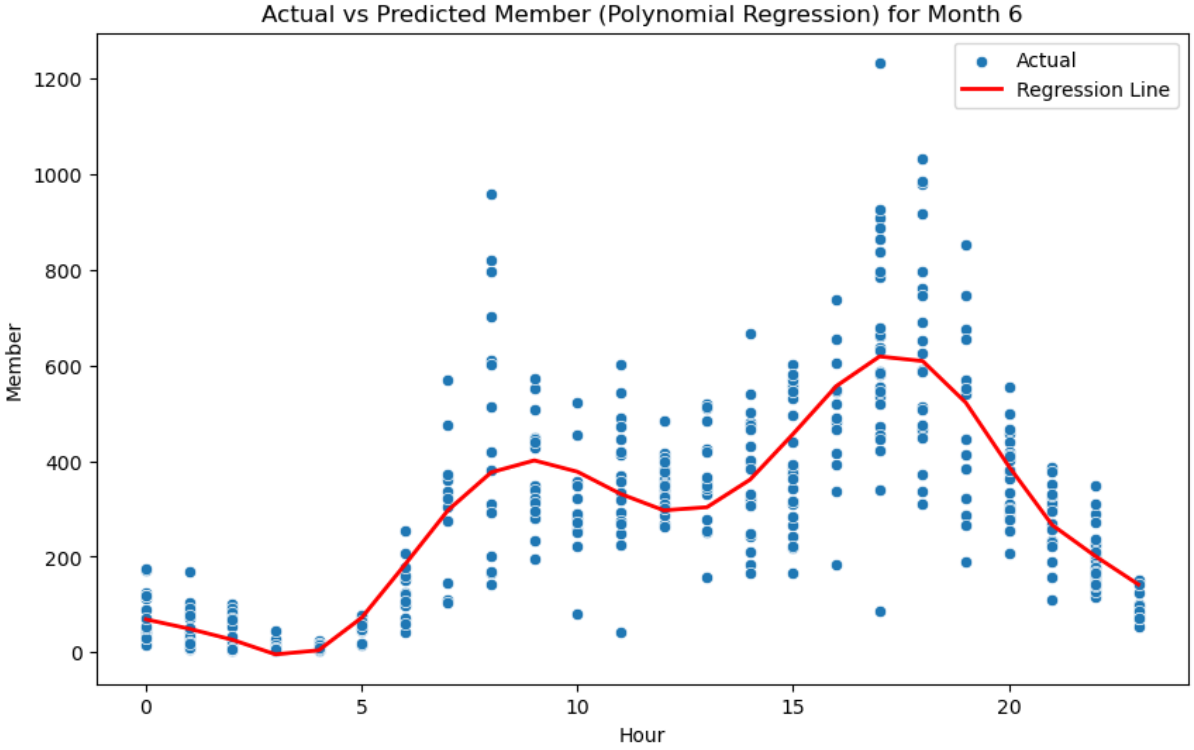
Polynomial Regression forecasting member rides demand by hours and month (in this case June)

R2
0,69

MSE
16k

MAE
88

Degree
10



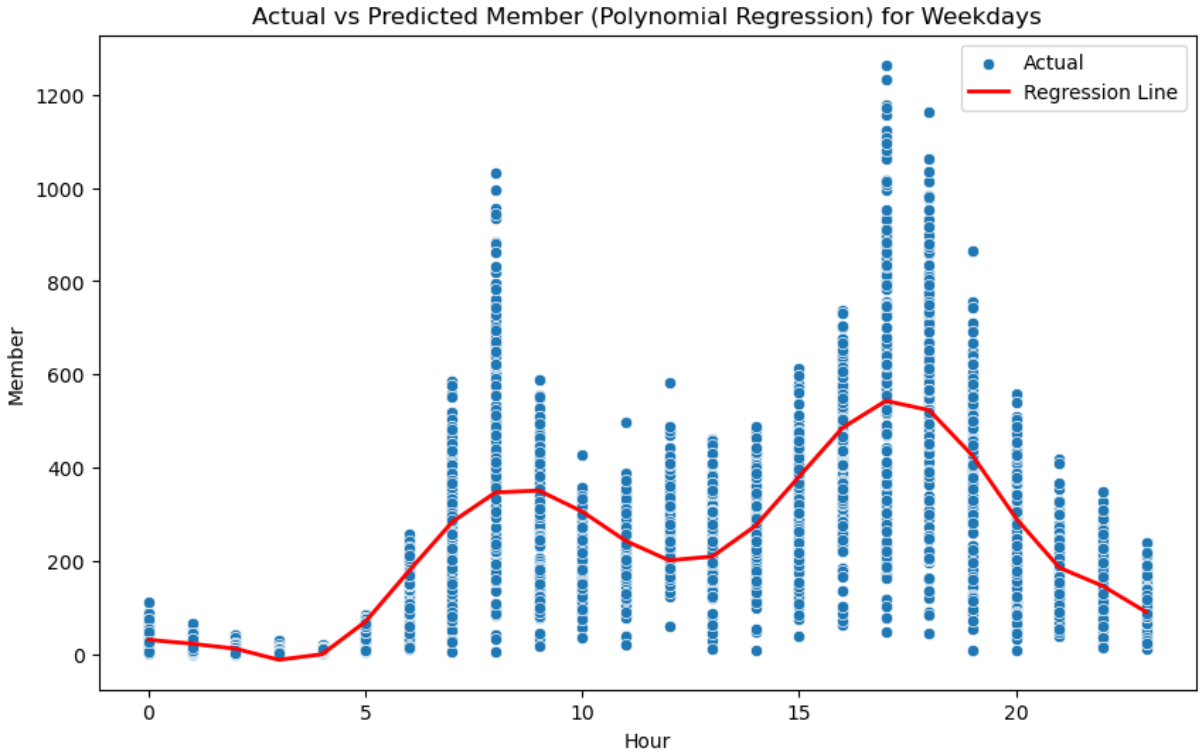
Polynomial Regression forecasting member rides demand by hours and weekdays

R2
0,60

MSE
18k

MAE
88

Degree
10



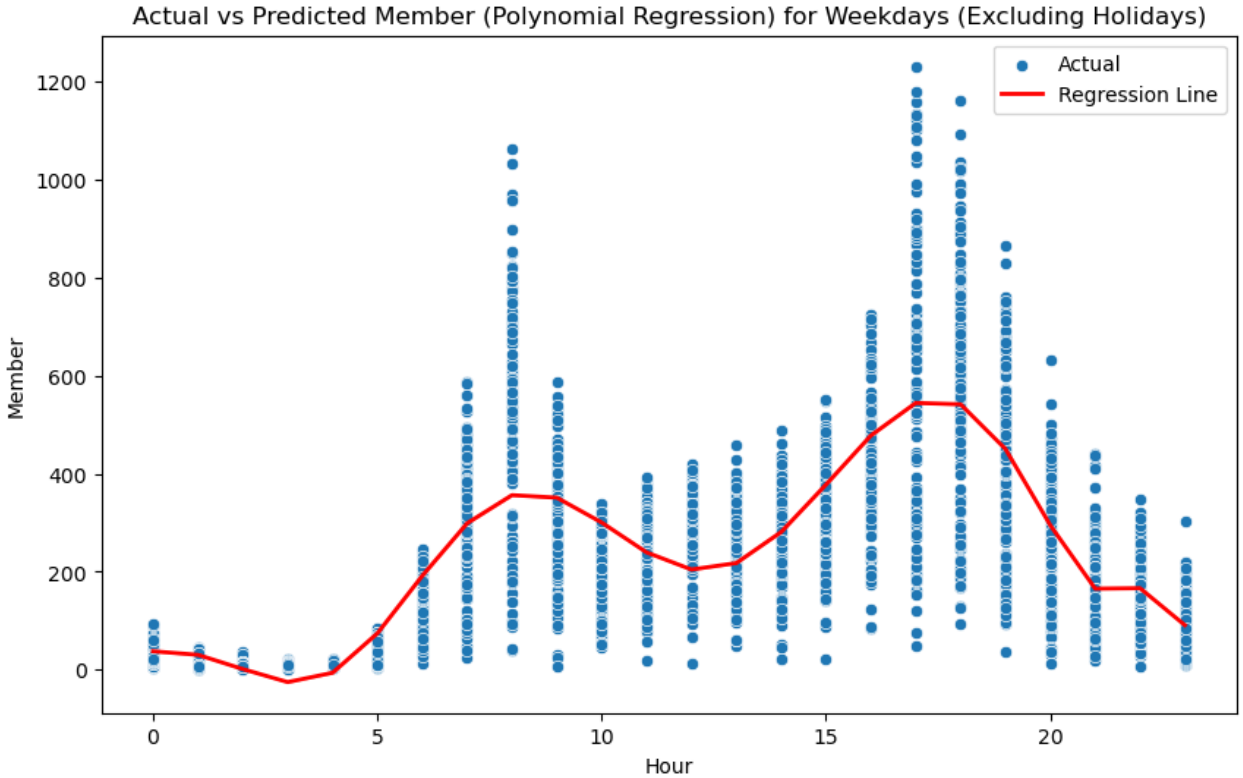
Polynomial Regression forecasting member rides demand by hours and weekdays (without holidays)

R2
0,62

MSE
17,7k

MAE
88

Degree
12



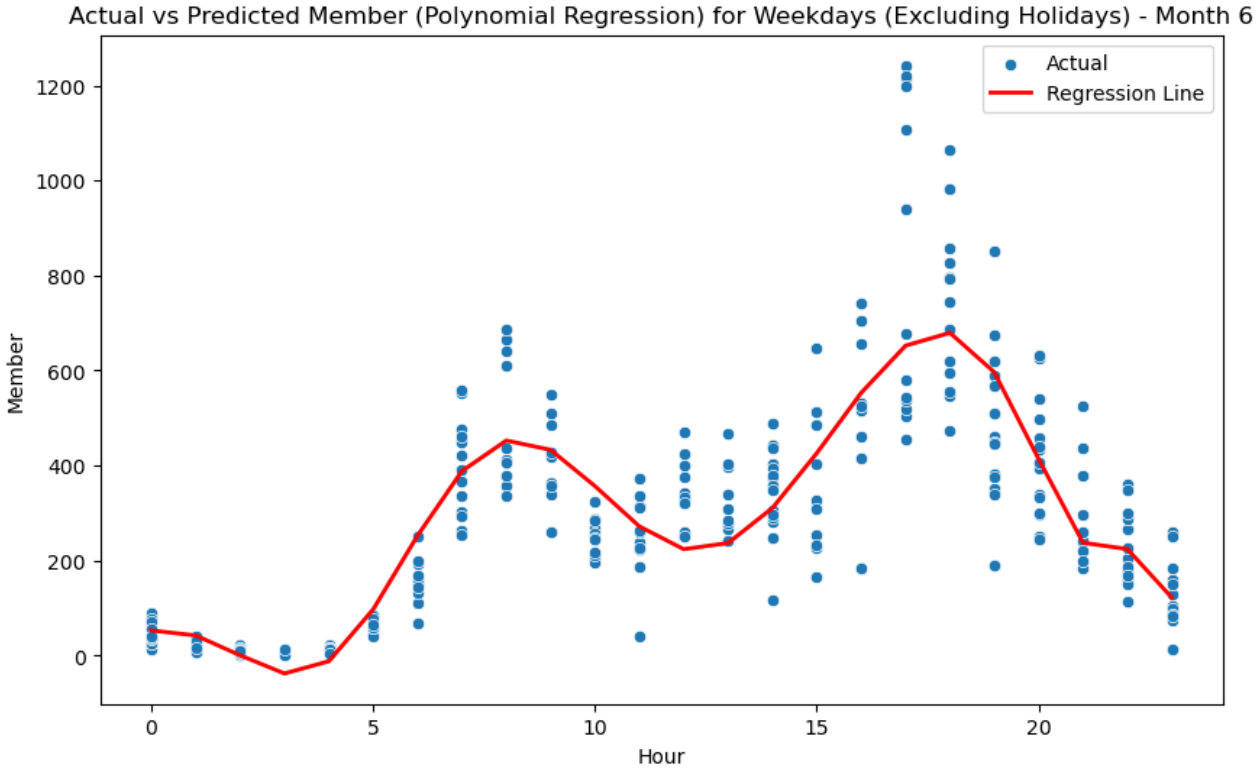
Polynomial Regression
forecasting member rides demand
by hours
and weekdays (without holidays) for June

R2
0,73

MSE
16,8k

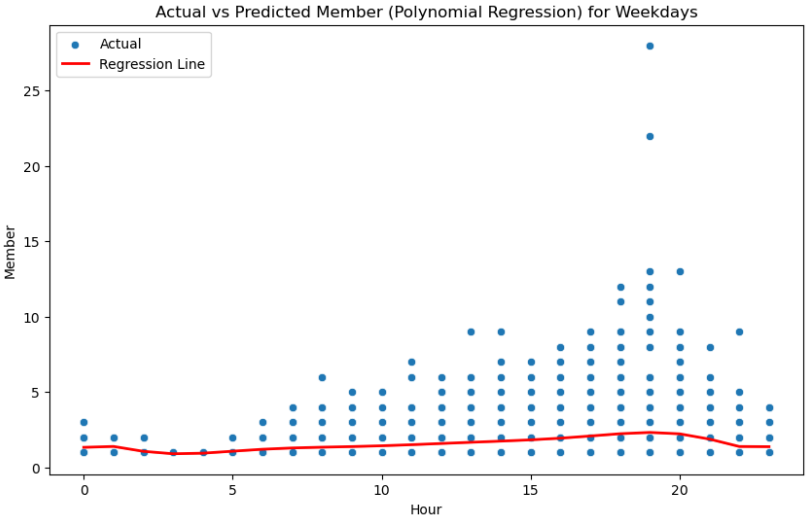
MAE
87

Degree
12



Jefferson Dr & 14th St SW

Unsuccessful attempt to implement polynomial regression for forecasting member rides demand by hours for 1 station



- not enough data
- grouping stations patterns can show better results
- this situation doesn't need ML model

The project was implemented as part of the Datanalysis & Machine Learning Bootcamp at Code Academy Berlin
10/21 week of the program

Pictures source: https://unsplash.com/, https://www.wikipedia.org/