```
import duckdb
conn = duckdb.connect()
import matplotlib
%matplotlib
%pip install jupysql
%env PLOOMBER_STATS_ENABLED="false"
%env PLOOMBER_VERSION_CHECK_DISABLED="false"
%pip install -U "jupysql[plot]" matplotlib seaborn
%load_ext sql
```

Using matplotlib backend: inline

```
Requirement already satisfied: jupysql in c:\users\lbana\documents\csprojects\when2g o\.venv\lib\site-packages (0.11.1)
```

Requirement already satisfied: prettytable>=3.12.0 in c:\users\lbana\documents\csprojects\when2go\.venv\lib\site-packages (from jupysql) (3.16.0)

Requirement already satisfied: sqlalchemy in c:\users\lbana\documents\csprojects\whe n2go\.venv\lib\site-packages (from jupysql) (2.0.43)

Requirement already satisfied: sqlparse in c:\users\lbana\documents\csprojects\when2 go\.venv\lib\site-packages (from jupysql) (0.5.3)

Requirement already satisfied: ipython-genutils>=0.1.0 in c:\users\lbana\documents\c sprojects\when2go\.venv\lib\site-packages (from jupysql) (0.2.0)

Requirement already satisfied: jinja2 in c:\users\lbana\documents\csprojects\when2go \.venv\lib\site-packages (from jupysql) (3.1.6)

Requirement already satisfied: sqlglot>=11.3.7 in c:\users\lbana\documents\csproject s\when2go\.venv\lib\site-packages (from jupysql) (27.18.0)

Requirement already satisfied: jupysql-plugin>=0.4.2 in c:\users\lbana\documents\csp rojects\when2go\.venv\lib\site-packages (from jupysql) (0.4.5)

Requirement already satisfied: ploomber-core>=0.2.7 in c:\users\lbana\documents\cspr ojects\when2go\.venv\lib\site-packages (from jupysql) (0.2.27)

Requirement already satisfied: pyyaml in c:\users\lbana\documents\csprojects\when2go \.venv\lib\site-packages (from ploomber-core>=0.2.7->jupysql) (6.0.2)

Requirement already satisfied: posthog>=3.0 in c:\users\lbana\documents\csprojects\w hen2go\.venv\lib\site-packages (from ploomber-core>=0.2.7->jupysql) (6.7.6)

Requirement already satisfied: requests<3.0,>=2.7 in c:\users\lbana\documents\csproj ects\when2go\.venv\lib\site-packages (from posthog>=3.0->ploomber-core>=0.2.7->jupys q1) (2.32.5)

Requirement already satisfied: six>=1.5 in c:\users\lbana\documents\csprojects\when2 go\.venv\lib\site-packages (from posthog>=3.0->ploomber-core>=0.2.7->jupysql) (1.17. 0)

Requirement already satisfied: python-dateutil>=2.2 in c:\users\lbana\documents\cspr ojects\when2go\.venv\lib\site-packages (from posthog>=3.0->ploomber-core>=0.2.7->jup ysql) (2.9.0.post0)

Requirement already satisfied: backoff>=1.10.0 in c:\users\lbana\documents\csproject s\when2go\.venv\lib\site-packages (from posthog>=3.0->ploomber-core>=0.2.7->jupysql) (2.2.1)

Requirement already satisfied: distro>=1.5.0 in c:\users\lbana\documents\csprojects \when2go\.venv\lib\site-packages (from posthog>=3.0->ploomber-core>=0.2.7->jupysql) (1.9.0)

Requirement already satisfied: typing-extensions>=4.2.0 in c:\users\lbana\documents \csprojects\when2go\.venv\lib\site-packages (from posthog>=3.0->ploomber-core>=0.2.7 ->jupysql) (4.15.0)

Requirement already satisfied: charset\_normalizer<4,>=2 in c:\users\lbana\documents \csprojects\when2go\.venv\lib\site-packages (from requests<3.0,>=2.7->posthog>=3.0-> ploomber-core>=0.2.7->jupysql) (3.4.3)

Requirement already satisfied: idna<4,>=2.5 in c:\users\lbana\documents\csprojects\w hen2go\.venv\lib\site-packages (from requests<3.0,>=2.7->posthog>=3.0->ploomber-core >=0.2.7->jupysql) (3.10)

Requirement already satisfied: urllib3<3,>=1.21.1 in c:\users\lbana\documents\csproj ects\when2go\.venv\lib\site-packages (from requests<3.0,>=2.7->posthog>=3.0->ploombe r-core>=0.2.7->jupysql) (2.5.0)

Requirement already satisfied: certifi>=2017.4.17 in c:\users\lbana\documents\csproj ects\when2go\.venv\lib\site-packages (from requests<3.0,>=2.7->posthog>=3.0->ploombe r-core>=0.2.7->jupysql) (2025.8.3)

Requirement already satisfied: wcwidth in c:\users\lbana\documents\csprojects\when2g o\.venv\lib\site-packages (from prettytable>=3.12.0->jupysql) (0.2.14)

Requirement already satisfied: MarkupSafe>=2.0 in c:\users\lbana\documents\csproject s\when2go\.venv\lib\site-packages (from jinja2->jupysql) (3.0.2)

```
Requirement already satisfied: greenlet>=1 in c:\users\lbana\documents\csprojects\wh
en2go\.venv\lib\site-packages (from sqlalchemy->jupysql) (3.2.4)
Note: you may need to restart the kernel to use updated packages.
env: PLOOMBER_STATS_ENABLED="false"
env: PLOOMBER_VERSION_CHECK_DISABLED="false"
Requirement already satisfied: matplotlib in c:\users\lbana\documents\csprojects\whe
n2go\.venv\lib\site-packages (3.10.6)
Requirement already satisfied: seaborn in c:\users\lbana\documents\csprojects\when2g
o\.venv\lib\site-packages (0.13.2)
Requirement already satisfied: jupysql[plot] in c:\users\lbana\documents\csprojects
\when2go\.venv\lib\site-packages (0.11.1)
Requirement already satisfied: prettytable>=3.12.0 in c:\users\lbana\documents\cspro
jects\when2go\.venv\lib\site-packages (from jupysql[plot]) (3.16.0)
Requirement already satisfied: sqlalchemy in c:\users\lbana\documents\csprojects\whe
n2go\.venv\lib\site-packages (from jupysql[plot]) (2.0.43)
Requirement already satisfied: sqlparse in c:\users\lbana\documents\csprojects\when2
go\.venv\lib\site-packages (from jupysql[plot]) (0.5.3)
Requirement already satisfied: ipython-genutils>=0.1.0 in c:\users\lbana\documents\c
sprojects\when2go\.venv\lib\site-packages (from jupysql[plot]) (0.2.0)
Requirement already satisfied: jinja2 in c:\users\lbana\documents\csprojects\when2go
\.venv\lib\site-packages (from jupysql[plot]) (3.1.6)
Requirement already satisfied: sqlglot>=11.3.7 in c:\users\lbana\documents\csproject
s\when2go\.venv\lib\site-packages (from jupysql[plot]) (27.18.0)
Requirement already satisfied: jupysql-plugin>=0.4.2 in c:\users\lbana\documents\csp
rojects\when2go\.venv\lib\site-packages (from jupysql[plot]) (0.4.5)
Requirement already satisfied: ploomber-core>=0.2.7 in c:\users\lbana\documents\cspr
ojects\when2go\.venv\lib\site-packages (from jupysql[plot]) (0.2.27)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\lbana\documents\csprojec
ts\when2go\.venv\lib\site-packages (from matplotlib) (1.3.3)
Requirement already satisfied: cycler>=0.10 in c:\users\lbana\documents\csprojects\w
hen2go\.venv\lib\site-packages (from matplotlib) (0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\lbana\documents\csproje
cts\when2go\.venv\lib\site-packages (from matplotlib) (4.60.0)
Requirement already satisfied: kiwisolver>=1.3.1 in c:\users\lbana\documents\csproje
cts\when2go\.venv\lib\site-packages (from matplotlib) (1.4.9)
Requirement already satisfied: numpy>=1.23 in c:\users\lbana\documents\csprojects\wh
en2go\.venv\lib\site-packages (from matplotlib) (2.3.3)
Requirement already satisfied: packaging>=20.0 in c:\users\lbana\documents\csproject
s\when2go\.venv\lib\site-packages (from matplotlib) (25.0)
Requirement already satisfied: pillow>=8 in c:\users\lbana\documents\csprojects\when
2go\.venv\lib\site-packages (from matplotlib) (11.3.0)
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\lbana\documents\csprojec
ts\when2go\.venv\lib\site-packages (from matplotlib) (3.2.5)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\lbana\documents\cspr
ojects\when2go\.venv\lib\site-packages (from matplotlib) (2.9.0.post0)
Requirement already satisfied: pandas>=1.2 in c:\users\lbana\documents\csprojects\wh
en2go\.venv\lib\site-packages (from seaborn) (2.3.2)
Requirement already satisfied: pytz>=2020.1 in c:\users\lbana\documents\csprojects\w
hen2go\.venv\lib\site-packages (from pandas>=1.2->seaborn) (2025.2)
Requirement already satisfied: tzdata>=2022.7 in c:\users\lbana\documents\csprojects
\when2go\.venv\lib\site-packages (from pandas>=1.2->seaborn) (2025.2)
Requirement already satisfied: pyyaml in c:\users\lbana\documents\csprojects\when2go
\.venv\lib\site-packages (from ploomber-core>=0.2.7->jupysql[plot]) (6.0.2)
Requirement already satisfied: posthog>=3.0 in c:\users\lbana\documents\csprojects\w
hen2go\.venv\lib\site-packages (from ploomber-core>=0.2.7->jupysql[plot]) (6.7.6)
Requirement already satisfied: requests<3.0,>=2.7 in c:\users\lbana\documents\csproj
```

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```
eda
        ects\when2go\.venv\lib\site-packages (from posthog>=3.0->ploomber-core>=0.2.7->jupys
        ql[plot]) (2.32.5)
        Requirement already satisfied: six>=1.5 in c:\users\lbana\documents\csprojects\when2
        go\.venv\lib\site-packages (from posthog>=3.0->ploomber-core>=0.2.7->jupysql[plot])
        (1.17.0)
        Requirement already satisfied: backoff>=1.10.0 in c:\users\lbana\documents\csproject
        s\when2go\.venv\lib\site-packages (from posthog>=3.0->ploomber-core>=0.2.7->jupysql
        [plot]) (2.2.1)
        Requirement already satisfied: distro>=1.5.0 in c:\users\lbana\documents\csprojects
        \when2go\.venv\lib\site-packages (from posthog>=3.0->ploomber-core>=0.2.7->jupysql[p
        lot]) (1.9.0)
        Requirement already satisfied: typing-extensions>=4.2.0 in c:\users\lbana\documents
        \csprojects\when2go\.venv\lib\site-packages (from posthog>=3.0->ploomber-core>=0.2.7
        ->jupysql[plot]) (4.15.0)
        Requirement already satisfied: charset normalizer<4,>=2 in c:\users\lbana\documents
        \csprojects\when2go\.venv\lib\site-packages (from requests<3.0,>=2.7->posthog>=3.0->
        ploomber-core>=0.2.7->jupysql[plot]) (3.4.3)
        Requirement already satisfied: idna<4,>=2.5 in c:\users\lbana\documents\csprojects\w
        hen2go\.venv\lib\site-packages (from requests<3.0,>=2.7->posthog>=3.0->ploomber-core
        >=0.2.7->jupysql[plot]) (3.10)
        Requirement already satisfied: urllib3<3,>=1.21.1 in c:\users\lbana\documents\csproj
        ects\when2go\.venv\lib\site-packages (from requests<3.0,>=2.7->posthog>=3.0->ploombe
        r-core>=0.2.7->jupysql[plot]) (2.5.0)
        Requirement already satisfied: certifi>=2017.4.17 in c:\users\lbana\documents\csproj
        ects\when2go\.venv\lib\site-packages (from requests<3.0,>=2.7->posthog>=3.0->ploombe
        r-core>=0.2.7->jupysql[plot]) (2025.8.3)
        Requirement already satisfied: wcwidth in c:\users\lbana\documents\csprojects\when2g
        o\.venv\lib\site-packages (from prettytable>=3.12.0->jupysql[plot]) (0.2.14)
        Requirement already satisfied: MarkupSafe>=2.0 in c:\users\lbana\documents\csproject
        s\when2go\.venv\lib\site-packages (from jinja2->jupysql[plot]) (3.0.2)
        Requirement already satisfied: greenlet>=1 in c:\users\lbana\documents\csprojects\wh
        en2go\.venv\lib\site-packages (from sqlalchemy->jupysql[plot]) (3.2.4)
        Note: you may need to restart the kernel to use updated packages.
        The sql extension is already loaded. To reload it, use:
          %reload_ext sql
        WARNING: jupysql 0.11.1 does not provide the extra 'plot'
In [28]:
         %sql conn
In [29]: %load_ext sql
         # Ensure jupysql plot magic is available
         # If not already installed earlier in the notebook, ensure jupysql was installed.
        The sql extension is already loaded. To reload it, use:
          %reload_ext sql
In [30]: | %%sql
         CREATE OR REPLACE VIEW yellow_2024 AS
```

```
SELECT *
FROM 'yellow_2024_clean.parquet';
CREATE OR REPLACE VIEW fhv 2024 AS
```

Running query in 'DuckDBPyConnection'

FROM 'fhvhv\_2024\_clean.parquet';

SELECT \*

## Out[30]: Count

```
In [31]: %%sql --save per_bin --no-index
         WITH scoped AS (
           SELECT
             CASE hvfhs_license_num WHEN 'HV0003' THEN 'Uber' WHEN 'HV0005' THEN 'Lyft' END
             trip miles,
             trip_time,
             COALESCE(base_passenger_fare,0)+COALESCE(sales_tax,0)+COALESCE(bcf,0)+
             COALESCE(congestion_surcharge,0)+COALESCE(airport_fee,0)+COALESCE(tolls,0) AS t
           FROM fhv 2024
           WHERE hvfhs license num IN ('HV0003', 'HV0005')
             AND trip miles >= 0.5 AND trip miles < 30
             AND trip time BETWEEN 60 AND 14400
         binned AS (
           SELECT
             company,
             CAST(FLOOR(trip miles / 3.0) AS INTEGER) AS miles bin,
             total_ex_tip,
             trip_miles
           FROM scoped
         ),
         stats AS (
           SELECT
             company, miles_bin,
             COUNT(*) AS trips,
             AVG(total_ex_tip/NULLIF(trip_miles,0)) AS avg_per_mile,
             quantile(total ex tip/NULLIF(trip miles,0), 0.5) AS p50 per mile
           FROM binned
           GROUP BY 1,2
         ),
         joined AS (
           SELECT
             u.miles bin,
             u.trips AS trips uber,
             l.trips AS trips_lyft,
             u.avg_per_mile AS avg_per_mile_uber,
             1.avg_per_mile AS avg_per_mile_lyft,
             u.p50_per_mile AS p50_per_mile_uber,
             1.p50 per mile AS p50 per mile lyft
           FROM stats u
           JOIN stats 1 USING (miles_bin)
           WHERE u.company = 'Uber' AND 1.company = 'Lyft'
         SELECT
           miles bin,
           CONCAT(CAST(miles bin*3 AS INT), '-', CAST((miles bin+1)*3 AS INT), ' mi') AS bin
           trips_uber, trips_lyft,
           avg_per_mile_uber, avg_per_mile_lyft,
           (avg_per_mile_uber - avg_per_mile_lyft) AS diff_per_mile,
           100.0 * (avg_per_mile_uber - avg_per_mile_lyft) / NULLIF(avg_per_mile_lyft, 0) AS
           p50_per_mile_uber, p50_per_mile_lyft
         FROM joined
```

WHERE miles\_bin BETWEEN 0 AND 9
ORDER BY miles\_bin;

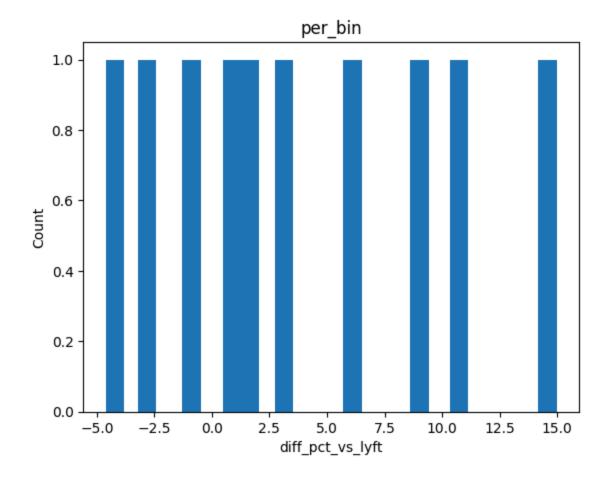
Running query in 'DuckDBPyConnection'

Out[31]:	miles_bin	bin_label	trips_uber	trips_lyft	avg_per_mile_uber	avg_per_mile_lyft	
	0	0-3 mi	7289922	2715380	11.020374070859075	10.1090004704684	0.911
	1	3-6 mi	3294877	1212778	6.722938073010101	6.664341461221657	0.0585
	2	6-9 mi	1491349	513278	5.230713877272654	5.460489852122013	-0.2297
	3	9-12 mi	890044	304608	4.88842354776572	4.932328616991318	-0.0439
	4	12-15 mi	433002	144238	4.38890448505322	4.516258743972218	-0.1273
	5	15-18 mi	345023	107627	4.644536626857059	4.568909149966782	0.0756
	6	18-21 mi	232460	70669	4.530622229100431	4.392747127679986	0.1378
	7	21-24 mi	91340	27391	4.39379182673262	4.14102901752747	0.252
	8	24-27 mi	55226	18617	4.293025739723407	3.8766577682271444	0.416
	9	27-30 mi	42135	14601	4.363775204167202	3.808441898306672	0.555
	4						

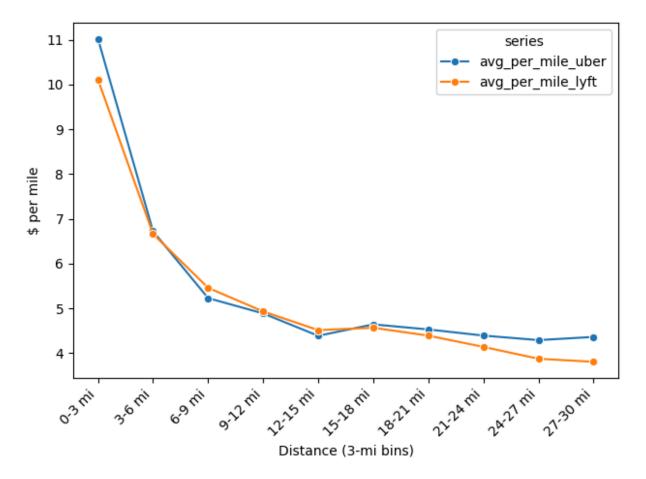
In [32]: %sqlplot bar --table per\_bin --column diff\_pct\_vs\_lyft --with per\_bin --title "Uber

Removing NULLs, if there exists any from diff\_pct\_vs\_lyft

Out[32]: <Axes: title={'center': 'per\_bin'}, xlabel='diff\_pct\_vs\_lyft', ylabel='Count'>



Generating CTE with stored snippets: 'per\_bin' Running query in 'DuckDBPyConnection'



Running query in 'DuckDBPyConnection'

Out[34]:	column_name	column_type	null	key	default	extra
	hvfhs_license_num	VARCHAR	YES	None	None	None
	dispatching_base_num	VARCHAR	YES	None	None	None
	originating_base_num	VARCHAR	YES	None	None	None
	request_datetime	TIMESTAMP	YES	None	None	None
	on_scene_datetime	TIMESTAMP	YES	None	None	None
	pickup_datetime	TIMESTAMP	YES	None	None	None
	dropoff_datetime	TIMESTAMP	YES	None	None	None
	PULocationID	INTEGER	YES	None	None	None
	DOLocationID	INTEGER	YES	None	None	None
	trip_miles	DOUBLE	YES	None	None	None
	trip_time	BIGINT	YES	None	None	None
	base_passenger_fare	DOUBLE	YES	None	None	None
	tolls	DOUBLE	YES	None	None	None
	bcf	DOUBLE	YES	None	None	None
	sales_tax	DOUBLE	YES	None	None	None
	congestion_surcharge	DOUBLE	YES	None	None	None
	airport_fee	DOUBLE	YES	None	None	None
	tips	DOUBLE	YES	None	None	None
	driver_pay	DOUBLE	YES	None	None	None
	shared_request_flag	VARCHAR	YES	None	None	None
	shared_match_flag	VARCHAR	YES	None	None	None
	access_a_ride_flag	VARCHAR	YES	None	None	None
	wav_request_flag	VARCHAR	YES	None	None	None
	wav_match_flag	VARCHAR	YES	None	None	None

Running query in 'DuckDBPyConnection'

```
Out[35]: hvfhs_license_num dispatching_base_num originating_base_num request_datetime on_scen
                                                                             2024-01-01
                    HV0003
                                          B03404
                                                               B03404
                                                                                00:21:47
                                                                             2024-01-01
                    HV0003
                                          B03404
                                                               B03404
                                                                                00:10:56
                                                                             2024-01-01
                    HV0003
                                          B03404
                                                               B03404
                                                                                00:20:04
                                                                             2024-01-01
                    HV0003
                                          B03404
                                                               B03404
                                                                                00:35:46
                                                                             2024-01-01
                    HV0003
                                          B03404
                                                               B03404
                                                                                00:48:19
In [36]: %%sql
          SELECT
            CASE hvfhs_license_num
              WHEN 'HV0003' THEN 'Uber'
              WHEN 'HV0005' THEN 'Lyft'
              WHEN 'HV0004' THEN 'Via'
              WHEN 'HV0002' THEN 'Juno'
              ELSE hvfhs_license_num
            END AS company,
           COUNT(*) AS trips
          FROM fhv_2024
          GROUP BY 1 ORDER BY trips DESC;
       Running query in 'DuckDBPyConnection'
Out[36]: company
                        trips
              Uber 14432755
               Lyft
                     5231175
In [37]: %%sql
         WITH scoped AS (
              CASE hvfhs_license_num WHEN 'HV0003' THEN 'Uber' WHEN 'HV0005' THEN 'Lyft' END
              trip_miles,
              trip_time,
              COALESCE(base_passenger_fare,0) AS base_fare,
              COALESCE(sales_tax,0) AS sales_tax,
              COALESCE(bcf,0) AS bcf,
              COALESCE(congestion_surcharge,0) AS congestion,
              COALESCE(airport_fee,0) AS airport_fee,
              COALESCE(tolls,0) AS tolls,
              COALESCE(tips,0) AS tips,
              COALESCE(base_passenger_fare,0)+COALESCE(sales_tax,0)+COALESCE(bcf,0)+
              COALESCE(congestion_surcharge,0)+COALESCE(airport_fee,0)+COALESCE(tolls,0)
              COALESCE(base_passenger_fare,0)+COALESCE(sales_tax,0)+COALESCE(bcf,0)+
```

```
COALESCE(congestion_surcharge,0)+COALESCE(airport_fee,0)+COALESCE(tolls,0)+tips
  FROM fhv 2024
 WHERE hvfhs license num IN ('HV0003', 'HV0005')
   AND trip miles BETWEEN 0.5 AND 100
   AND trip_time BETWEEN 60 AND 14400
SELECT
 company,
 COUNT(*) AS trips,
 AVG(total_ex_tip) AS avg_total_ex_tip,
 quantile(total_ex_tip, 0.5) AS p50_total_ex_tip,
 quantile(total_ex_tip, 0.9) AS p90_total_ex_tip,
 AVG(total_with_tip) AS avg_total_with_tip,
 AVG(total_ex_tip/NULLIF(trip_miles,0)) AS avg_per_mile_ex_tip,
  quantile(total ex tip/NULLIF(trip miles,0), 0.5) AS p50 per mile ex tip,
 AVG(tips) AS avg_tip
FROM scoped
GROUP BY 1
ORDER BY 1;
```

Running query in 'DuckDBPyConnection'

```
Out[37]: company
                       trips
                                 avg total ex tip
                                                    p50 total ex tip
                                                                        p90 total ex tip
                                                                                          avg to
               Lyft
                    5160561 27.966477501184748 20.959999999999 54.6600000000000004
                                                                                         29.1333
              Uber 14257632 29.622154873208316 21.90999999999999
                                                                                  56.96 30.64979
In [38]:
         %%sql
         WITH scoped AS (
             CASE hvfhs license num WHEN 'HV0003' THEN 'Uber' WHEN 'HV0005' THEN 'Lyft' END
             trip_miles,
             trip_time,
             COALESCE(base passenger fare,0)+COALESCE(sales tax,0)+COALESCE(bcf,0)+
             COALESCE(congestion_surcharge,0)+COALESCE(airport_fee,0)+COALESCE(tolls,0) AS t
           FROM fhv 2024
           WHERE hvfhs license num IN ('HV0003', 'HV0005')
```

AVG(total\_ex\_tip) FILTER (WHERE company='Uber') AS avg\_total\_uber, AVG(total ex tip) FILTER (WHERE company='Lyft') AS avg\_total\_lyft,

AVG(total\_ex\_tip/NULLIF(trip\_miles,0)) FILTER (WHERE company='Uber')

- AVG(total\_ex\_tip) FILTER (WHERE company='Lyft') AS avg\_total\_diff,

AVG(total\_ex\_tip/NULLIF(trip\_miles,0)) FILTER (WHERE company='Uber') AS per\_mile\_ AVG(total\_ex\_tip/NULLIF(trip\_miles,0)) FILTER (WHERE company='Lyft') AS per\_mile\_

AVG(total\_ex\_tip/NULLIF(trip\_miles,0)) FILTER (WHERE company='Lyft') AS per\_m

Running query in 'DuckDBPyConnection'

AND trip\_miles BETWEEN 0.5 AND 100 AND trip\_time BETWEEN 60 AND 14400

AVG(total ex tip) FILTER (WHERE company='Uber')

) SELECT

FROM scoped

Out[38]: avg\_total\_uber avg\_total\_lyft avg\_total\_diff per\_mile\_uber per\_m

29.622154873205165 27.966477501191992 1.655677372013173 8.44576983201331 8.070227684

In [39]: %config SqlMagic.displaylimit = None

displaylimit: Value None will be treated as 0 (no limit)