Reproducibility review of: Optimizing Electric Vehicle Charging Schedules Based on Probabilistic Forecast of Individual Mobility



2022-06-10



This report is part of the reproducibility review at the AGILE conference. For more information see $\frac{\text{https://reproducible-agile.github.io/.}}{\text{This document is published on OSF at }\frac{\text{https://osf.io/jdtn3/.}}{\text{To cite the report use}}$

Granell, C. (2022, May 13). Reproducibility review of: Optimizing Electric Vehicle Charging Schedules Based on Probabilistic Forecast of Individual Mobility. https://doi.org/10.17605/OSF.IO/JDTN3

Reviewed paper

Cai, H., Xin, Y., Martin, H., and Raubal, M.: Optimizing Electric Vehicle Charging Schedules Based on Probabilistic Forecast of Individual Mobility, AGILE GIScience Ser., 3, 3, https://doi.org/10.5194/agile-giss-3-3-2022

Summary

The authors included a Data and Software Availability ("DASA") section, where a link to an anonymous GitHub repo was provided. It contains a landing page with detailed instructions and an entry point (main script) to run the entire analysis. The authors also specified which scripts are involved in the different outputs of the paper (tables, figures, etc). The authors claimed that input data cannot be disclosed. After communicating with authors, they provided me a few synthetic input samples (CSV format) to run the probabilistic models and charging strategies for simulation and evaluation, therefore skipping the need to access and getting real data from a remote database, as coded in the original main scripts. Because only synthetic samples are provided, there are differences between the results of the reproduction and the ones in the original paper.

The reproduction described in this report uses the Python code provided in a GitHub repo. Even though the reproduction exercise with synthetic data failed during the last step of the script, I can consider the paper was partially reproducible based on the synthetic data prepared by the authors.

Reproducibility reviewer notes

The original paper submission did not provide a link to the input data. All scripts were provided on an anonymised GitHub repo https://anonymous.4open.science/r/agile22_evprediction-2F28/README. md. I got synthetic data via email by authors. Given a project folder, all scripts are included in the cproject-folder>/code folder and synthetic data in the cproject-folder/data folder. The authors updated the scripts on the anonymised GitHub repo (addition of comments, basically) to facilitate the reproduction check. In particular, I commented the code in main.py that refers to get real data from a remote database to use instead the synthetics data, and adjusted some file paths. Next, I followed the steps below.

```
cgranell@DESKTOP-1PKOUTF:~/code/$ mkdir agile2022-010
cgranell@DESKTOP-1PKOUTF:~/code/agile2022-010$ cd agile2022-010
cgranell@DESKTOP-1PKOUTF:~/code/agile2022-010$ python3 -m venv venv --prompt="agile2022-010"
cgranell@DESKTOP-1PKOUTF:~/code/agile2022-010$ source venv/bin/activate
(agile2022-010) cgranell@DESKTOP-1PKOUTF:~/code/agile2022-010$ python -m pip install geopandas, matplotlib, statsmodels
# Installing skgarden through github. Despite the errors on the console, it was successfully installed
(agile2022-010) cgranell@DESKTOP-1PKOUTF:~/code/agile2022-010$ python -m pip install skgarden
ERROR: Could not find a version that satisfies the requirement skgarden (from versions: none)
ERROR: No matching distribution found for skgarden
(agile2022-010) cgranell@DESKTOP-1PKOUTF:~/code/agile2022-010$ python -m pip install git+https://github.com/scikit-garden/scikit-garden
Collecting git+https://github.com/scikit-garden/scikit-garden
   Cloning https://github.com/scikit-garden/scikit-garden to /tmp/pip-req-build-mh2llzdv
   Running \ command \ git \ clone \ \ \frac{-q}{pip-req-build-mh2llzdv} \ https://github.com/scikit-garden/scikit-garden / tmp/pip-req-build-mh2llzdv / tmp/pip-req-b
Requirement already satisfied: numpy in ./venv/lib/python3.8/site-packages (from scikit-garden==0.1.3) (1.22.3)
Collecting scikit-learn>=0.22
   Using cached scikit_learn-1.0.2-cp38-cp38-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (26.7 MB)
Requirement already satisfied: scipy in ./venv/lib/python3.8/site-packages (from scikit-garden==0.1.3) (1.8.0)
Requirement already satisfied: six in ./venv/lib/python3.8/site-packages (from scikit-garden==0.1.3) (1.16.0)
Collecting threadpoolct1>=2.0.0
   Using cached threadpoolctl-3.1.0-py3-none-any.whl (14 kB)
Collecting joblib>=0.11
   Using cached joblib-1.1.0-py2.py3-none-any.whl (306 kB)
Building wheels for collected packages: scikit-garden
   Building wheel for scikit-garden (setup.py) ...
   {\tt ERROR:} \ {\tt Command} \ {\tt errored} \ {\tt out} \ {\tt with} \ {\tt exit} \ {\tt status} \ {\tt 1:}
     command: /home/cgranell/code/agile2022-010/venv/bin/python -u -c 'import sys, setuptools, tokenize; sys.argv[0] = '"'"/tmp/pip-req-build-
   cwd: /tmp/pip-req-build-mh21lzdv/
Complete output (7 lines):
   WARNING: The wheel package is not available.
   usage: setup.py [global_opts] cmd1 [cmd1_opts] [cmd2 [cmd2_opts] ...]
       or: setup.py --help [cmd1 cmd2 ...]
or: setup.py --help-commands
or: setup.py cmd --help
   error: invalid command 'bdist_wheel'
   ERROR: Failed building wheel for scikit-garden
   Running setup.py clean for scikit-garden
Failed to build scikit-garden
Installing collected packages: threadpoolctl, joblib, scikit-learn, scikit-garden
      Running setup.py install for scikit-garden ... done
Successfully installed joblib-1.1.0 scikit-garden-0.1.3 scikit-learn-1.0.2 threadpoolctl-3.1.0
# Copy scripts from anonymised repo in "code" folder
(agile2022-010) cgranell@DESKTOP-1PKOUTF:~/code/agile2022-010$ mkdir code
(agile2022-010) cgranell@DESKTOP-1PKOUTF:~/code/agile2022-010$ ls code/*.py
                                                                          code/evaluate_unidirectional_smartcharging.py
code/calculate_feature_importance.py
code/calculate_under_overestimation.py
                                                                          code/extract_arrival.py
code/compare_baseline_bismart.py
                                                                          code/extract_depart.py
                                                                          code/extract evfeatures.py
code/compare baseline unismart.py
code/compare_probablistic_results.py
                                                                          code/extract_mobility.py
code/compare_three_charging_onpeakdef2.py
                                                                          code/extract_soc.py
code/evaluate_bidirectional_smartcharging.py code/main.py
code/evaluate_uncontrolled_charging.py
                                                                          code/predict_probablistic_results.py
# Copy synthetic input samples in "data" folder
(agile2022-010) cgranell@DESKTOP-1PKOUTF:~/code/agile2022-010$ mkdir data
(agile2022-010) cgranell@DESKTOP-1PKOUTF:~/code/agile2022-010$ ls -R data
inputs
data/inputs:
arrival prediction
```

auction_spot_prices_switzerland_2017_syn.csv

```
depart_prediction
electricity_load_profile_day_Jun2nd.csv
soc_prediction

data/inputs/arrival_prediction:
1_input.csv
2_input.csv

data/inputs/depart_prediction:
1_input.csv
2_input.csv
3_input.csv

data/inputs/soc_prediction:
1_input.csv
2_input.csv
3_input.csv
2_input.csv
3_input.csv
```

Execution of the main.py script. The output on the console is quite large, so I only copy below some parts of the output, including the generated error at the end of the execution of the main.py script.

```
# in ./agile2022-010
(agile2022-010) cgranell@DESKTOP-1PKOUTF:~/code/agile2022-010$ python3 code/main.py
Current working directory: /home/cgranell/code/agile2022-010
##REPRODUCTION CHECK##: Run Quantile Regression Predictions
3davavr
START--
soc
lqr_mob
        -----START-----
Index(['day_of_week', 'realentro_3dayavr', 'ev_duration_3dayavr', 'ev_dist_3dayavr', 'radgyr_3dayavr', 'avrjumplen_3dayavr', 'top10locfre_3dayavr', 'ecar_hhindex_3dayavr', 'weekend_flag', 'soc_p1',
      'soc_p2', 'soc_p3'],
     dtype='object')
12
       1.0
0
       2.0
1
2
       0.5
      67.0
4
      87.0
194
      81.5
195
      61.5
196
      60.5
197
       7.0
198
Name: soc, Length: 199, dtype: float64
'soc_p2', 'soc_p3'],
     dtype='object')
12
       0.5
0
       2.5
1
2
       3.5
3
      37.0
4
      46.5
253
      61.5
254
       3.0
      30.0
255
256
257
      41.5
Name:
     soc, Length: 258, dtype: float64
'soc_p2', 'soc_p3'],
     dtype='object')
12
       5.5
0
       6.0
1
      68.0
3
      77.5
4
      21.0
269
       9.5
270
      19.0
```

```
271
    19.5
272
    19.0
273
    10.0
Name: soc, Length: 274, dtype: float64
lqr
    -----START-----
0
     1.0
     2.0
2
    0.5
3
    67.0
    87.0
4
194
    81.5
195
    61.5
196
    60.5
197
     7.0
198
     6.5
Name: soc, Length: 199, dtype: float64
Index(['day_of_week', 'ev_duration_3dayavr', 'ev_dist_3dayavr', 'weekend_flag',
     'soc_p1', 'soc_p2', 'soc_p3'],
    dtype='object')
7
0
     0.5
     2.5
1
     3.5
3
    37.0
4
    46.5
253
    61.5
254
     3.0
    30.0
255
256
257
    41.5
Name: soc, Length: 258, dtype: float64
3
0
     5.5
    6.0
1
2
    68.0
    77.5
4
    21.0
     9.5
269
270
    19.0
271
    19.5
272
    19.0
273
    10.0
Name: soc, Length: 274, dtype: float64
qrf_mob
    -----START-----
'soc_p2', 'soc_p3'],
dtype='object')
12
0
     1.0
     2.0
     0.5
3
    67.0
4
    87.0
    81.5
194
195
    61.5
196
    60.5
197
     7.0
198
     6.5
Name: soc, Length: 199, dtype: float64
'soc_p2', 'soc_p3'],
    dtype='object')
12
0
     0.5
```

```
2.5
2
       3.5
      37.0
4
      46.5
253
254
       3.0
255
      30.0
256
      9.0
257
      41.5
Name: soc, Length: 258, dtype: float64
Index(['day_of_week', 'realentro_3dayavr', 'ev_duration_3dayavr',
    'ev_dist_3dayavr', 'radgyr_3dayavr', 'avrjumplen_3dayavr',
      'top10locfre_3dayavr', 'ecar_hhindex_3dayavr', 'weekend_flag', 'soc_p1',
     'soc_p2', 'soc_p3'],
dtype='object')
12
0
       5.5
      6.0
2
      68.0
      77.5
      21.0
4
269
      9.5
270
      19.0
271
      19.5
272
      19.0
273
      10.0
Name: soc, Length: 274, dtype: float64
qrf
        -----START-----
1
0
      1.0
      2.0
2
      0.5
      67.0
4
      87.0
194
      81.5
195
      61.5
196
      60.5
      7.0
197
198
       6.5
Name: soc, Length: 199, dtype: float64
dtype='object')
0
       0.5
      2.5
1
      3.5
3
      37.0
4
      46.5
253
      61.5
254
       3.0
255
      30.0
256
      9.0
257
     41.5
Name: soc, Length: 258, dtype: float64
Index(['day_of_week', 'ev_duration_3dayavr', 'ev_dist_3dayavr', 'weekend_flag',
     'soc_p1', 'soc_p2', 'soc_p3'],
dtype='object')
7
0
      5.5
      6.0
1
2
      68.0
4
      21.0
      9.5
269
270
      19.0
271
      19.5
272
      19.0
273
      10.0
Name: soc, Length: 274, dtype: float64
gbqr_mob
           -----START-----
1
```

```
'soc_p2', 'soc_p3'],
dtype='object')
12
     1.0
0
     2.0
2
     0.5
    67.0
87.0
3
4
194
     81.5
195
196
     60.5
197
     7.0
198
     6.5
Name: soc, Length: 199, dtype: float64
'soc_p2', 'soc_p3'],
dtype='object')
12
0
     0.5
     2.5
2
     3.5
3
     37.0
4
     46.5
253
     61.5
254
     3.0
255
     30.0
256
     9.0
     41.5
257
Name: soc, Length: 258, dtype: float64
12
     5.5
     6.0
2
     68.0
3
     77.5
     21.0
4
269
     9.5
270
     19.0
271
     19.5
272
     19.0
273
    10.0
Name: soc, Length: 274, dtype: float64
gbqr
        -----START-----
0
     2.0
2
     0.5
3
     67.0
     87.0
4
194
195
     61.5
196
     60.5
     7.0
197
198
     6.5
Name: soc, Length: 199, dtype: float64
Index(['day_of_week', 'ev_duration_3dayavr', 'ev_dist_3dayavr', 'weekend_flag',
    'soc_p1', 'soc_p2', 'soc_p3'],
dtype='object')
0
     0.5
     2.5
     3.5
3
     37.0
4
     46.5
```

```
253
     61.5
254
     3.0
255
     30.0
256
     9.0
257
     41.5
Name: soc, Length: 258, dtype: float64
0
     5.5
     6.0
2
     68.0
3
     77.5
4
     21.0
269
     9.5
270
     19.0
271
     19.5
272
     19.0
273
    10.0
Name: soc, Length: 274, dtype: float64
depart
lqr_mob
  -----START-----
9
      9.783056
0
     7.369727
7.314597
1
2
3
     19.645551
4
     24.000000
429
      9.178611
430
      9.259167
     8.375833
431
432
     9.425833
433
     24.000000
Name: depart_float, Length: 434, dtype: float64
9
0
     16.017116
1
     6.174167
2
     7.948056
     19.007569
3
4
     11.058333
294
      5.545866
295
     9.120394
296
     13.243917
297
     6.311245
298
      7.786509
Name: depart_float, Length: 299, dtype: float64
9
0
     17.884625
     12.002403
2
     8.950866
3
     10.461139
     10.976847
4
412
     13.254444
413
     5.775000
414
     7.464444
     15.018611
415
     24.000000
416
Name: depart_float, Length: 417, dtype: float64
lgr
     -----START-----
Index(['day_of_week', 'weekend_flag', 'depart_p1', 'depart_p2', 'depart_p3'], dtype='object')
0
      9.783056
```

```
1
       7.369727
2
       7.314597
      19.645551
      24.000000
4
429
       9.178611
430
       9.259167
431
       8.375833
432
       9.425833
433
      24.000000
Name: depart_float, Length: 434, dtype: float64
Index(['day_of_week', 'weekend_flag', 'depart_p1', 'depart_p2', 'depart_p3'], dtype='object')
5
0
      16.017116
       6.174167
1
       7.948056
2
3
      19.007569
4
      11.058333
       5.545866
294
295
       9.120394
296
      13.243917
297
       6.311245
298
       7.786509
Name: depart_float, Length: 299, dtype: float64
Index(['day_of_week', 'weekend_flag', 'depart_p1', 'depart_p2', 'depart_p3'], dtype='object')
0
      17.884625
      12.002403
       8.950866
3
      10.461139
4
      10.976847
412
      13.254444
       5.775000
413
414
       7.464444
415
      15.018611
416
      24.000000
Name: depart_float, Length: 417, dtype: float64
qrf_mob
             ----START----
Index(['day_of_week', 'realentro_3dayavr', 'radgyr_3dayavr',
     'avrjumplen_3dayavr', 'top10locfre_3dayavr', 'weekend_flag', 'depart_p1', 'depart_p2', 'depart_p3'], dtype='object')
0
       9.783056
       7.369727
2
       7.314597
3
      19.645551
4
      24.000000
429
       9.178611
430
       9.259167
431
       8.375833
432
       9.425833
      24.000000
433
Name: depart_float, Length: 434, dtype: float64
'depart_p1', 'depart_p2', 'depart_p3'],
dtype='object')
9
0
      16.017116
       6.174167
2
       7.948056
3
      19.007569
4
      11.058333
294
       5.545866
295
       9.120394
296
      13.243917
297
       6.311245
298
       7.786509
Name: depart_float, Length: 299, dtype: float64
3
'depart_p1', 'depart_p2', 'depart_p3'],
dtype='object')
9
0
      17.884625
```

```
1
      12.002403
2
       8.950866
      10.461139
      10.976847
4
412
      13.254444
413
       5.775000
414
       7.464444
415
      15.018611
      24,000000
416
Name: depart_float, Length: 417, dtype: float64
qrf
           -----START-----
Index(['day_of_week', 'weekend_flag', 'depart_p1', 'depart_p2', 'depart_p3'], dtype='object')
5
0
       9.783056
1
       7.369727
       7.314597
3
      19.645551
4
      24.000000
       9.178611
429
430
       9.259167
431
       8.375833
432
       9.425833
433
      24.000000
Name: depart_float, Length: 434, dtype: float64
Index(['day_of_week', 'weekend_flag', 'depart_p1', 'depart_p2', 'depart_p3'], dtype='object')
5
0
      16.017116
1
       6.174167
2
       7.948056
      19.007569
3
4
      11.058333
294
       5.545866
295
       9.120394
296
      13.243917
297
       6.311245
298
       7.786509
Name: depart_float, Length: 299, dtype: float64
Index(['day_of_week', 'weekend_flag', 'depart_p1', 'depart_p2', 'depart_p3'], dtype='object')
      17.884625
0
      12.002403
1
       8.950866
3
      10.461139
      10.976847
412
      13.254444
      5.775000
413
       7.464444
414
      15.018611
415
416
      24.000000
Name: depart_float, Length: 417, dtype: float64
gbqr_mob
              -----START-----
'depart_p1', 'depart_p2', 'depart_p3'],
dtype='object')
9
0
       9.783056
       7.369727
       7.314597
3
      19.645551
4
      24.000000
       9.178611
429
430
       9.259167
431
       8.375833
432
       9.425833
433
      24.000000
Name: depart_float, Length: 434, dtype: float64
Index(['day_of_week', 'realentro_3dayavr', 'radgyr_3dayavr', 'avrjumplen_3dayavr', 'top10locfre_3dayavr', 'weekend_flag',
       'depart_p1', 'depart_p2', 'depart_p3'],
     dtype='object')
9
      16.017116
0
       6.174167
1
```

```
2
      7.948056
3
      19.007569
      11.058333
4
294
       5.545866
       9.120394
296
      13.243917
297
      6.311245
298
       7.786509
Name: depart_float, Length: 299, dtype: float64
9
      17.884625
0
      12.002403
1
       8.950866
3
      10.461139
4
      10.976847
     13.254444
412
      5.775000
7.464444
413
414
415
      15.018611
416
     24.000000
Name: depart_float, Length: 417, dtype: float64
gbqr
          -----START-----
Index(['day_of_week', 'weekend_flag', 'depart_p1', 'depart_p2', 'depart_p3'], dtype='object')
5
0
       9.783056
       7.369727
1
2
       7.314597
      19.645551
      24.000000
429
       9.178611
430
       9.259167
431
      8.375833
432
       9.425833
433
     24.000000
Name: depart_float, Length: 434, dtype: float64
Index(['day_of_week', 'weekend_flag', 'depart_p1', 'depart_p2', 'depart_p3'], dtype='object')
0
      6.174167
       7.948056
3
      19.007569
4
      11.058333
294
       5.545866
295
       9.120394
296
      13.243917
297
      6.311245
298
       7.786509
Name: depart_float, Length: 299, dtype: float64
3
Index(['day_of_week', 'weekend_flag', 'depart_p1', 'depart_p2', 'depart_p3'], dtype='object')
0
      17.884625
      12.002403
8.950866
2
3
      10.461139
      10.976847
412
      13.254444
413
      5.775000
414
      7.464444
415
      15.018611
416
      24.000000
Name: depart_float, Length: 417, dtype: float64
arrival
         -----START-----
1
9
      21.534167
0
      20.613662
1
```

```
2
       19.645551
3
       22.909903
       17.603444
4
       17.302222
425
       15.350556
427
       16.310278
428
       19.896944
429
      16.257222
Name: arrival_float, Length: 430, dtype: float64
9
0
       20.383056
       20.369324
1
       18.187500
3
       16.514787
4
       21.167375
250
      16.617315
251
       19.556801
252
       16.581560
253
       21.173500
254
      20.691764
Name: arrival_float, Length: 255, dtype: float64
Index(['day_of_week', 'realentro_3dayavr', 'radgyr_3dayavr',
     'avrjumplen_3dayavr', 'radgyr_3dayavr', 'avrjumplen_3dayavr', 'top10locfre_3dayavr', 'weekend_flag', 'arrival_p1', 'arrival_p2', 'arrival_p3'], dtype='object')
9
       22.384718
0
       22.006981
       20.128889
3
       17.662208
4
       22.668546
       21.835278
378
379
      18.335833
380
       17.041667
381
       20.232778
382
      20.276111
Name: arrival_float, Length: 383, dtype: float64
lqr
        -----START-----
Index(['day_of_week', 'weekend_flag', 'arrival_p1', 'arrival_p2',
       'arrival_p3'],
      dtype='object')
5
       21.534167
0
       20.613662
       19.645551
3
       22.909903
4
       17.603444
425
       17.302222
426
       15.350556
427
       16.310278
428
       19.896944
429
       16.257222
Name: arrival_float, Length: 430, dtype: float64
2
dtype='object')
5
       20.383056
0
       20.369324
1
       18.187500
2
3
       16.514787
       21.167375
       16.617315
250
       19.556801
251
       16.581560
252
253
       21.173500
254
       20.691764
Name: arrival_float, Length: 255, dtype: float64
Index(['day_of_week', 'weekend_flag', 'arrival_p1', 'arrival_p2', 'arrival_p3'],
      dtype='object')
```

```
5
     22.384718
0
     22.006981
1
     20.128889
2
     17.662208
3
     22.668546
378
     21.835278
     18.335833
379
380
     17.041667
     20.232778
381
382
     20.276111
Name: arrival_float, Length: 383, dtype: float64
qrf_mob
    -----START-----
'arrival_p1', 'arrival_p2', 'arrival_p3'], dtype='object')
9
     21.534167
     20.613662
1
     19.645551
2
     22.909903
4
     17.603444
     17.302222
425
     15.350556
426
427
     16.310278
428
     19.896944
429
    16.257222
Name: arrival_float, Length: 430, dtype: float64
9
     20.383056
0
     20.369324
1
2
     18.187500
3
     16.514787
4
     21.167375
     16.617315
250
251
     19.556801
252
     16.581560
253
     21.173500
254
     20.691764
Name: arrival_float, Length: 255, dtype: float64
3
9
0
     22.384718
1 2
     22.006981
     20.128889
     17.662208
3
4
     22.668546
378
     21.835278
379
     18.335833
17.041667
380
381
     20.232778
382
     20.276111
Name: arrival_float, Length: 383, dtype: float64
qrf
     -----START-----
1
dtype='object')
5
0
     21.534167
     20.613662
1
     19.645551
2
     22.909903
3
4
     17.603444
     17.302222
425
     15.350556
426
427
     16.310278
428
     19.896944
```

```
429 16.257222
Name: arrival_float, Length: 430, dtype: float64
Index(['day_of_week', 'weekend_flag', 'arrival_p1', 'arrival_p2', 'arrival_p3'],
    dtype='object')
5
0
     20.383056
     20.369324
1
     18.187500
2
3
     16.514787
4
     21.167375
     16.617315
250
251
     19.556801
     16.581560
252
253
     21.173500
     20.691764
254
Name: arrival_float, Length: 255, dtype: float64
dtype='object')
5
0
     22.384718
     22.006981
2
     20.128889
3
     17.662208
     22.668546
4
378
     21.835278
379
     18.335833
380
     17.041667
381
     20.232778
    20.276111
382
Name: arrival_float, Length: 383, dtype: float64
gbqr_mob
           -----START-----
9
0
     21.534167
     20.613662
2
     19.645551
     22.909903
3
4
     17.603444
425
     17.302222
426
     15.350556
427
     16.310278
428
     19.896944
429
     16.257222
Name: arrival_float, Length: 430, dtype: float64
9
0
     20.383056
1
     20.369324
2
     18.187500
3
     16.514787
4
     21.167375
250
     16.617315
251
     19.556801
252
     16.581560
     21.173500
253
254
     20.691764
Name: arrival_float, Length: 255, dtype: float64
9
0
     22.384718
     22.006981
2
     20.128889
3
     17.662208
4
     22.668546
```

```
378
      21.835278
379
      18.335833
380
      17.041667
      20.232778
381
382
      20.276111
Name: arrival_float, Length: 383, dtype: float64
gbqr
     -----START-----
1
dtype='object')
0
      21.534167
1
      20.613662
      19.645551
2
      22.909903
3
      17.603444
425
     17.302222
426
      15.350556
427
      16.310278
     19.896944
428
429
      16.257222
Name: arrival_float, Length: 430, dtype: float64
Index(['day_of_week', 'weekend_flag', 'arrival_p1', 'arrival_p2',
       'arrival_p3'],
     dtype='object')
5
0
      20.383056
      20.369324
2
      18.187500
3
      16.514787
      21.167375
4
250
     16.617315
251
      19.556801
252
      16.581560
253
      21,173500
254
     20.691764
Name: arrival_float, Length: 255, dtype: float64
Index(['day_of_week', 'weekend_flag', 'arrival_p1', 'arrival_p2',
      'arrival_p3'],
     dtype='object')
5
      22.384718
0
      22.006981
1
      20.128889
3
      17.662208
4
      22.668546
     21.835278
378
      18.335833
379
380
      17.041667
381
      20.232778
382
      20.276111
Name: arrival_float, Length: 383, dtype: float64
[Skipeed intermediate results to aavoid a lengthy list of printed dates...]
##REPRODUCTION CHECK##: Simulate uncontrolled charging as baseline
    -----START-----
2
   -----START-----
-----START-----
##REPRODUCTION CHECK##: Evaluate unidirectional smart charging compared with baseline
Model type: qrf_mob
Quantile prediction of \operatorname{soc} \colon \operatorname{O.5}
Model type: qrf_mob
Quantile prediction of soc: 0.55
Model type: qrf_mob
Quantile prediction of soc: 0.6
Model type: qrf_mob
Quantile prediction of soc: 0.65
```

```
Model type: qrf_mob
Quantile prediction of soc: 0.7
Model type: qrf_mob
Quantile prediction of soc: 0.75
_____
Model type: qrf_mob
Quantile prediction of soc: 0.8
Model type: qrf_mob
Quantile prediction of soc: 0.85
_____
Model type: qrf_mob
Quantile prediction of soc: 0.9
Model type: qrf_mob
Quantile prediction of soc: 0.95
qrf_mob_soc0.5
On-peak hours [12, 13, 19, 20, 21, 22]
Traceback (most recent call last):
  File "code/main.py", line 309, in <module>
  base_uni.evaluate_peakshaving_way2(model_type, mob_flags, soc_quan_list, LOADPROFILE_PATH, BASELINE_PATH, UNISMARTCHARGE_PATH, RESULT_PATFile "/home/cgranell/code/agile2022-010/code/compare_baseline_unismart.py", line 379, in evaluate_peakshaving_way2 base_max_time = base_load_hour.index[base_load_hour['load'] == base_max_load].values[0]
IndexError: index 0 is out of bounds for axis 0 with size 0
```

The exception raised appears to be related to an error in the contained data in one of the synthetic data files.