Data Quality Asessement of events data on ORBIT

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Preface

After you have acquired the data, you should do the Data Quality Assessement (DQA) before to move forward to Advanced Analytics.

The structure of this kernel is as follows

- **Preface**
- **Load data**
- **Data quality assessment using metrics of six dimensions: DQA1-DQA6**
- **Automated reporting**

Purpose and structure of this kernel

- **Give a systematic assessment of the quality of the raw data on ORBIT about events and Events** link
  - **1.Validity/Semantic Accurary** *Check if data conforms to the syntax (format, type, range) of its definition*
  - **2.Cardinality/uniqueness/duplicates** *Nothing will be recorded more than once based upon how that thing is identified*
  - **3.Completeness**
    a. **3.1. Overall completeness** *The overall proportion of stored data against the potential of "100% complete"*
    b. **3.2. Time series completeness** *The proportion of stored data against the potential of "100% complete" in the course of time*
  - **4.Accuracy**
    a. **4.1. Distribution of raw data** *Distribution analysis entails counting all the records associated with each value and dividing these by the total number of records to see what percentage of the data is associated with any specific value and how the percentages compare to each other*
    b. **4.2. Outlier detection** *An outlier is a value that lies in the tail of the statistical distribution of a set of data values(usually +-2 SD)*
  - **5.Consistency** *The absence of difference, when comparing two or more representations of a thing against a definition*
  - **6.Timeliness/availability** *The degree to which data represent reality from the required point in time*
- **Performs a data diagnosis and automatically generates a DQA report.**

This document introduces **Data Quality Assessment** methods. You will learn how to diagnose the quality of `tbl_df` data that inherits from data.frame and `data.frame` with functions provided by `dlookr`.

This package is in synergy with `dplyr`. Particularly in data exploration and data wrangle, it increases the efficiency of the `tidyverse` package group.

Table 1: A knitr kable

Id	UCB_Business_Unit___c	UCB_External_Id___c	Name
a0pG000000AATC1IAP	IMM	E-00062294	2016-09-17-Bonn-Sponsoring-Patienten-
a0p4A00000A0wciQAB	IMM	E-00106476	2018-04-25 Strategisches Beraterboard I
a0p4A00000EJaNIQA1	IMM	E-00122393	2018-11-27-Essen-Dermaxchange
a0p4A00000A0x9WQAR	IMM	E-00106624	2018-03-26München Round Table Prof.
a0p4A00000A0x9vQAB	IMM	E-00106628	2018-05-30 Hamburg Immunology for yo
a0pG000000BQxm3IAD	IMM	E-00075967	2017-10-07 Hamburg Weltrheumatag Pa
a0p4A000009z7rxQAA	IMM	E-00093724	2017-09-21-EssenProjektbesprechung
a0p4A000009zmEQQAY	IMM	E-00099660	2018-02-16-Würzburg-Sponsoring
a0p4A00000CldOHQAZ	IMM	E-00112519	2018-08-30-Halle-Sponsoring-Sommersch
a0pG000000ARWQnIAP	IMM	E-00065933	2016-11-03 Demmin Expertengespräch

Supported data structures

Data diagnosis supports the following data structures.

- data frame : data.frame class.
- data table : tbl_df class.
- **table of DBMS** : table of the DBMS through tbl_dbi.
- **Using dplyr backend for any DBI-compatible database.**

Load libraries

0. Load Data

```
[1] "Dimension of data:"
[1] 1632   24
```

0.Preview data

```
[1] "Preview of 'Events_nPVU_Germany' data frame"
```

1.DQA Dimension1/Rule1: Validity/Semantic Accurary

- Picking the data subset relevant to Epilepsy other than Parkinson's disease
- Cleansing up:
- Extract a substring (like "2017-09-21" from "2017-09-21T09:30:29.000+0000") both for Date and CreateDate;+Mis-format of "Call2_vod___r.CreatedDate"; +Wrongly formatted"Call2_vod___r.UCB_Owner_Full_N and "Call2_vod___r.Account_vod___r.UCB_Primary_Grand_Parent___c"

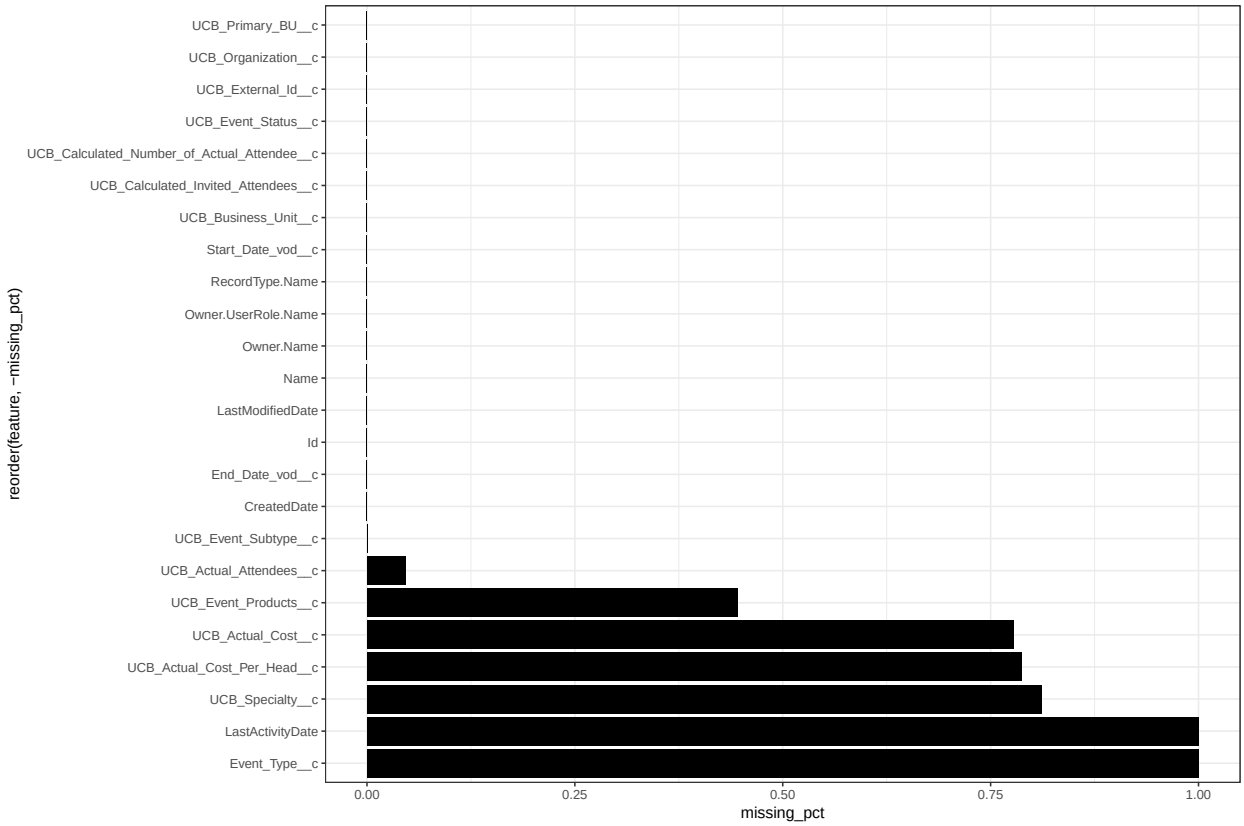
2. DQA Dimension2/Rule2: Cardinality/uniqueness/duplicates

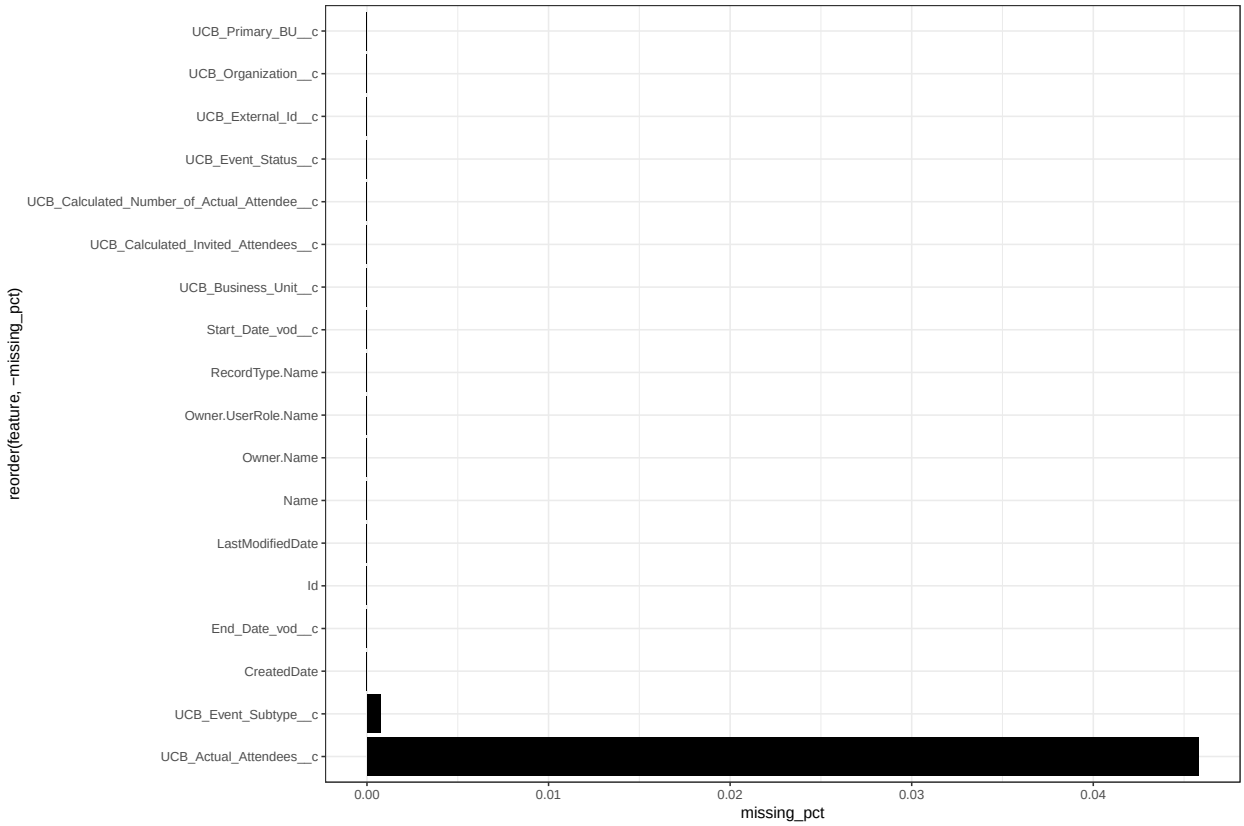
- Based on business understanding of ORBIT data, a hiddent feature "Discussion Priority" differentiates the duplicates. Many duplicates because of "Discussion Priority" behind the data (hinted by "Call2_vod___r.Detailed_Products_vod___c")

3. DQA Dimension3/Rule3: Handling missing data

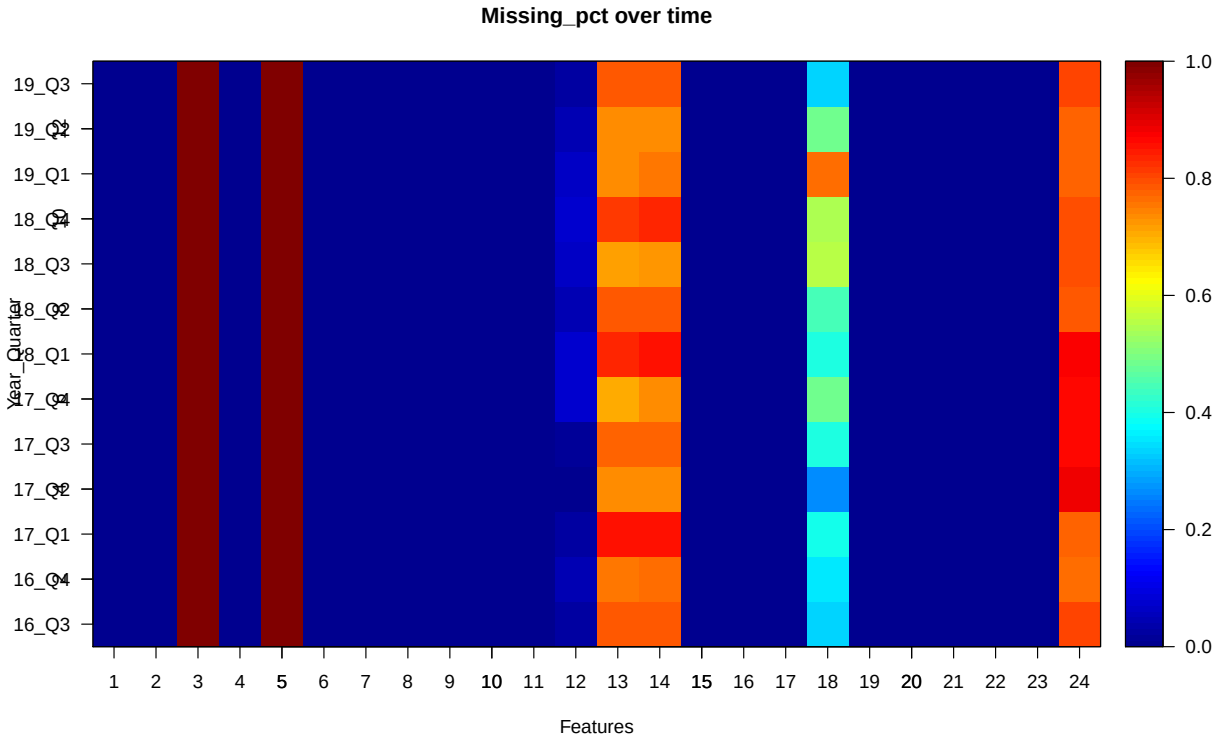
We want to get rid of any features that have >= 10% of the data missing. We're presuming there's little information in those features,and just adds noise.We plot all the features against the percent of missing values. We keep only those features with <10% missing values, and re-adjust the data frame, accordingly.

3.1 find percent missing values for each feature during all period





3.2 Handling historical missing data at at level of quarter, we use 3D plot, with time included to visualize the time series data select the columns to visualize



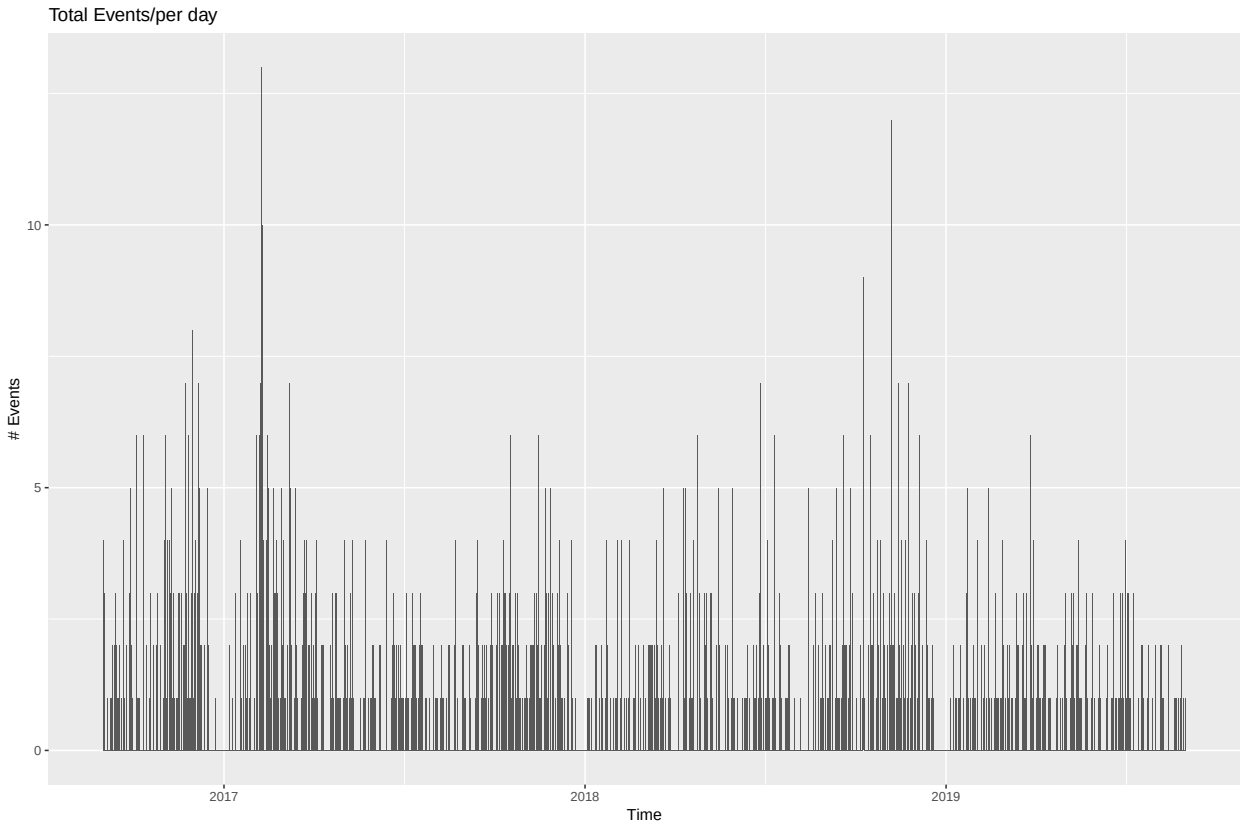

```
[1] "# Feature"
 [1] "CreatedDate"
 [2] "End_Date_vod__c"
 [3] "Event_Type__c"
 [4] "Id"
 [5] "LastActivityDate"
 [6] "LastModifiedDate"
 [7] "Name"
 [8] "Owner.Name"
 [9] "Owner.UserRole.Name"
[10] "RecordType.Name"
[11] "Start_Date_vod__c"
[12] "UCB_Actual_Attendees__c"
[13] "UCB_Actual_Cost__c"
[14] "UCB_Actual_Cost_Per_Head__c"
[15] "UCB_Business_Unit__c"
[16] "UCB_Calculated_Invited_Attendees__c"
[17] "UCB_Calculated_Number_of_Actual_Attendee__c"
[18] "UCB_Event_Products__c"
[19] "UCB_Event_Status__c"
[20] "UCB_Event_Subtype__c"
[21] "UCB_External_Id__c"
[22] "UCB_Organization__c"
[23] "UCB_Primary_BU__c"
[24] "UCB_Specialty__c"
```

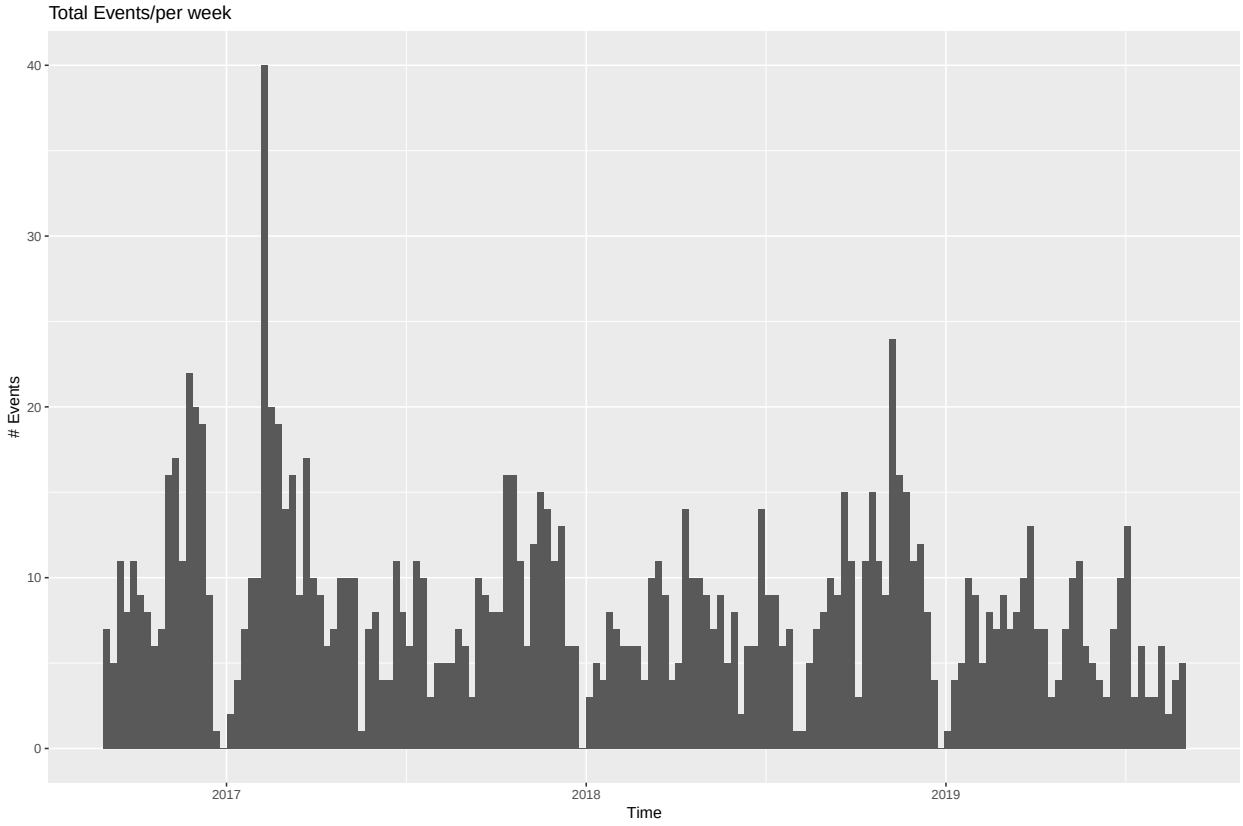
4. DQA Dimension4/Rule4: Distribution and Outlier Detection

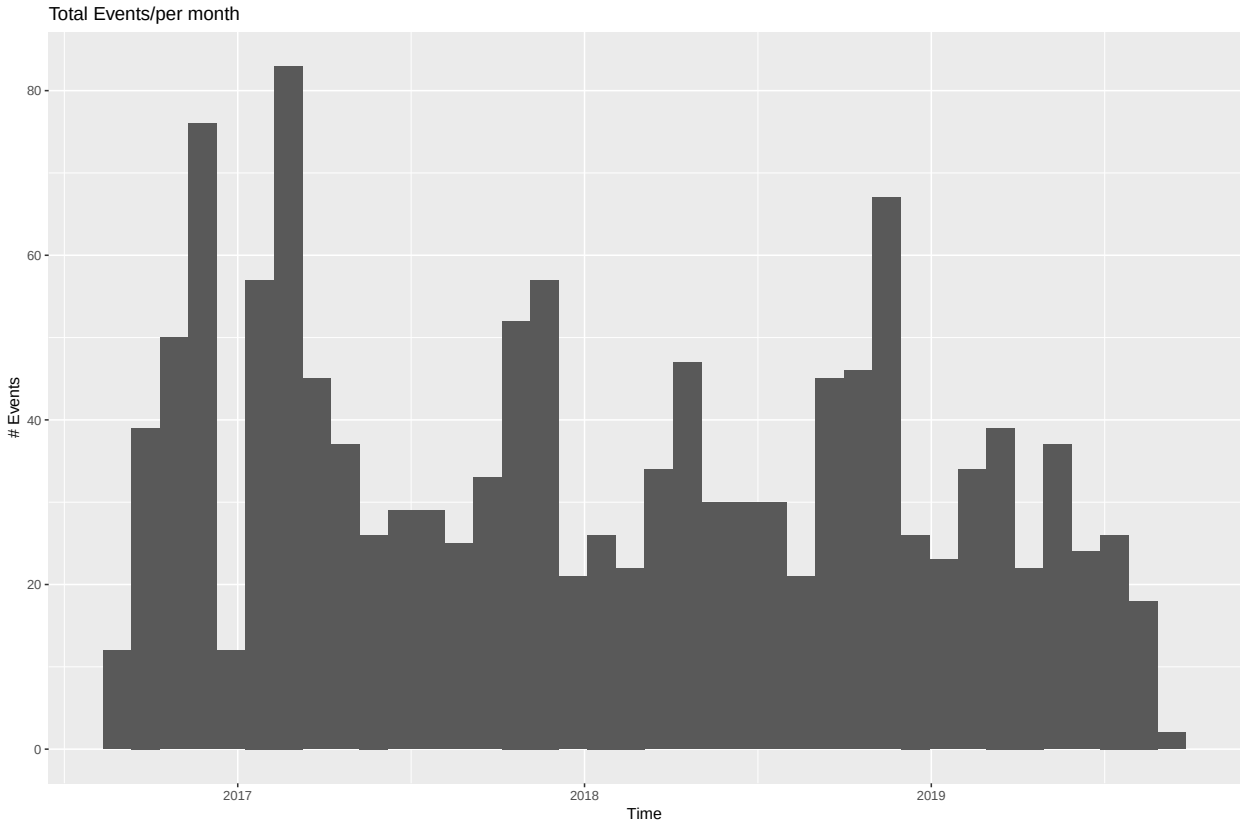
4.1 Distribution of raw data

4.1.1 Visualization and statistics

```
pdf
  2
```




Total Events/per week
40
30
20
10
0
Events
2017
2018
2019
Time


Total Events/per month
80
60
40
20
0
Events
2017
2018
2019
Time

4.1.2 Normality test on numeric variables using `normality()`

`normality()` performs a normality test on numerical data. `Shapiro-Wilk normality test` is performed. If the number of observations is larger than 5000, 5000 observations are extracted by random simple sampling and then tested.

The variables of `tbl_df` object returned by `normality()` are as follows.

- `statistic` : Statistics of the Shapiro-Wilk test
- `p_value` : p-value of the Shapiro-Wilk test
- `sample` : Number of sample observations performed Shapiro-Wilk test

We can use dplyr to sort non-normal distribution variables by p_value.:

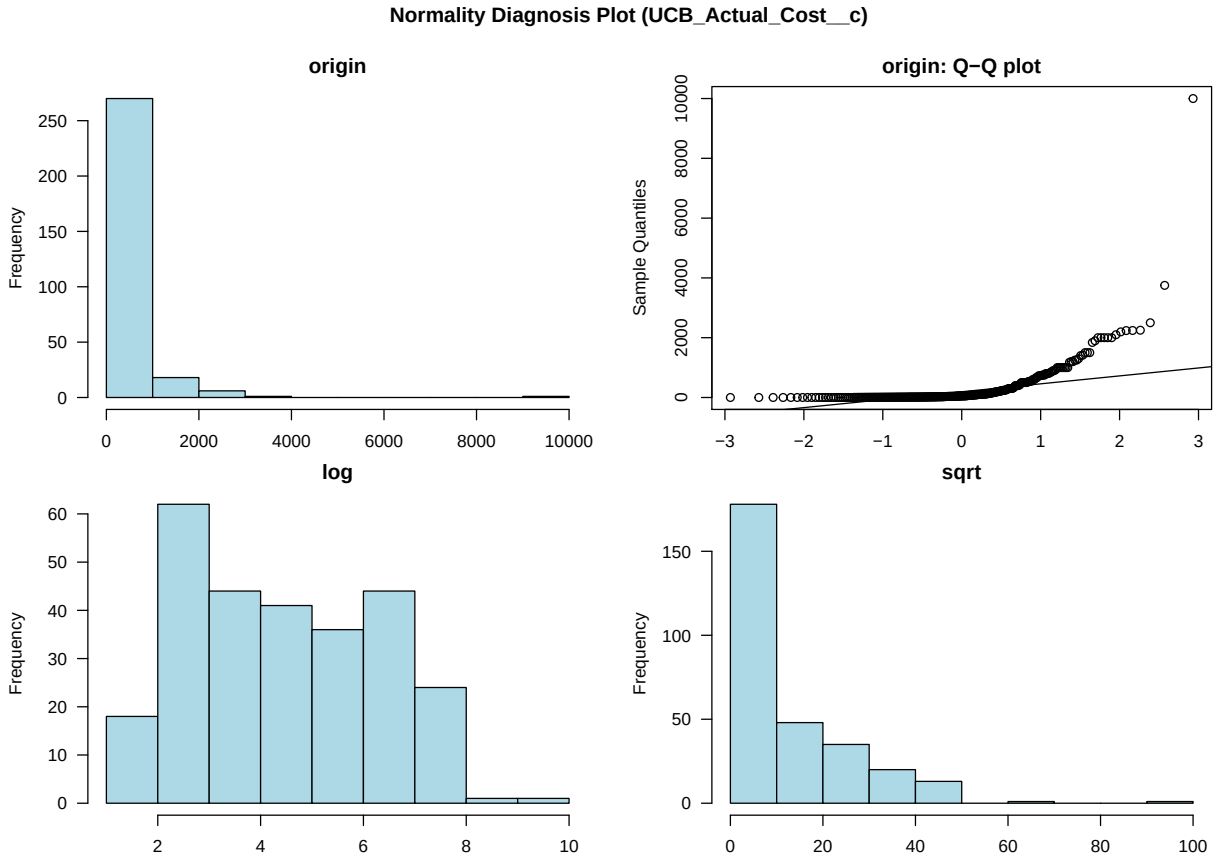
```
# A tibble: 5 x 4
  vars                                      statistic  p_value sample
  <chr>                                         <dbl>    <dbl>  <dbl>
1 UCB_Actual_Attendees__c                       0.108 1.34e-60   1332
2 UCB_Calculated_Invited_Attendees__c           0.671 6.14e-45   1332
3 UCB_Calculated_Number_of_Actual_Attendee__c   0.684 2.51e-44   1332
4 UCB_Actual_Cost_Per_Head__c                   0.197 4.97e-33   1332
# ... with 1 more row
```

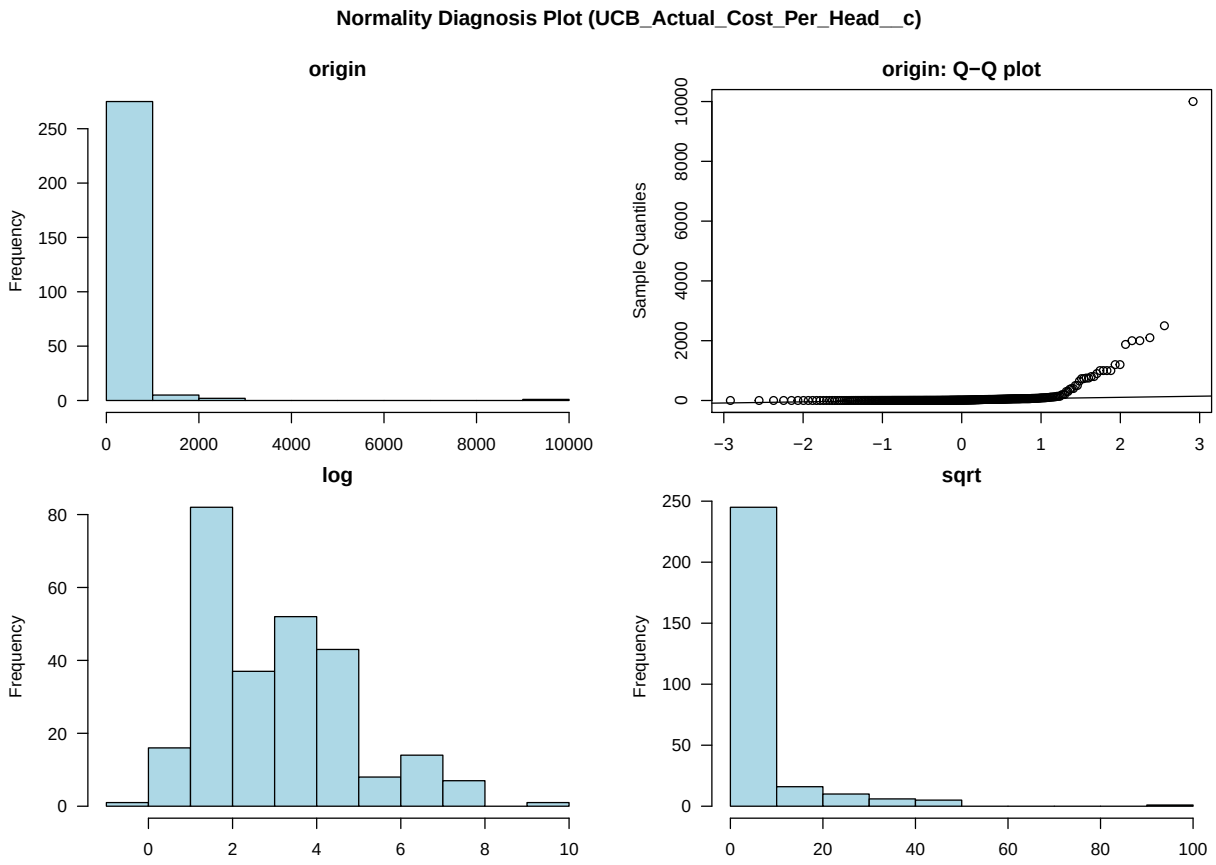
Normalization visualization of numerical variables using `plot_normality()` `plot_normality()` visualizes the normality of numeric data.

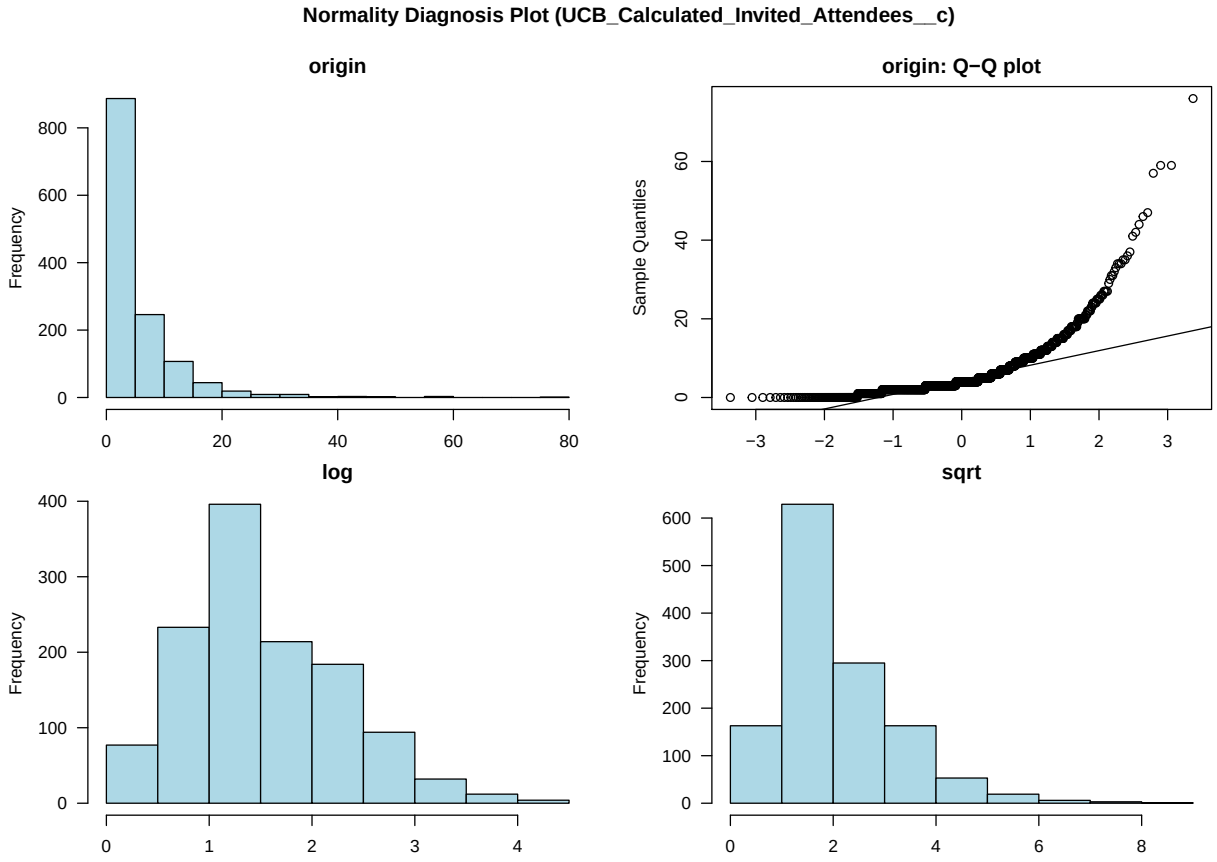
The information that `plot_normality()` visualizes is as follows.

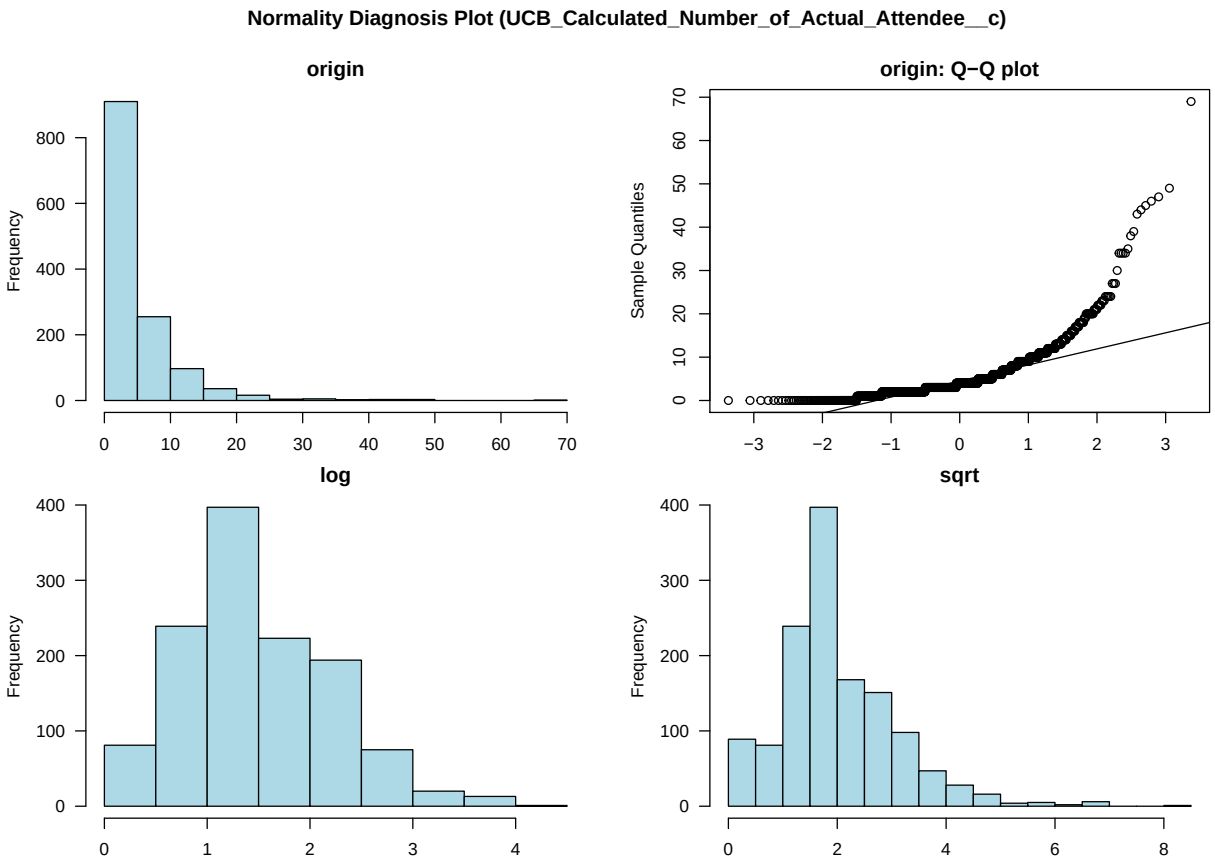
- `Histogram of original data`
- `Q-Q plot of original data`
- `histogram of log transformed data`
- `Histogram of square root transformed data`

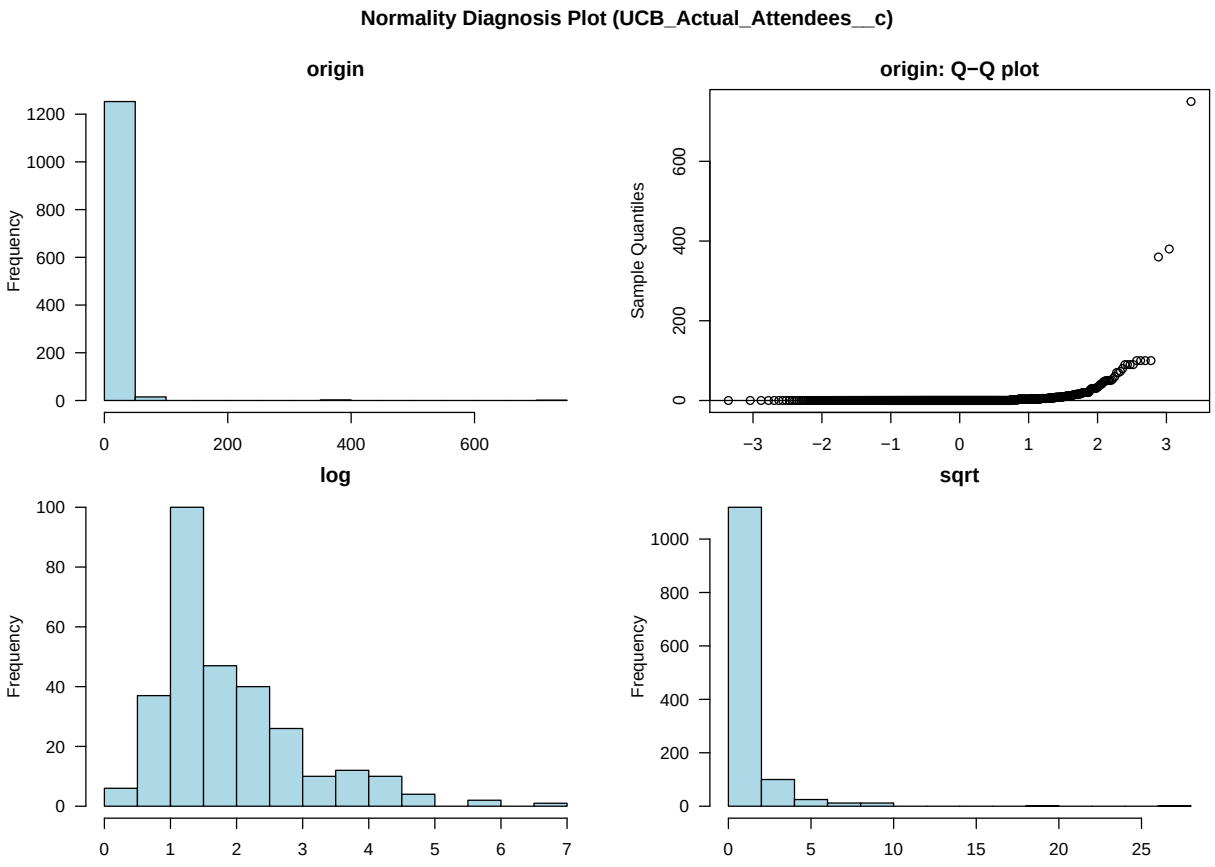
`plot_normality()` can also specify several variables like `normality()` function.


Normality Diagnosis Plot (UCB_Actual_Cost__c)
origin
Frequency
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
origin: Q−Q plot
Sample Quantiles
0
2000
4000
6000
8000
10000
−3
−2
−1
0
1
2
3
log
Frequency
0
10
20
30
40
50
60
2
4
6
8
10
sqrt
Frequency
0
50
100
150
0
20
40
60
80
100


Normality Diagnosis Plot (UCB_Actual_Cost_Per_Head__c)
origin
Frequency
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
origin: Q−Q plot
Sample Quantiles
0
2000
4000
6000
8000
10000
−3
−2
−1
0
1
2
3
log
Frequency
0
20
40
60
80
0
2
4
6
8
10
sqrt
Frequency
0
50
100
150
200
250
0
20
40
60
80
100


Normality Diagnosis Plot (UCB_Calculated_Invited_Attendees__c)
origin
Frequency
origin: Q−Q plot
Sample Quantiles
log
Frequency
sqrt
Frequency


Normality Diagnosis Plot (UCB_Calculated_Number_of_Actual_Attendee__c)
origin
Frequency
origin: Q−Q plot
Sample Quantiles
log
Frequency
sqrt
Frequency

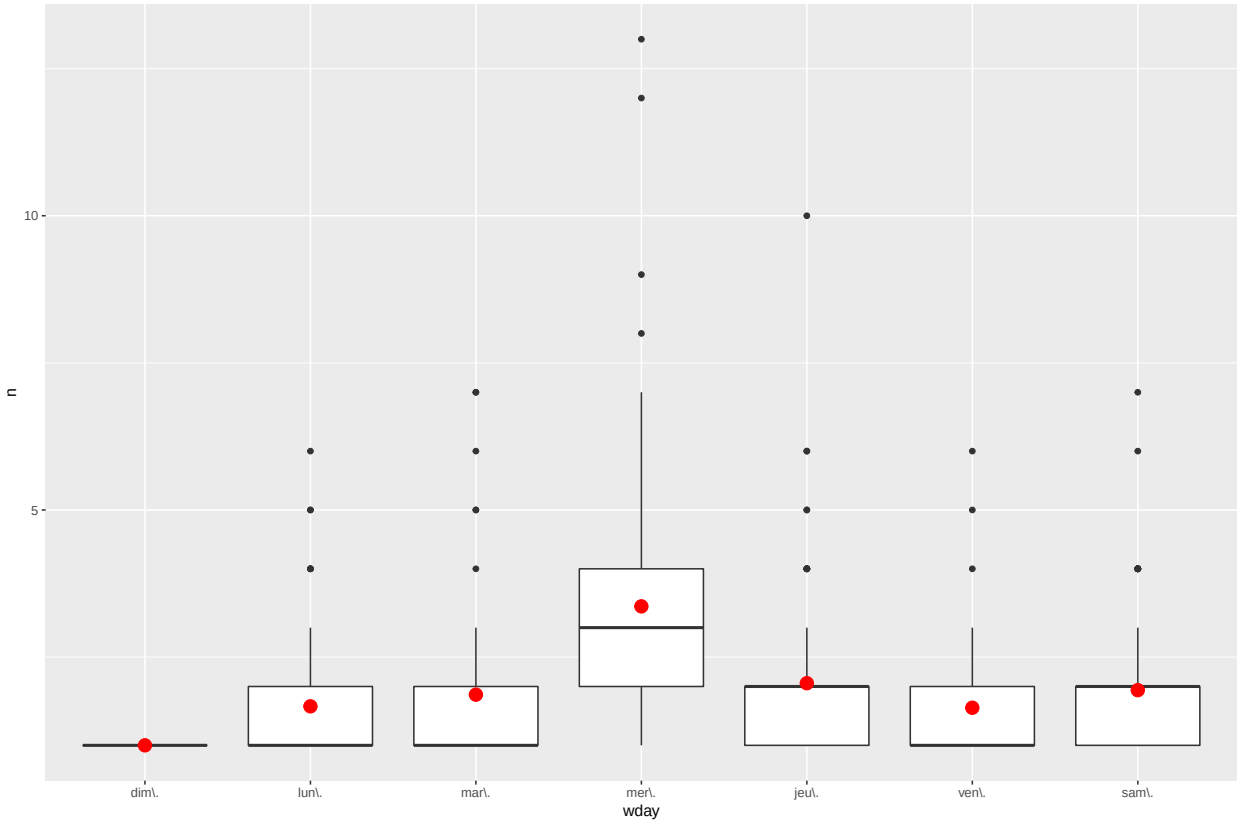


4.2 Detecting Outliers

day-of-week effect that dominates the subtler patterns we fit the model (lm) and display its predictions overlaid on the original data

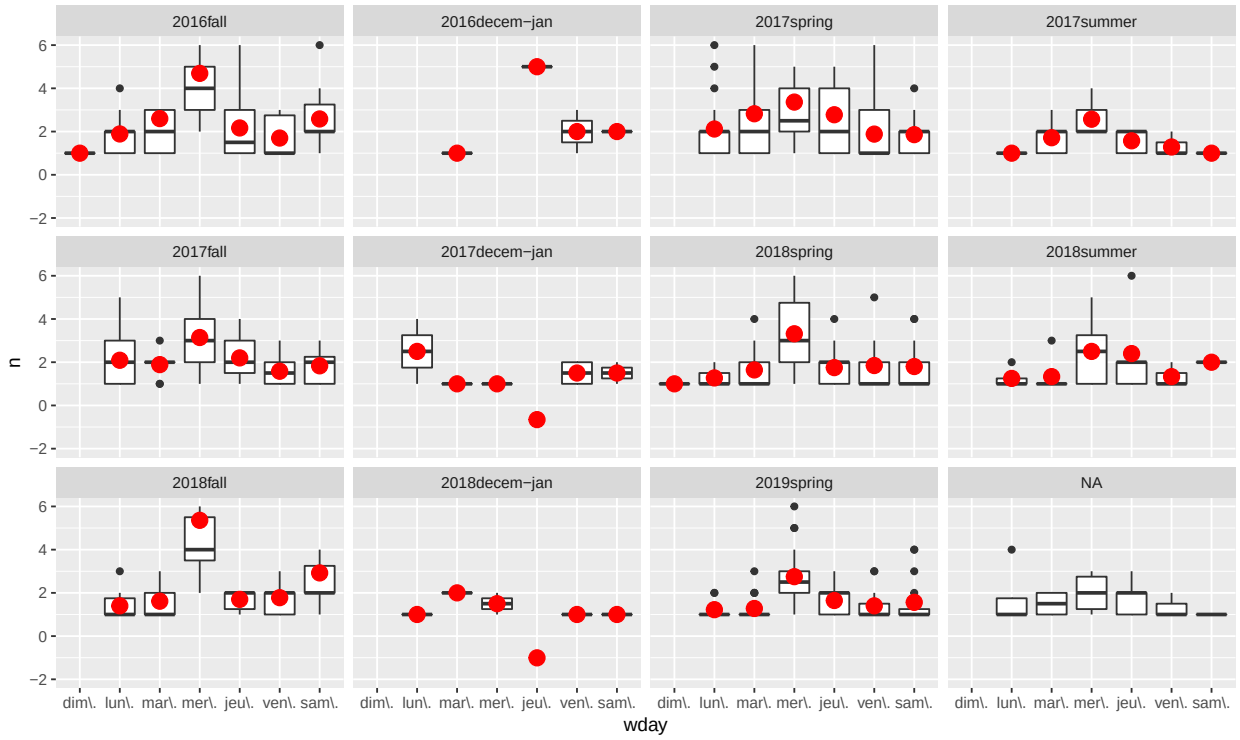
Let's figure out what data are getting wrong. First, I plotted the distribution of the data, and saw that it follows a normal distribution with mean = , std = To classify a data point as an outlier, I considered any data +/- 2 std above/below the mean is a significant error. Then, I created two data frames. One consisting of the "outliers", and another consisting of the "average". I plotted these on a graph (red = outliers; green = average), outlining the shape of the data. We observe something interesting.

```
pdf
  2
```



There is significant variation across the terms,so fitting a separate day-of-week effect for each term

```
pdf
  2
```

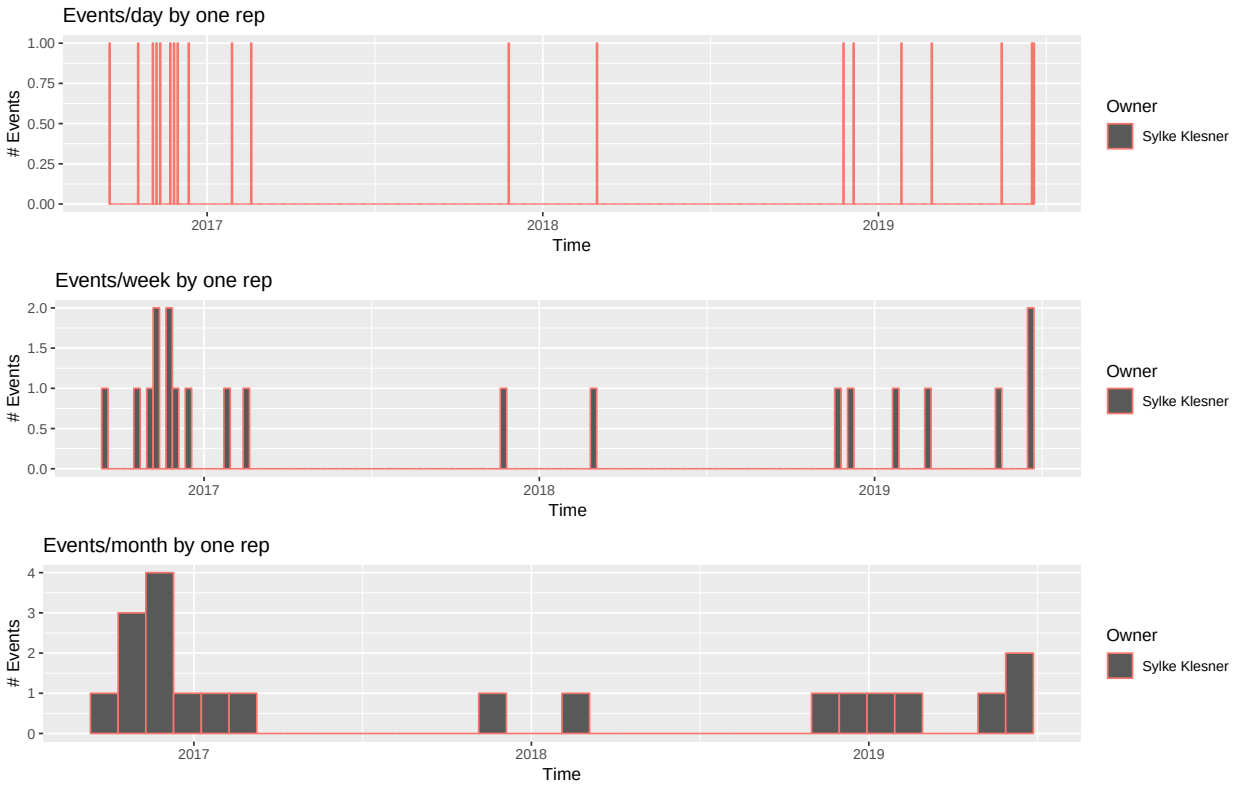


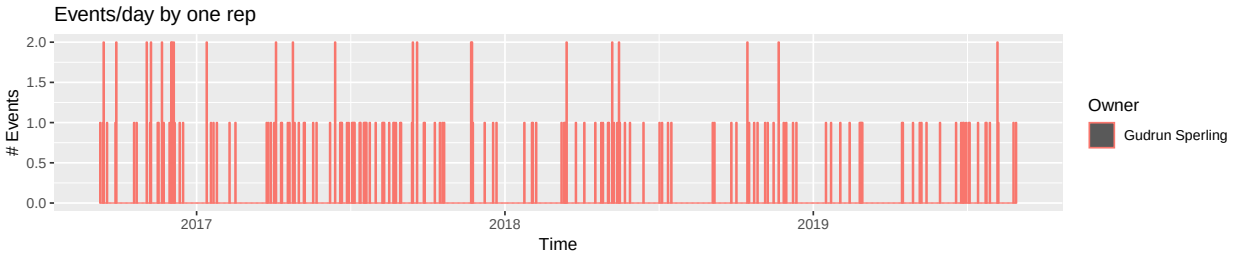
Understand how often each rep events on customers How many reps were involved in events

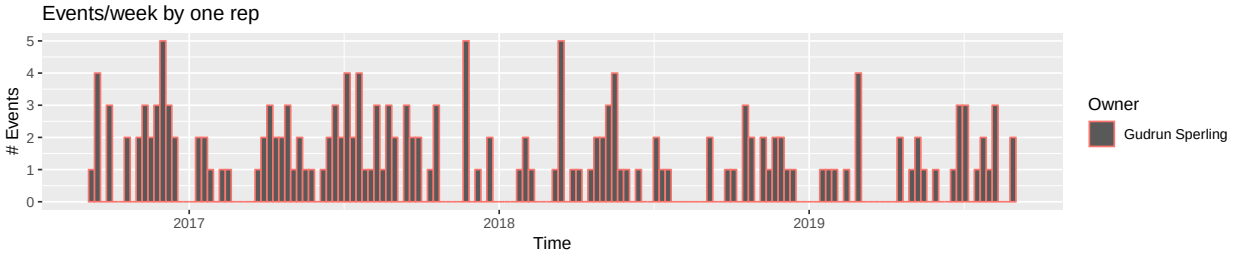
```
[1] List of reps who carried out events in 201608-201908
 [1] "Sylke Klesner"                  "Gudrun Sperling"
 [3] "Jutta Hoffmann-Nommensen"       "Astrid Hemschemeier"
 [5] "Constanze Erwin"                "Susanne Meinel-Schwebke"
 [7] "Nico Haag"                      "Lambrini Tontsidou"
 [9] "Bodo Stelle"                    "Nadine von Ryssel"
[11] "Friederike Hilger"              "Petra Opolka"
[13] "Angelika Gundlach"              "Sarah Sahlu"
[15] "Udo Lendl"                      "Stephanie Mueller-Varain"
[17] "Eike-Hans Zimmermann"           "Katrin Riedel"
[19] "Klaus Kalcum"                   "Rainer Krüger"
[21] "Balint Szilagyi"                "Petra Rösler"
[23] "Angela Hertel"                  "Lubica Vetrikova"
[25] "Ulrike Hermsdörfer-Vonalt"      "Alya Kokot"
[27] "Renate Bohnsack"                "Oliver Feil"
[29] "Jan Peetz"                      "Silvia Slazenger"
[31] "Caroline-Mascha Reifferscheid" "Sandra Mogk"
[33] "Jan Bretz"                      "Caroline Lehnart-Betz"
[35] "Heike Holländer"                "Sandra Schink"
[37] "Daniel Bura"                    "Heiko Sic"
[39] "Grit Brußig"                    "Michael Kemper"
[41] "Bianca Morgenstern"             "Viola Wernik"
[43] "Jan Helfrich"                   "Saskia Winter"
[45] "Fabian Paul"                    "Annina Getz"
[47] "Manh Dan Nguyen"                "Steffen Hiller"
[49] "Rüdiger Thees"                  "Florian Hinze"
[51] "Adrian Zander"                  "Tabea Thomas"
[53] "Wojciech Dombrowsky"            "Missanga van de Sand"
```

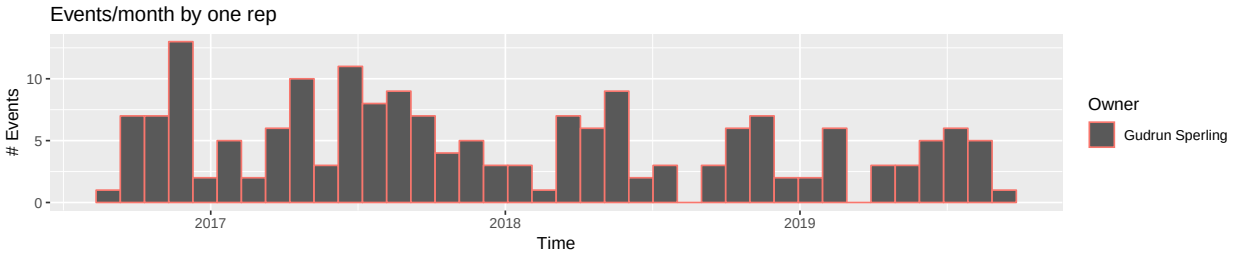
```
[55] "Joachim Hipp"
```

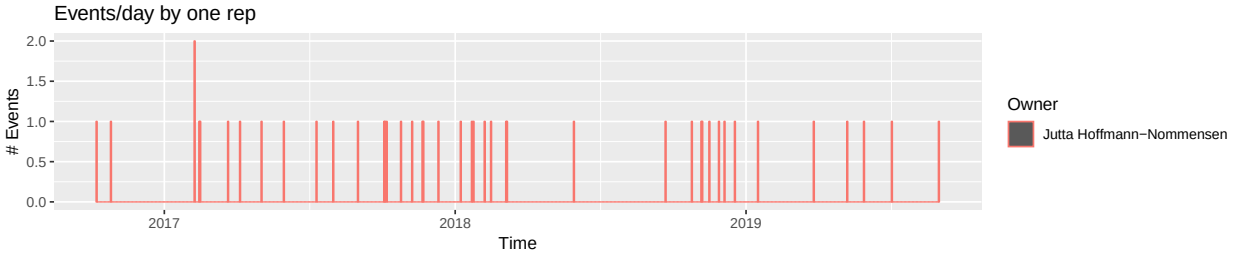
```
pdf
  2
```

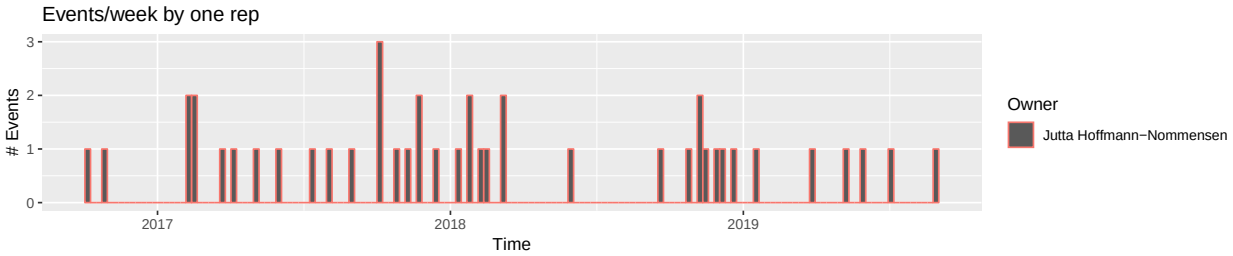


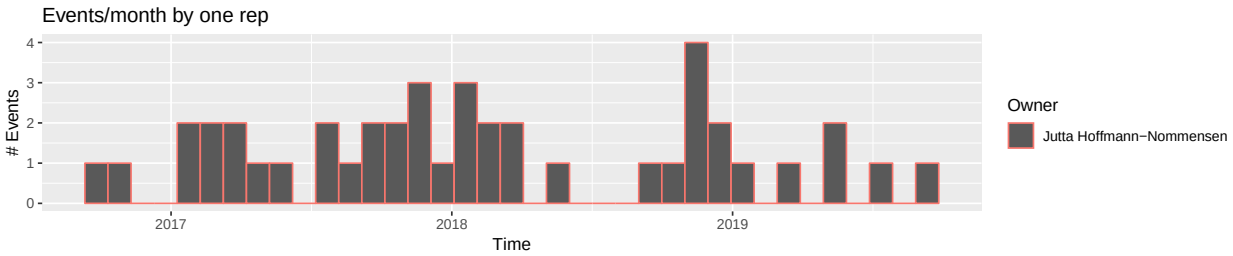

Events/day by one rep
Events
2.0
1.5
1.0
0.5
0.0
2017
2018
2019
Time
Owner
Gudrun Sperling

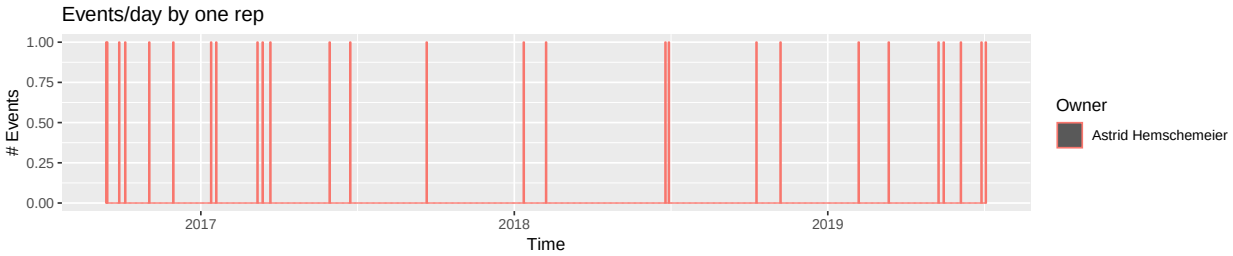

Events/week by one rep
Events
5
4
3
2
1
0
2017
2018
2019
Time
Owner
Gudrun Sperling

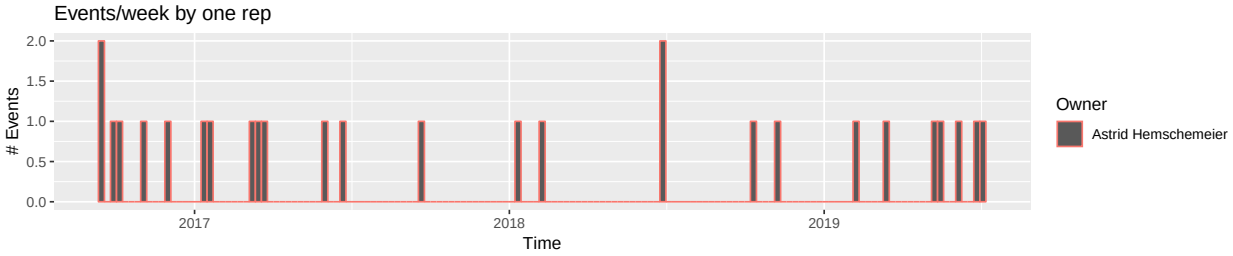

Events/month by one rep
Events
10
5
0
2017
2018
2019
Time
Owner
Gudrun Sperling

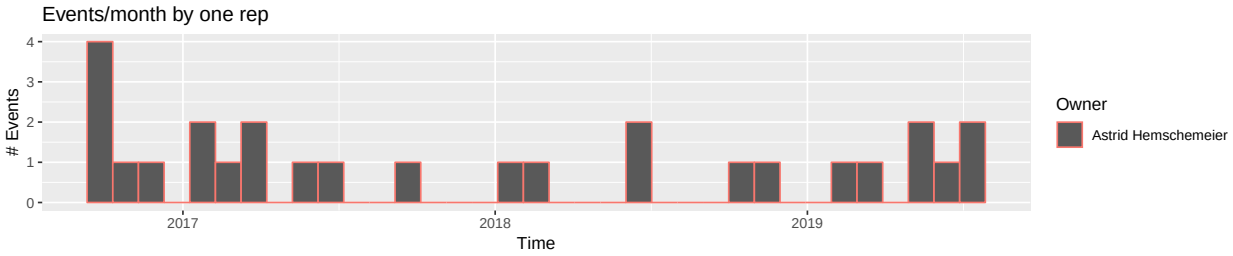

Events/day by one rep
Events
2.0
1.5
1.0
0.5
0.0
2017
2018
2019
Time
Owner
Jutta Hoffmann−Nommensen

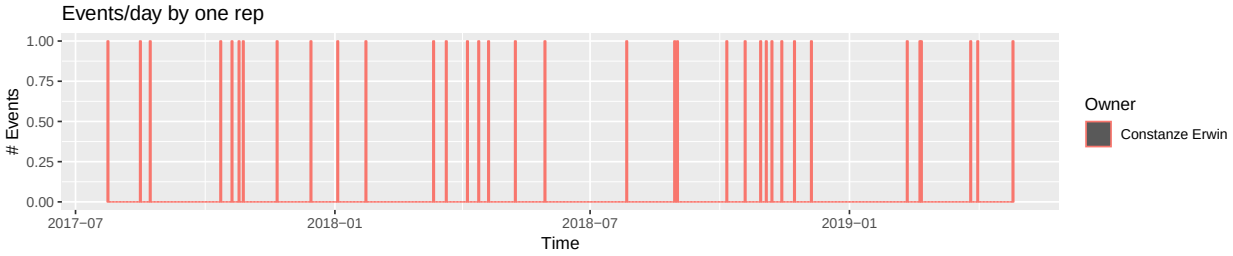

Events/week by one rep
Events
3
2
1
0
2017
2018
2019
Time
Owner
Jutta Hoffmann−Nommensen

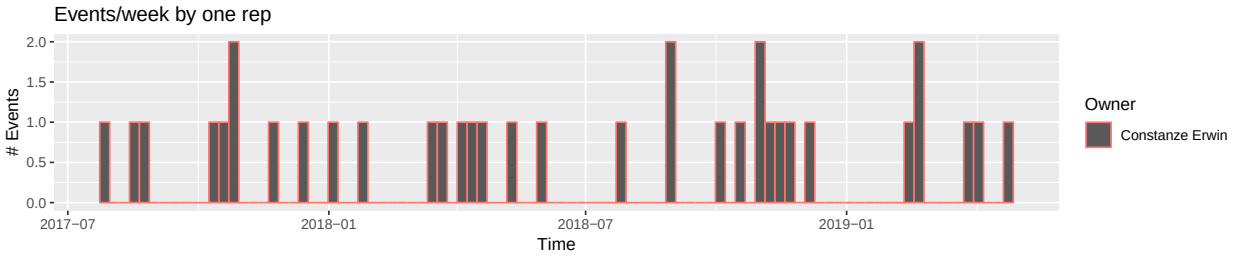

Events/month by one rep
Events
4
3
2
1
0
2017
2018
2019
Time
Owner
Jutta Hoffmann−Nommensen


Events/day by one rep
Events
1.00
0.75
0.50
0.25
0.00
2017
2018
2019
Time
Owner
Astrid Hemschemeier


Events/week by one rep
Events
2.0
1.5
1.0
0.5
0.0
2017
2018
2019
Time
Owner
Astrid Hemschemeier


Events/month by one rep
Events
4
3
2
1
0
2017
2018
2019
Time
Owner
Astrid Hemschemeier


Events/day by one rep
Events
1.00
0.75
0.50
0.25
0.00
2017–07
2018–01
2018–07
2019–01
Time
Owner
Constanze Erwin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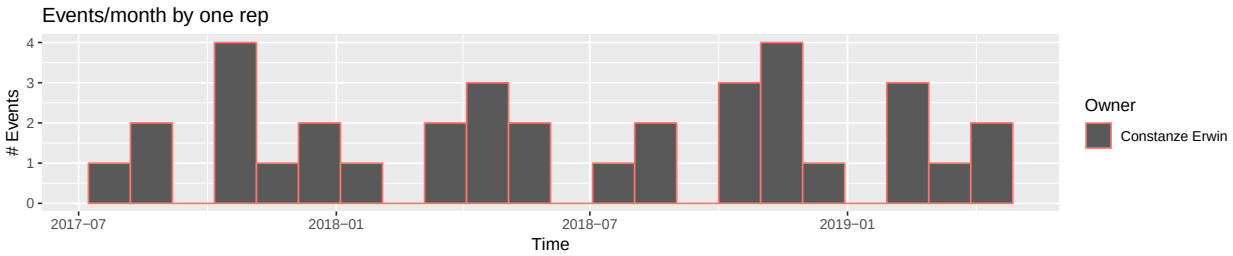
Time
Owner
Constanze Erwin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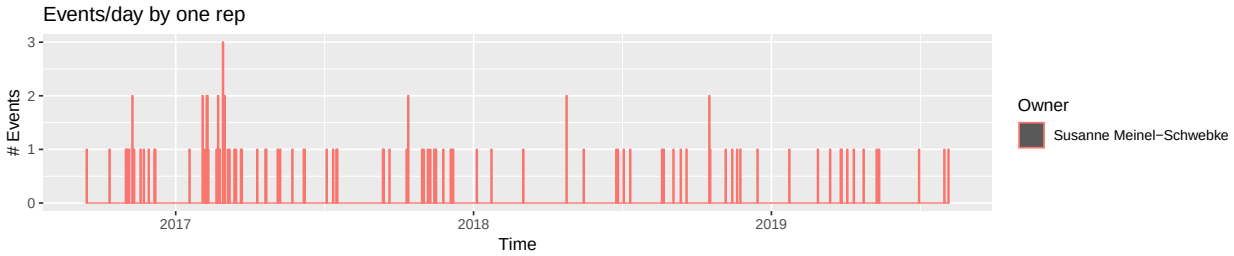
Owner
Constanze Erwin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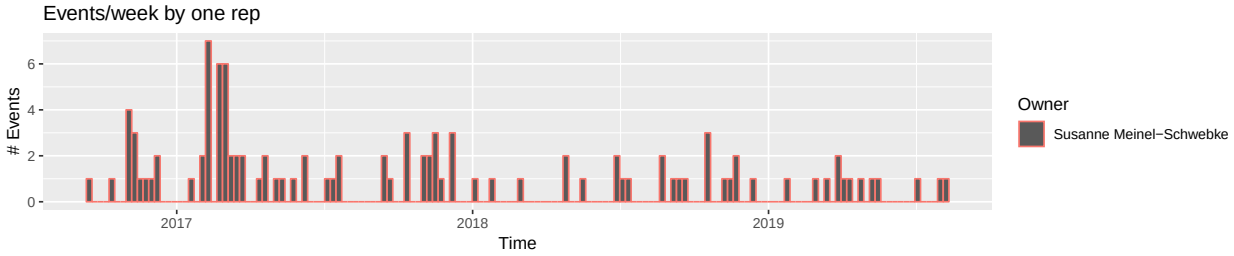
Susanne Meinel−Schwebke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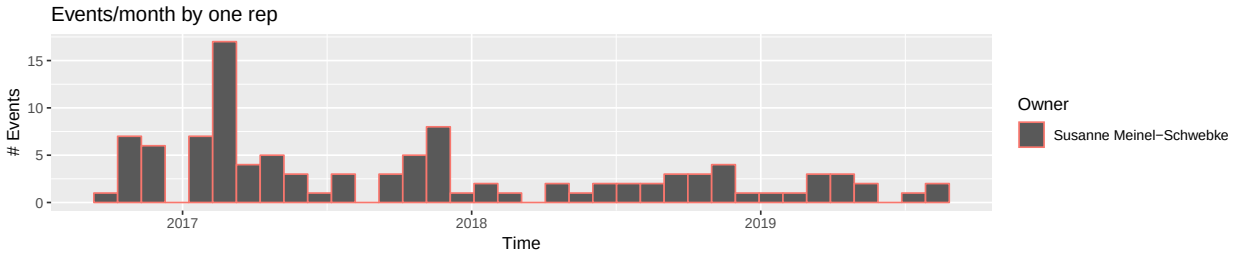
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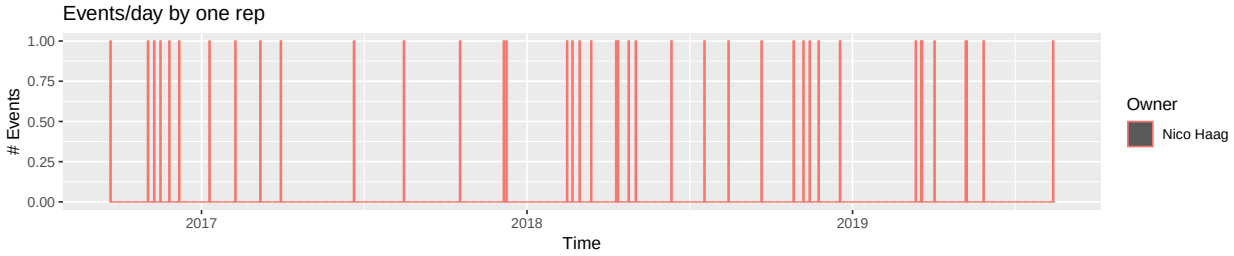
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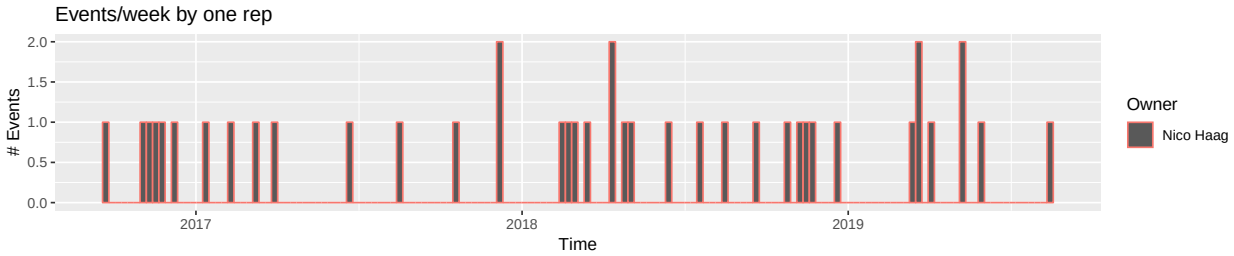
Nico Haag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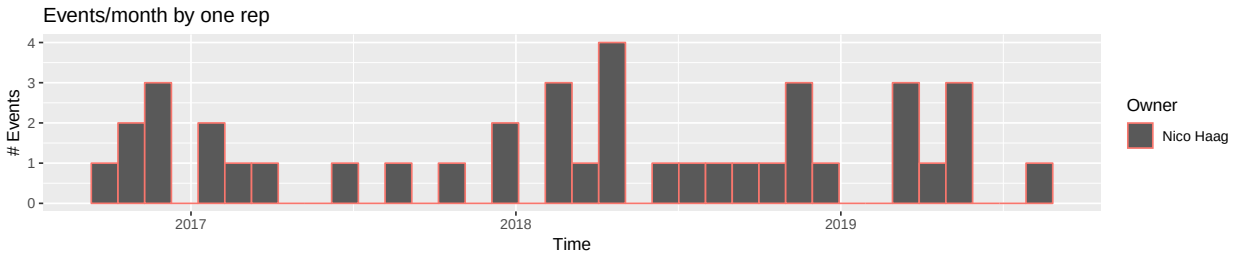
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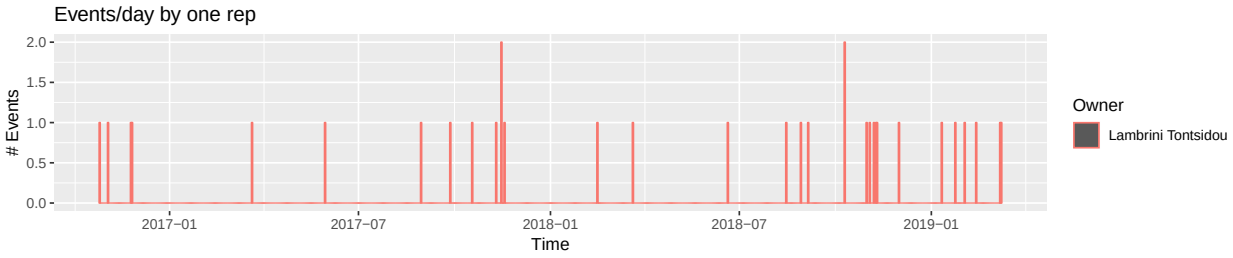
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Owner
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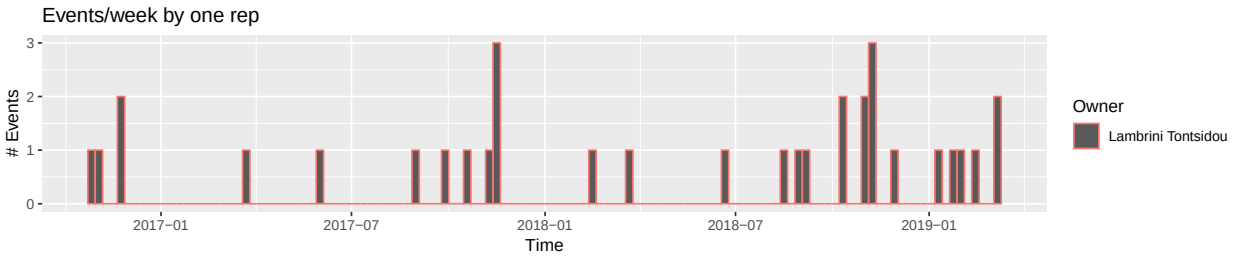
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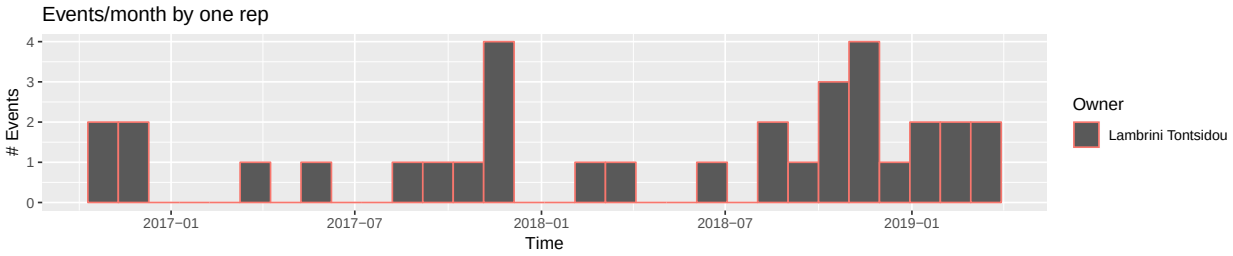
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Owner
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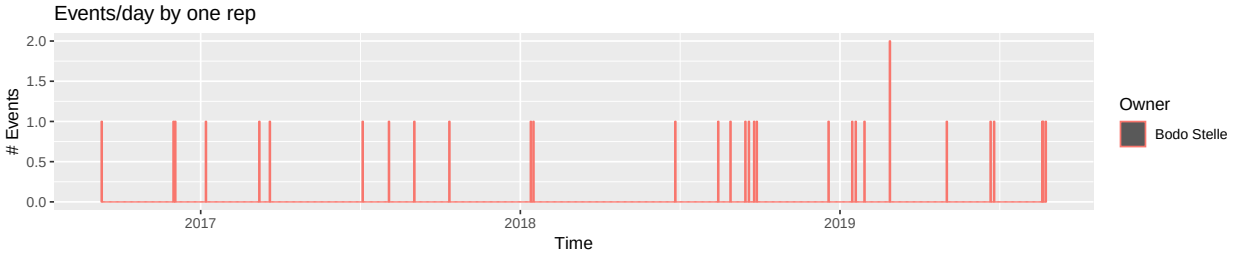
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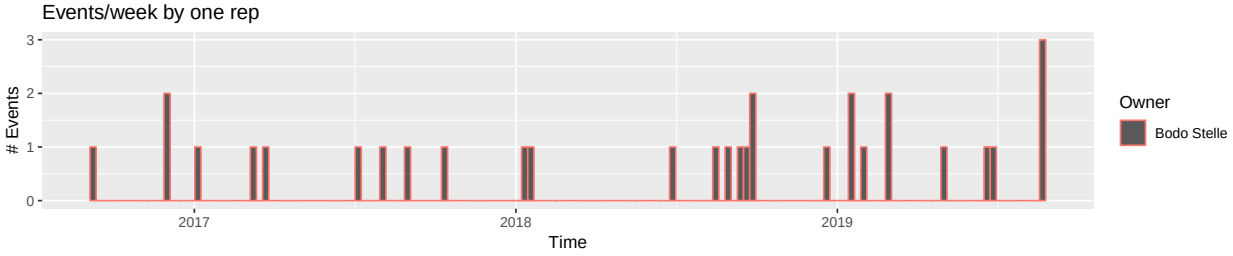
Bodo Stelle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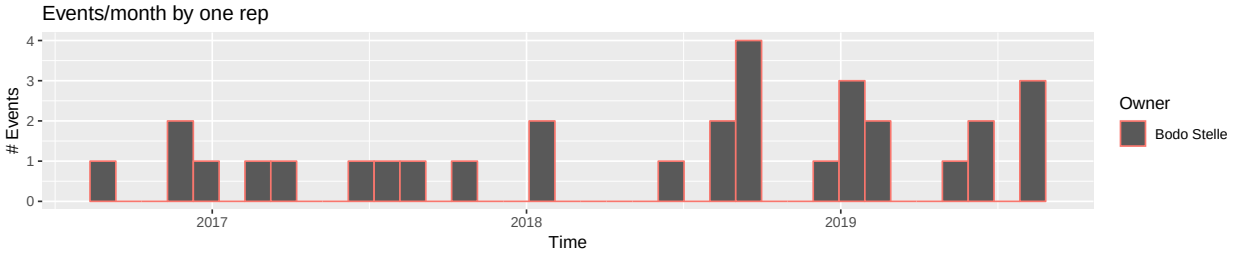
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Owner
Bodo Stelle


Events/day by one rep
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Owner
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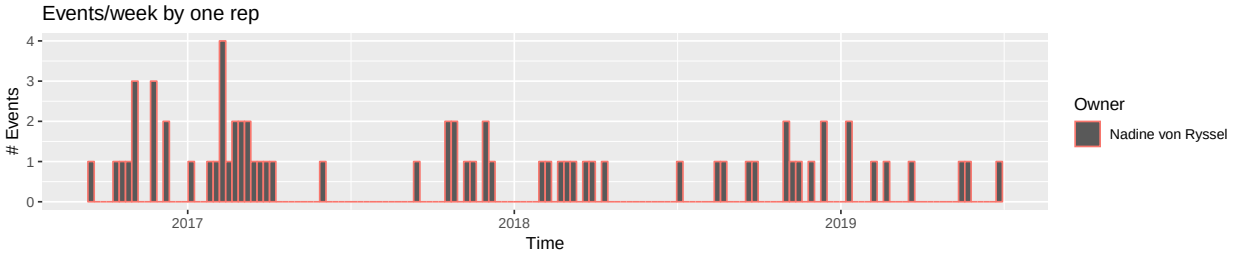
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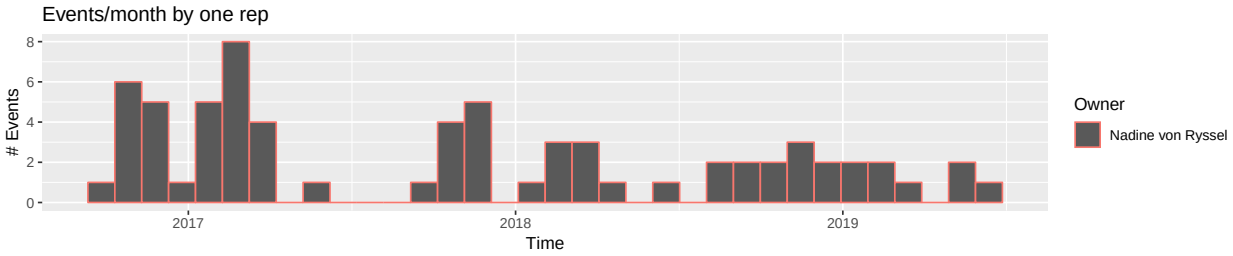
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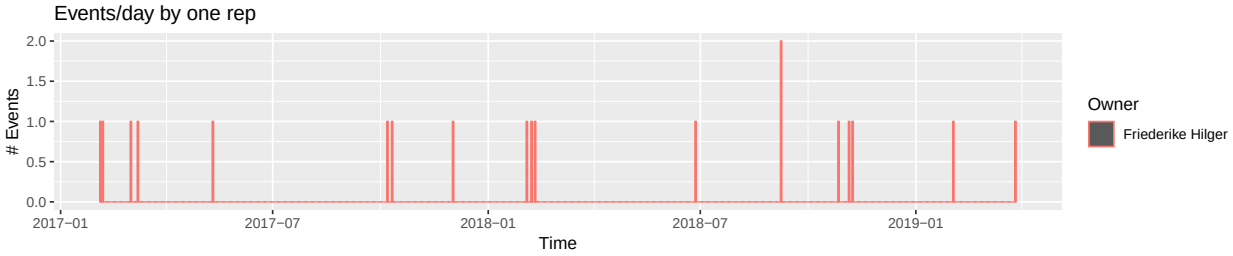
Nadine von Ryssel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2017–07
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Time
Owner
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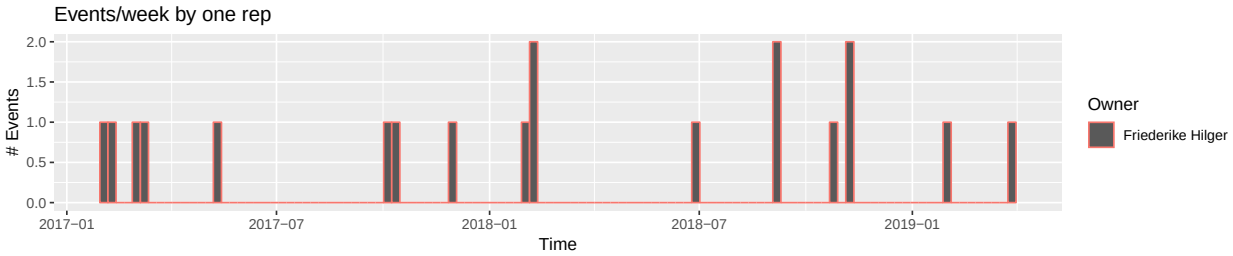
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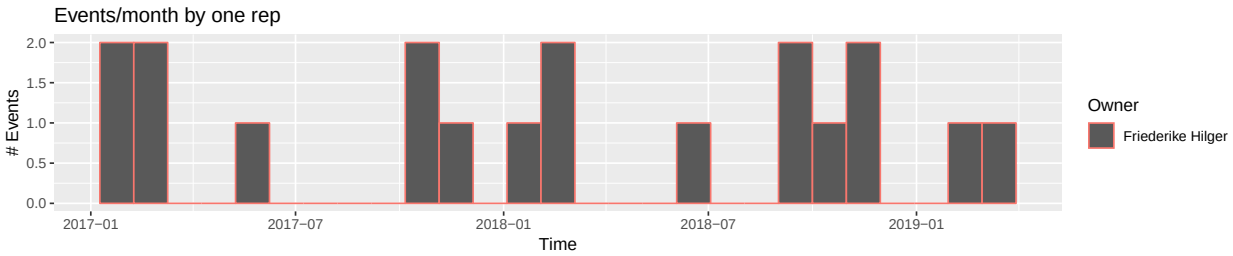
Owner
Friederike Hilger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Owner
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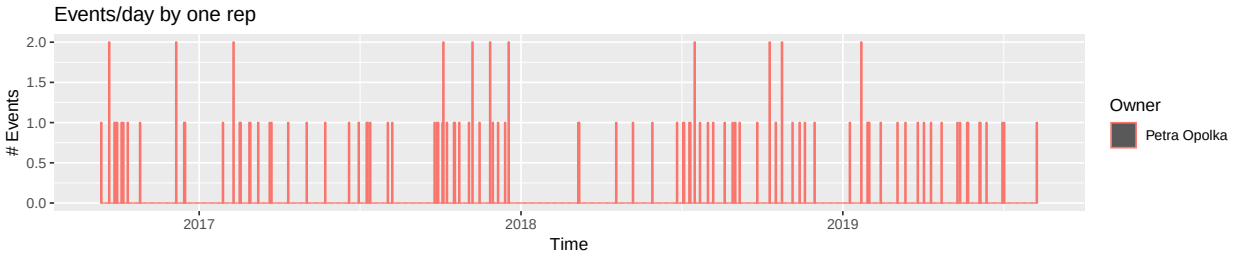
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Owner
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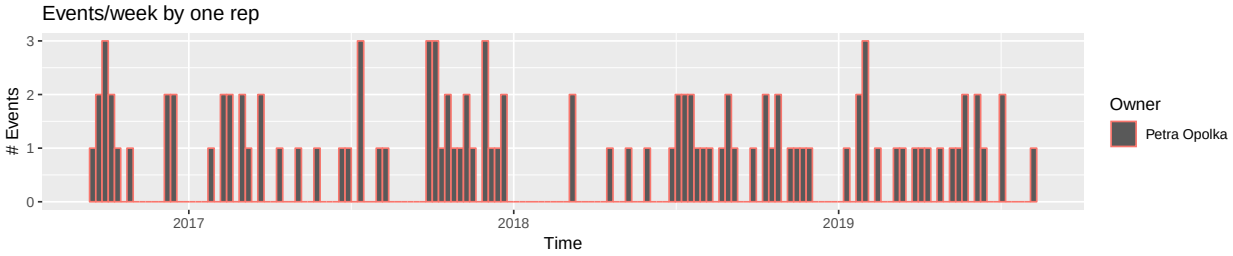
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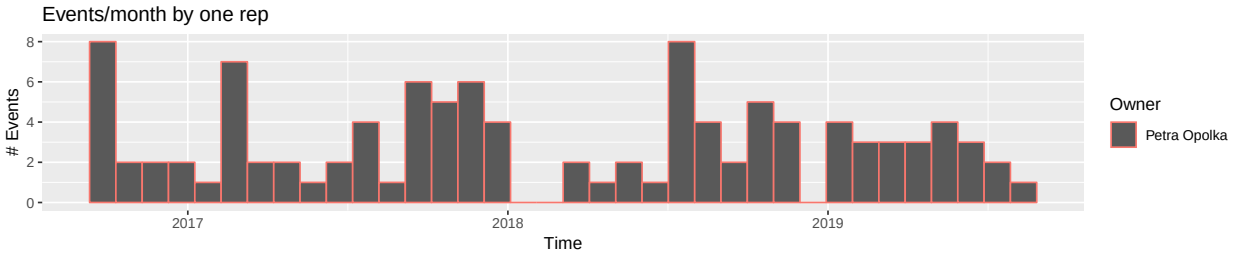
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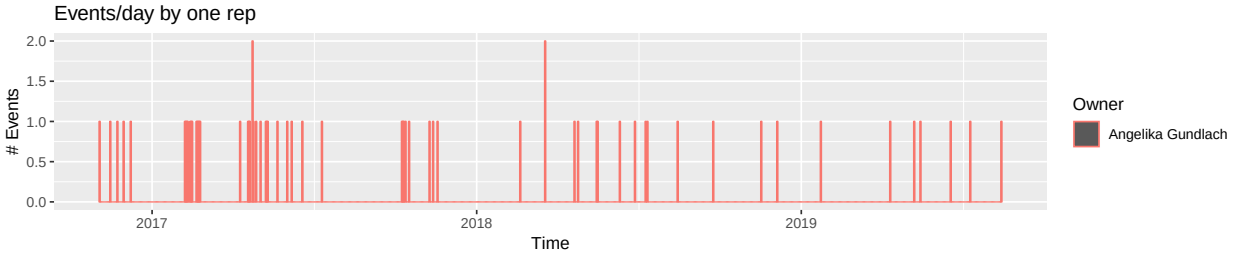
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Time
Owner
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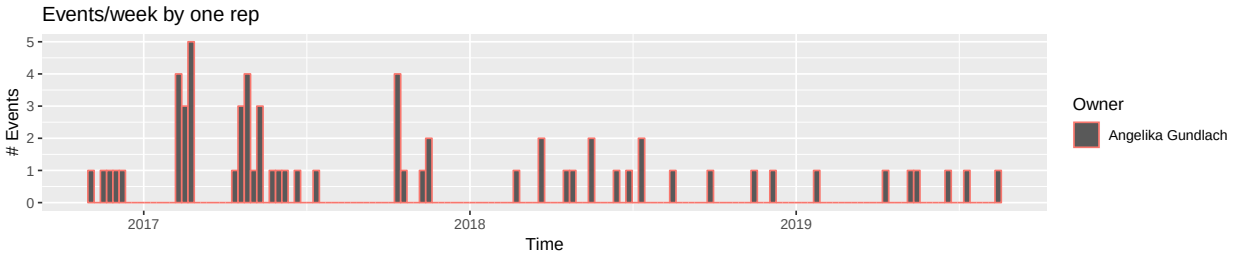
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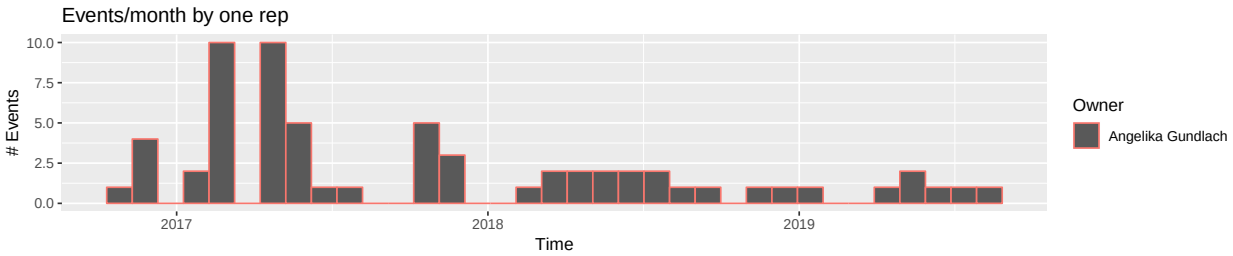
Angelika Gundlach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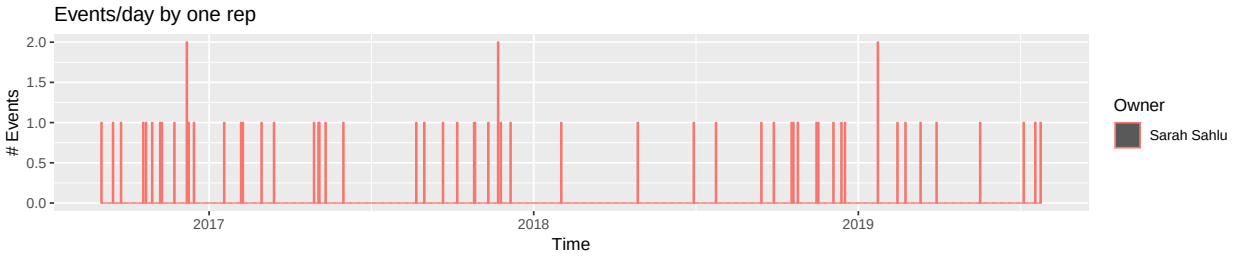
Angelika Gundlach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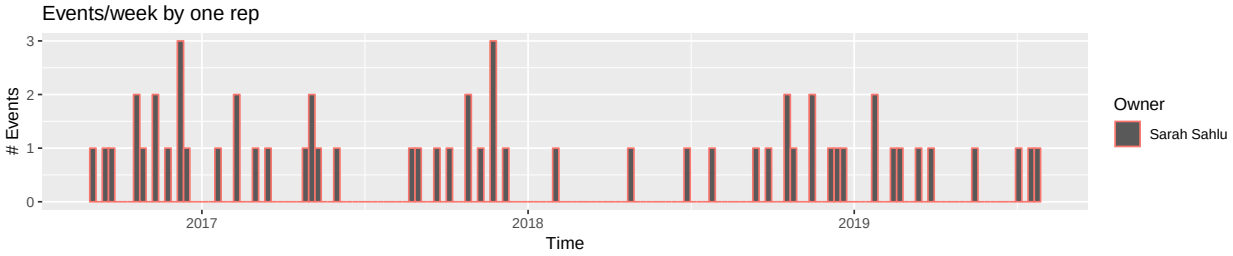
Time
Owner
Sarah Sahlu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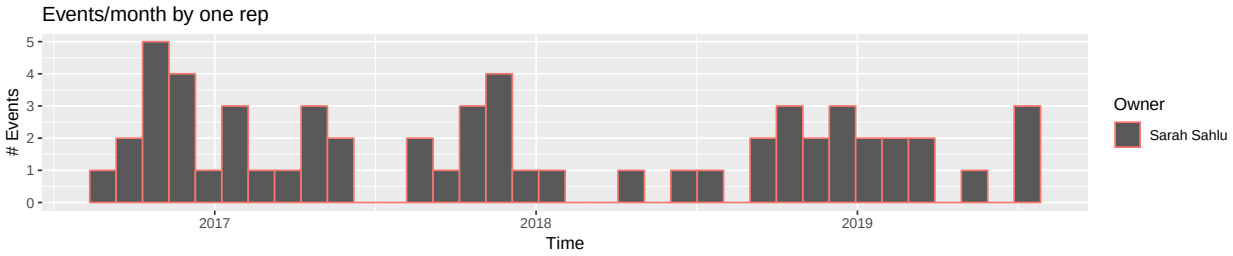
Sarah Sahlu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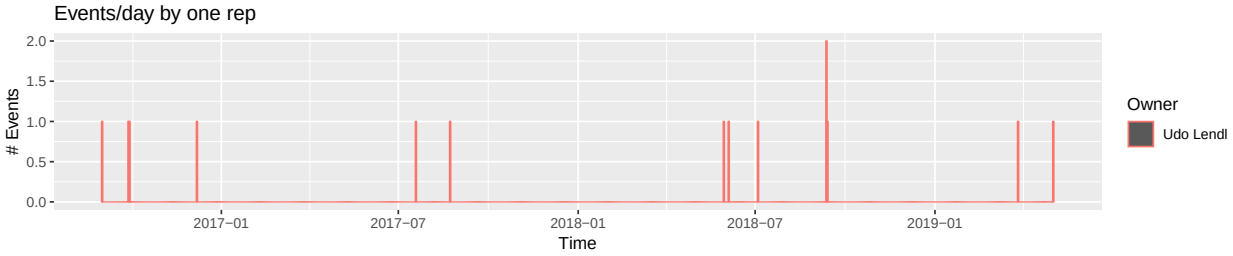
Sarah Sahlu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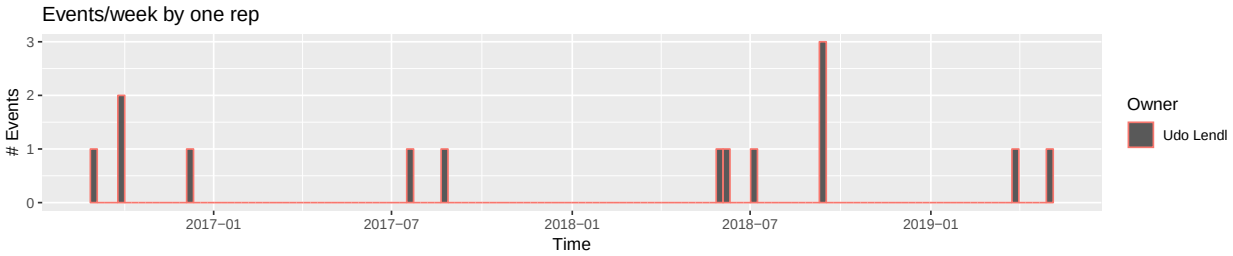
Owner
Udo Lendl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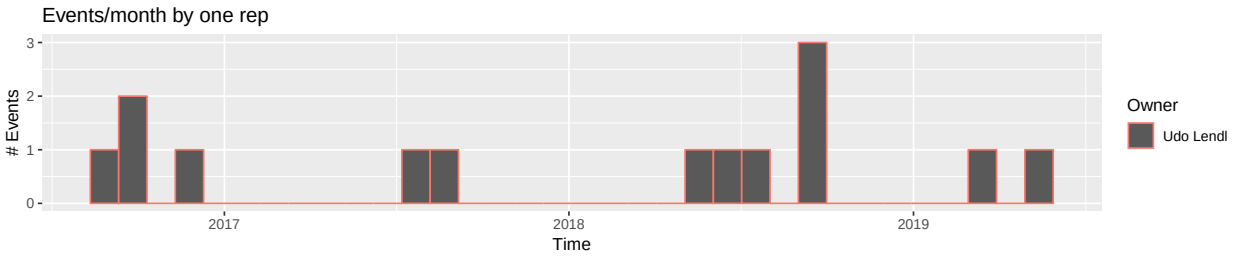
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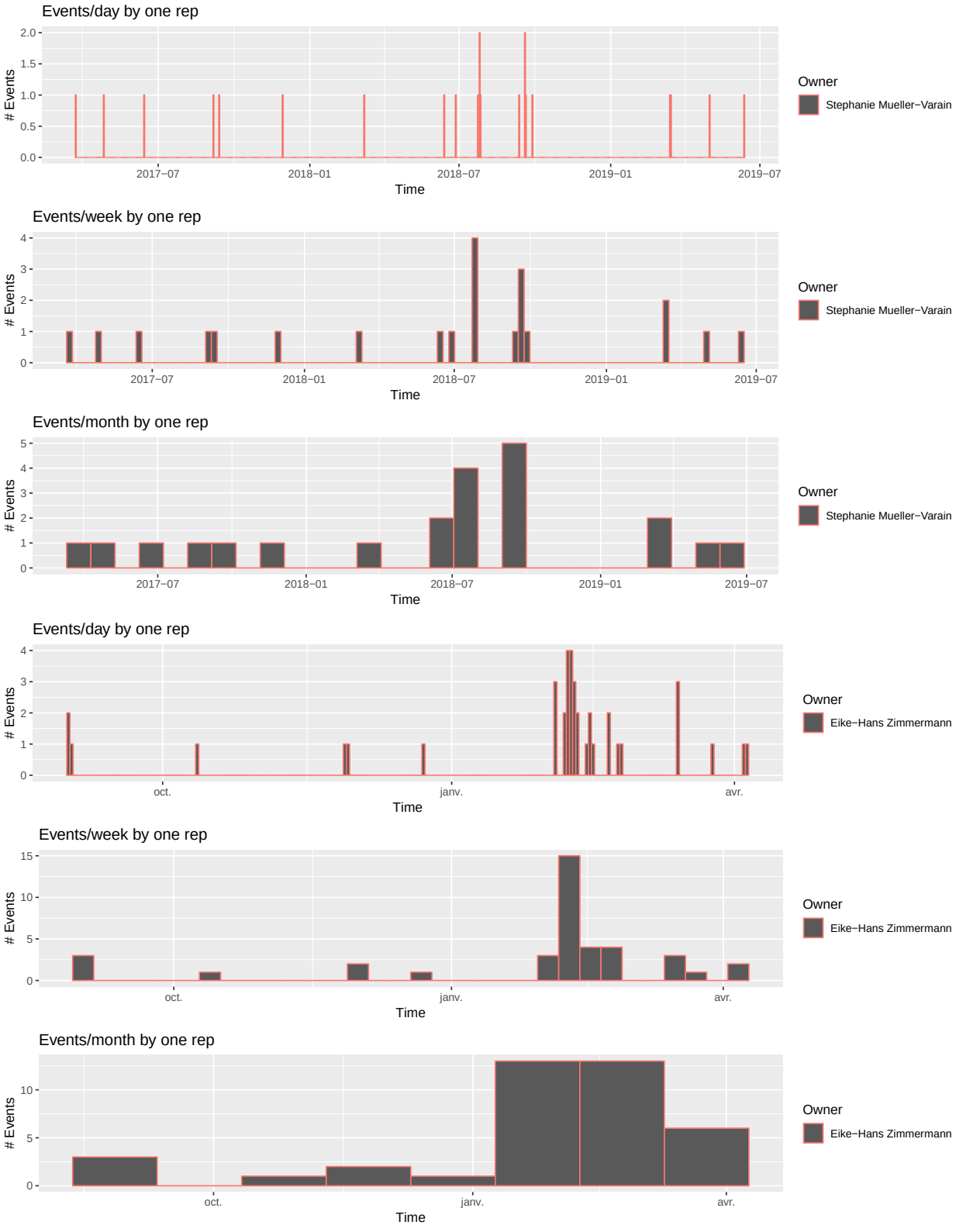
Udo Lendl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Owner
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Events/month by one rep
Events
Time
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Time
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janv.
avr.
Owner
Eike−Hans Zimmermann
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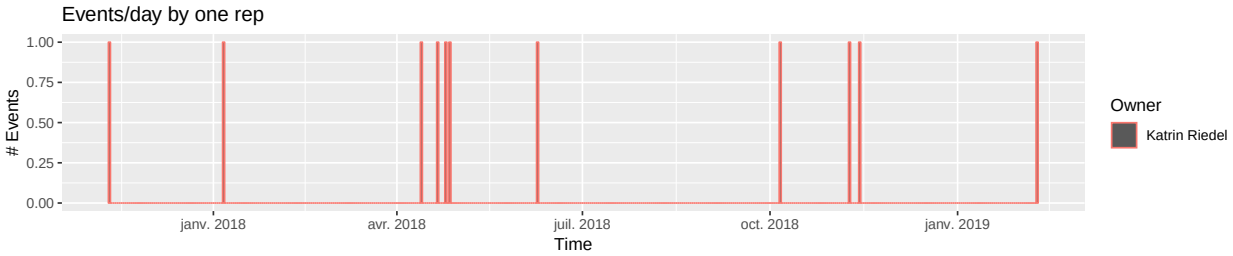
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avr. 2018
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Time
Owner
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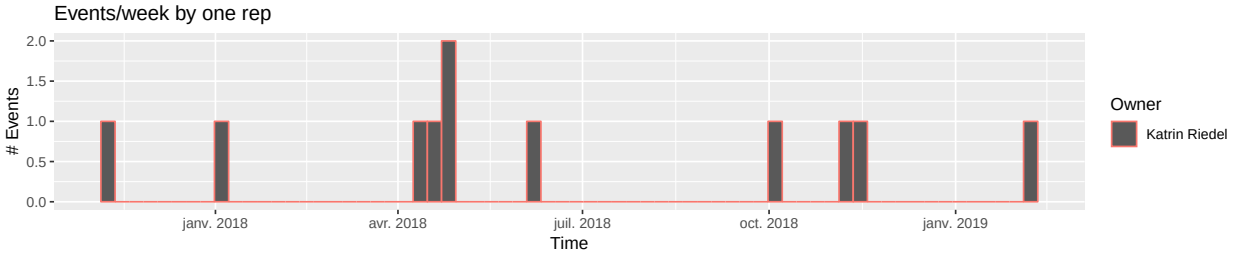
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avr. 2018
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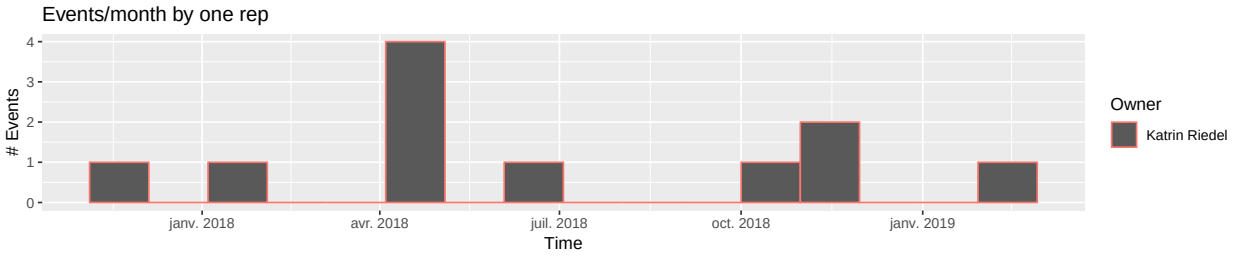
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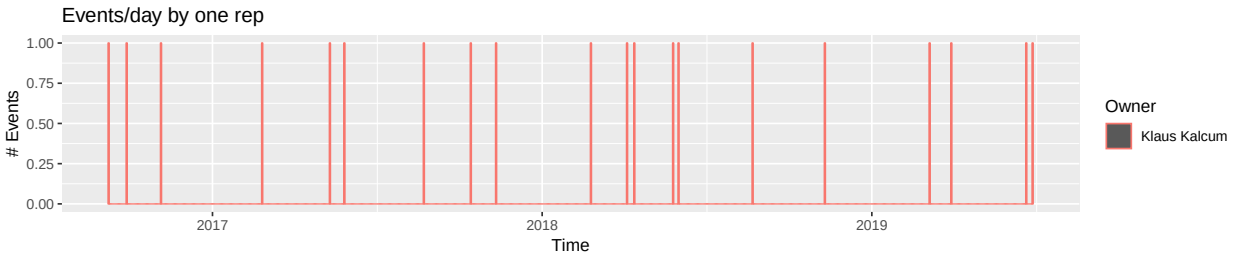
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Time
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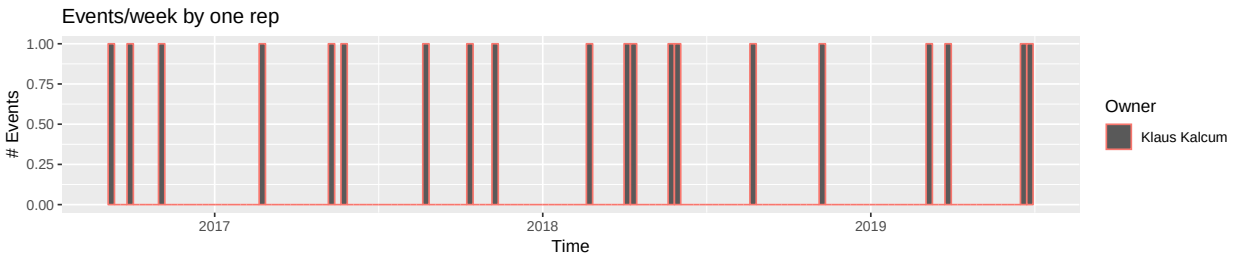
Klaus Kalcum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Time
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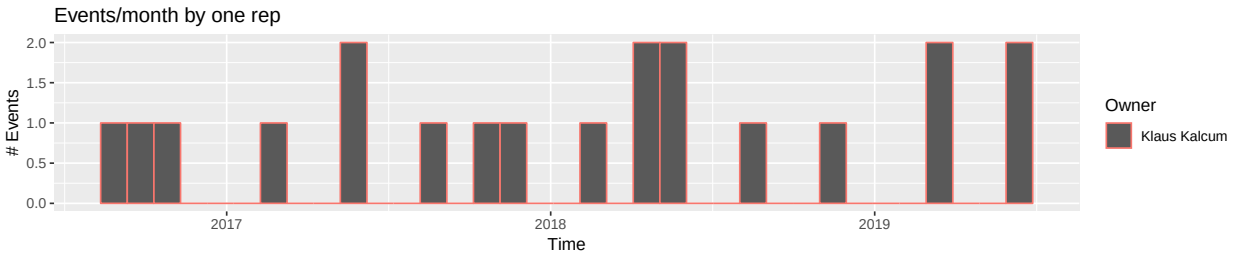
Klaus Kalcum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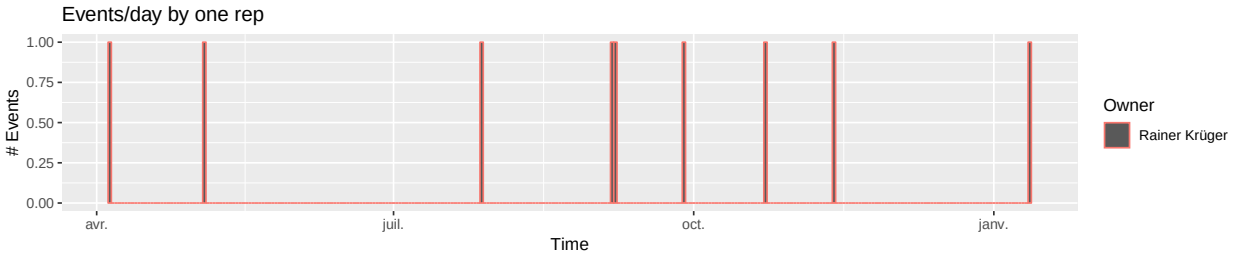
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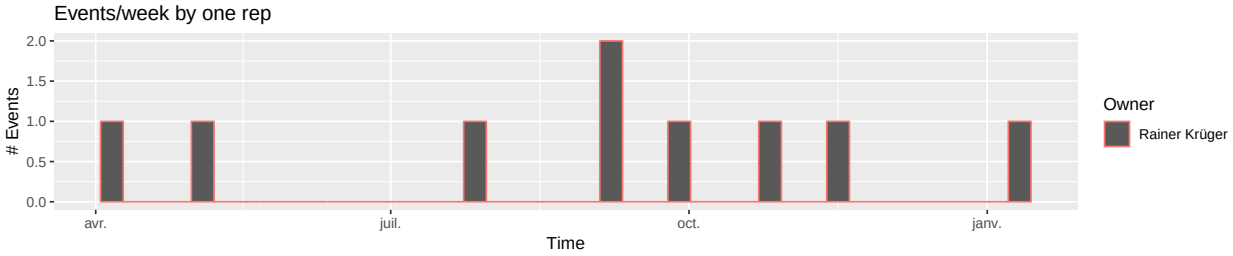
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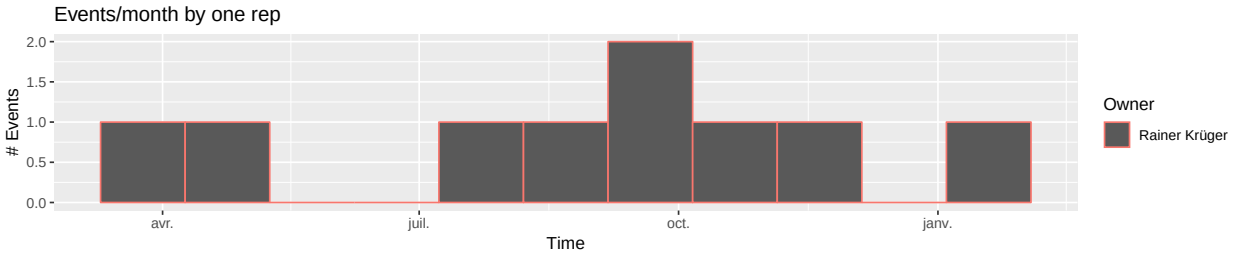
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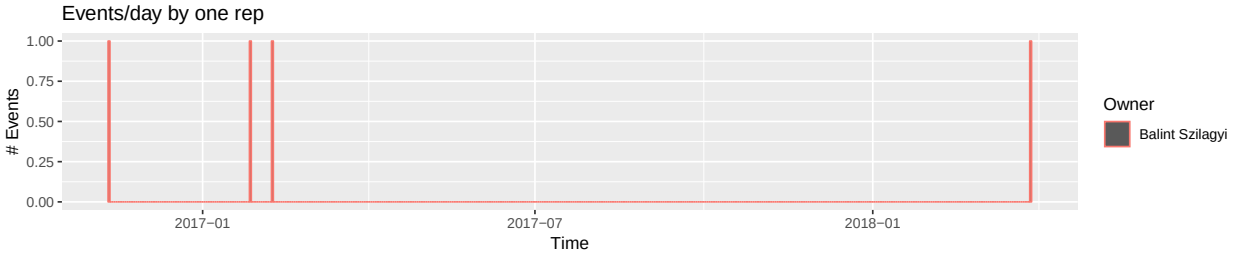
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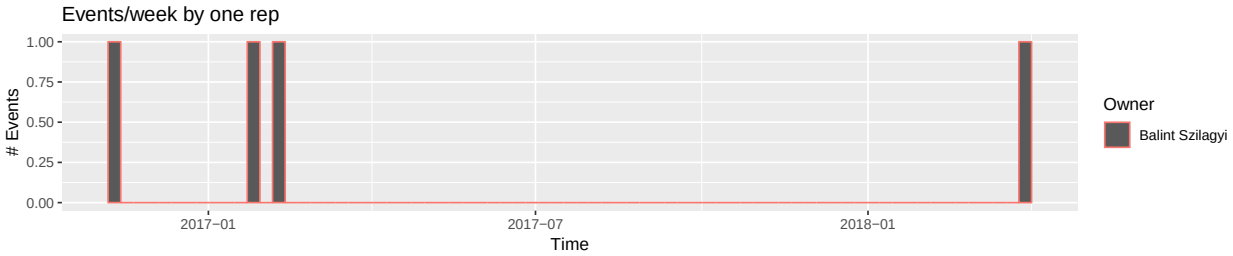
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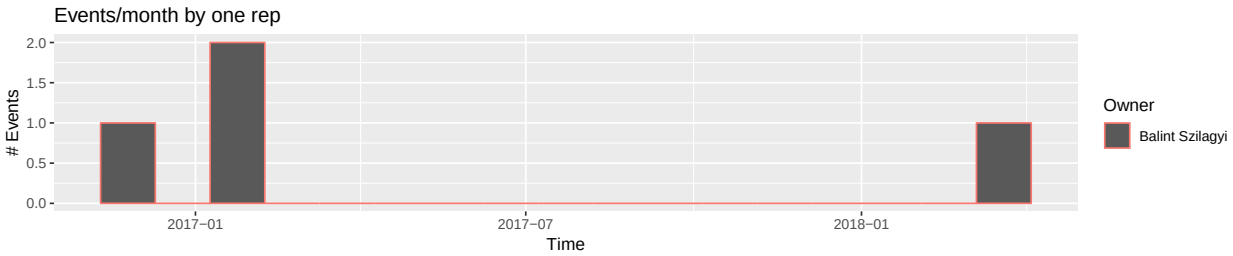
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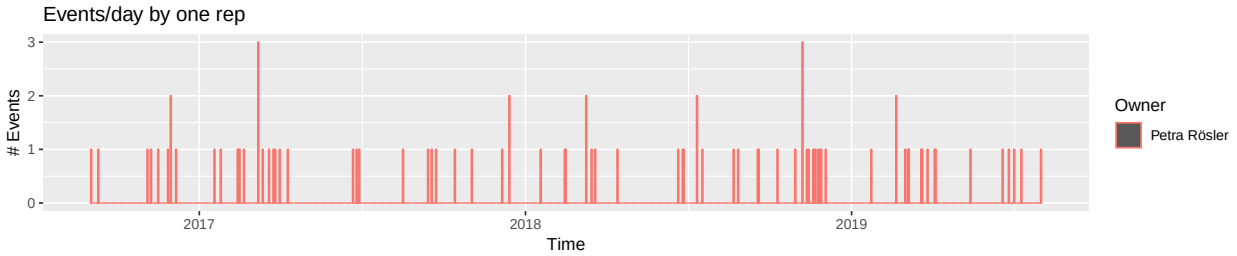
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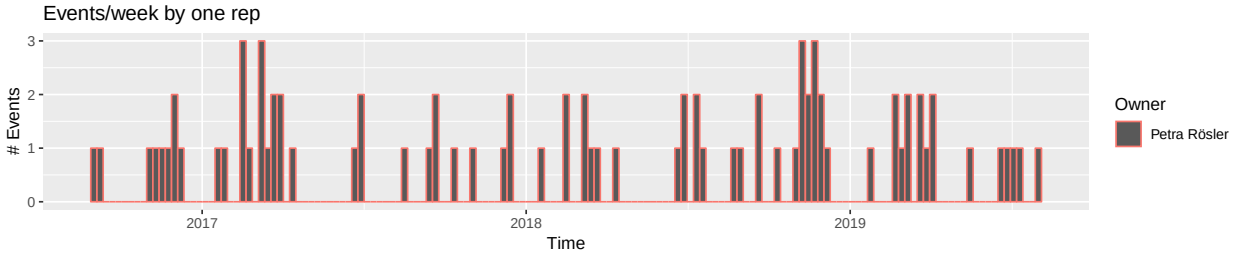
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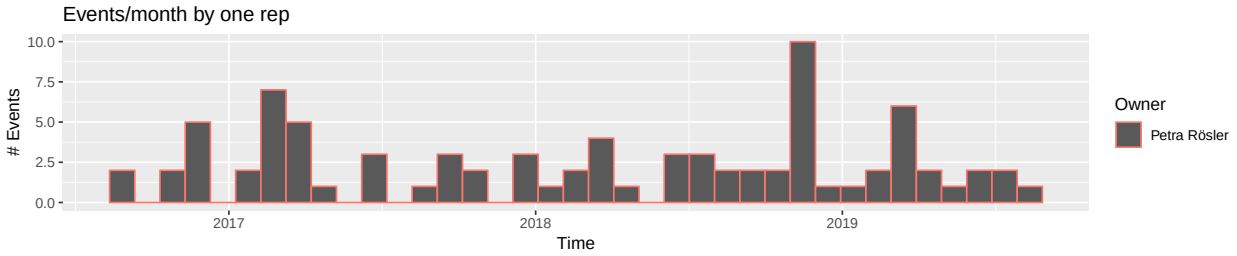
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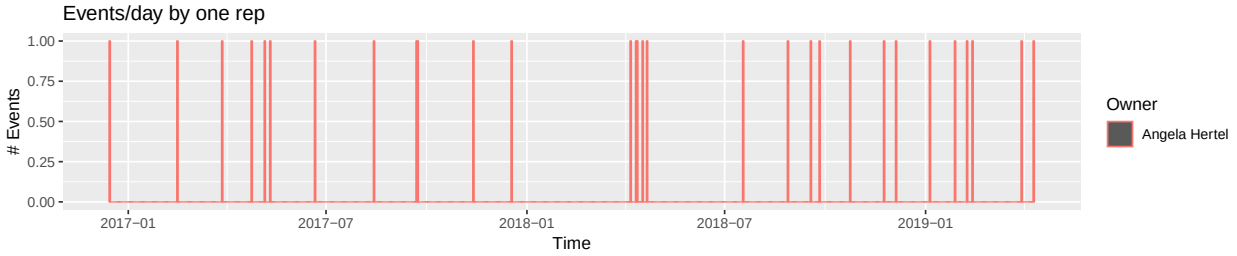
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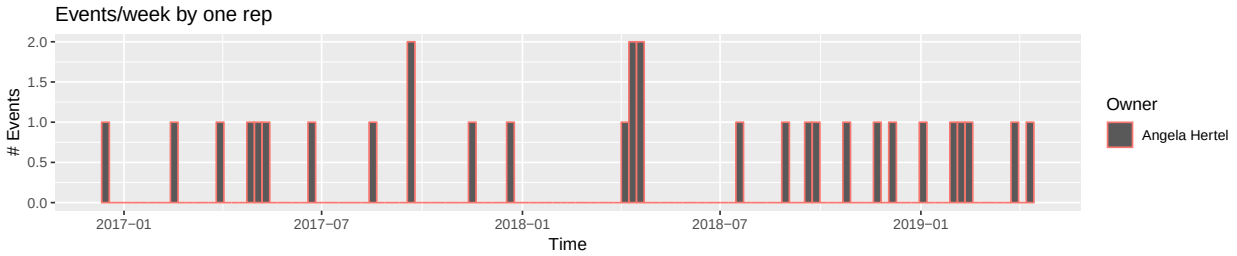
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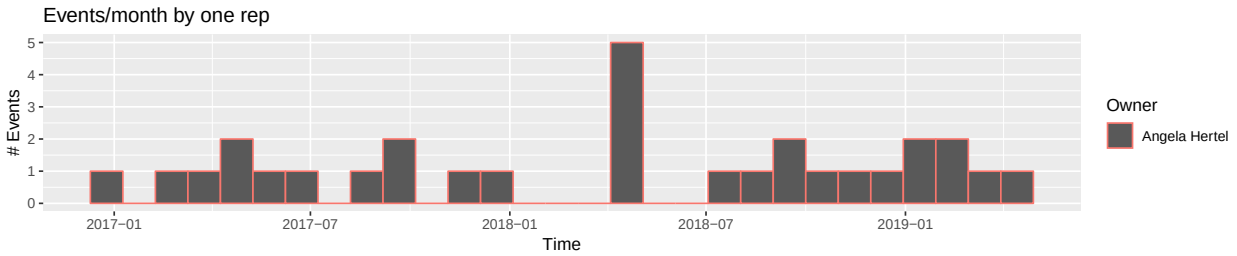
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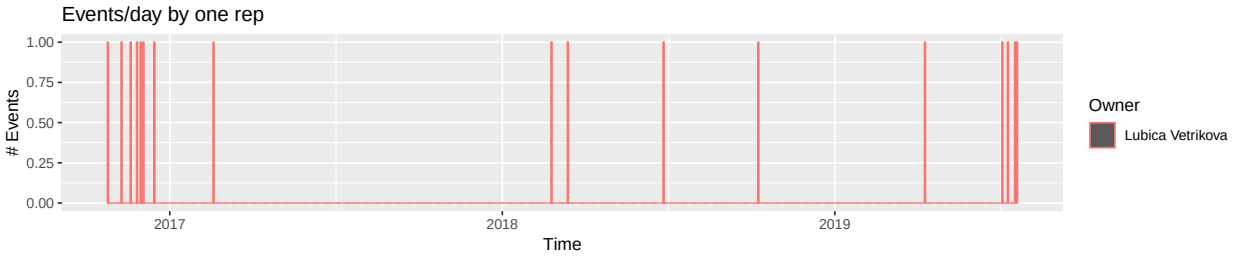
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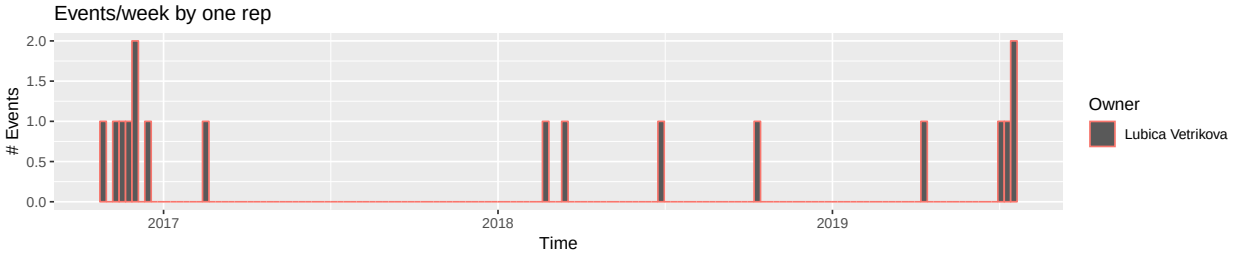
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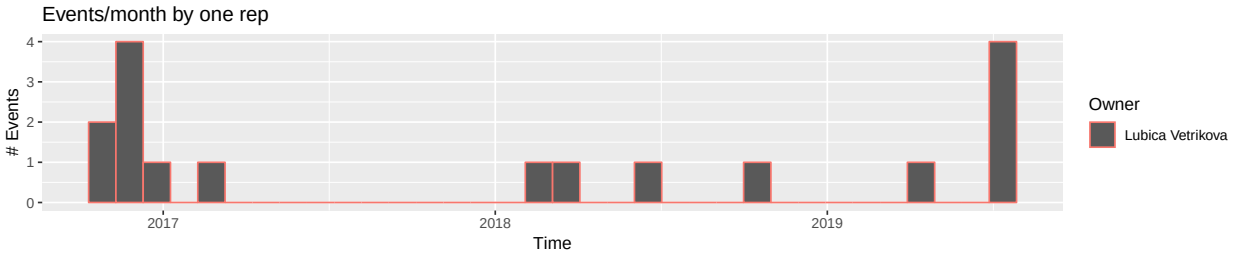
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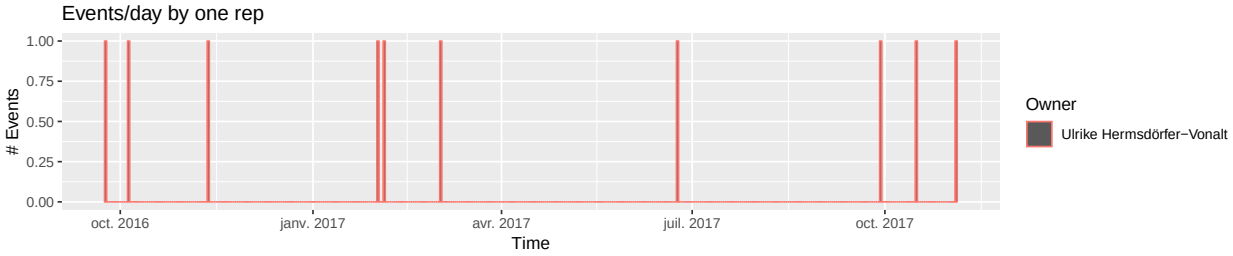
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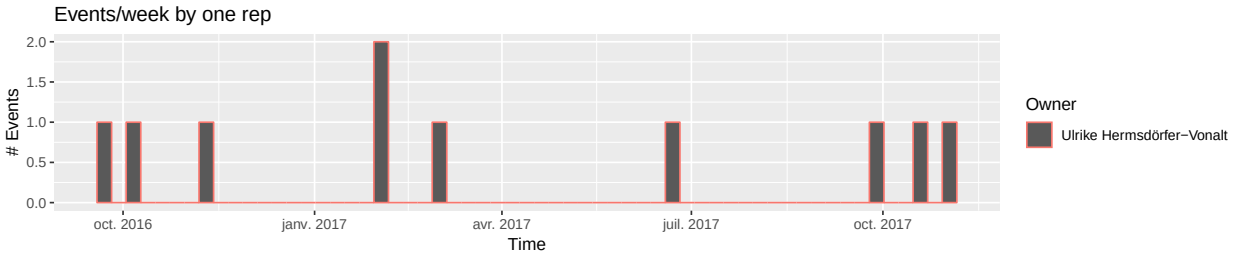
Owner
Ulrike Hermsdörfer−Vonalt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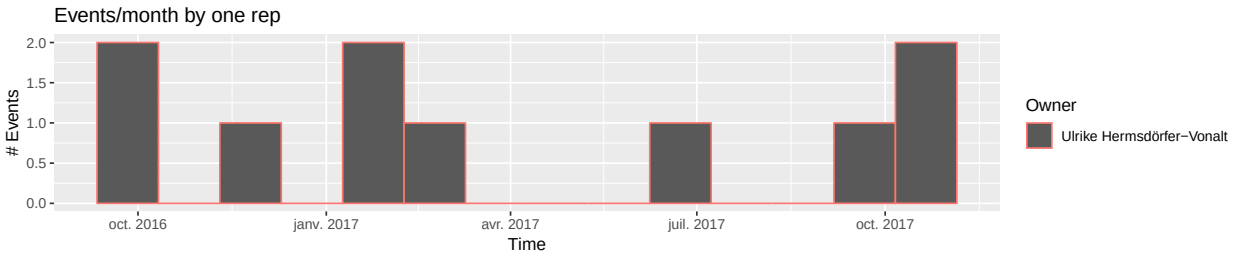
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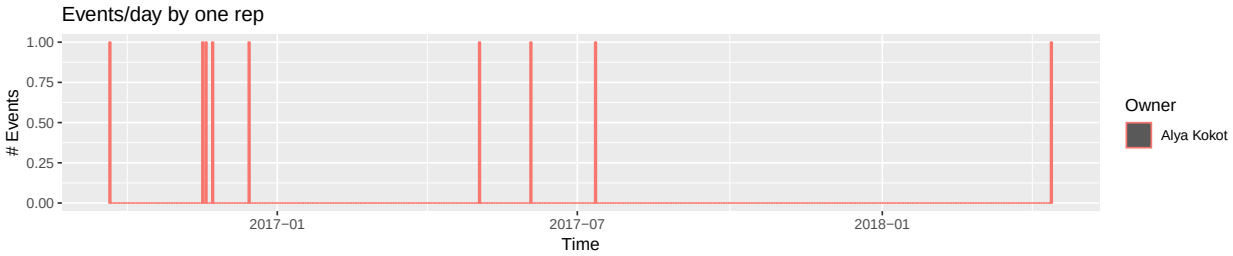
Ulrike Hermsdörfer−Vonalt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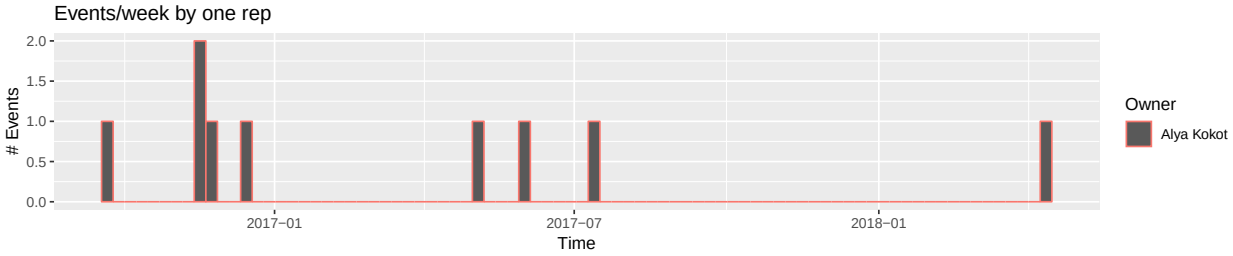
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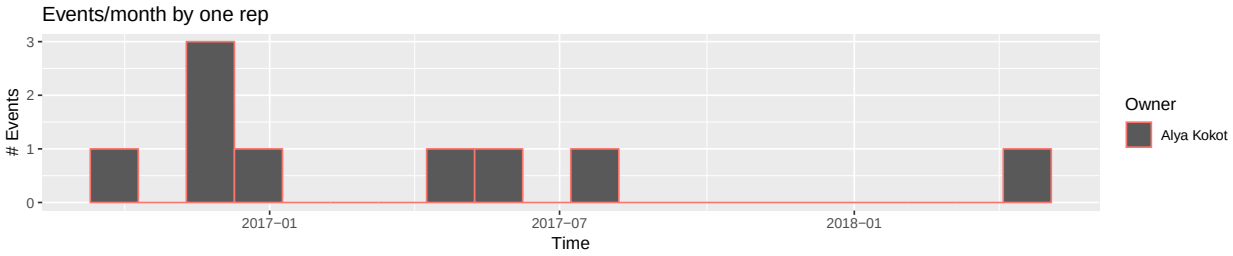
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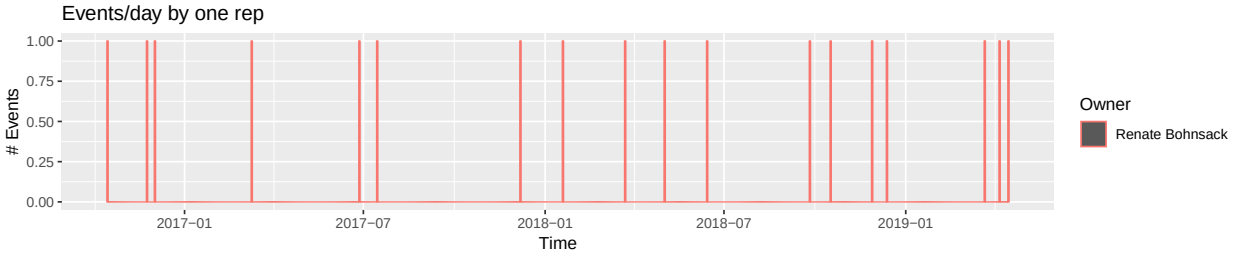
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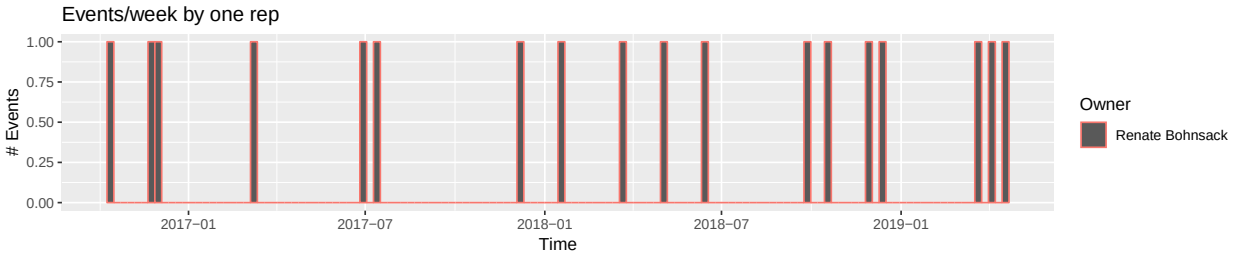
Renate Bohnsack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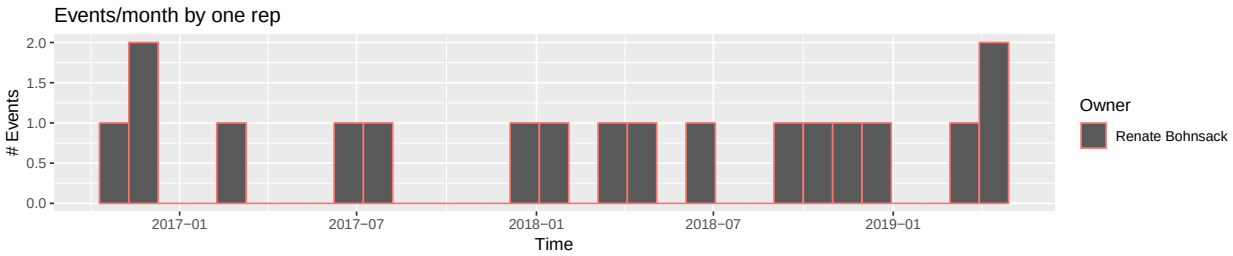
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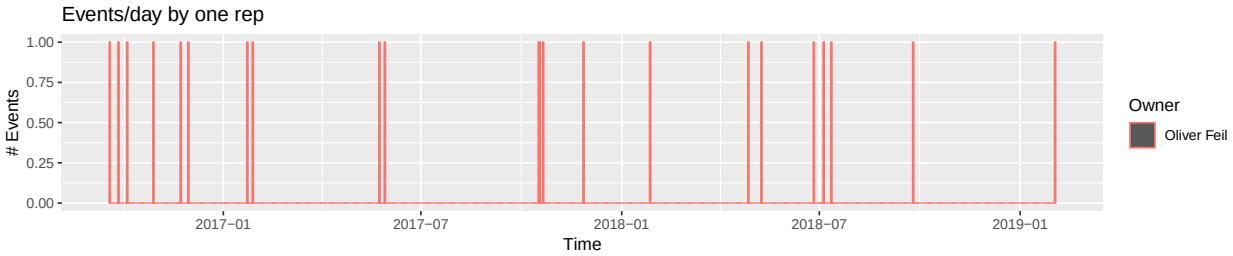
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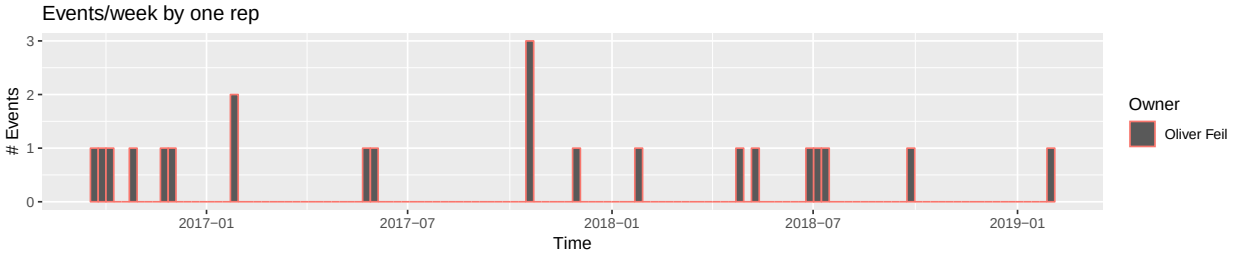
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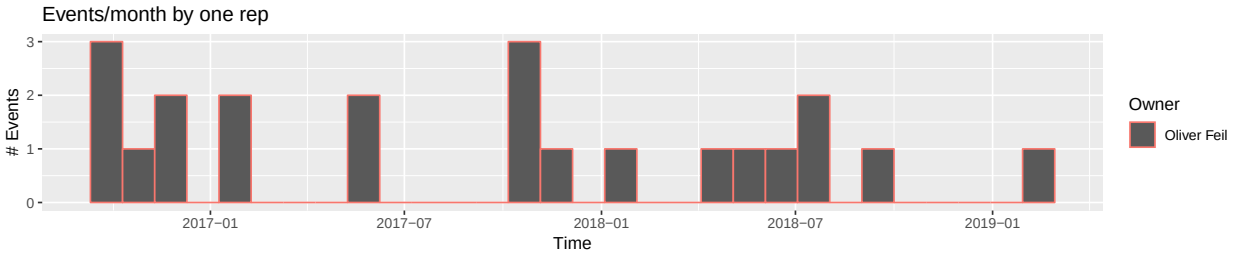
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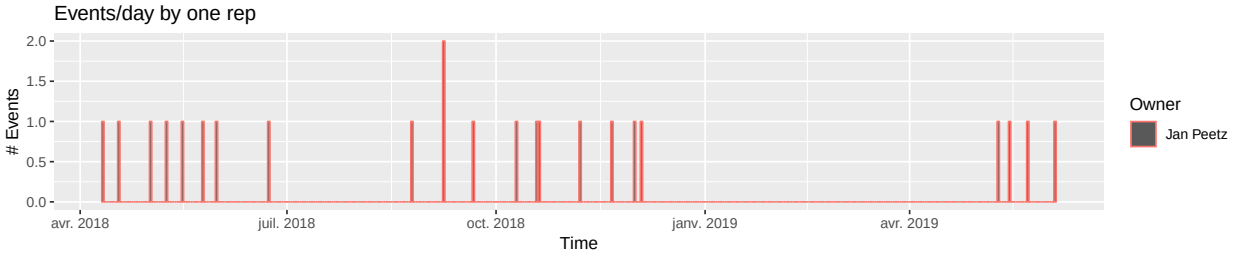
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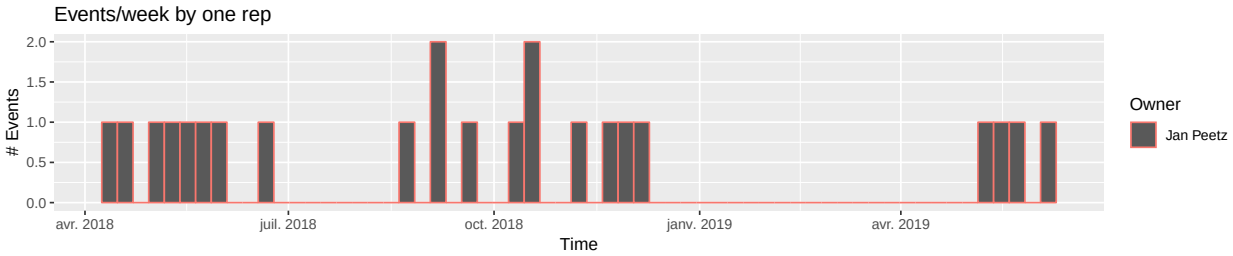
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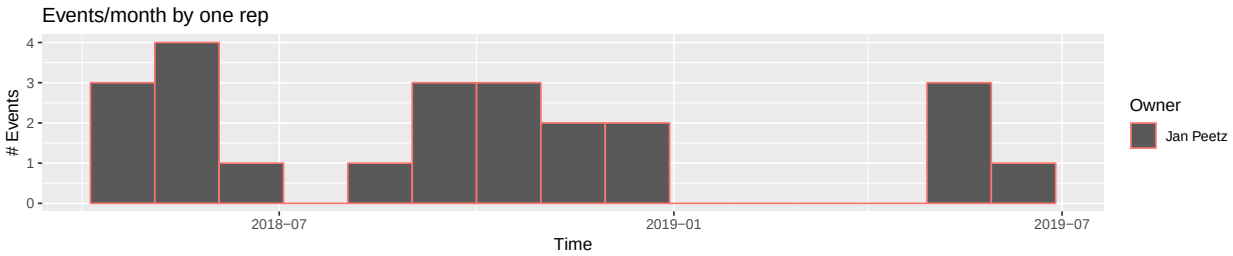
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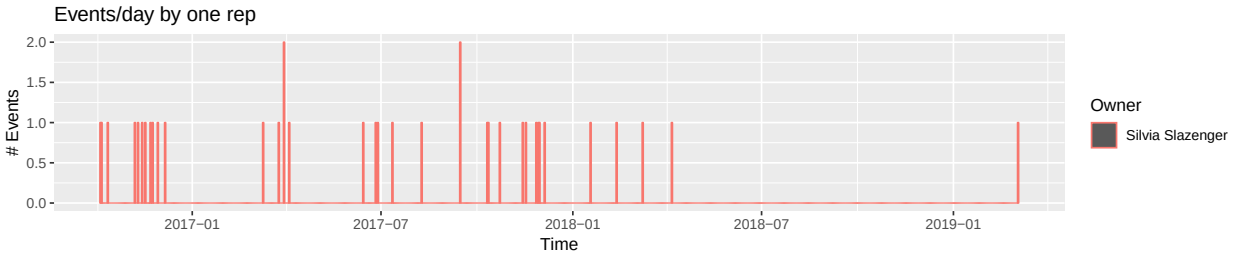
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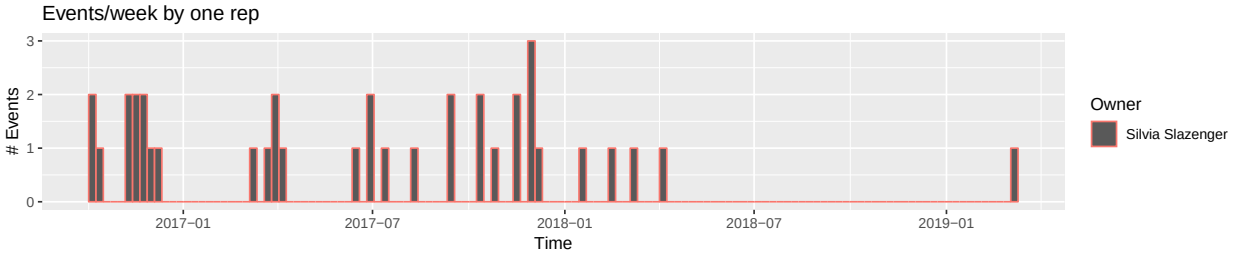
Silvia Slazenger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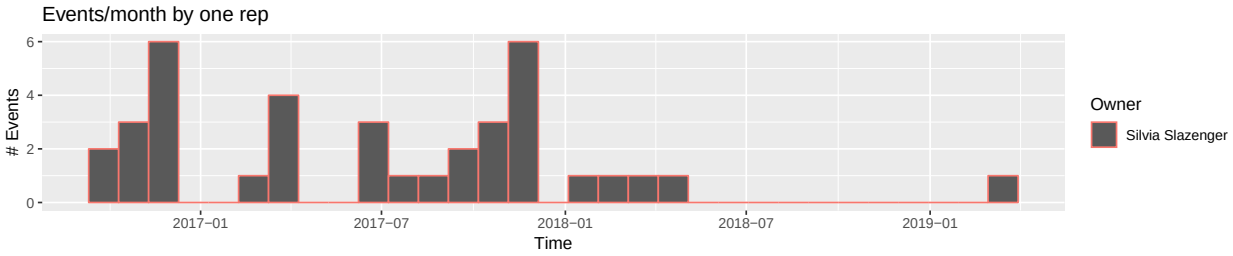
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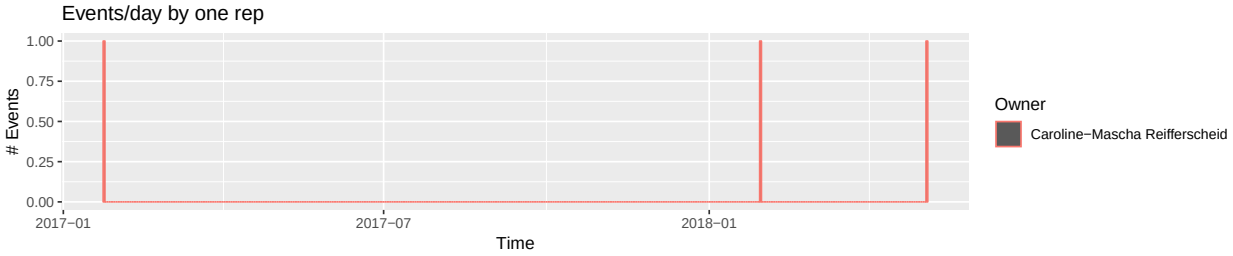
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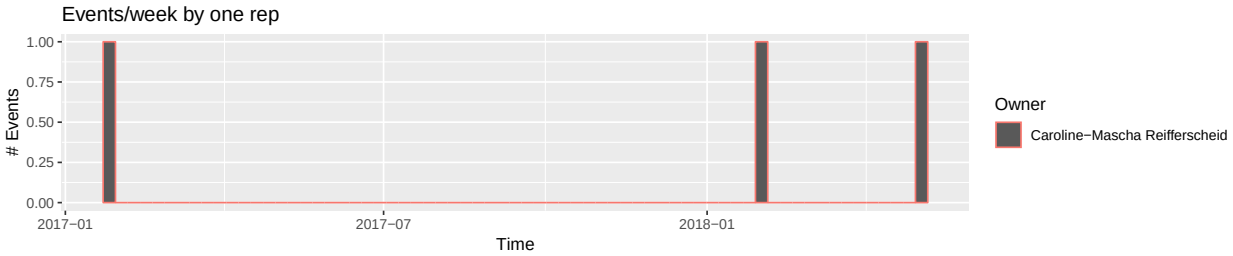
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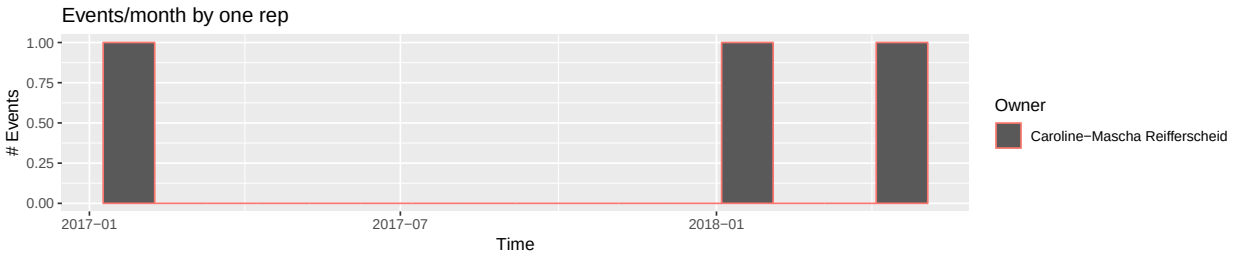
2017–07
2018–01
Time
Owner
Caroline−Mascha Reifferscheid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Time
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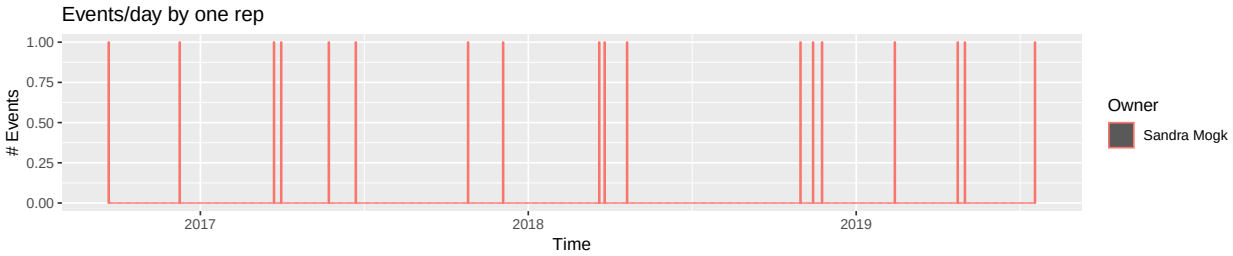
Caroline−Mascha Reifferscheid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2017
2018
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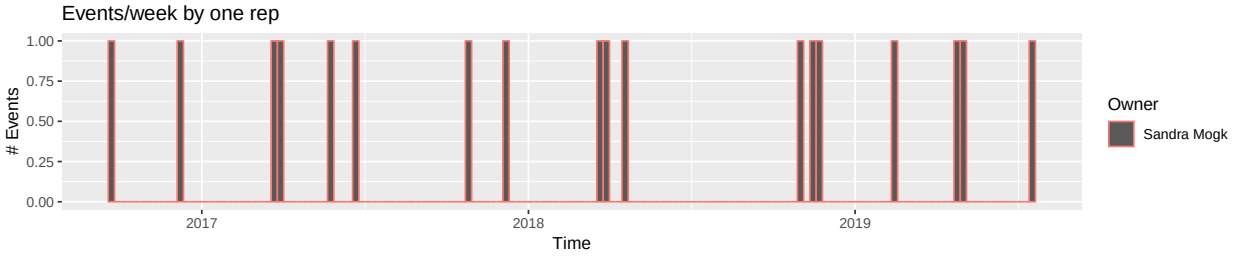
Time
Owner
Sandra Mogk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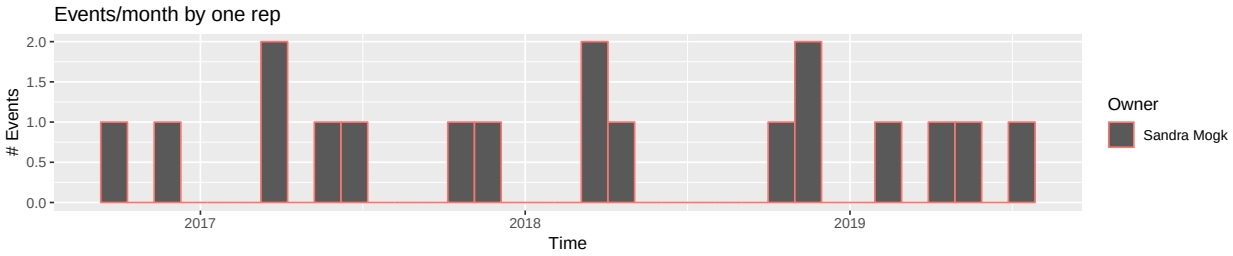
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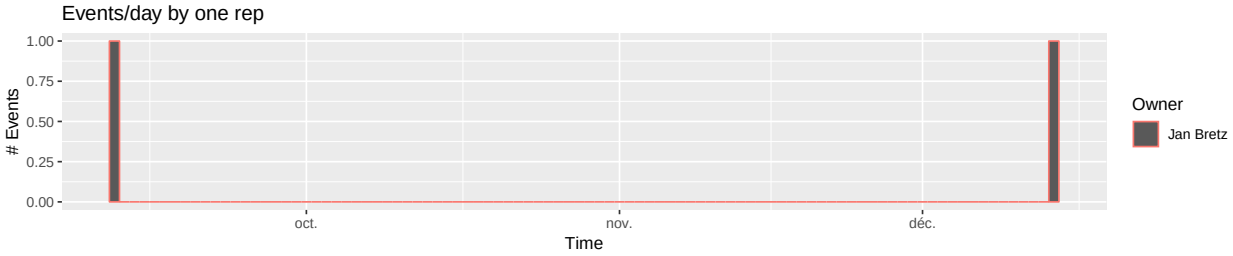
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Time
Owner
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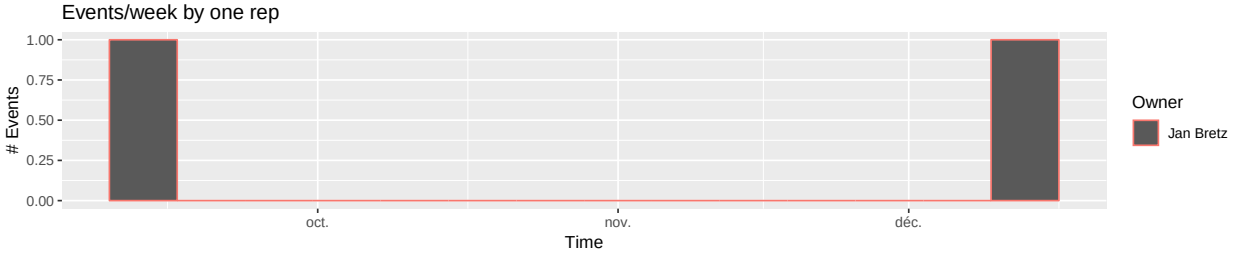
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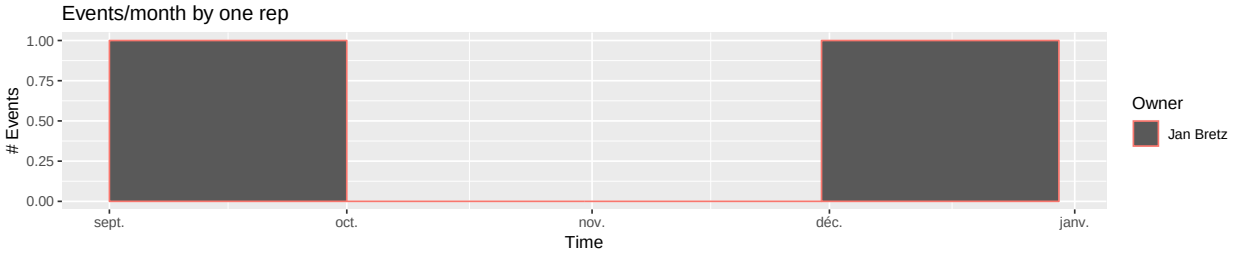
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Owner
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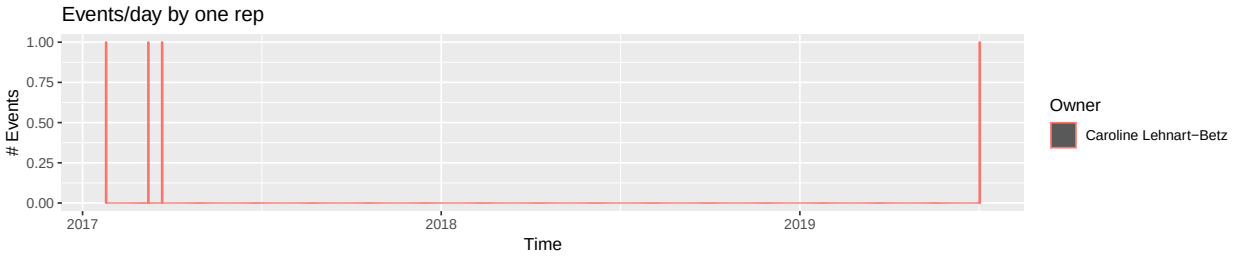
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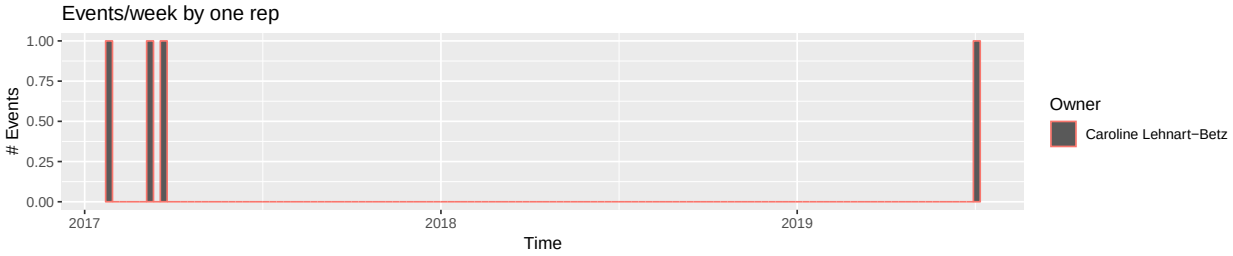
Caroline Lehnart−Betz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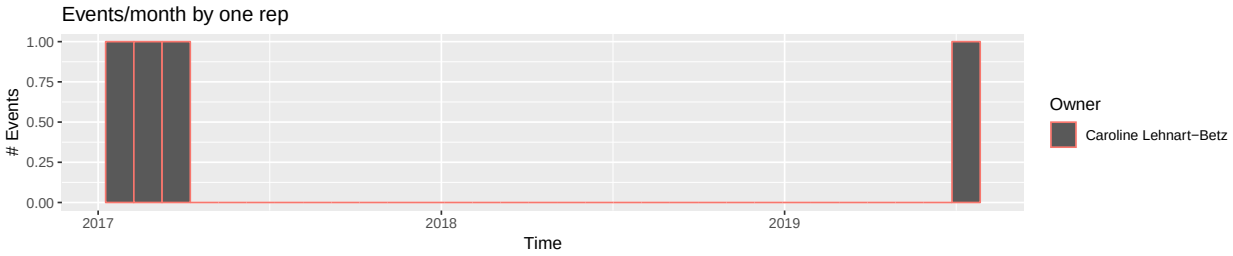
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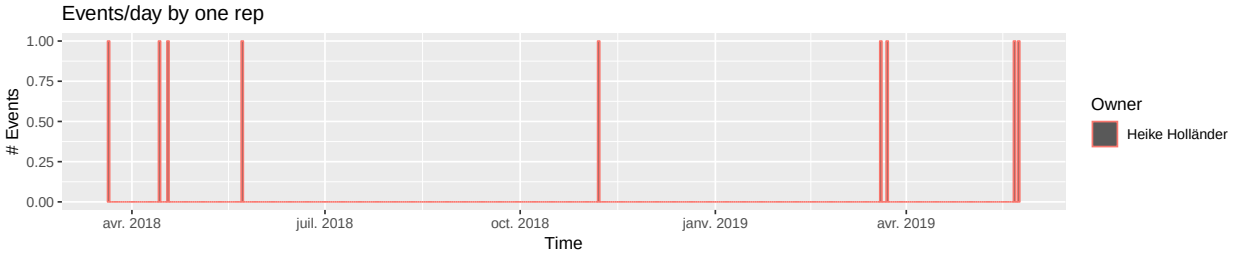
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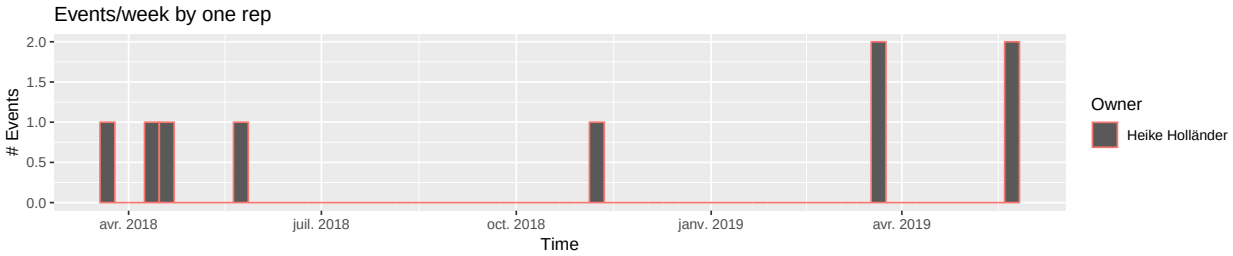
Time
Owner
Heike Holländer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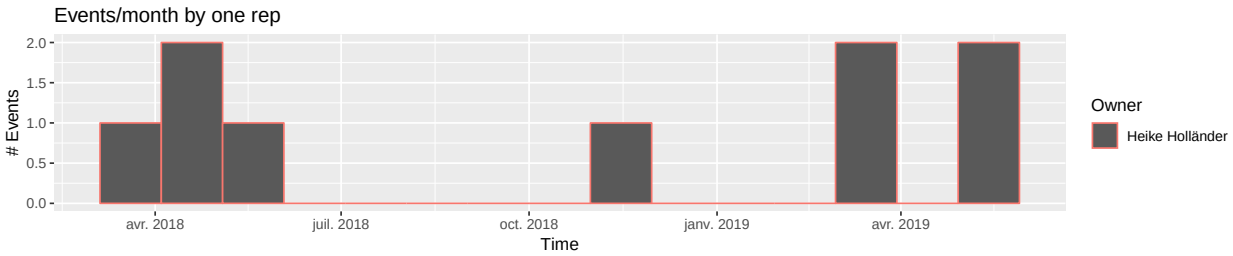
Heike Holländer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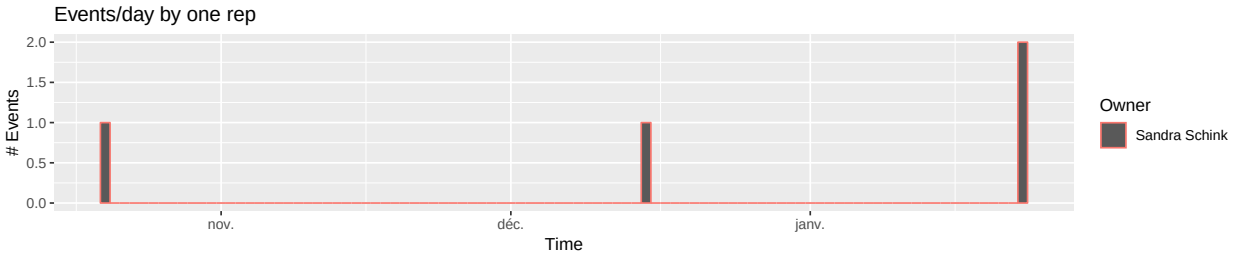
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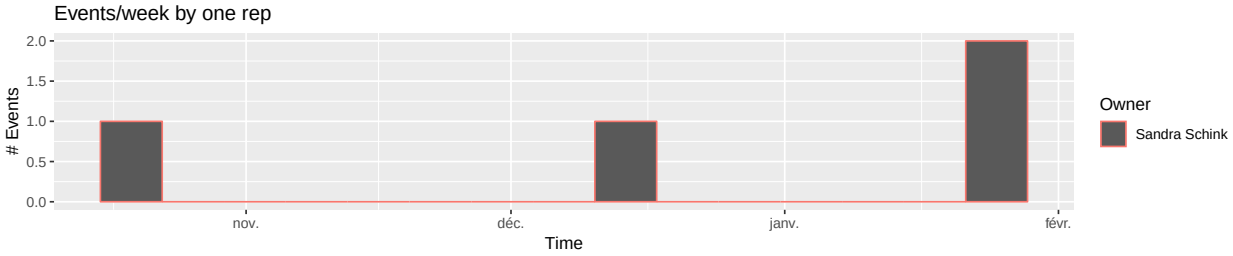
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Time
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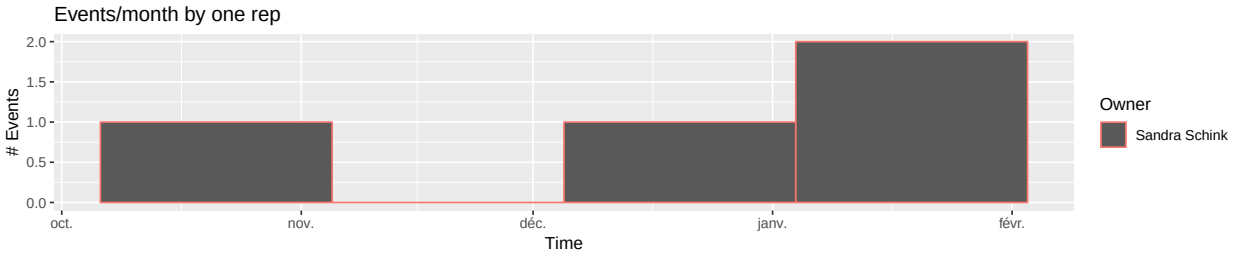
Sandra Schink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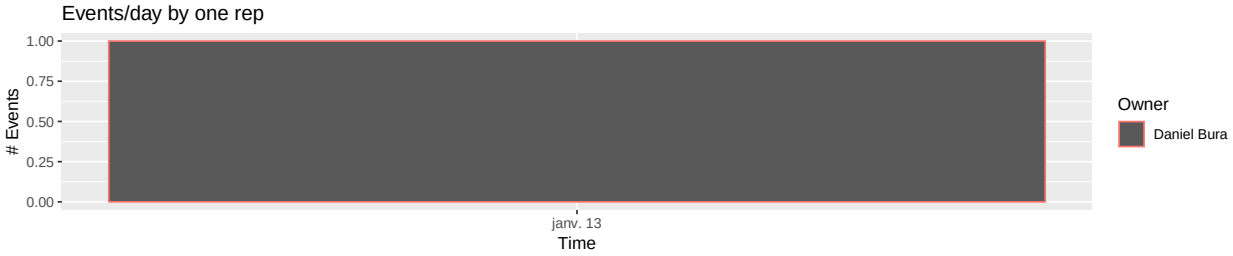
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Time
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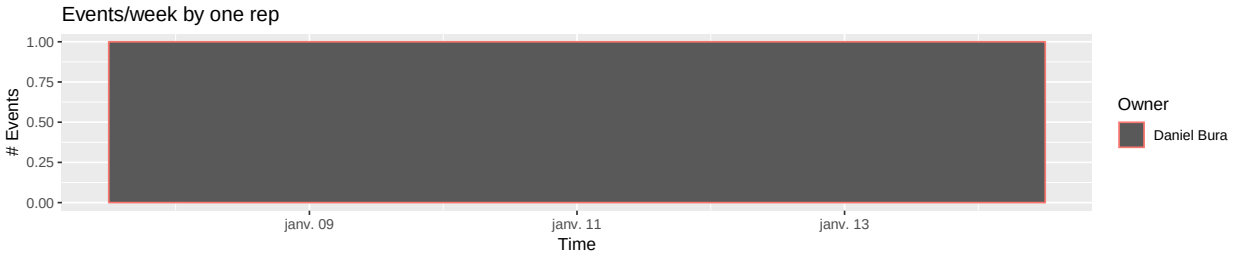
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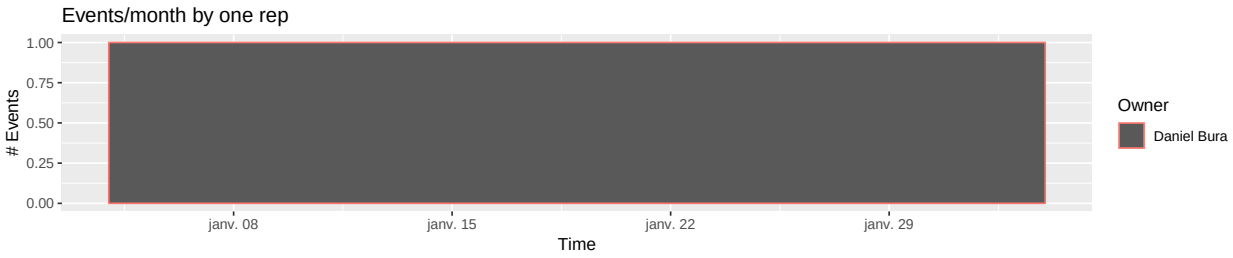
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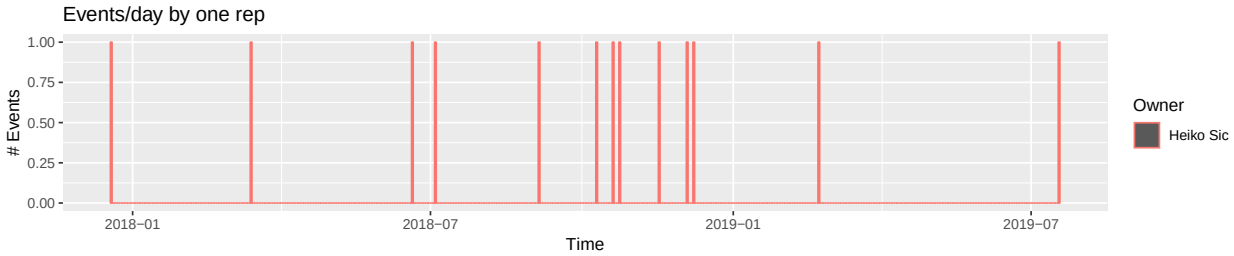
Owner
Daniel Bura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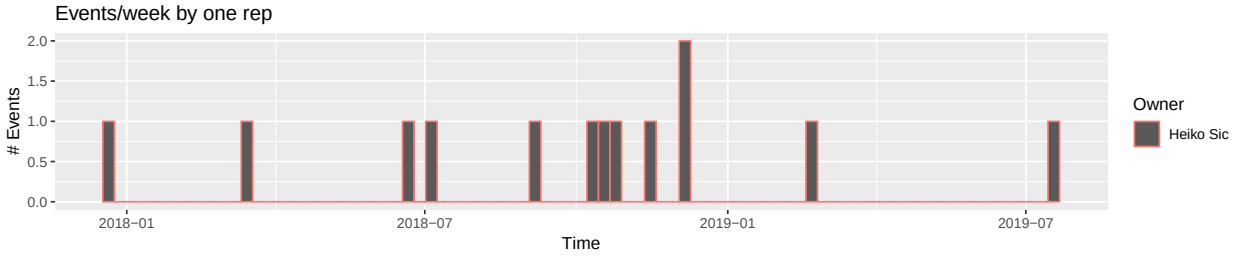
Time
Owner
Heiko Sic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Time
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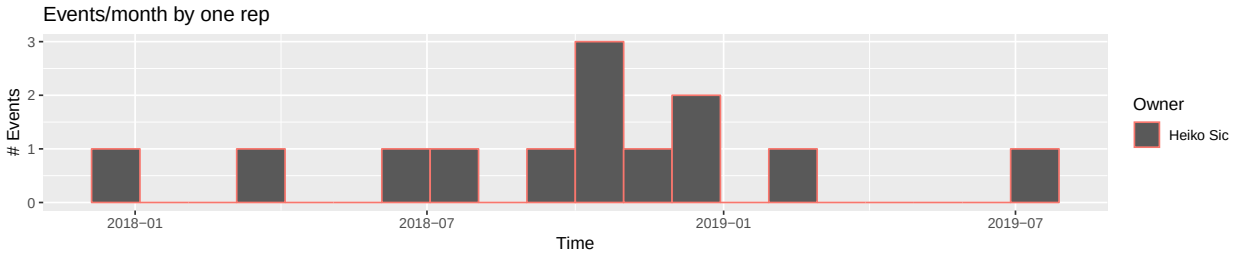
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Time
Owner
Heiko Sic


Events/day by one rep
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Time
Owner
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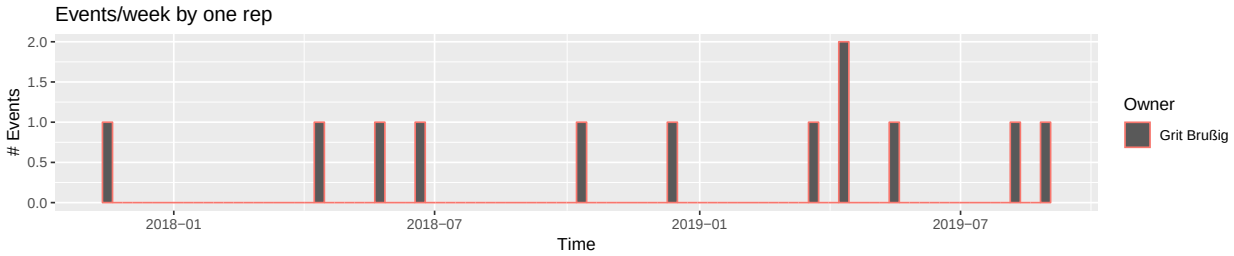
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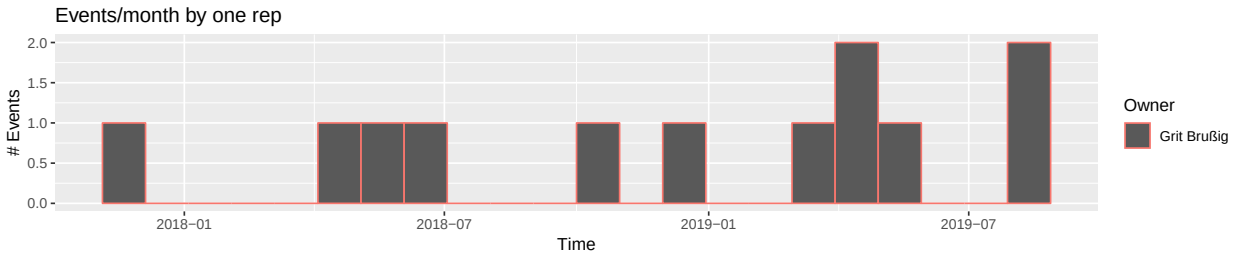
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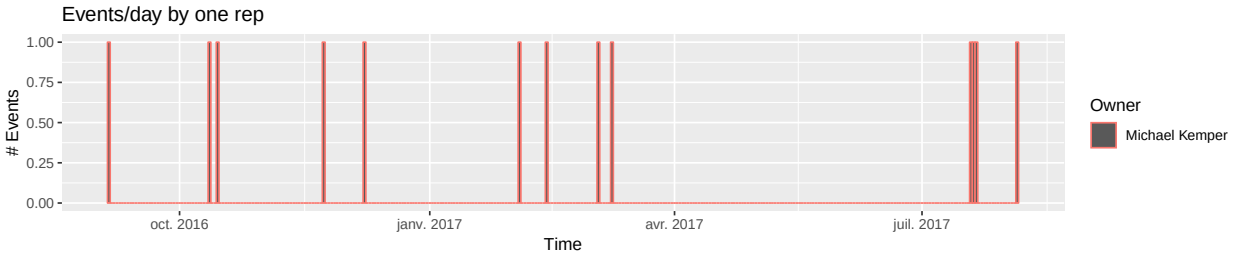
Grit Brußig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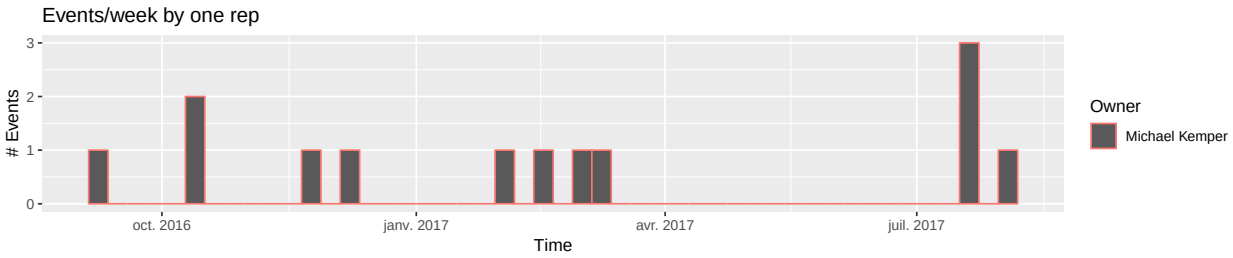
Time
Owner
Michael Kemper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Time
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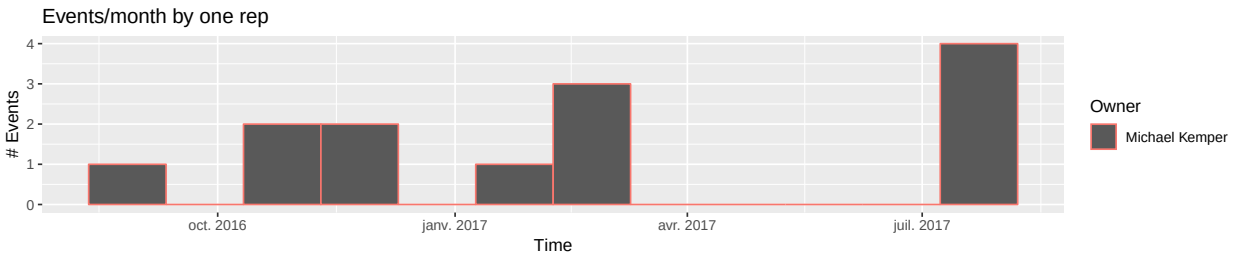
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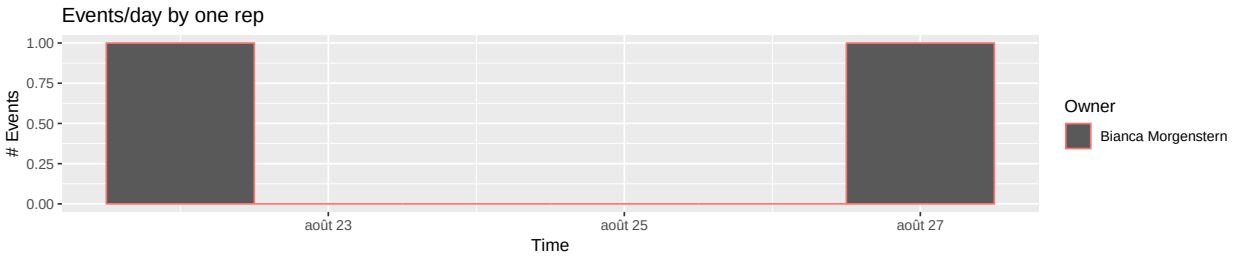
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Time
Owner
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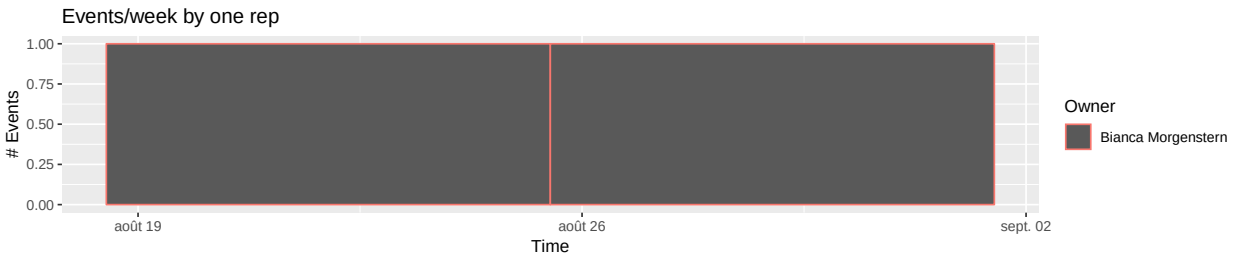
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août 19
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Time
Owner
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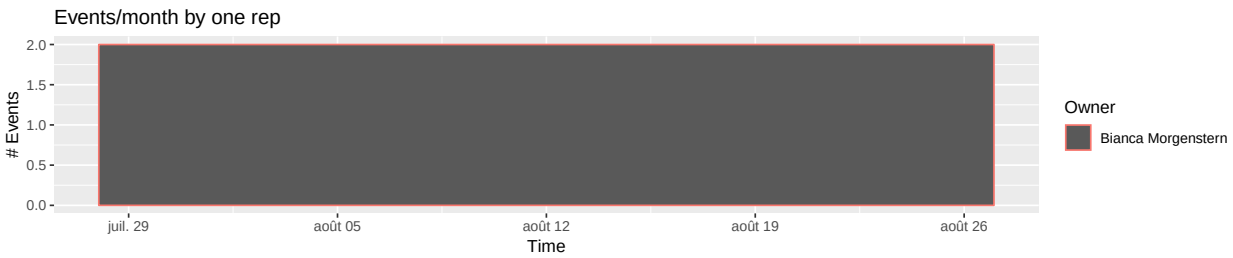
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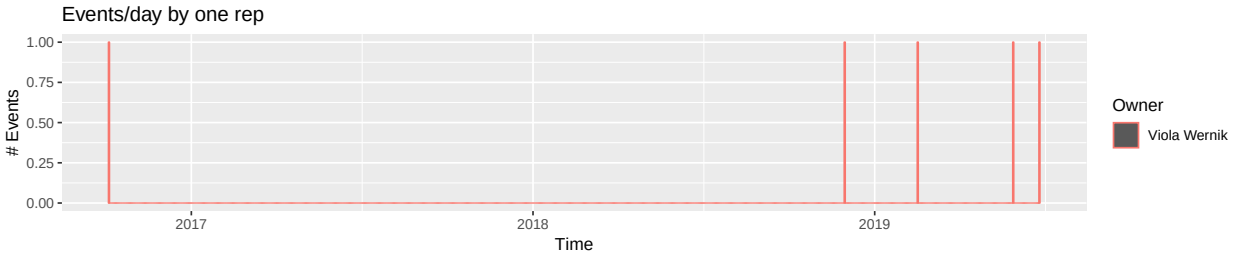
Time
Owner
Bianca Morgenstern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Owner
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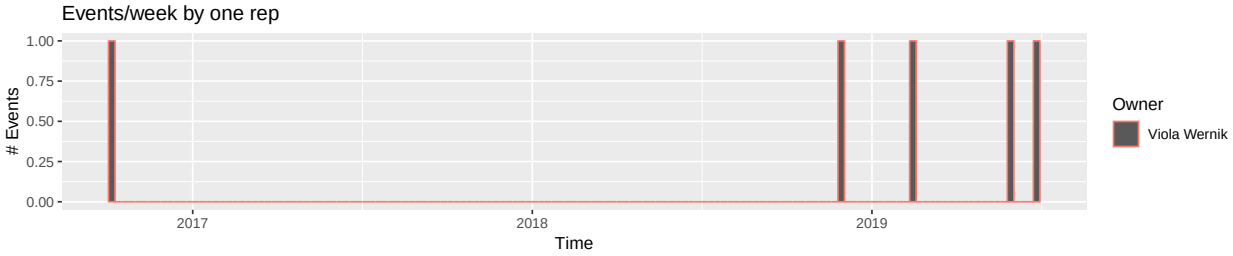
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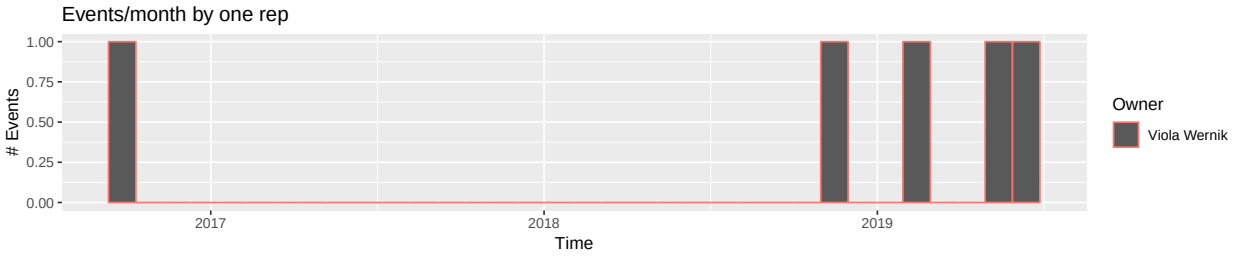
Viola Wernik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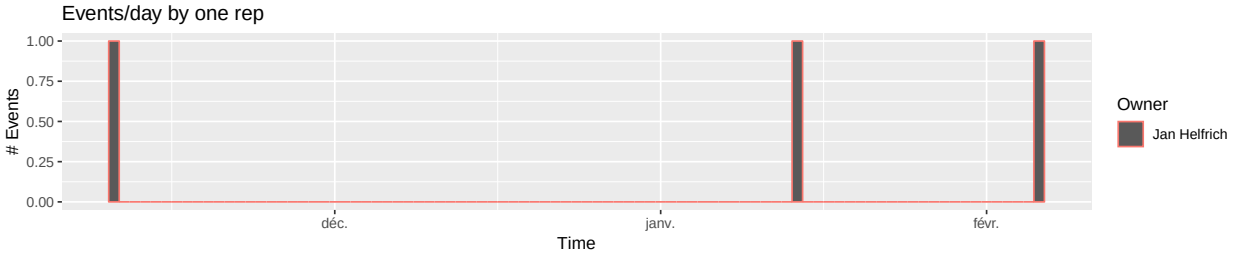
Viola Wernik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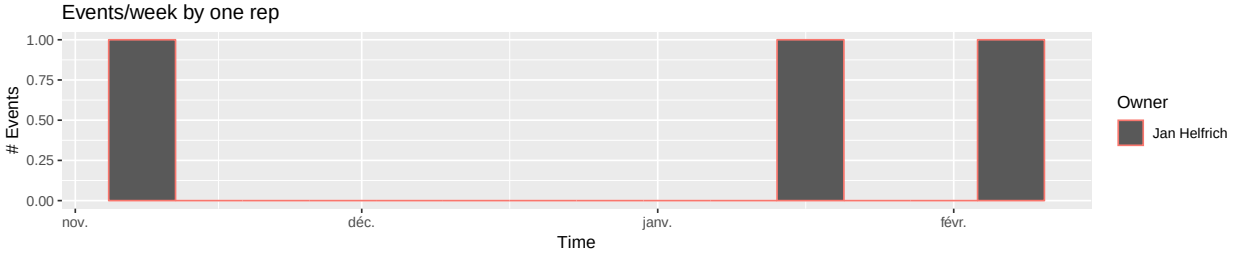
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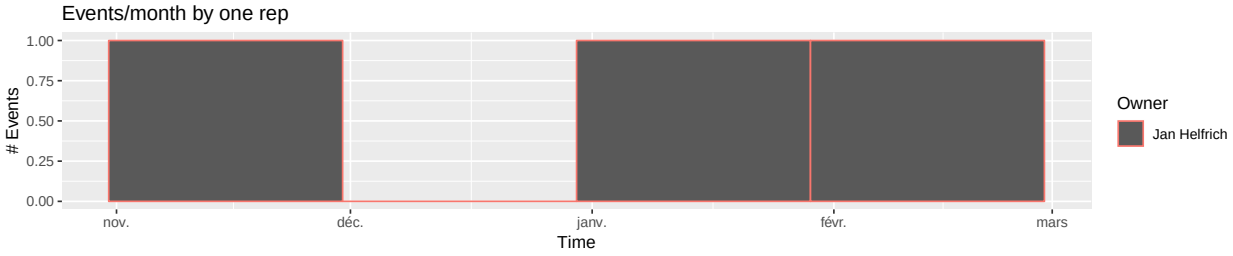
Jan Helfrich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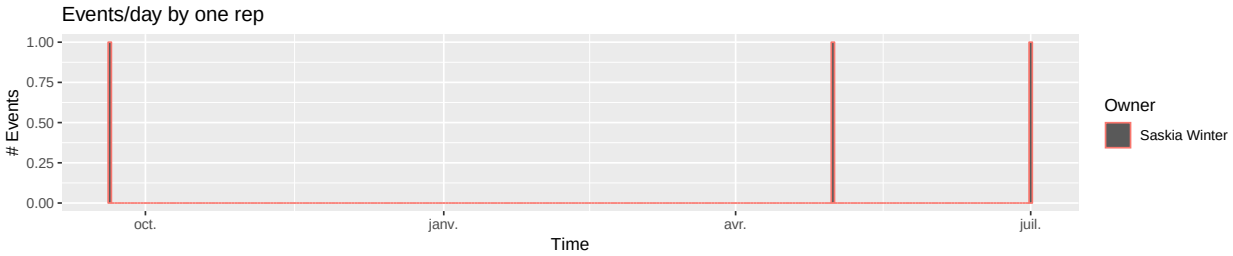
0.00
nov.
déc.
janv.
févr.
mars
Time
Owner
Jan Helfrich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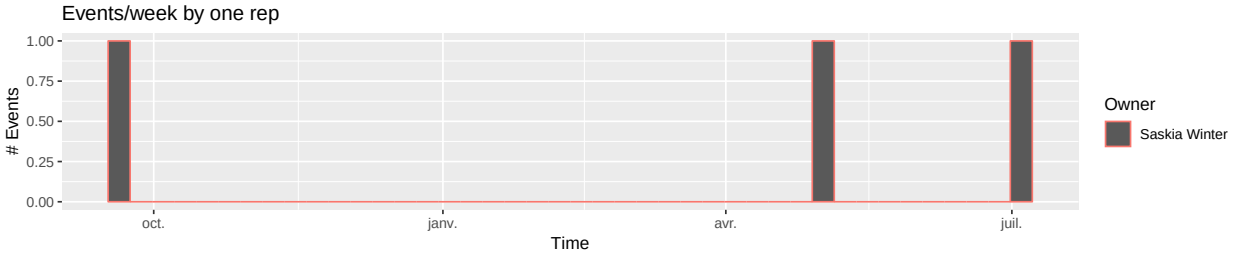
0.25
0.00
oct.
janv.
avr.
juil.
Time
Owner
Saskia Winter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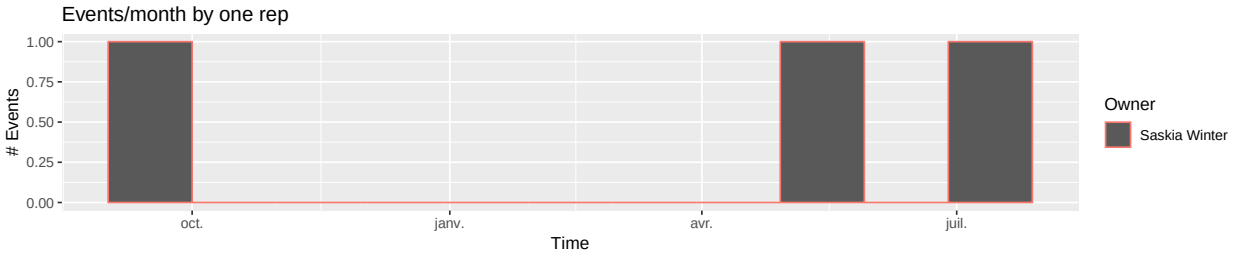
oct.
janv.
avr.
juil.
Time
Owner
Saskia Winter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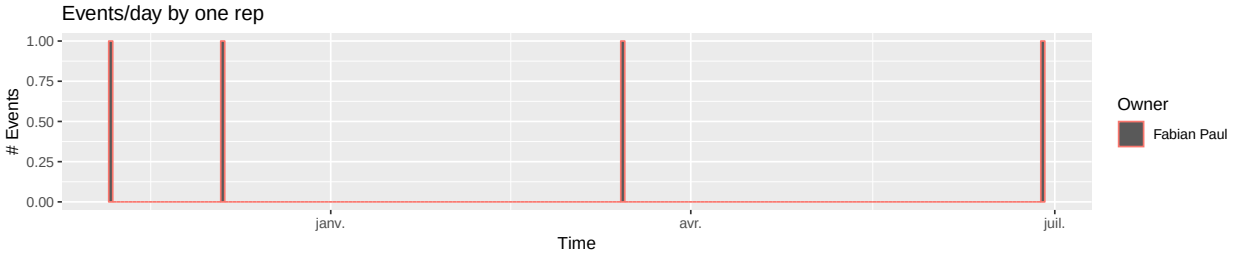
0.25
0.00
oct.
janv.
avr.
juil.
Time
Owner
Saskia Winter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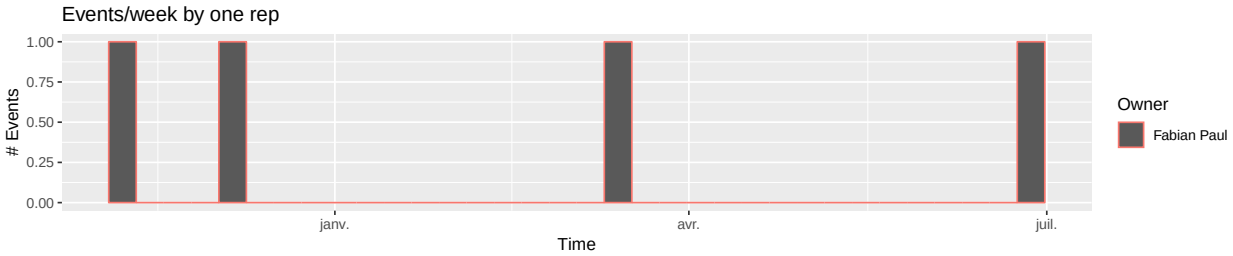
0.50
0.25
0.00
janv.
avr.
juil.
Time
Owner
Fabian Paul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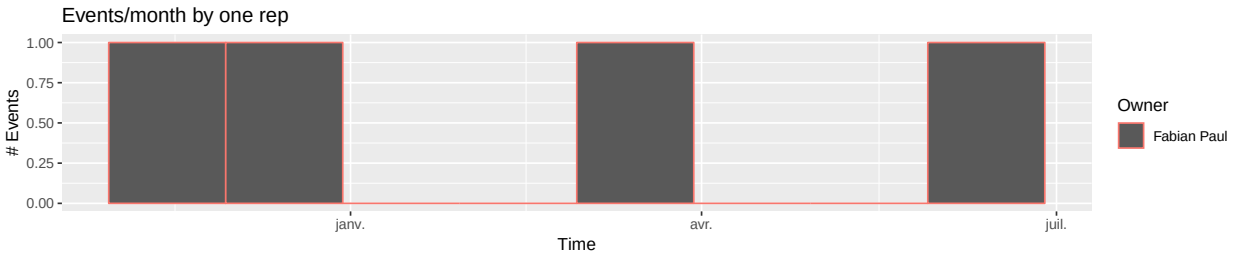
0.50
0.25
0.00
janv.
avr.
juil.
Time
Owner
Fabian Paul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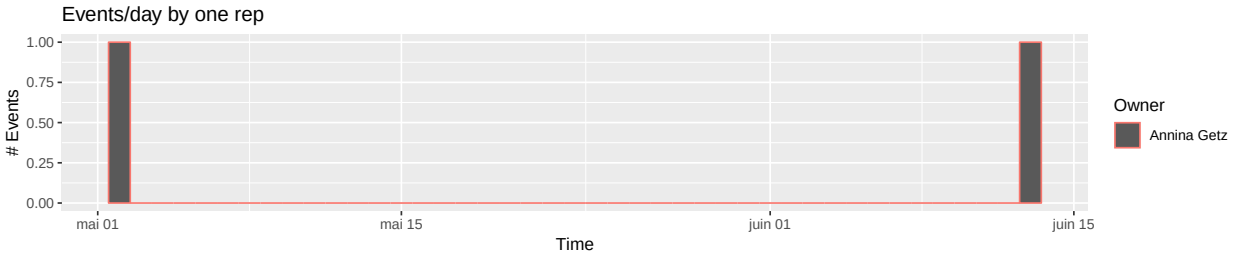
0.00
janv.
avr.
juil.
Time
Owner
Fabian Paul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Events
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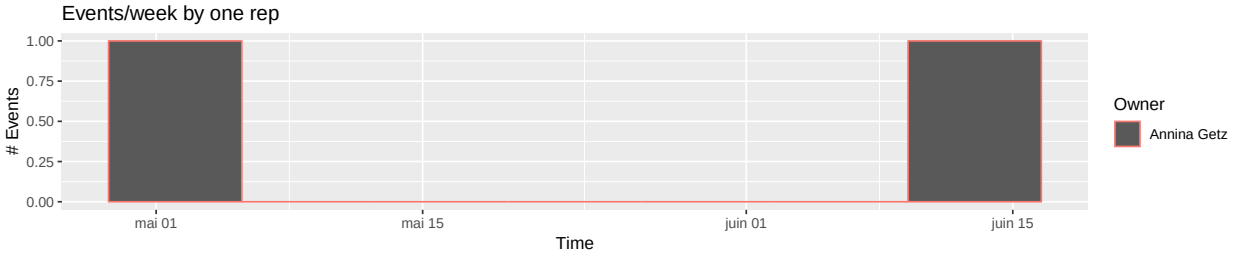
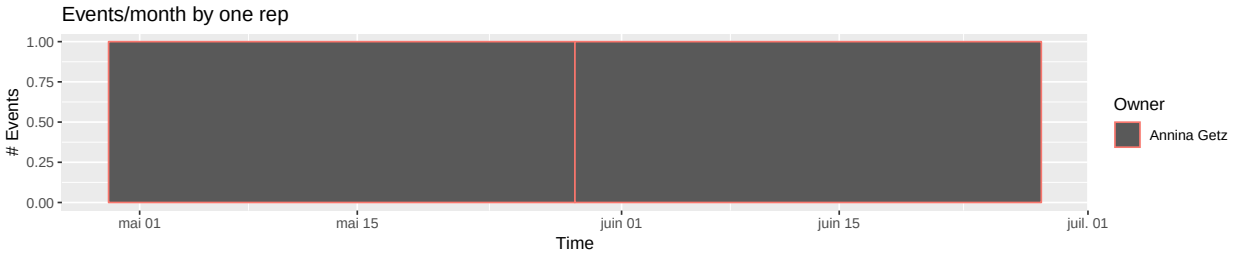
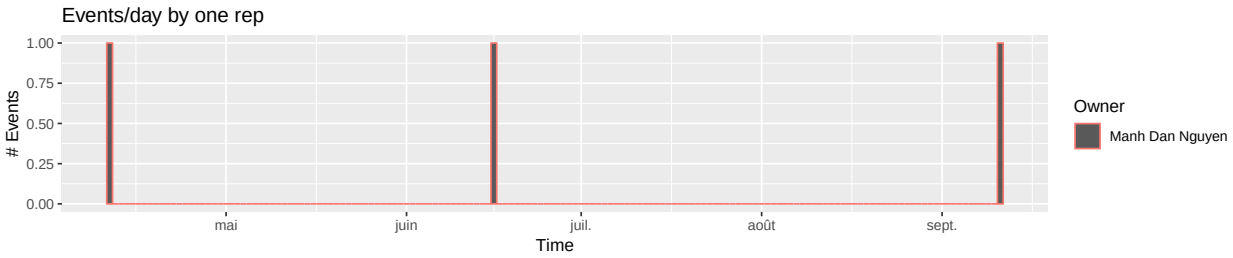
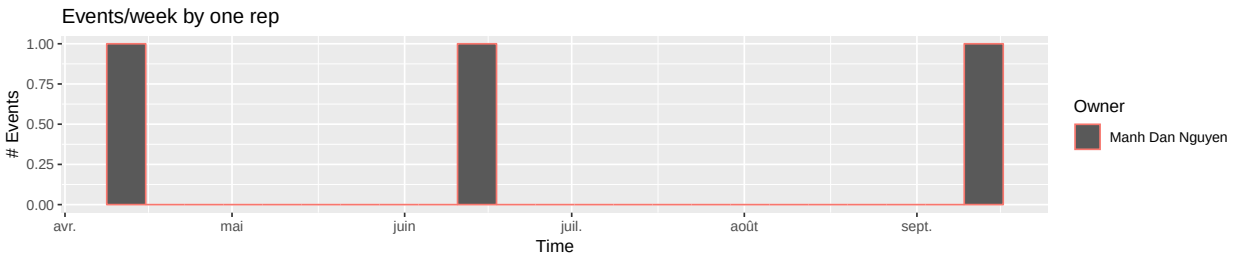
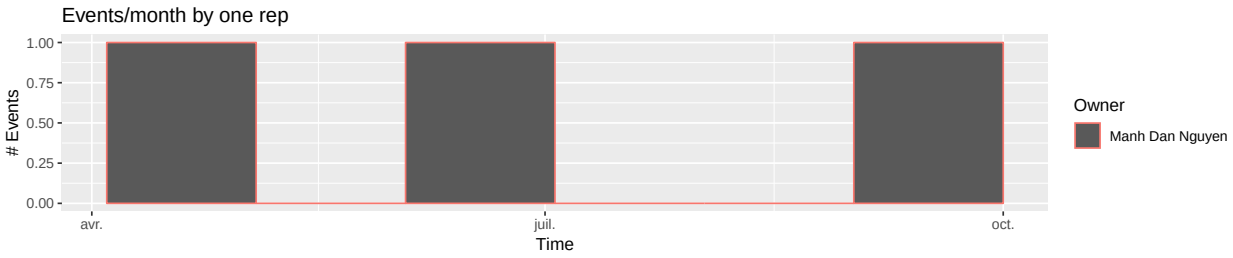
0.50
0.25
0.00
mai 01
mai 15
juin 01
juin 15
Time
Owner
Annina Getz

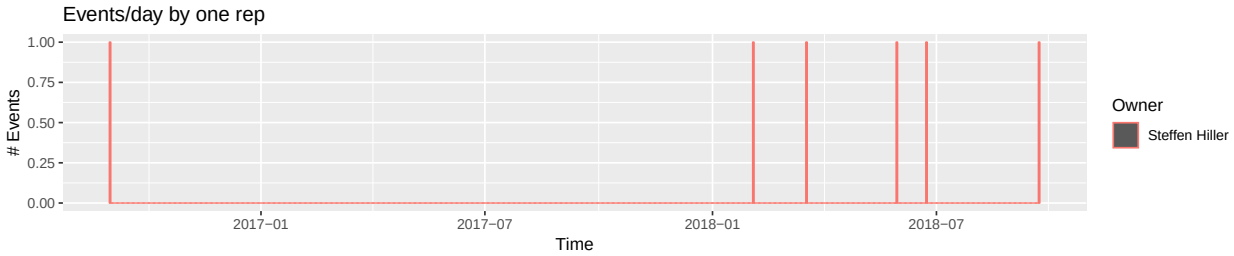

Events/week by one rep
Events
1.00
0.75
0.50
0.25
0.00
mai 01
mai 15
juin 01
juin 15
Time
Owner
Annina Getz

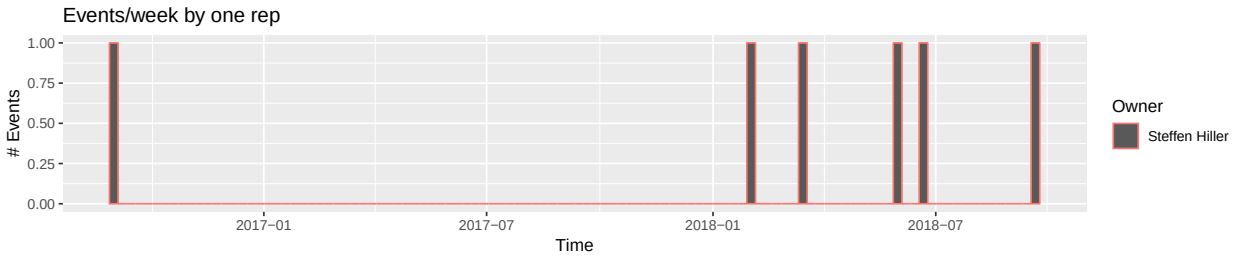

Events/month by one rep
Events
1.00
0.75
0.50
0.25
0.00
mai 01
mai 15
juin 01
juin 15
juil. 01
Time
Owner
Annina Getz


Events/day by one rep
Events
1.00
0.75
0.50
0.25
0.00
mai
juin
juil.
août
sept.
Time
Owner
Manh Dan Nguyen


Events/week by one rep
Events
1.00
0.75
0.50
0.25
0.00
avr.
mai
juin
juil.
août
sept.
Time
Owner
Manh Dan Nguyen


Events/month by one rep
Events
1.00
0.75
0.50
0.25
0.00
avr.
juil.
oct.
Time
Owner
Manh Dan Nguyen


Events/day by one rep
Events
1.00
0.75
0.50
0.25
0.00
2017−01
2017−07
2018−01
2018−07
Time
Owner
Steffen Hiller


Events/week by one rep
Events
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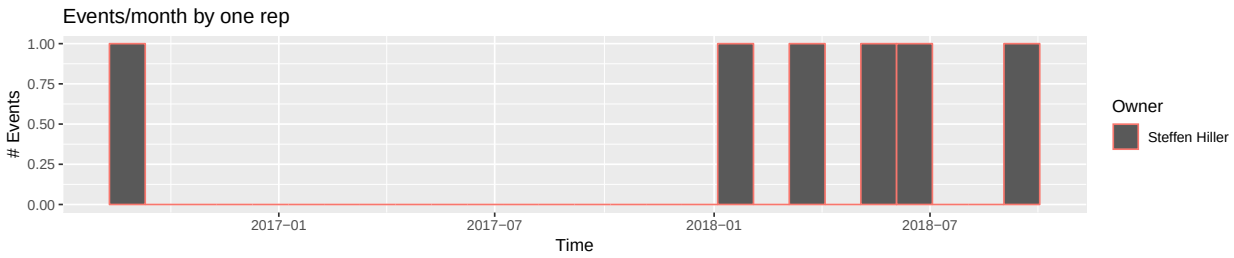
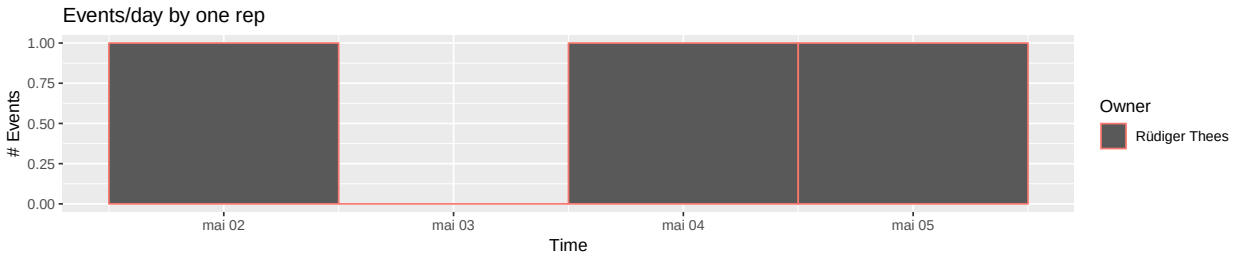
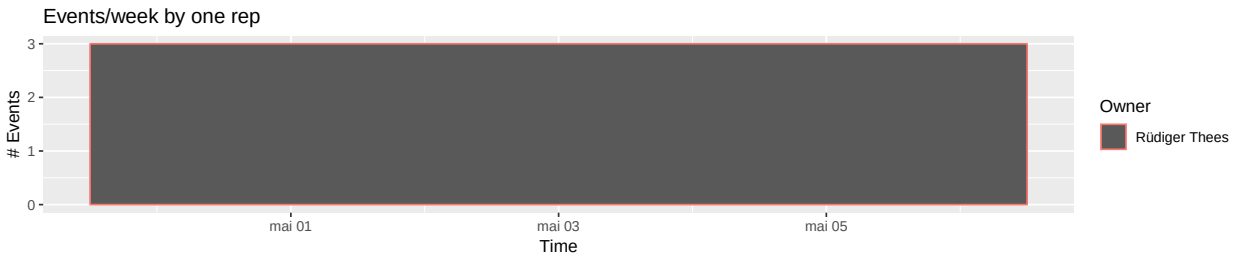
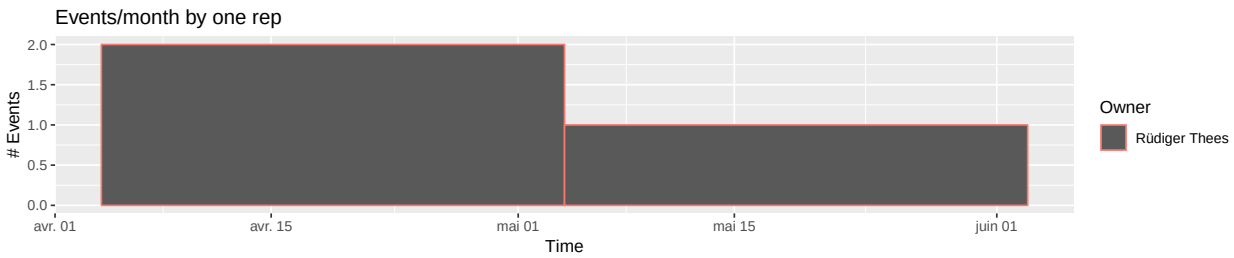
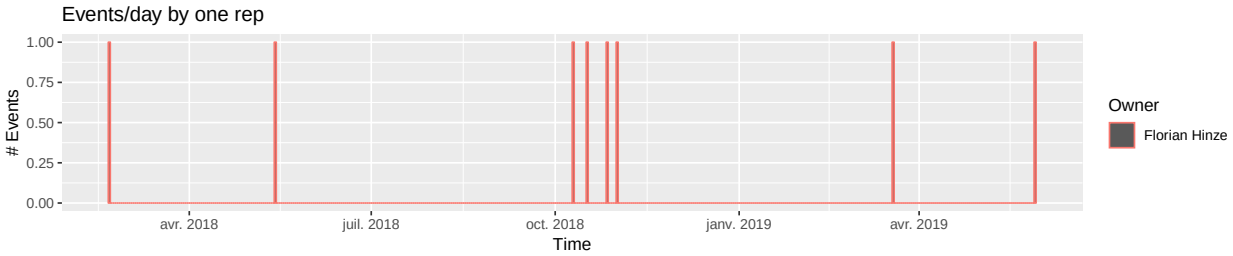
0.75
0.50
0.25
0.00
2017−01
2017−07
2018−01
2018−07
Time
Owner
Steffen Hiller

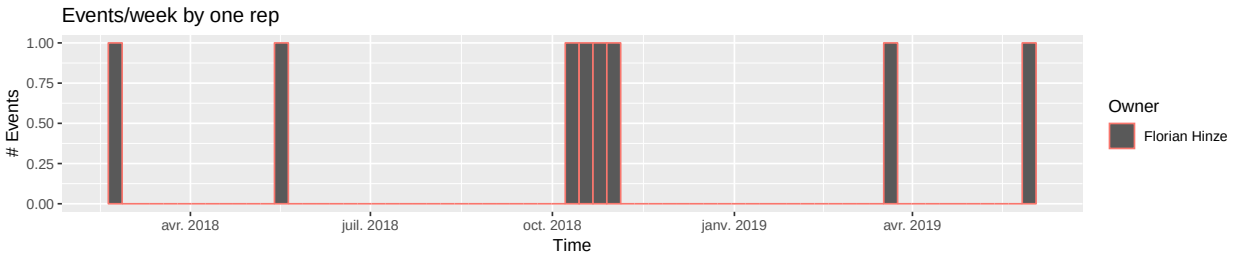

Events/month by one rep
Events
1.00
0.75
0.50
0.25
0.00
2017−01
2017−07
2018−01
2018−07
Time
Owner
Steffen Hiller

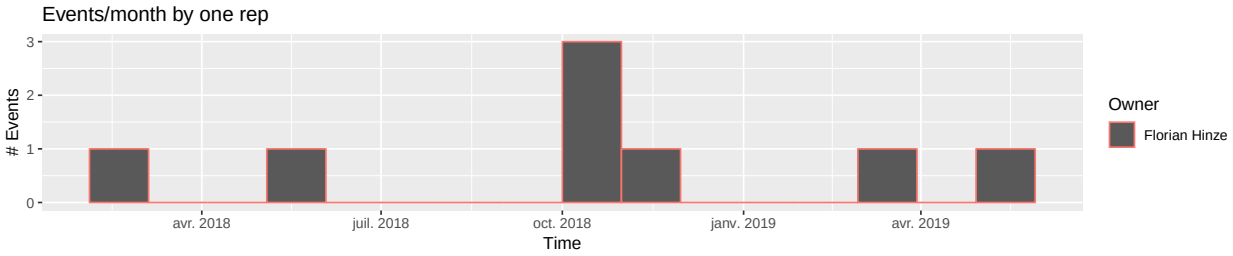

Events/day by one rep
Events
1.00
0.75
0.50
0.25
0.00
mai 02
mai 03
mai 04
mai 05
Time
Owner
Rüdiger Thees

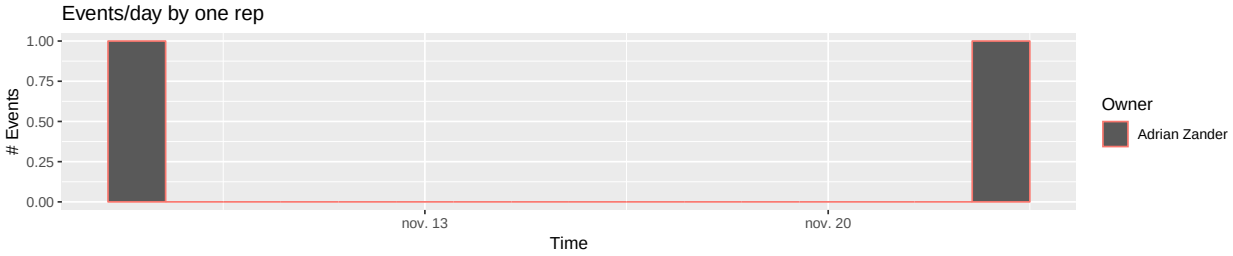

Events/week by one rep
Events
3
2
1
0
mai 01
mai 03
mai 05
Time
Owner
Rüdiger Thees

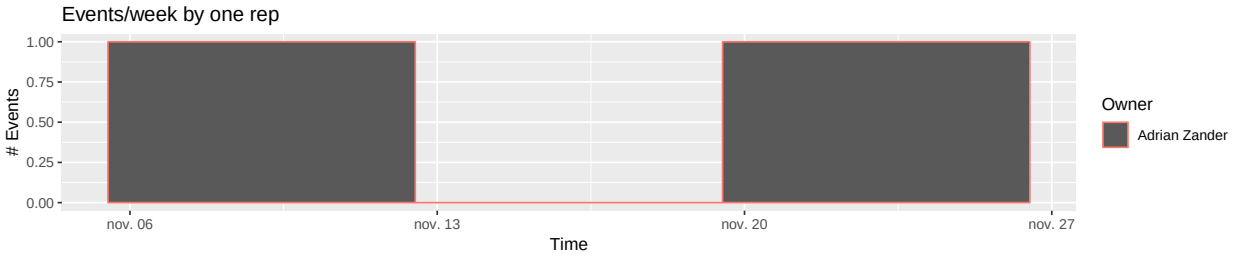

Events/month by one rep
Events
2.0
1.5
1.0
0.5
0.0
avr. 01
avr. 15
mai 01
mai 15
juin 01
Time
Owner
Rüdiger Thees


Events/day by one rep
Events
1.00
0.75
0.50
0.25
0.00
avr. 2018
juil. 2018
oct. 2018
janv. 2019
avr. 2019
Time
Owner
Florian Hinze

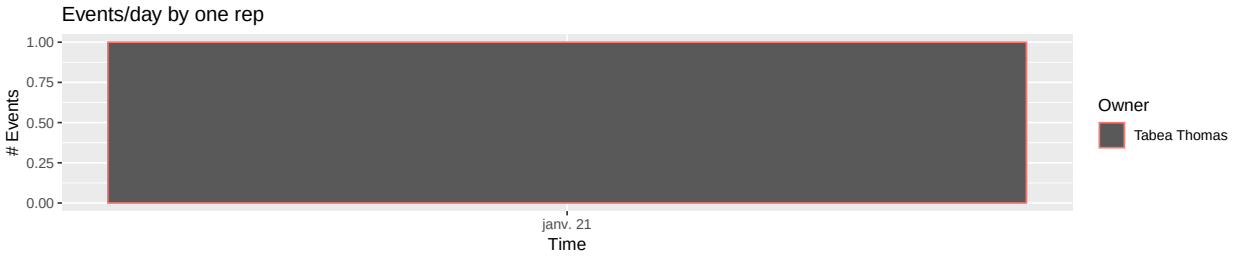

Events/week by one rep
Events
1.00
0.75
0.50
0.25
0.00
avr. 2018
juil. 2018
oct. 2018
janv. 2019
avr. 2019
Time
Owner
Florian Hinze


Events/month by one rep
Events
3
2
1
0
avr. 2018
juil. 2018
oct. 2018
janv. 2019
avr. 2019
Time
Owner
Florian Hinze

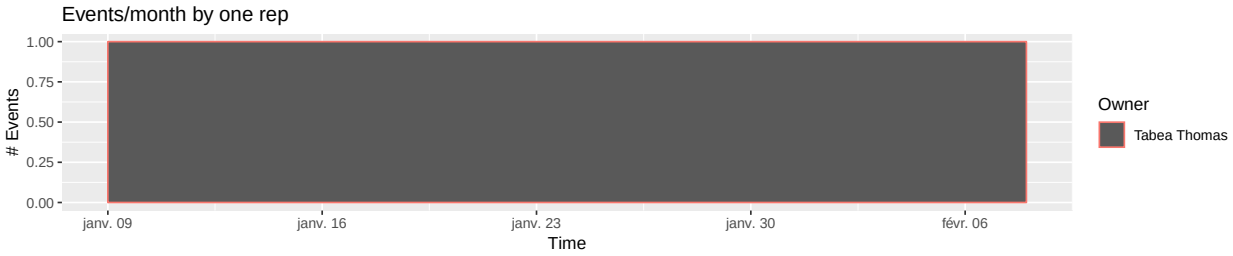

Events/day by one rep
Events
1.00
0.75
0.50
0.25
0.00
nov. 13
nov. 20
Time
Owner
Adrian Zander

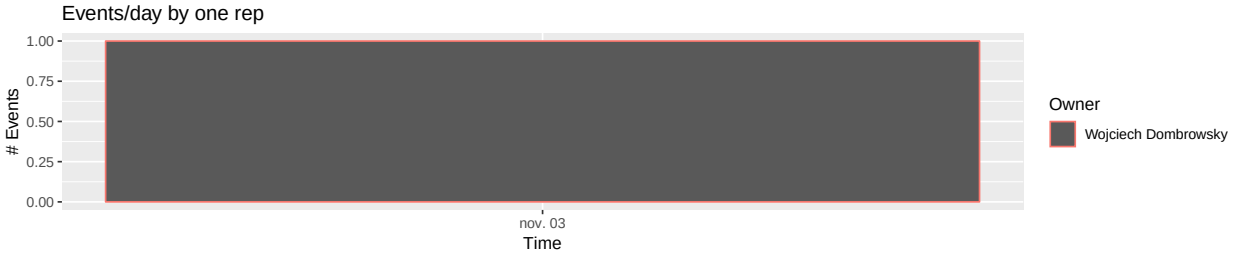

Events/week by one rep
Events
1.00
0.75
0.50
0.25
0.00
nov. 06
nov. 13
nov. 20
nov. 27
Time
Owner
Adrian Zander

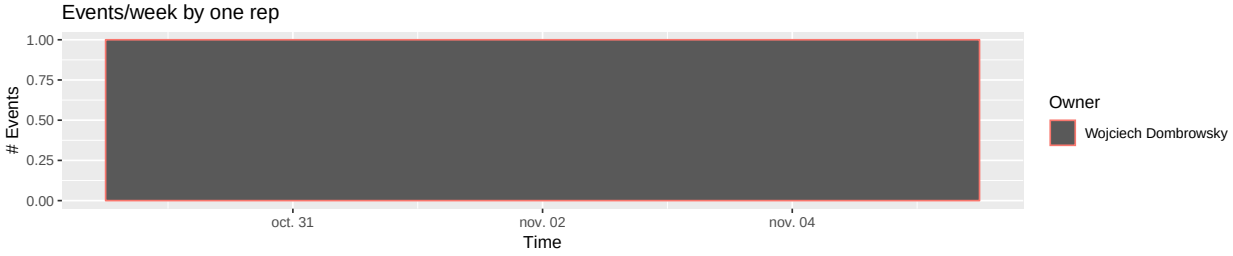

Events/month by one rep
Events
2.0
1.5
1.0
0.5
0.0
nov. 06
nov. 13
nov. 20
nov. 27
déc. 04
Time
Owner
Adrian Zander


Events/day by one rep
1.00
0.75
0.50
0.25
0.00
Events
janv. 21
Time
Owner
Tabea Thomas


Events/week by one rep
1.00
0.75
0.50
0.25
0.00
Events
janv. 17
janv. 19
janv. 21
Time
Owner
Tabea Thomas


Events/month by one rep
1.00
0.75
0.50
0.25
0.00
Events
janv. 09
janv. 16
janv. 23
janv. 30
févr. 06
Time
Owner
Tabea Thomas


Events/day by one rep
1.00
0.75
0.50
0.25
0.00
Events
nov. 03
Time
Owner
Wojciech Dombrowsky


Events/week by one rep
1.00
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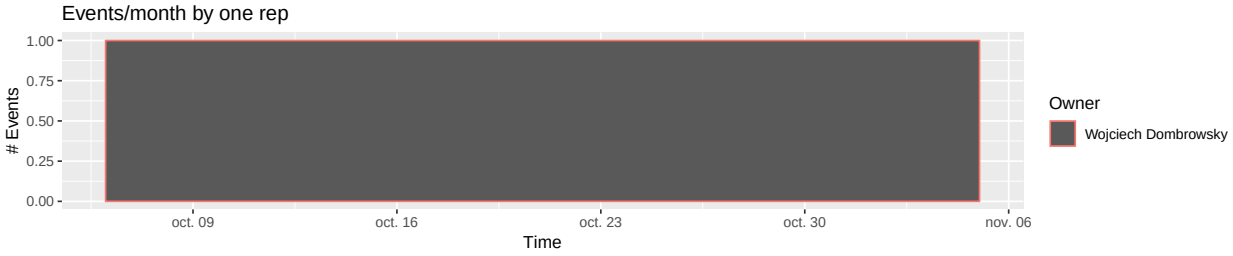
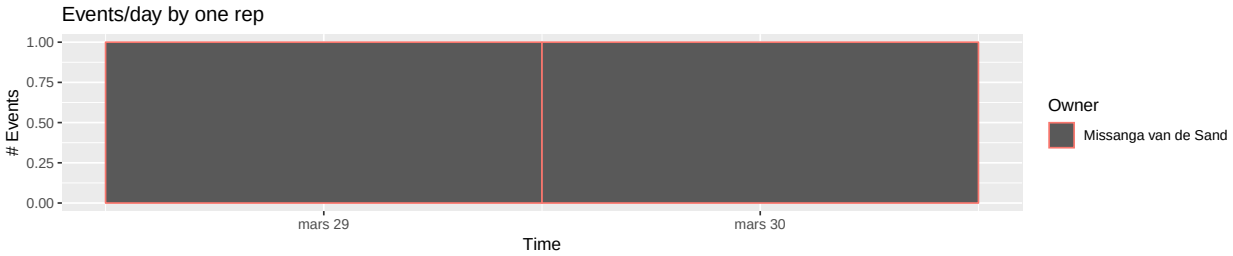
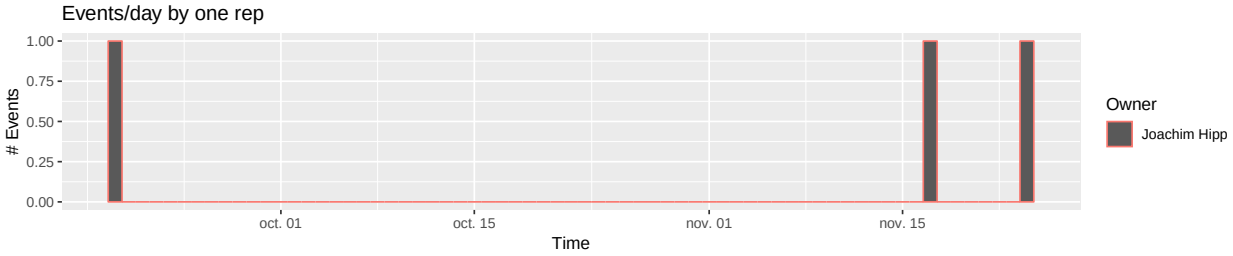
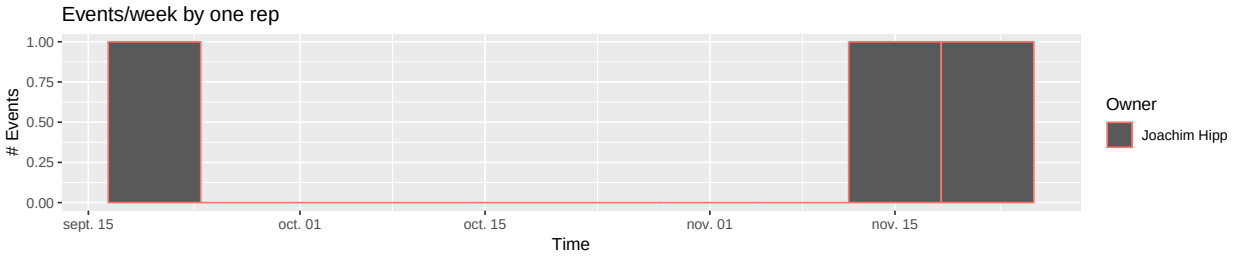
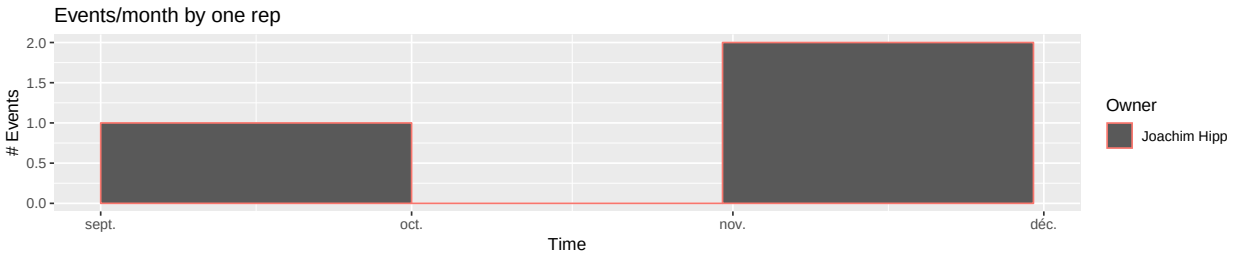
0.50
0.25
0.00
Events
oct. 31
nov. 02
nov. 04
Time
Owner
Wojciech Dombrowsky


Events/month by one rep
1.00
0.75
0.50
0.25
0.00
Events
oct. 09
oct. 16
oct. 23
oct. 30
nov. 06
Time
Owner
Wojciech Dombrowsky





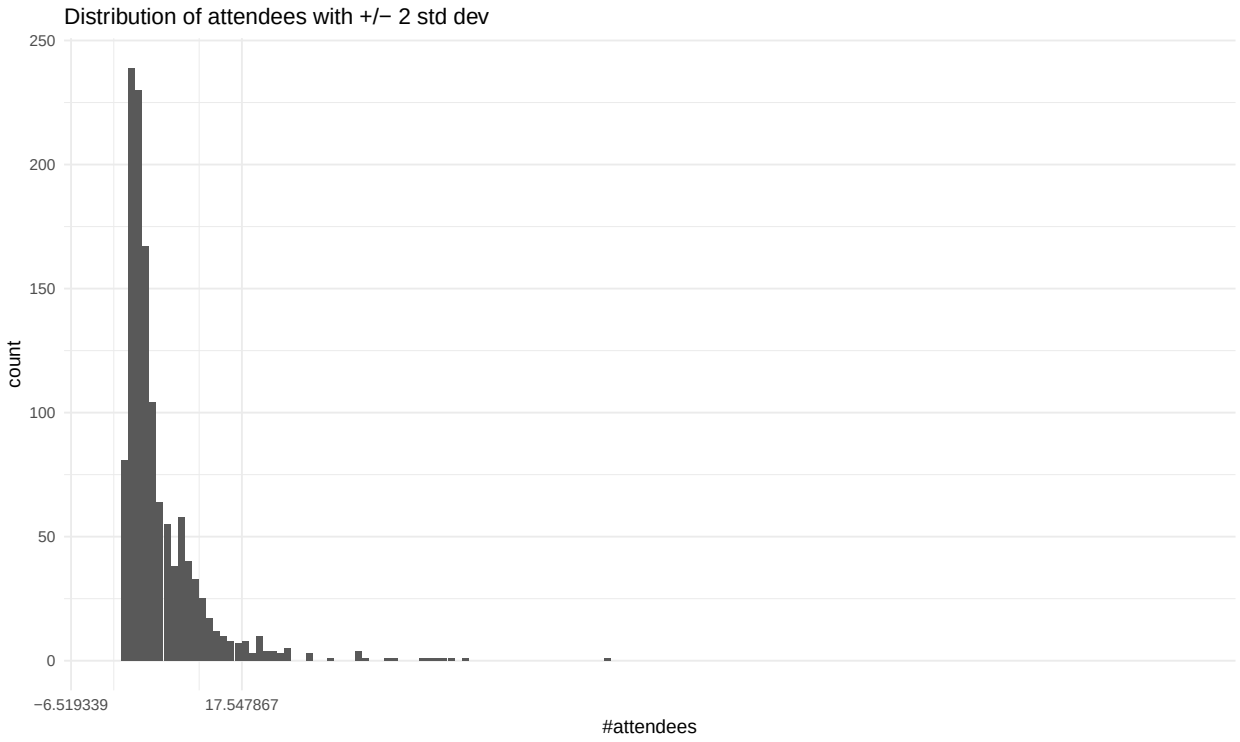




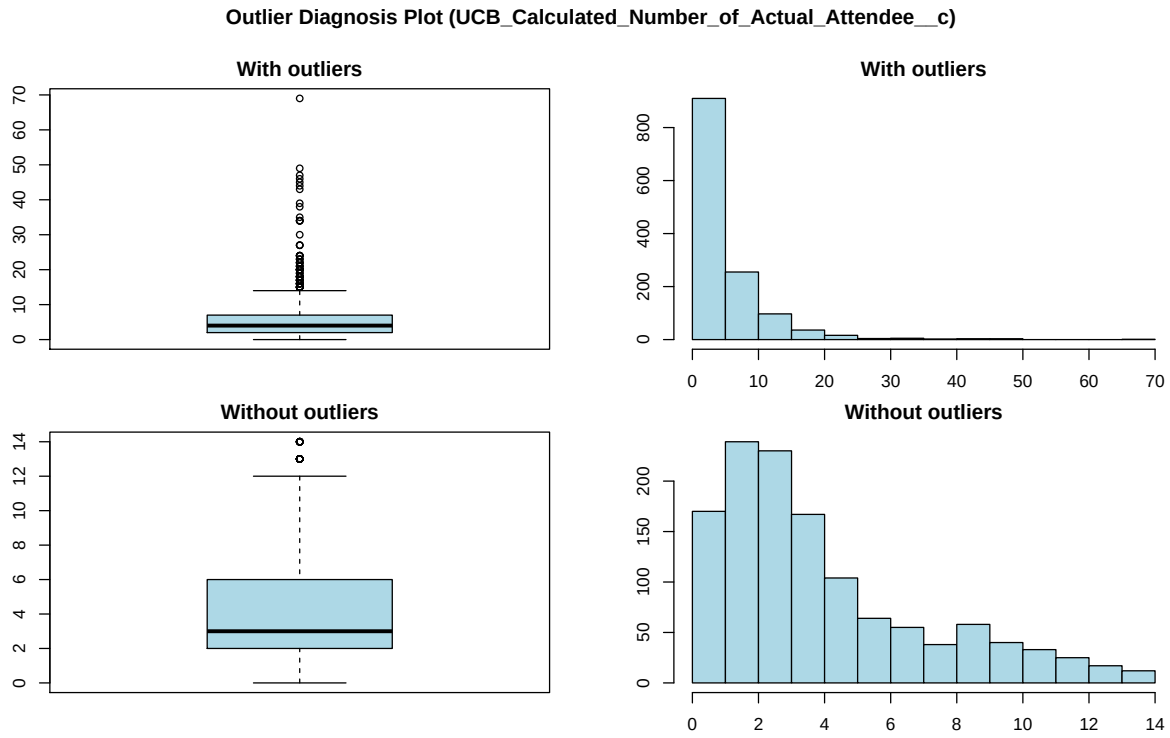
Distribution of attendees each event

```
[1] "mean:  5.51426426426426 std dev:  6.01680148079842"
```

```
pdf
  2
```

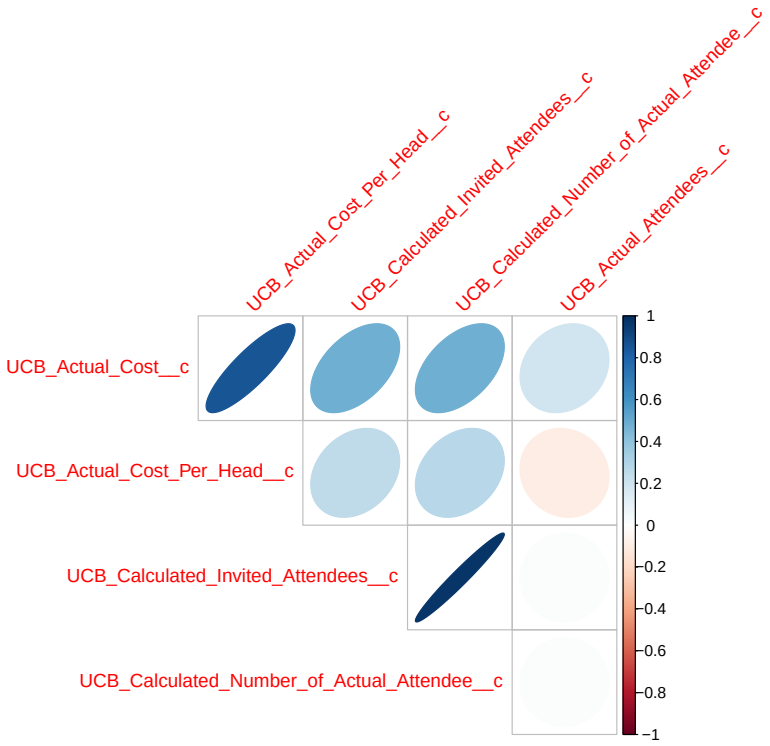

Distribution of attendees with +/− 2 std dev
count
250
200
150
100
50
0
−6.519339
17.547867
#attendees

```
pdf
  2
```


Outlier Diagnosis Plot (UCB_Calculated_Number_of_Actual_Attendee__c)
With outliers
With outliers
Without outliers
Without outliers
0 10 20 30 40 50 60 70
0 200 400 600 800
0 2 4 6 8 10 12 14
0 50 100 150 200

Bivariate data EDA. Calculation of `correlation coefficient` using `correlate()`

Visualization of the correlation matrix using `plot_correlate()` `plot_correlate()` visualizes the correlation matrix.



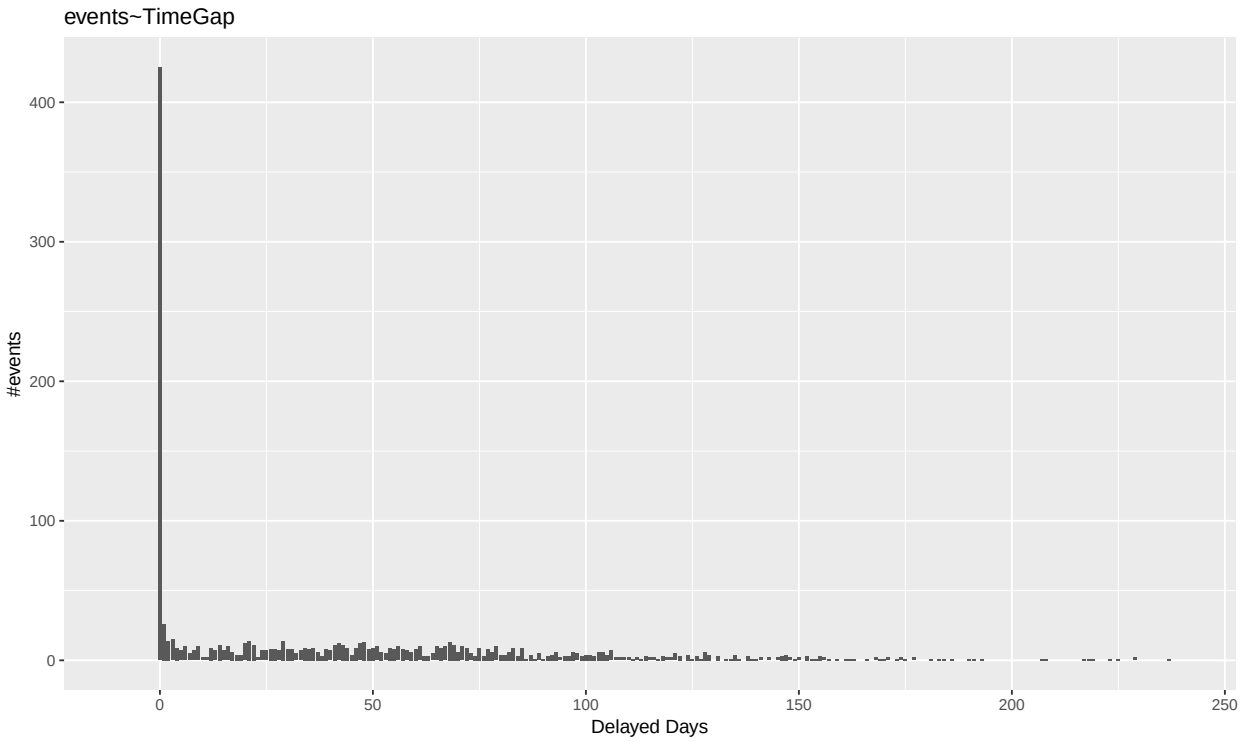
5. DQA Dimension5/Rule5: undestanding consistency of data from more than one source

Need other data sources for comparsion

6. DQA Dimension6/Rule6: undestanding timeline, trend & seasonality

The degree to which data represent reality from the required point in time Time difference: Ind_6= max[(threshold-xx days)/threshold,0]

```
pdf
  2
```




```
[1] "mean:  42.8843843843844 std dev:  50.4031544932102"
pdf
  2
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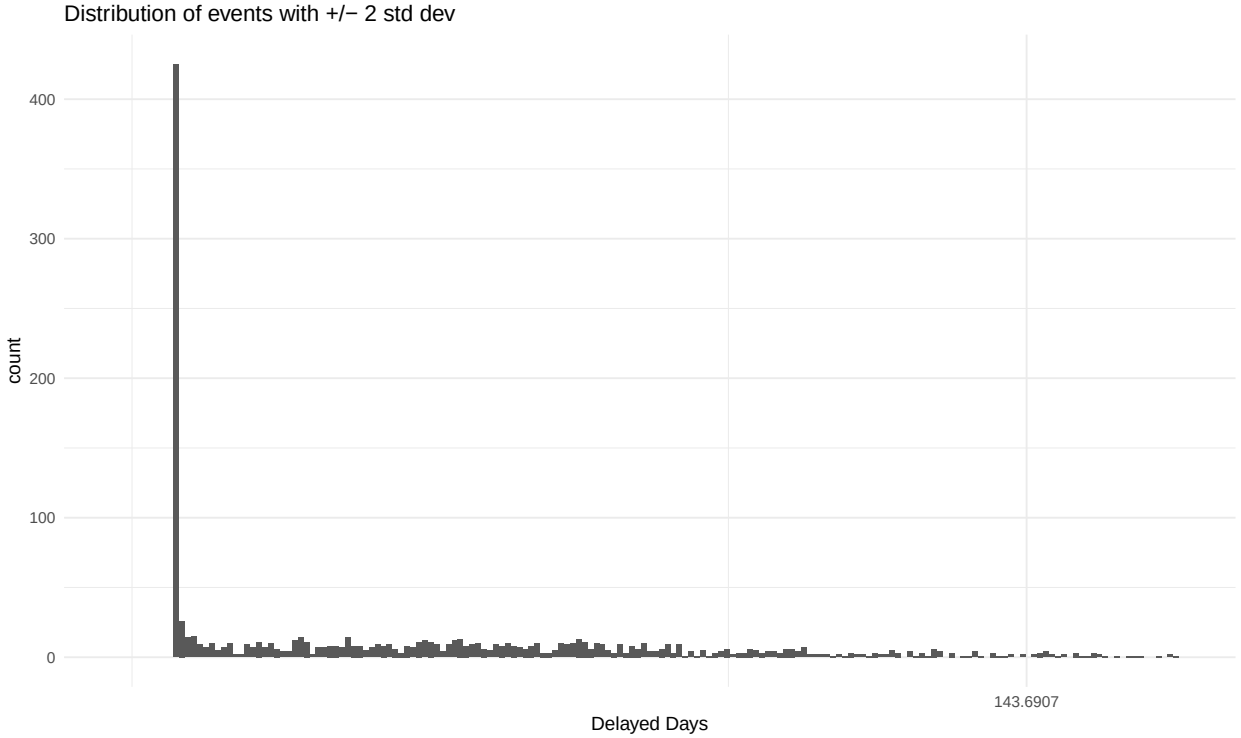


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pdf
```
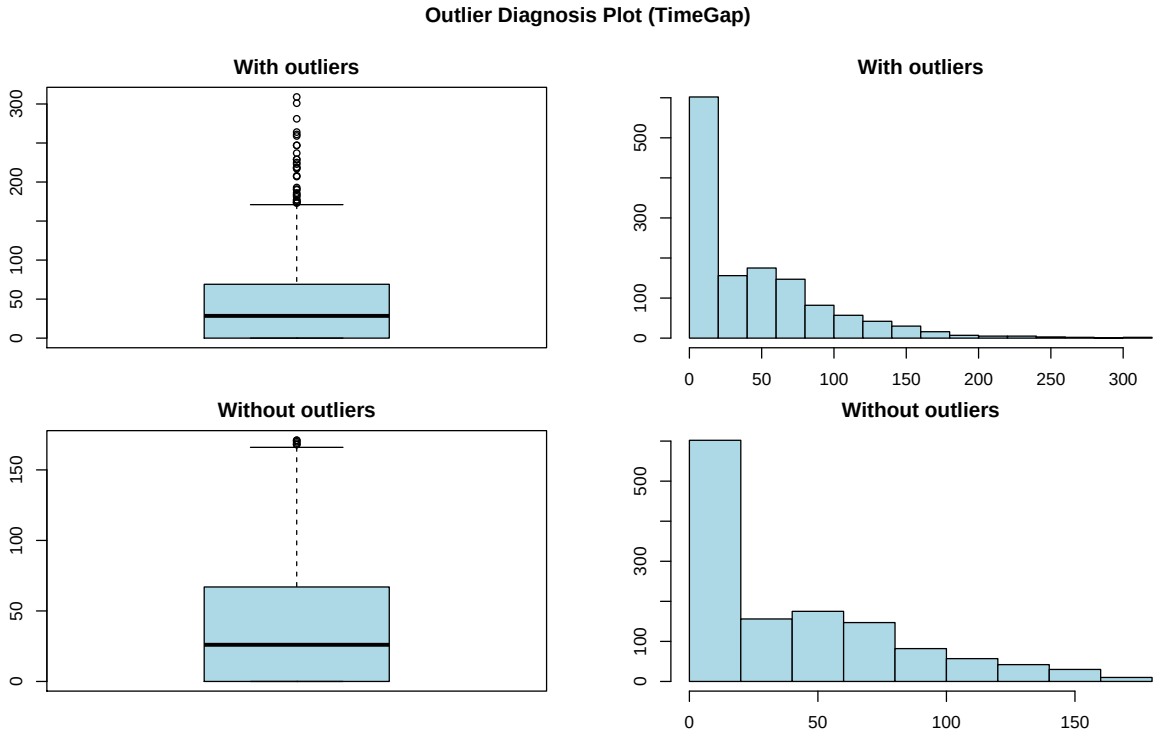

2


Outlier Diagnosis Plot (TimeGap)
With outliers
0
50
100
200
300
With outliers
0
100
300
500
0
50
100
150
200
250
300
Without outliers
0
50
100
150
Without outliers
0
100
300
500
0
50
100
150