As electronic vehicles (EVs) become more popular, there is an increasing need for access to charging stations, also known as ports. To that end, many modern apartment buildings have begun retrofitting their parking garages to include shared charging stations. A charging station is shared if it is accessible by anyone in the building.

But with increasing demand comes competition for these ports — nothing is more frustrating than coming home to find no charging stations available! In this project, you will use a dataset to help apartment building managers better understand their tenants' EV charging habits.

The data has been loaded into a PostgreSQL database with a table named `charging_sessions` with the following columns:

charging_sessions

Column	Definition	Data type
`garage_id`	Identifier for the garage/building	`VARCHAR`
`user_id`	Identifier for the individual user	`VARCHAR`
`user_type`	Indicating whether the station is `Shared` or `Private`	`VARCHAR`
`start_plugin`	The date and time the session started	`DATETIME`
`start_plugin_hour`	The hour (in military time) that the session started	`NUMERIC`
`end_plugout`	The date and time the session ended	`DATETIME`
`end_plugout_hour`	The hour (in military time) that the session ended	`NUMERIC`
`duration_hours`	The length of the session, in hours	`NUMERIC`
`el_kwh`	Amount of electricity used (in Kilowatt hours)	`NUMERIC`
`month_plugin`	The month that the session started	`VARCHAR`
`weekdays_plugin`	The day of the week that the session started	`VARCHAR`

Let's get started!

Sources

- **Data:** CC BY 4.0, via Kaggle,
- **Image:** Julian Herzog, CC BY 4.0, via Wikimedia Commons

Projects Data DataFrame as `df3`

```
-- Data Exploration
SELECT *
FROM charging_sessions
LIMIT 5;
```

	g		u	start_plugin	start_plugin_...	end_plugout	end_plugou...		duration...	mont...
0	AdO3	AdO3-4	Private	2018-12-21T10:20:00.000	10	2018-12-21T10:23:00.000	10	0.3	0.05	Dec
1	AdO3	AdO3-4	Private	2018-12-21T10:24:00.000	10	2018-12-21T10:32:00.000	10	0.87	0.136666667	Dec
2	AdO3	AdO3-4	Private	2018-12-21T11:33:00.000	11	2018-12-21T19:46:00.000	19	29.87	8.216388889	Dec
3	AdO3	AdO3-2	Private	2018-12-22T16:15:00.000	16	2018-12-23T16:40:00.000	16	15.56	24.41972222	Dec
4	AdO3	AdO3-2	Private	2018-12-24T22:03:00.000	22	2018-12-24T23:02:00.000	23	3.62	0.970555556	Dec

Rows: 5 Expand

Projects Data DataFrame as `unique_users_per_garage`

```
-- unique_users_per_garage
-- Modify the code below
SELECT *
FROM charging_sessions
LIMIT 5;

SELECT garage_id,
    COUNT(DISTINCT user_id) AS num_unique_users
FROM charging_sessions
WHERE user_type = 'Shared'
GROUP BY garage_id
ORDER BY COUNT(DISTINCT user_id) DESC
```

index	garage_id	num_unique_users
0	BI2	18
1	AsO2	17
2	UT9	16
3	AdO3	3
4	MS1	2
5	SR2	2
6	AdA1	1
7	Ris	1

Rows: 8 Expand

2 hidden cells

Projects Data DataFrame as `most_popular_shared_start_times`

```sql
-- most_popular_shared_start_times
SELECT weekdays_plugin,
    start_plugin_hour,
    COUNT(start_plugin_hour) AS num_charging_sessions
FROM charging_sessions
WHERE user_type = 'Shared'
GROUP BY weekdays_plugin,start_plugin_hour
ORDER BY COUNT(start_plugin_hour) DESC
LIMIT 10
```

index	weekdays_plugin	start_plugin_hour	num_charging_sessions
0	Sunday	17	30
1	Friday	15	28
2	Thursday	19	26
3	Thursday	16	26
4	Wednesday	19	25
5	Sunday	18	25
6	Sunday	15	25
7	Monday	15	24
8	Friday	16	24
9	Tuesday	16	23

Rows: 10 Expand

Projects Data DataFrame as `l`

```sql
-- long_duration_shared_users
SELECT user_id,
    AVG(duration_hours) AS avg_charging_duration
FROM charging_sessions
WHERE user_type = 'Shared'
GROUP BY user_id
HAVING AVG(duration_hours) > 10
ORDER BY AVG(duration_hours) DESC
```

		avg_charging_durati…
0	Share-9	16.845833335
1	Share-17	12.8945555511
2	Share-25	12.2144747466
3	Share-18	12.0888071898
4	Share-8	11.5504308392
5	AdO3-1	10.3693869729

Rows: 6 Expand