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How to write SQL queries?

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Citus Data
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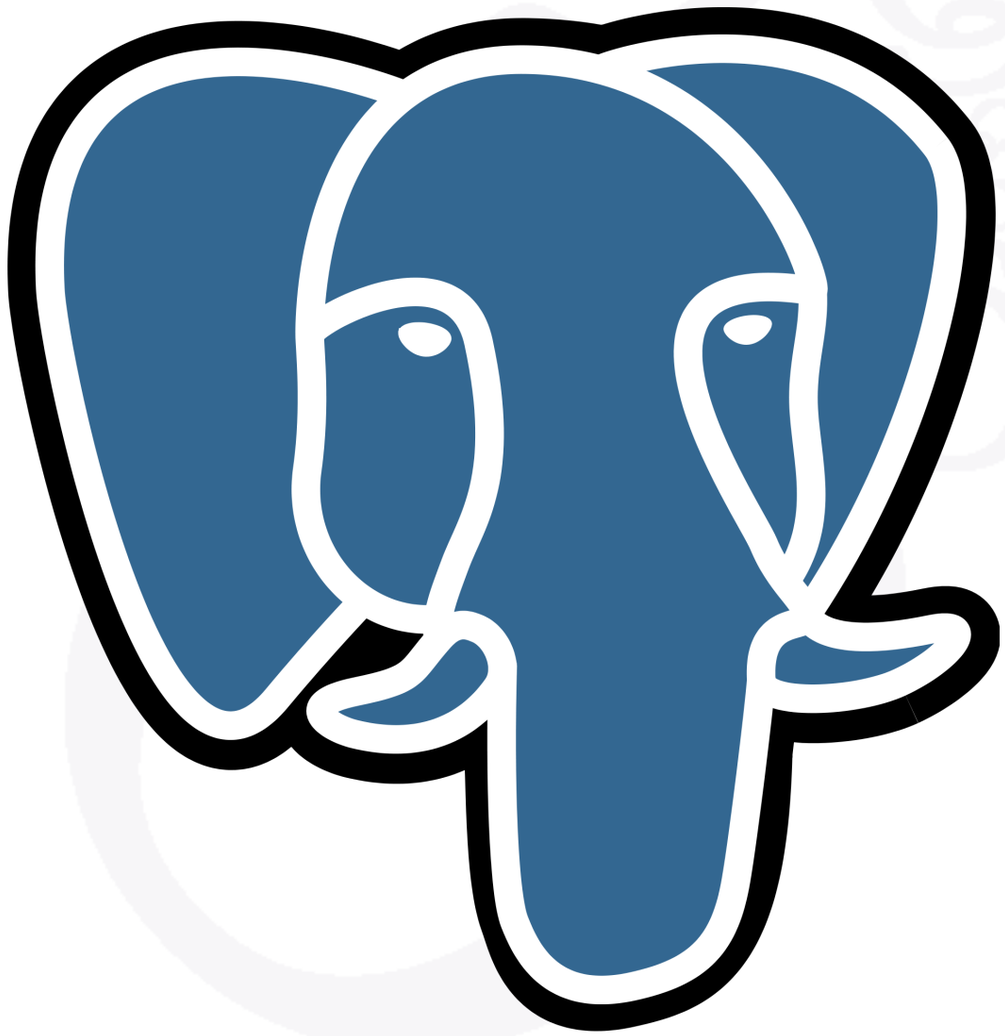
The Art of PostgreSQL

Turn Thousands of Lines
of Code into Simple Queries

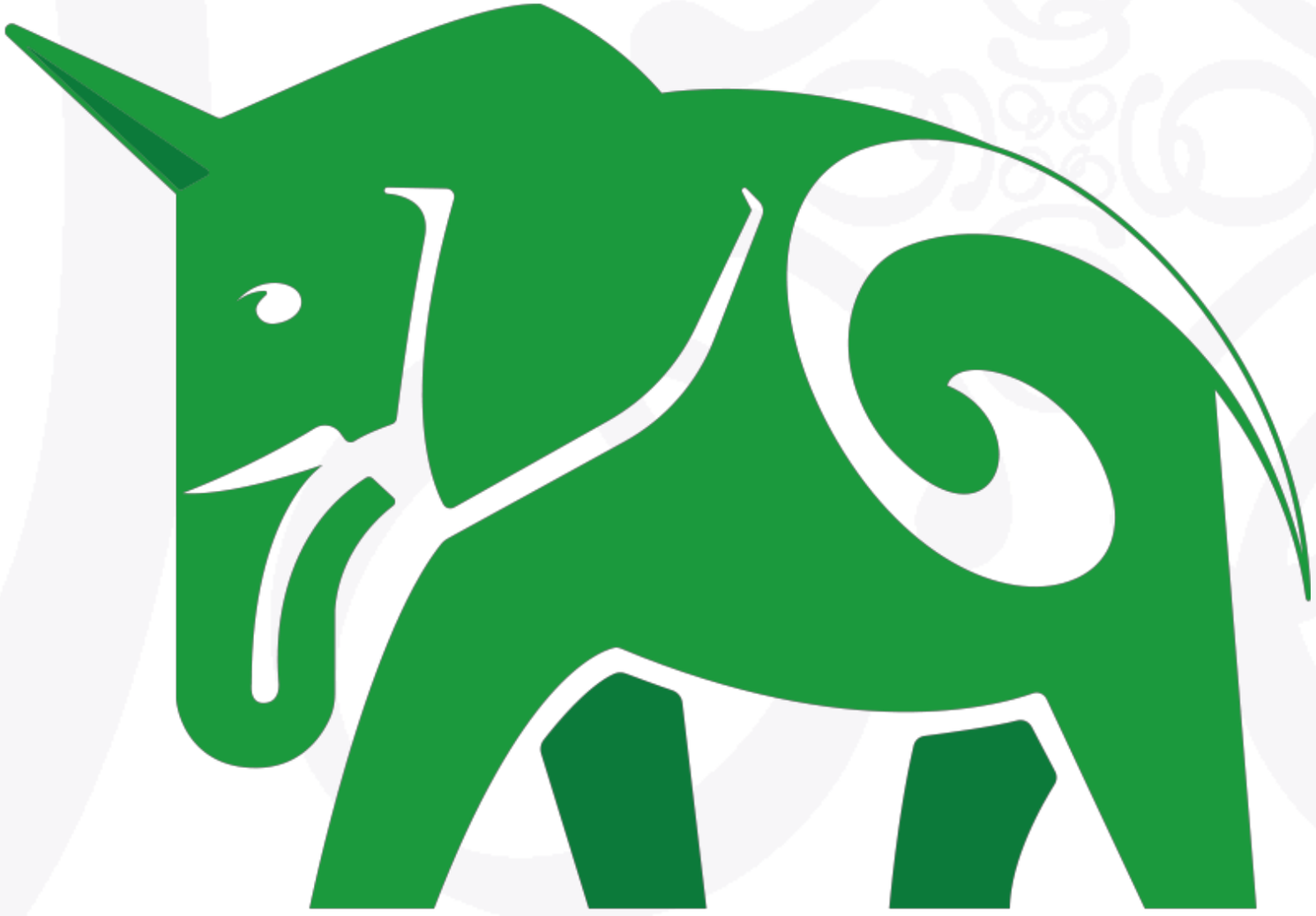
POSTGRESQL MAJOR CONTRIBUTOR

PostgreSQL



CURRENTLY WORKING AT

Citus Data



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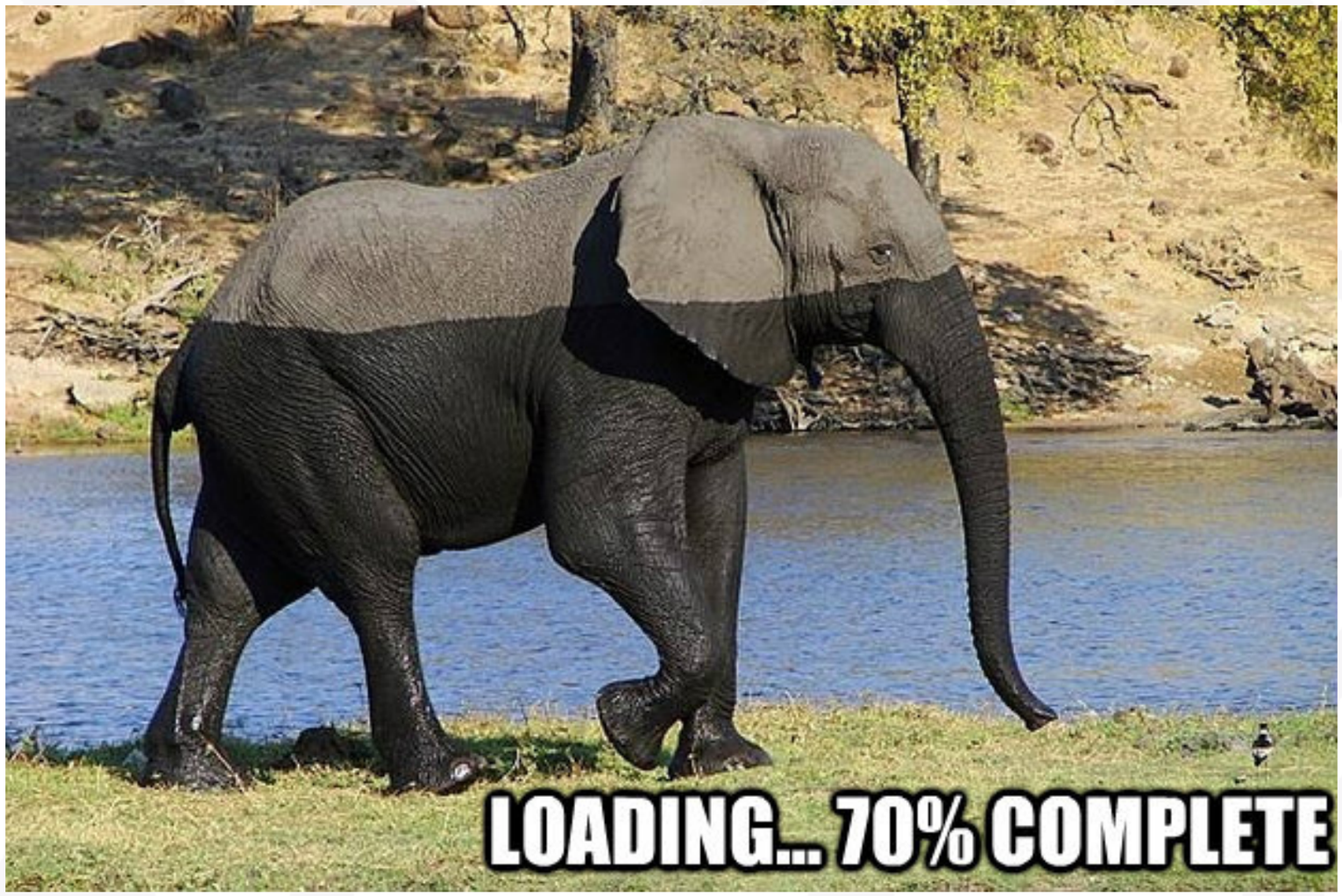


SQL Queries

Monthly Report, WoW%, SQL

```
with computed_data as
(
  select cast(date as date)   as date,
         to_char(date, 'Dy')  as day,
         coalesce(dollars, 0) as dollars,
         lag(dollars, 1)
           over(
             partition by extract('isodow' from date)
                 order by date
           )
       as last_week_dollars
    from /*
          * Generate the month calendar, plus a week
          * before so that we have values to compare
          * dollars against even for the first week
          * of the month.
          */
         generate_series(date :'start' - interval '1 week',
                         date :'start' + interval '1 month'
                                       - interval '1 day',
                         interval '1 day'
         )
         as calendar(date)
         left join factbook using(date)
)
```

```
select date, day,
       to_char(
           coalesce(dollars, 0),
           'L99G999G999G999'
       ) as dollars,
       case when dollars is not null
             and dollars <> 0
            then round(  100.0
                       * (dollars - last_week_dollars)
                       / dollars
                     , 2)
        end
       as "WoW %"
  from computed_data
 where date >= date :'start'
order by date;
```

Monthly Report, Fixed, SQL

```
    select cast(calendar.entry as date) as date,
           coalesce(shares, 0) as shares,
           coalesce(trades, 0) as trades,
           to_char(
               coalesce(dollars, 0),
               'L99G999G999G999'
           ) as dollars
      from /*
            * Generate the target month's calendar then LEFT JOIN
            * each day against the factbook dataset, so as to have
            * every day in the result set, whether or not we have a
            * book entry for the day.
            */
           generate_series(date :'start',
                           date :'start' + interval '1 month'
                                         - interval '1 day',
                           interval '1 day'
           )
           as calendar(entry)
           left join factbook
                  on factbook.date = calendar.entry
order by date;
```

Monthly Report, SQL

```
\set start '2017-02-01'

  select date,
         to_char(shares, '99G999G999G999') as shares,
         to_char(trades, '99G999G999') as trades,
         to_char(dollars, 'L99G999G999G999') as dollars
    from factbook
   where date >= date :'start'
     and date  < date :'start' + interval '1 month'
order by date;
```

Monthly Report, SQL

date	shares	trades	dollars
2017-02-01	1,161,001,502	5,217,859	$ 44,660,060,305
2017-02-02	1,128,144,760	4,586,343	$ 43,276,102,903
2017-02-03	1,084,735,476	4,396,485	$ 42,801,562,275
2017-02-06	954,533,086	3,817,270	$ 37,300,908,120
2017-02-07	1,037,660,897	4,220,252	$ 39,754,062,721
2017-02-08	1,100,076,176	4,410,966	$ 40,491,648,732
2017-02-09	1,081,638,761	4,462,009	$ 40,169,585,511
2017-02-10	1,021,379,481	4,028,745	$ 38,347,515,768
2017-02-13	1,020,482,007	3,963,509	$ 38,745,317,913
2017-02-14	1,041,009,698	4,299,974	$ 40,737,106,101
2017-02-15	1,120,119,333	4,424,251	$ 43,802,653,477
2017-02-16	1,091,339,672	4,461,548	$ 41,956,691,405
2017-02-17	1,160,693,221	4,132,233	$ 48,862,504,551
2017-02-21	1,103,777,644	4,323,282	$ 44,416,927,777
2017-02-22	1,064,236,648	4,169,982	$ 41,137,731,714
2017-02-23	1,192,772,644	4,839,887	$ 44,254,446,593
2017-02-24	1,187,320,171	4,656,770	$ 45,229,398,830
2017-02-27	1,132,693,382	4,243,911	$ 43,613,734,358
2017-02-28	1,455,597,403	4,789,769	$ 57,874,495,227

(19 rows)

The data model

Races, drivers, results

```
appdev> \dt f1db.
                List of relations
 Schema |          Name          | Type  | Owner
--------+------------------------+-------+--------
 f1db   | circuits               | table | appdev
 f1db   | constructorresults     | table | appdev
 f1db   | constructors           | table | appdev
 f1db   | constructorstandings   | table | appdev
 f1db   | drivers                | table | appdev
 f1db   | driverstandings        | table | appdev
 f1db   | laptimes               | table | appdev
 f1db   | pitstops               | table | appdev
 f1db   | qualifying             | table | appdev
 f1db   | races                  | table | appdev
 f1db   | results                | table | appdev
 f1db   | seasons                | table | appdev
 f1db   | status                 | table | appdev
(13 rows)
```

Races

```
select * from races limit 1;

-[ RECORD 1 ]-------------------------------------------------------------
raceid    | 1
year      | 2009
round     | 1
circuitid | 1
name      | Australian Grand Prix
date      | 2009-03-29
time      | 06:00:00
url       | http://en.wikipedia.org/wiki/2009_Australian_Grand_Prix
```

Drivers

```
select code,
       format('%s %s', forename, surname) as fullname,
       forename,
       surname
  from drivers;
```

code	fullname	forename	surname
HAM	Lewis Hamilton	Lewis	Hamilton
HEI	Nick Heidfeld	Nick	Heidfeld
ROS	Nico Rosberg	Nico	Rosberg

(3 rows)

Results

```
   select code, forename, surname,
          count(*) as wins
     from      drivers
          join results using(driverid)
    where position = 1
group by driverid
order by wins desc
   limit 3;
```

code	forename	surname	wins
MSC	Michael	Schumacher	91
HAM	Lewis	Hamilton	56
¤	Alain	Prost	51

(3 rows)

How to write SQL

Inquiries

- Business Cases
- User Stories
- Marketing dept.
- Dashboards
- Practice

display all the races from a quarter with their winner

```
\set beginning '2017-04-01'
\set months 3
```

display all the races from a quarter with their winner

```
select date, name, drivers.surname as winner
  from races
       left join results
              on results.raceid = races.raceid
             and results.position = 1
       left join drivers using(driverid)
where date >= date :'beginning'
  and date <  date :'beginning'
             + :months * interval '1 month';
```

display all the races from a quarter with their winner

```
select date, name, drivers.surname as winner
  from races
       left join
           ( select raceid, driverid
             from results
            where position = 1
          )
          as winners using(raceid)
      left join drivers using(driverid)
where date >= date :'beginning'
  and date <  date :'beginning'
             + :months * interval '1 month';
```

Top-3 drivers by decade

Top-3 drivers by decade

```
with decades as (
  select extract('year' from date_trunc('decade', date))::int as decade
    from races
group by decade
)
 select decade,
        rank() over (partition by decade order by points desc) as rank,
        surname,
        points
   from decades
        left join lateral
        (
          select surname, sum(points) as points
            from races
            join results using(raceid)
            join drivers using(driverid)

           where extract('year' from date_trunc('decade', races.date))::int
               = decades.decade

         group by surname
         order by sum(points) desc
            limit 3
        )
        as winners on true
order by decade, points desc;
```

Compute cumulated constructor and drivers points in a season

Compute cumulated constructor and drivers points in a season

```
select drivers.surname as driver,
       constructors.name as constructor,
       sum(points) as points

  from results
       join races using(raceid)
       join drivers using(driverid)
       join constructors using(constructorid)

 where date >= :season
   and date <  :season + interval '1 year'

group by grouping sets((drivers.surname),
                       (constructors.name))
  having sum(points) > 20
order by constructors.name is not null,
         drivers.surname is not null,
         points desc;
```

PostgreSQL Extensions

Geolocation: ip4r

```
select *
   from geolite.blocks
   join geolite.location
        using(locid)
 where iprange
                >>=
        '74.125.195.147';
```

Constraint Exclusion

```
create table geolite.blocks
(
    iprange     ip4r,
    locid       integer,

    exclude using gist (iprange with &&)
);
```

Geolocation & earthdistance

```
with geoloc as
 (
  select location as l
    from location
    join blocks using(locid)
   where iprange
         >>=
         '212.58.251.195'
 )
  select name,
         pos <@> l miles
    from pubnames, geoloc
order by pos <-> l
   limit 10;
```

name	miles
The Windmill	0.238820308117723
County Hall Arms	0.343235607674773
St Stephen's Tavern	0.355548630092567
The Red Lion	0.417746499125936
Zeitgeist	0.395340599421532
The Rose	0.462805636194762
The Black Dog	0.536202634581979
All Bar One	0.489581827372222
Slug and Lettuce	0.49081531378207
Westminster Arms	0.42400619117691

(10 rows)

NBA Games Statistics

"An interesting factoid: the team that recorded the fewest defensive rebounds in a win was the 1995-96 Toronto Raptors, who beat the Milwaukee Bucks 93-87 on 12/26/1995 despite recording only 14 defensive rebounds."

NBA Games Statistics

```
with stats(game, team, drb, min) as (
    select ts.game, ts.team, drb, min(drb) over ()
      from team_stats ts
           join winners w on w.id = ts.game
                         and w.winner = ts.team
)
select game.date::date,
       host.name || ' -- ' || host_score as host,
       guest.name || ' -- ' || guest_score as guest,
       stats.drb as winner_drb
  from stats
       join game on game.id = stats.game
       join team host on host.id = game.host
       join team guest on guest.id = game.guest
 where drb = min;
```

NBA Games Statistics

```
-[ RECORD 1 ]--------------------------
date       | 1995-12-26
host       | Toronto Raptors -- 93
guest      | Milwaukee Bucks -- 87
winner_drb | 14
-[ RECORD 2 ]--------------------------
date       | 1996-02-02
host       | Golden State Warriors -- 114
guest      | Toronto Raptors -- 111
winner_drb | 14
-[ RECORD 3 ]--------------------------
date       | 1998-03-31
host       | Vancouver Grizzlies -- 101
guest      | Dallas Mavericks -- 104
winner_drb | 14
-[ RECORD 4 ]--------------------------
date       | 2009-01-14
host       | New York Knicks -- 128
guest      | Washington Wizards -- 122
winner_drb | 14

Time: 126.276 ms
```

Pure SQL Histograms

```
with drb_stats as (
    select min(drb) as min,
           max(drb) as max
      from team_stats
),
     histogram as (
   select width_bucket(drb, min, max, 9) as bucket,
          int4range(min(drb), max(drb), '[]') as range,
          count(*) as freq
     from team_stats, drb_stats
 group by bucket
 order by bucket
)
 select bucket, range, freq,
        repeat('■',
               (   freq::float
                 / max(freq) over()
                 * 30
               )::int
        ) as bar
   from histogram;
```

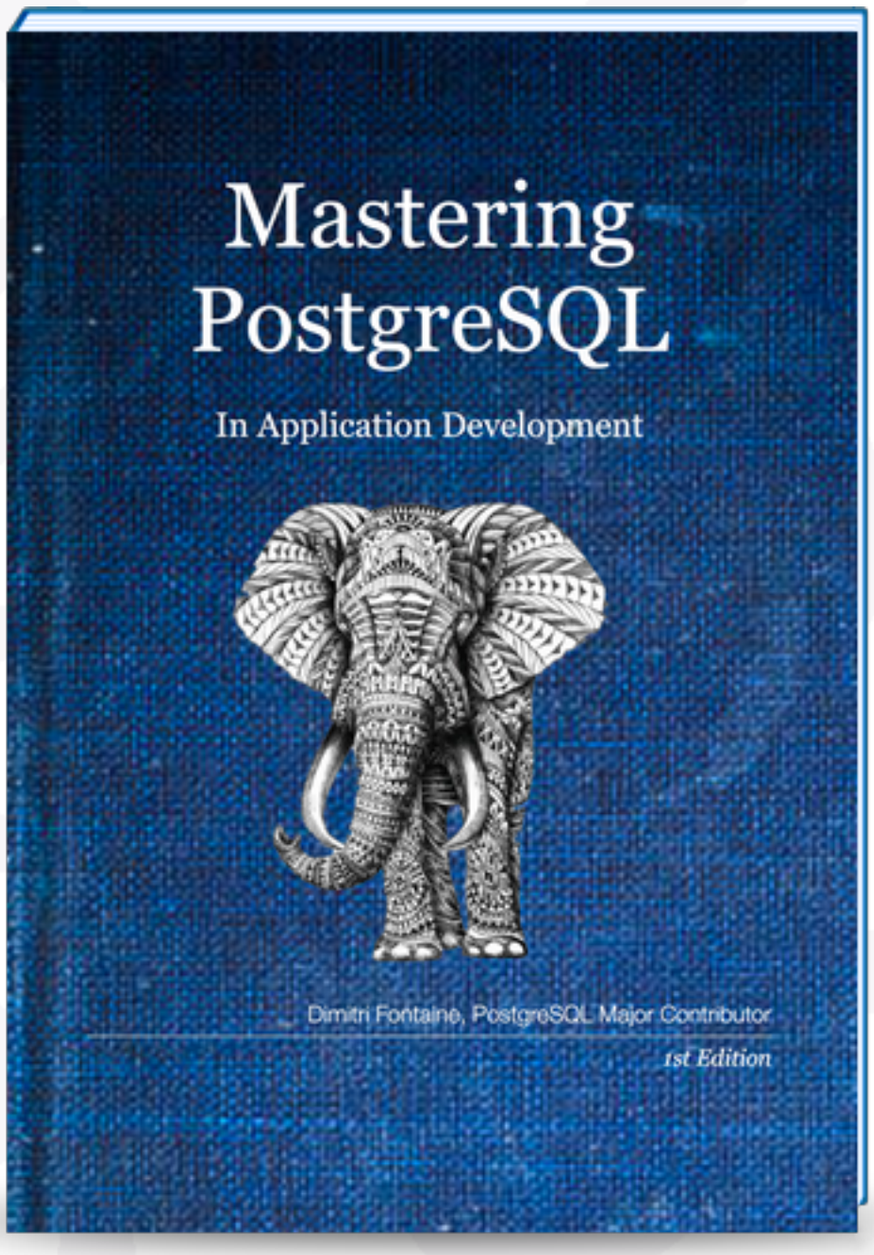
Pure SQL Histograms

```
 bucket |   range   | freq  |               bar
--------+-----------+-------+---------------------------------
      1 | [10,15)   |    52 |
      2 | [15,20)   |  1363 | ██
      3 | [20,25)   |  8832 | █████████████
      4 | [25,30)   | 20917 | ███████████████████████████████
      5 | [30,35)   | 20681 | ███████████████████████████████
      6 | [35,40)   |  9166 | █████████████
      7 | [40,45)   |  2093 | ███
      8 | [45,50)   |   247 |
      9 | [50,54)   |    20 |
     10 | [54,55)   |     1 |
(10 rows)
```

Mastering PostgreSQL in Application Development

https://masteringpostgresql.com

Mastering PostgreSQL In Application Development



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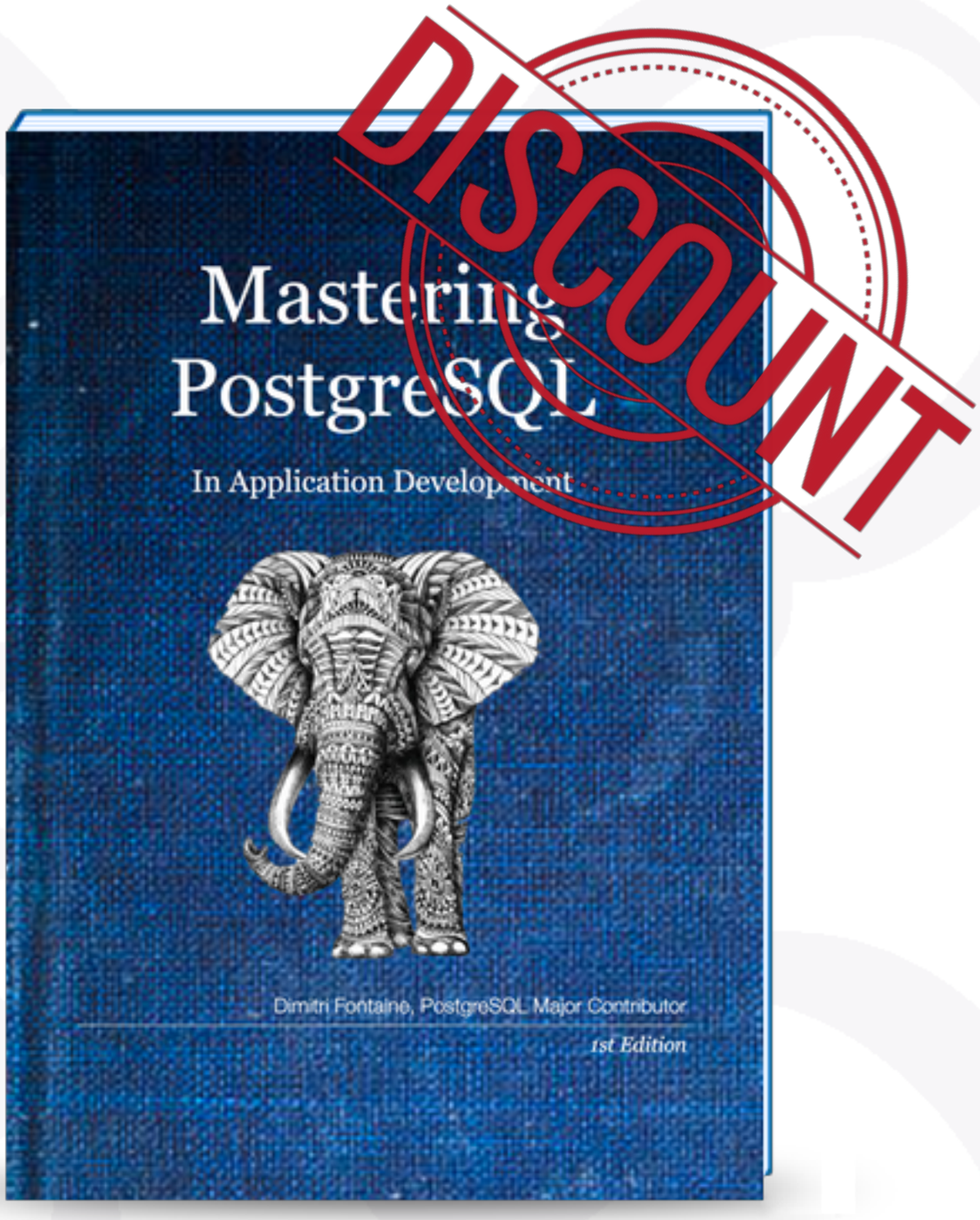

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Ask Me Two Questions!

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