

TRABALHO FINAL - BD

LOGÍSTICA E ROTEAMENTO

UTILIZANDO BANCO DE GRAFOS E
BANCO DE DADOS RELACIONAL

Integrantes - GCP



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PROBLEMA: OTIMIZAÇÃO DE ROTAS DE ENTREGA



Definir a rota de veículos de entrega, minimizando custo e distância percorrida, visando a logística da empresa

A logística de entrega e movimentação de produtos é crucial em todos os setores do mercado.



Empresas enfrentam desafios diários para manter operações logísticas eficientes.

IMPACTOS

01

Redução de custos operacionais e tempo de entrega

02

Melhoria na qualidade de serviço

03

Impacto ambiental positivo



PROBLEMA DO CAIXEIRO VIAJANTE:

Qual a maneira mais eficiente de realizar as entregas dentro do prazo?



MODELAGEM DO GRAFO (DIRECIONADO)

Vertices

Arestas

Pontos de entrega (seja de uma pessoa ou de uma encomenda). Temos atributos de posição X e Y, ID e numeros de ruas conectadas

Cada caminho de um ponto de entrega até o outro, com seus devidos pesos representando a distância (efetivamente o tempo). Temos atributos de posições U e V, Nome das ruas, se é mão unica ou não e etc.

NOSSO PROJETO



graph heuristics vehicle routing graph database AI Machine Learning OpenStreetMap Ortools NetworkX Folium Streamlit Neo4j
PostgreSQL

Roteamento de Veículos

[Main](#) | [Installation](#) | [Architecture](#) | [Contributors](#) | [Licence](#)

Trabalho final de Algoritmos e Estruturas de Dados 2 voltado para o roteamento de veículos.

A map of a residential neighborhood with several streets and buildings. Blue lines represent the routes calculated by the vehicle routing algorithm, connecting various points of interest. Labels on the map include: Represa do Córrego Samambaiá, Represa da EA UFC, RESIDENCIAL ANTONIO BARBOSA, RESIDENCIAL ALICE BARBOSA, VILA ATALAIA, CONDOMÍNIO RESIDENCIAL CAMPUS, RESIDENCIAL DOS PES, MORADA DOS SONHOS, VILA ITATIAIA, CHÁCARAS, and VILA VILA. The map also shows some green spaces and other residential areas in the background.

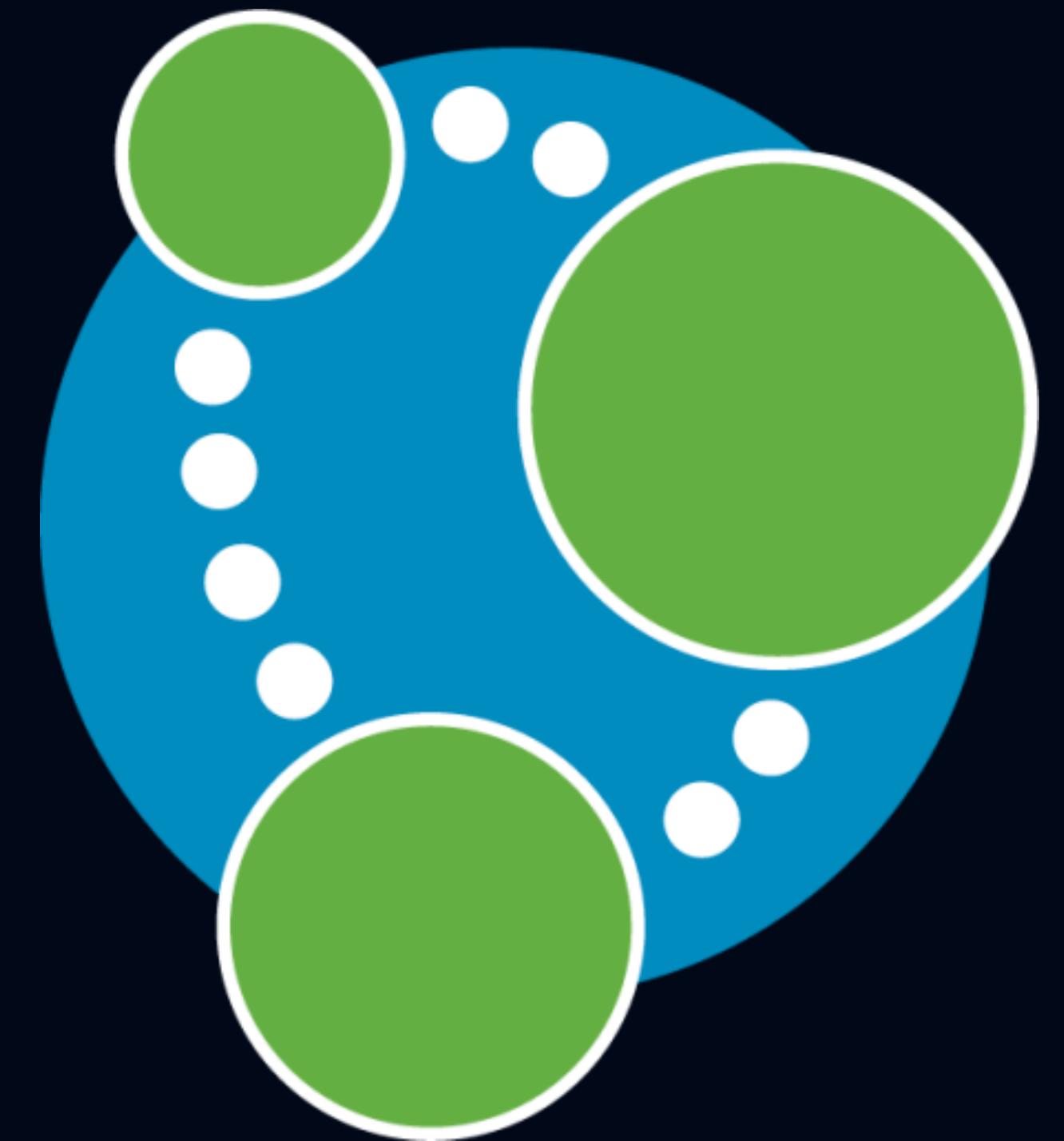
E O



?

BANCO DE GRAFOS - NEO4J

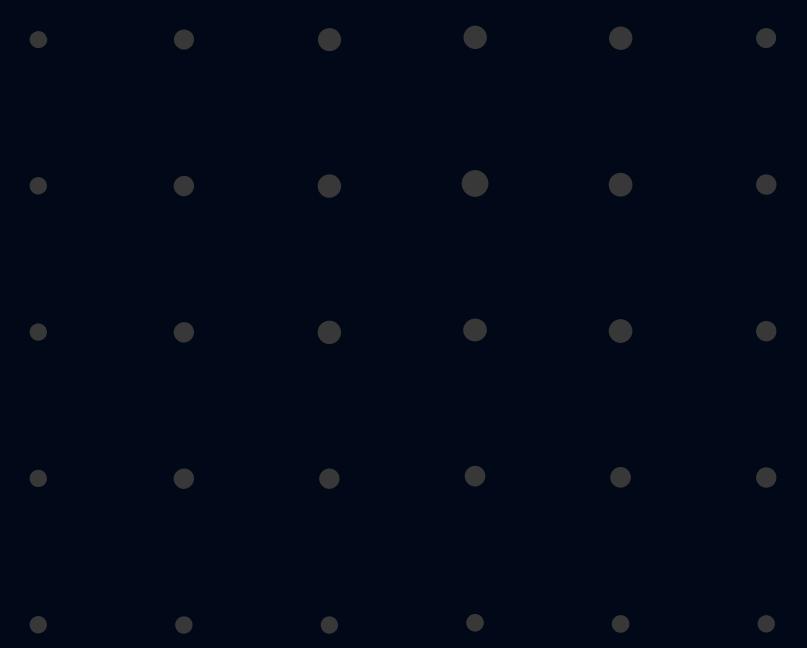
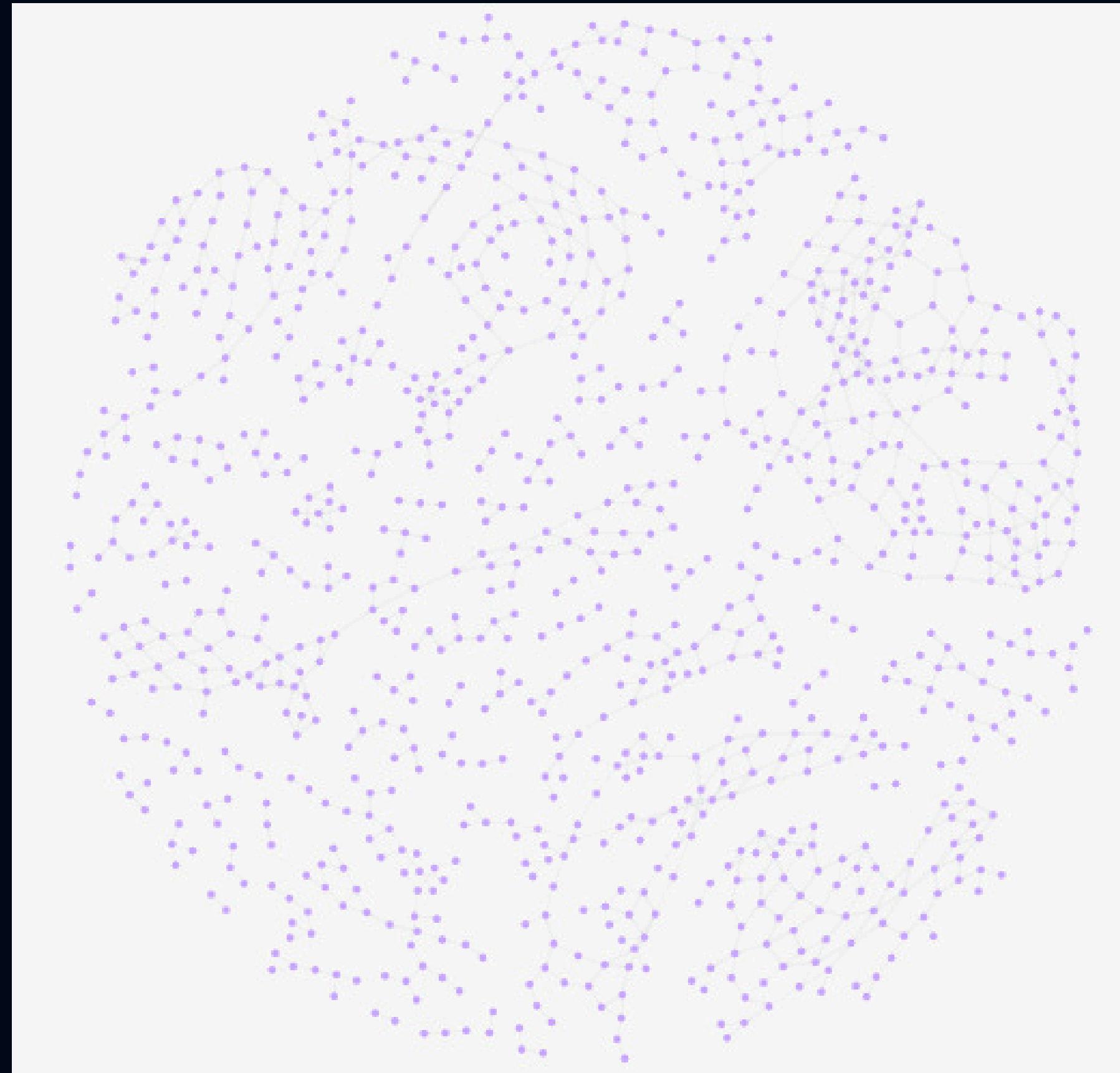
Neo4j



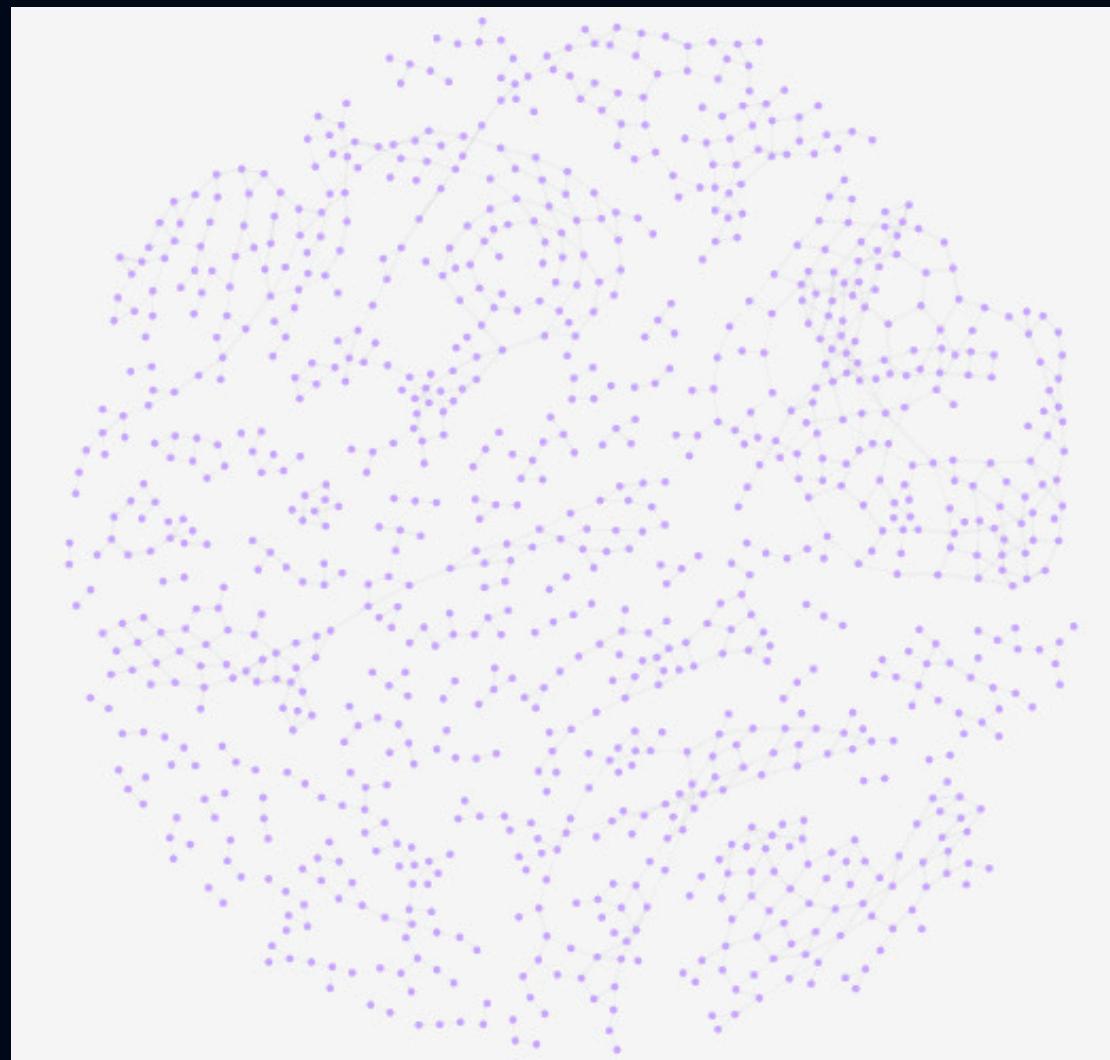
Linguagem
Cypher



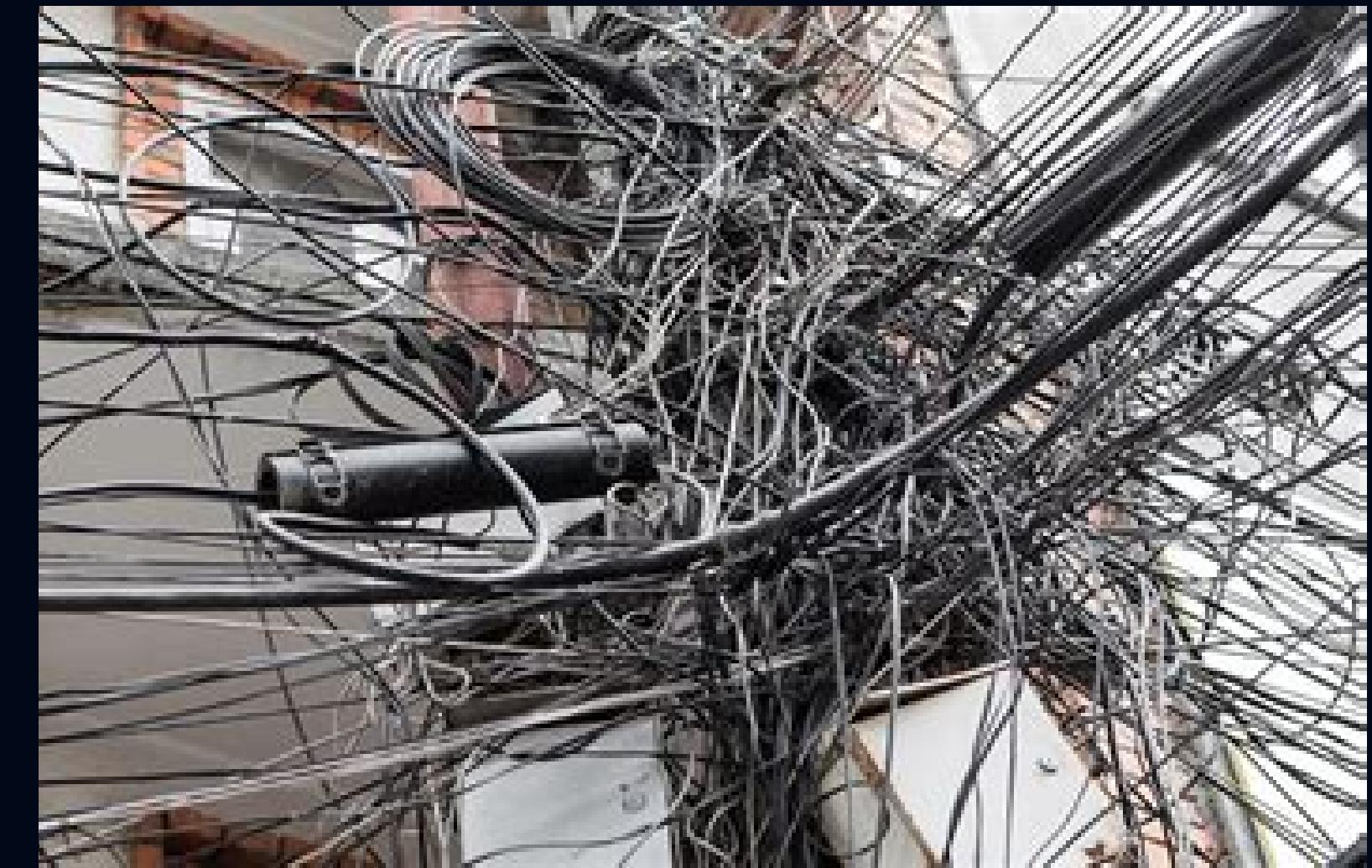
O GRAFO!

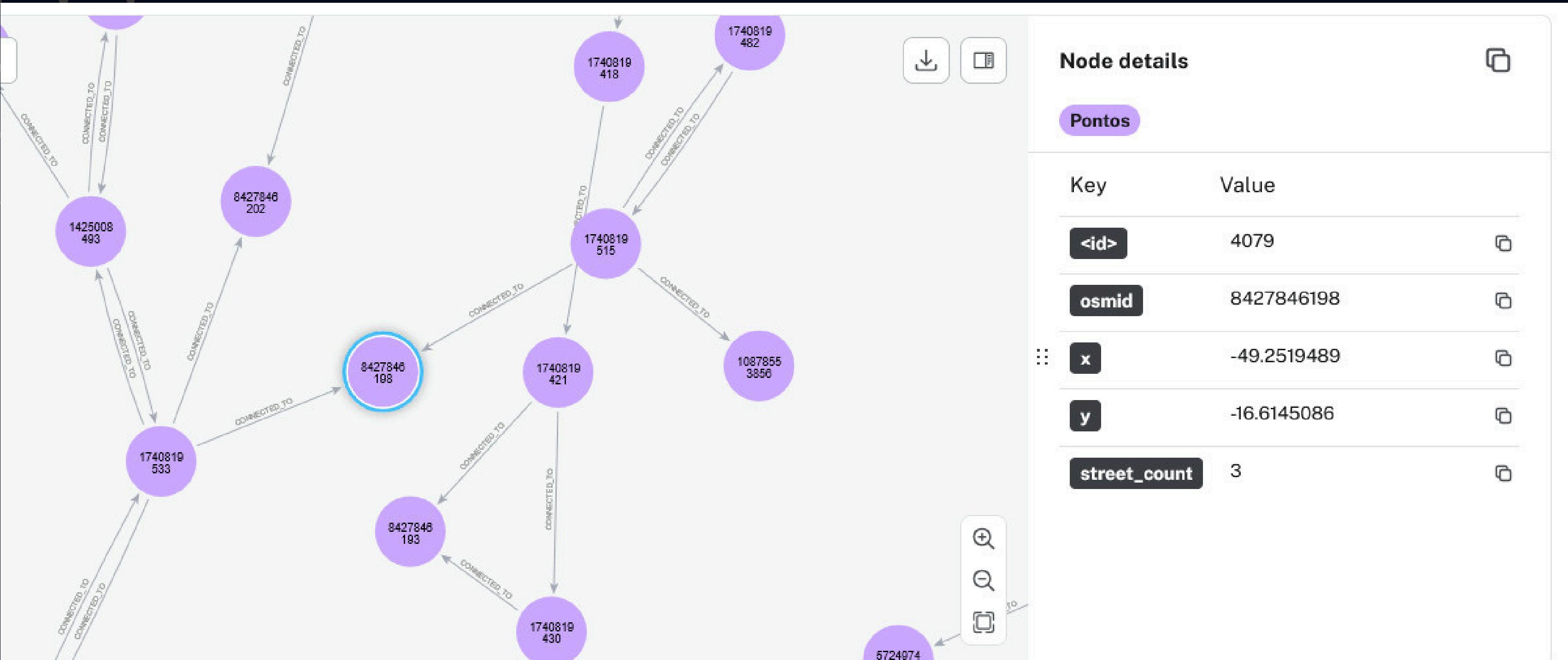


O GRAFO!



VS





• neo4j \$ MATCH p=()-[]->() RETURN p;

Graph Table RAW

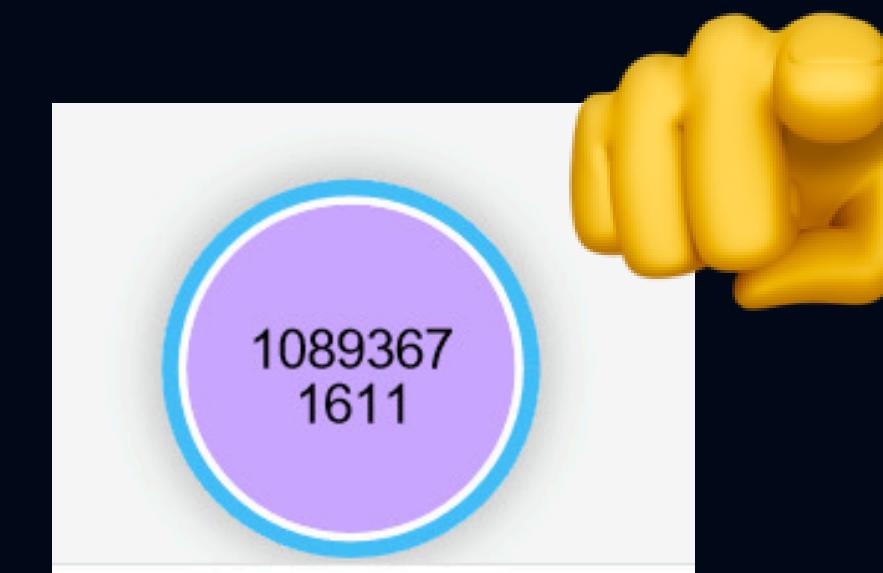
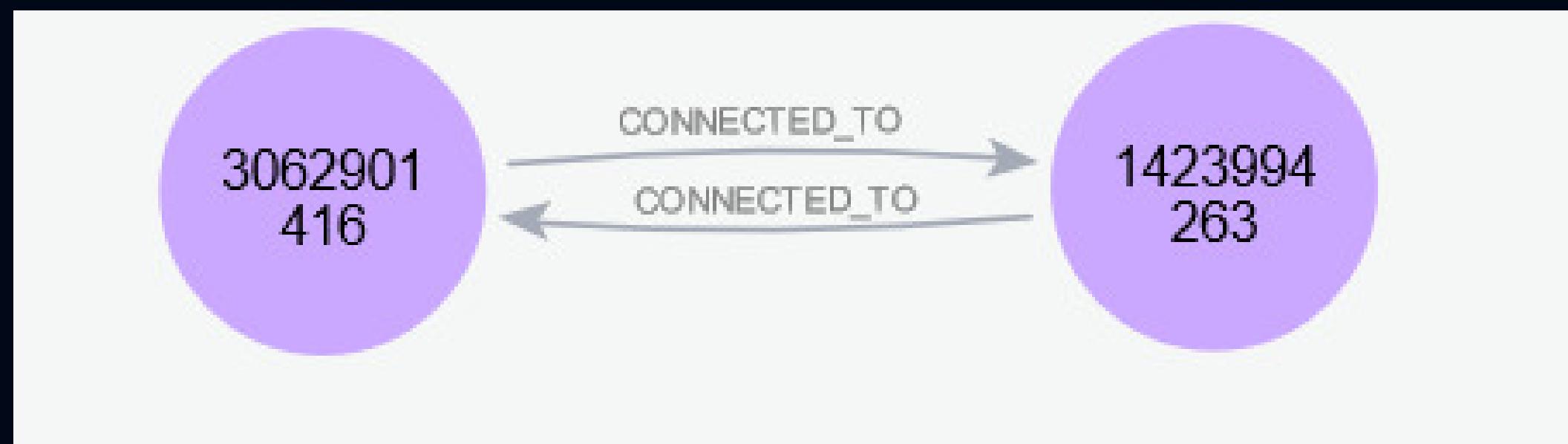
Relationship details

CONNECTED_TO

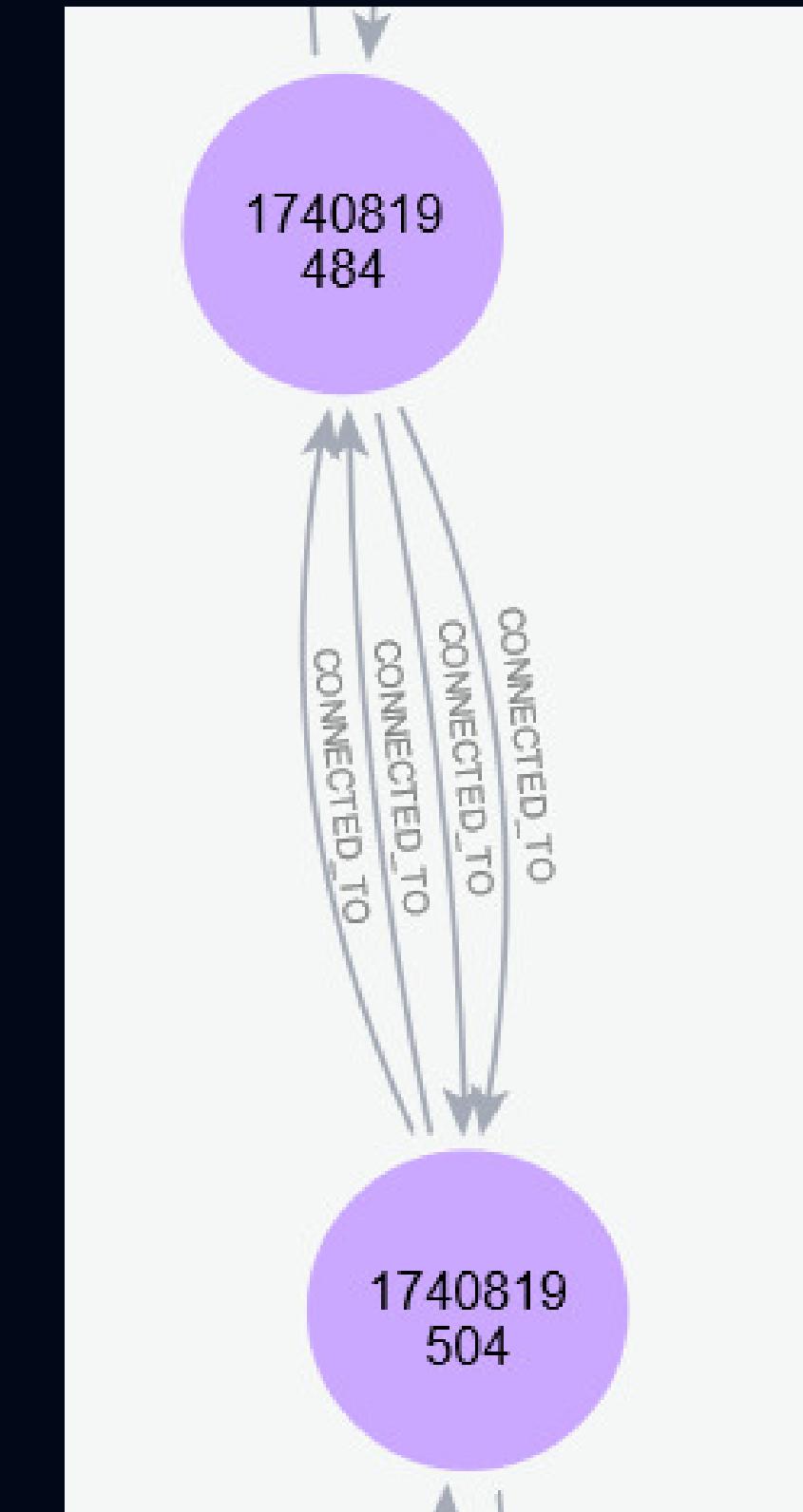
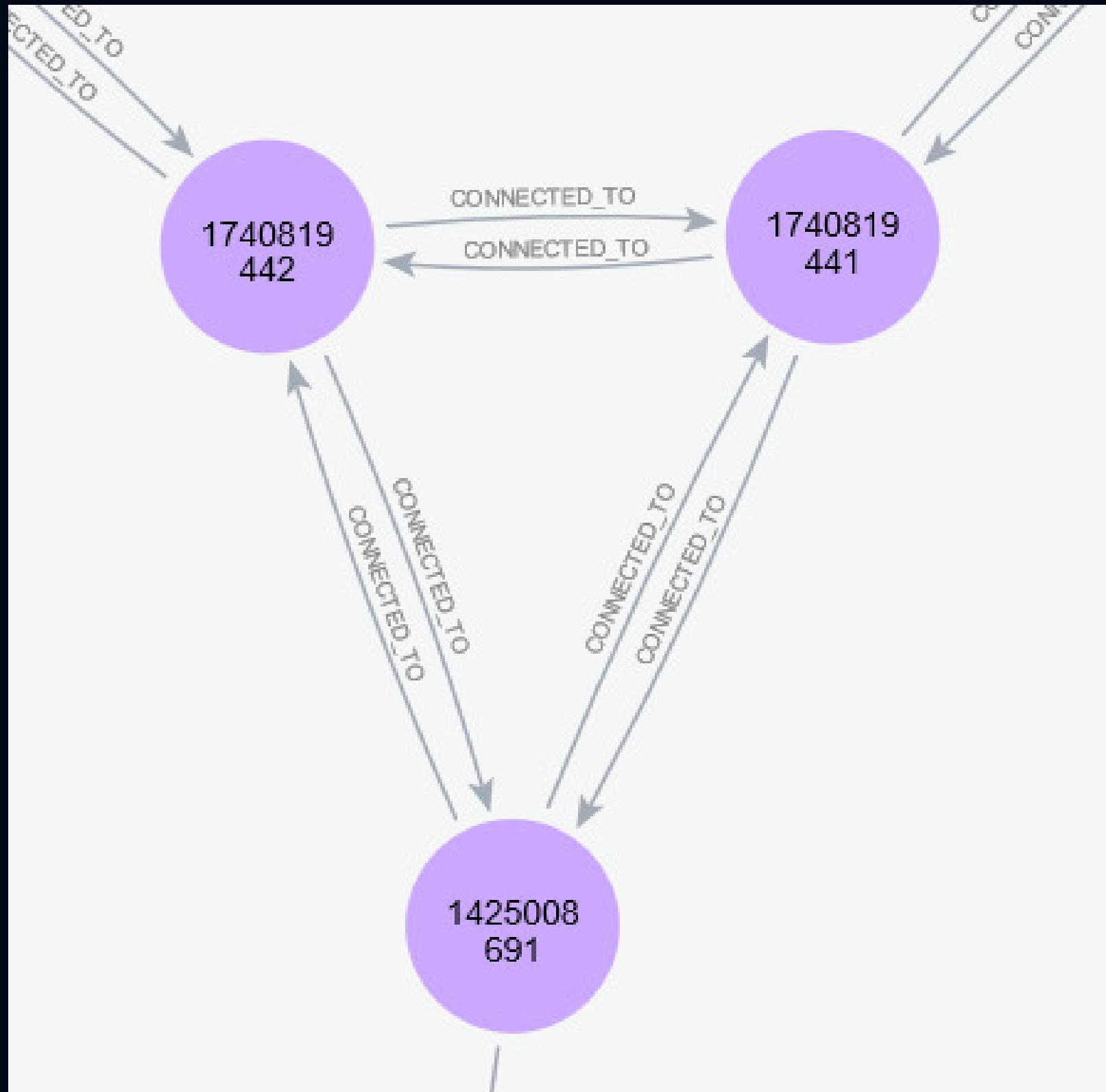
Key	Value
<id>	1159676904047904714
osmid	"129096330"
name	"Rua Monte Castelo"
length	32.562
geometry	"LINESTRING (-49.2522395-1 6.6145992,-49.2519489-16.6145086)"
highway	"residential"
oneway	false

Fetch limit hit at 5000 records. Started streaming after 22 ms and completed after 373 ms.

Guilhermão



Uma rotatória



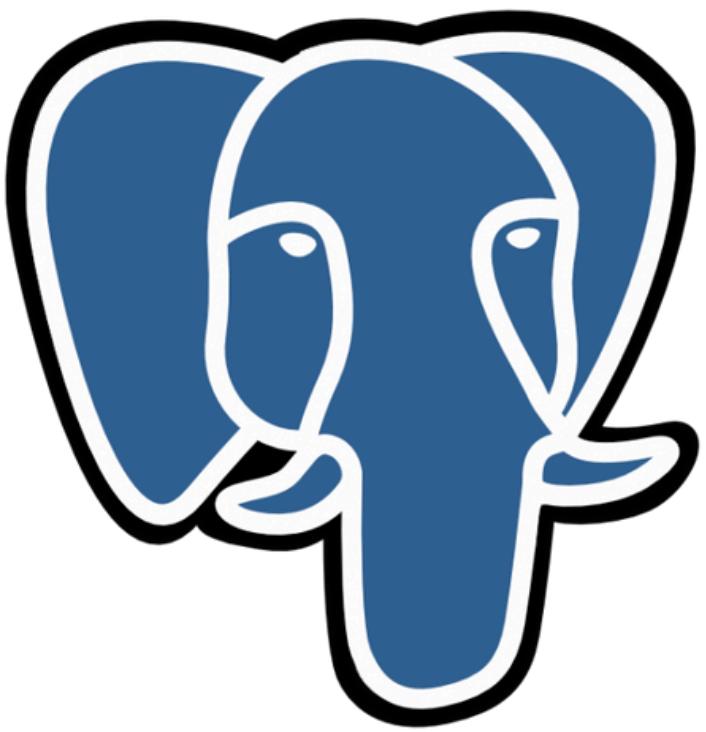
Via de mão
dupla

Vamos ver na prática...



Neo4j's fully managed cloud database service

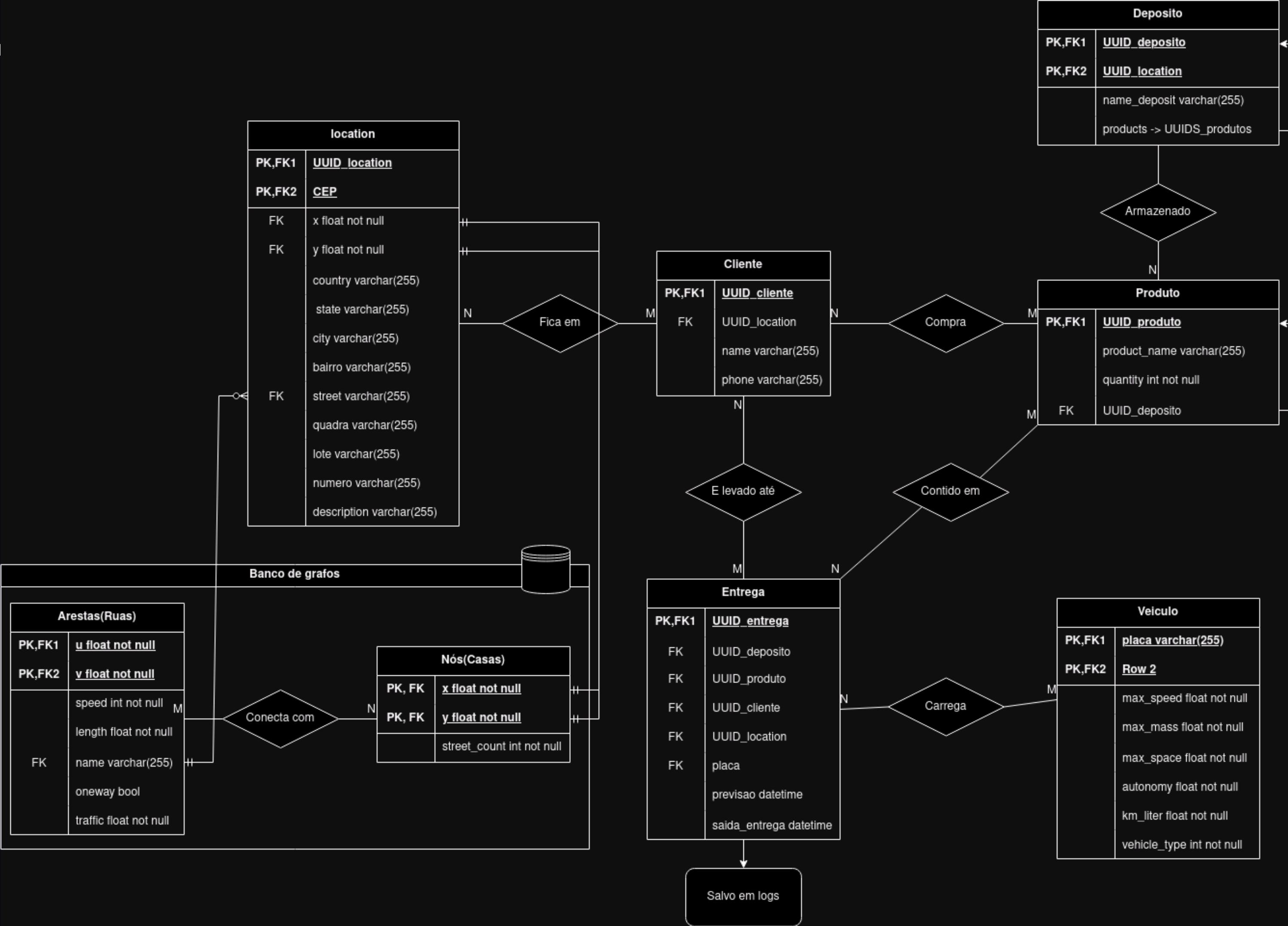
Relacional



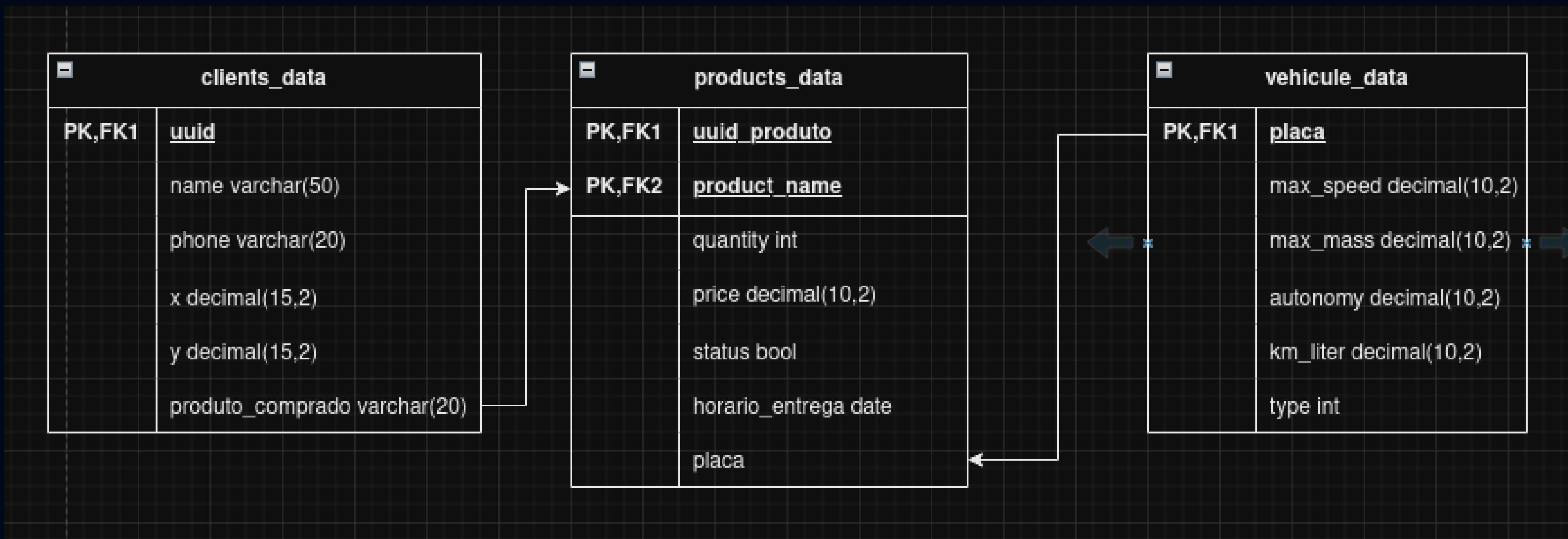
PostgreSQL



DBeaver



Um pouco melhor...



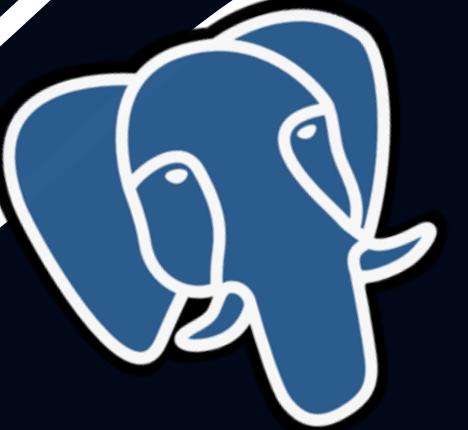


Consultas

```
● select
    placas,
    max_speed
  from vehicle_data vd
 where max_speed >50
```

	ABC placas	123 max_speed
1	GOU-7063	80.07
2	YAN-7225	166.18
3	JEX-2089	98.27
4	RLE-2909	143.95
5	NHZ-5114	108.42
6	OVI-9000	127.83
7	XCW-5741	166.78





Consultas

```
select * from products_data pd
```

①	ABC UUID_produto	ABC product_name	123 quantity	123 price
1	8003027d-11d3-41eb-89d2	product_1	25	130.02
2	b4e5952e-18db-41e4-961d	product_2	35	89.2
3	17102ce1-6f53-4768-8925	product_3	3	328.82
4	e561a255-aefa-42e7-8224-1	product_4	29	979.4
5	f99ac4b8-5f5a-4b76-bf27-3	product_5	48	673.44
6	0526b379-73a2-496b-9d79	product_6	69	260.72
7	05f098dd-56f3-4039-8828-	product_7	6	





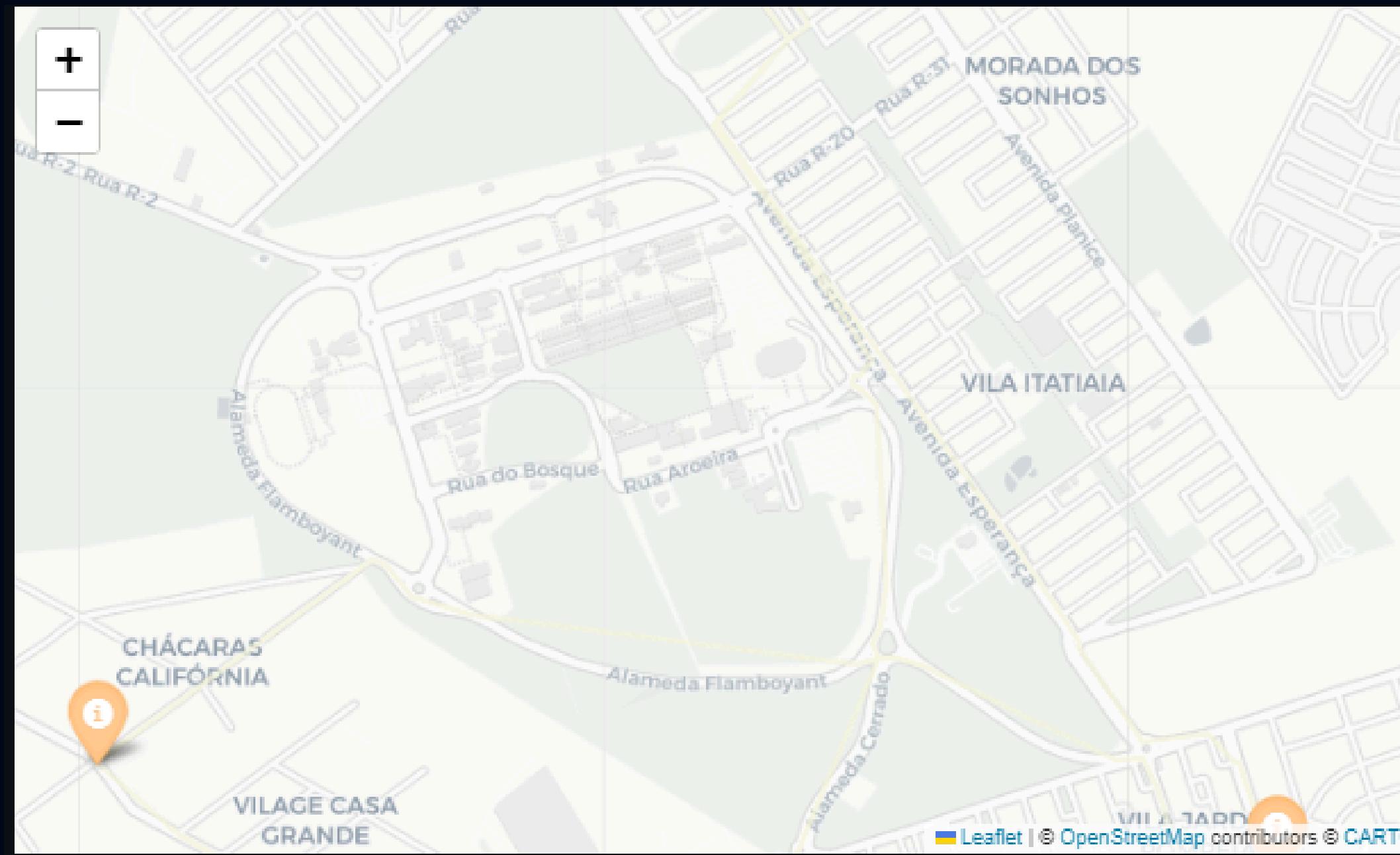
Consultas

④	abc name	abc phone	123 x	123 y
1	3-47f2-8761- Edward Thomas	710.838.0676x0639	-49.247993	-16.6133
2	1-459a-84d0- Barry Taylor	+1-261-323-6314	-49.297695	-16.62387
3	2-4c04-82f8- Valerie Soto	374-452-9364x2139	-49.253716	-16.628042
4	35-4001-b0c1 Kristen Schmidt	001-581-974-7743x826	-49.237606	-16.629038
5	1-4e16-8590 Sarah Mann	261-941-3179x4226	-49.29883	-16.616816
6	9-48e9-aa8b Michelle Morales	7359494046	-49.27045	-16.601519
7	4-43bd-8404 Rebecca Chambers	367-261-3987	-49.251633	-16.616621

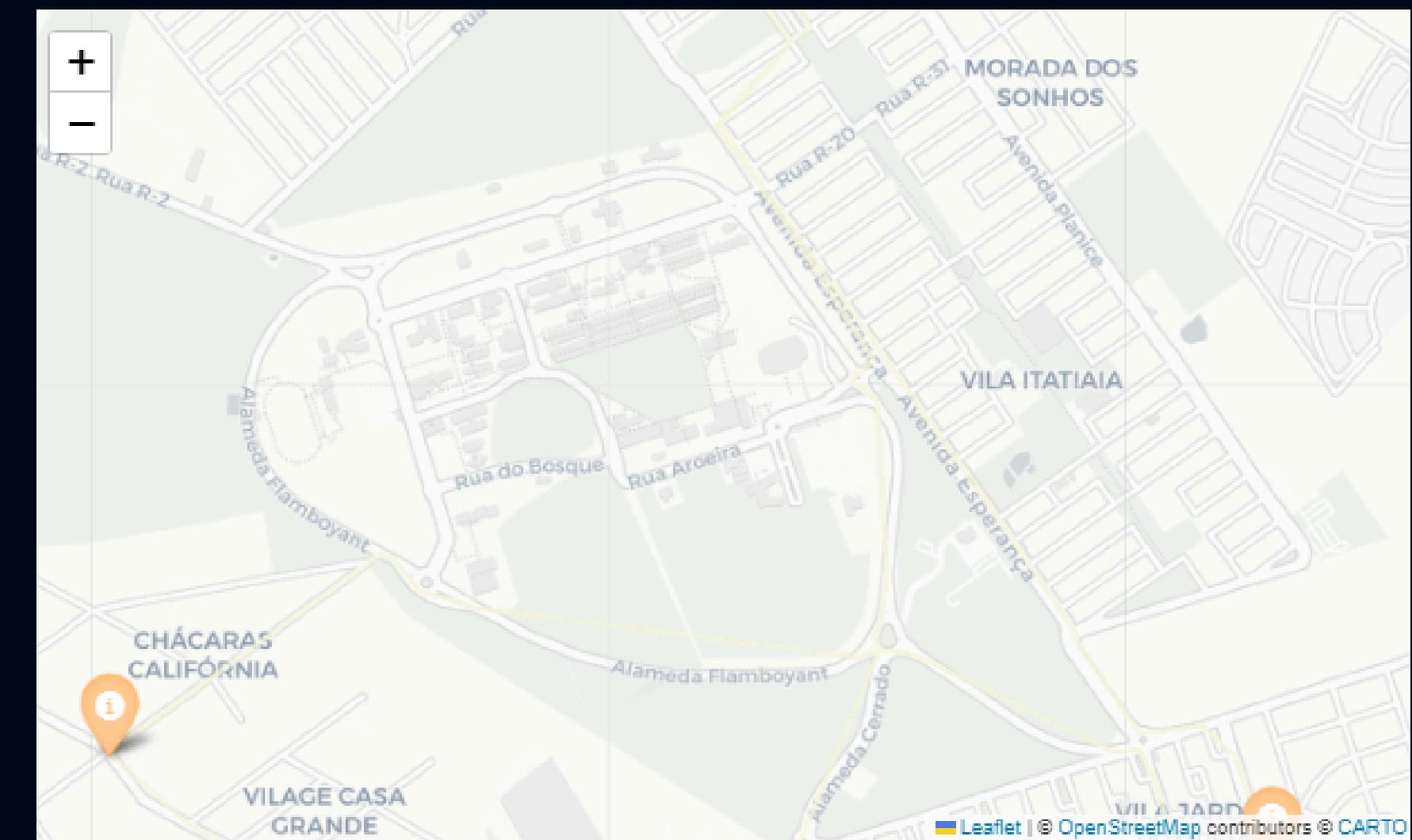
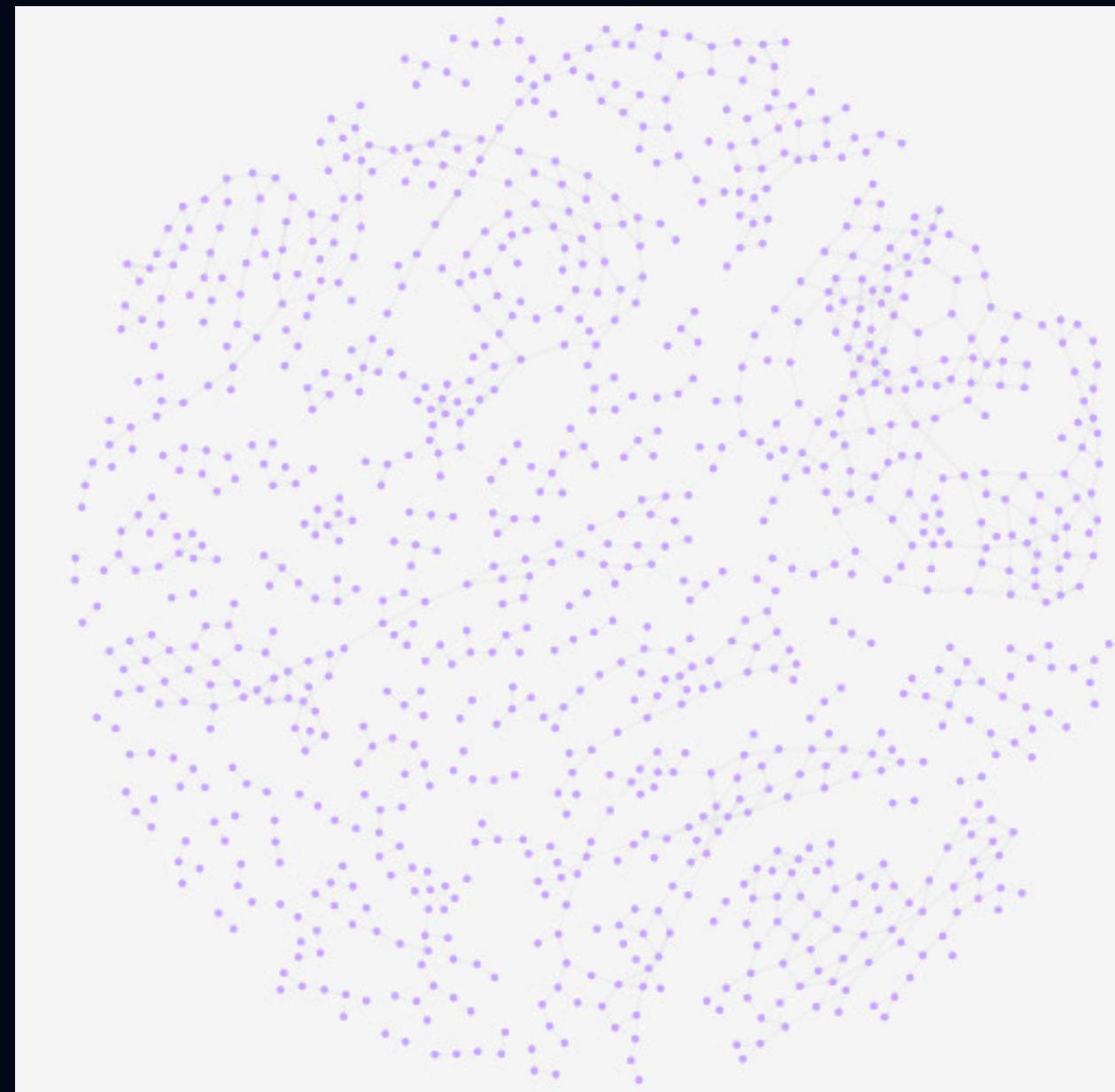
```
select
*
from
    clients_data as cd
where cd.x > -49.302 and cd.y < -16.60
```



Aplicação

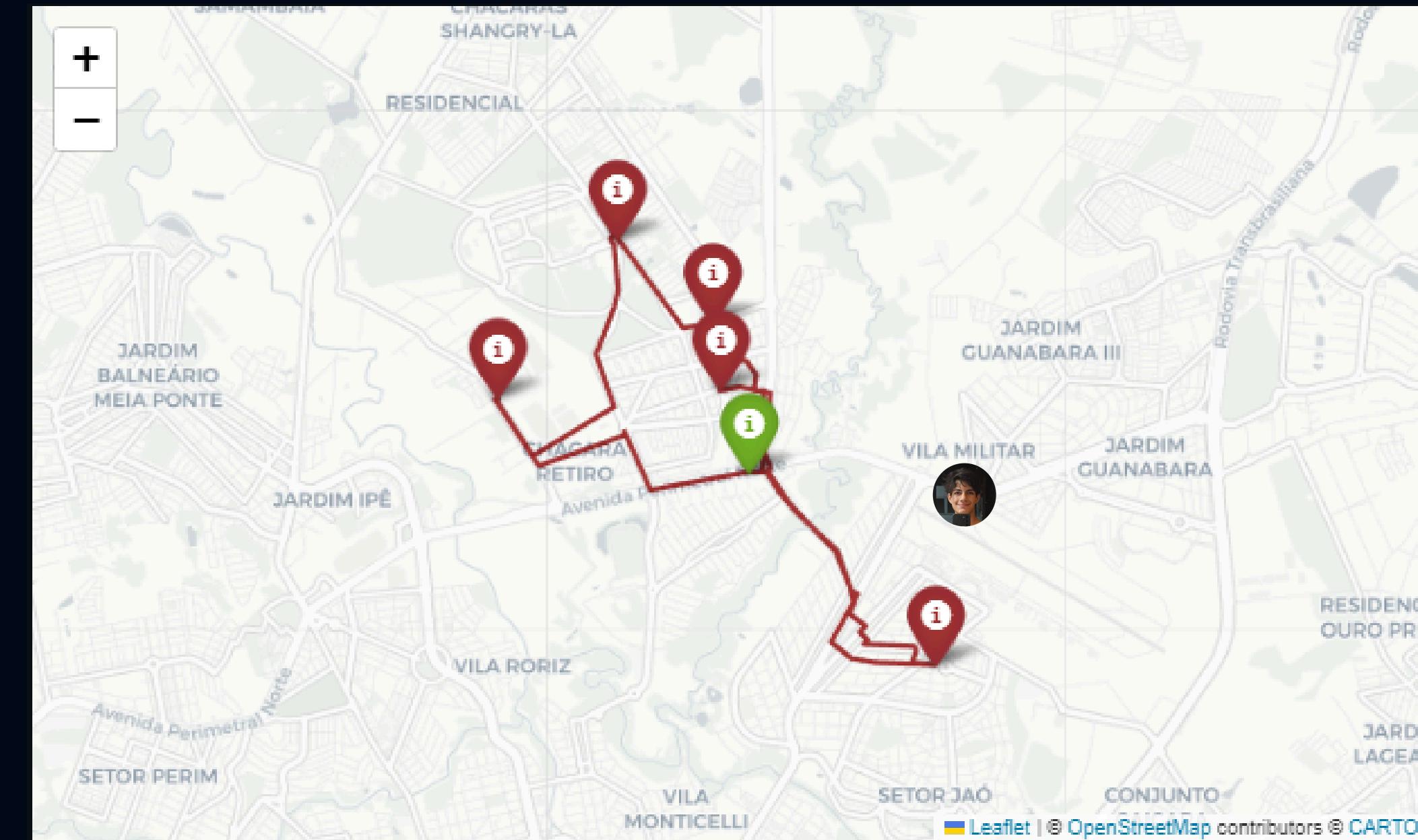


Aplicação

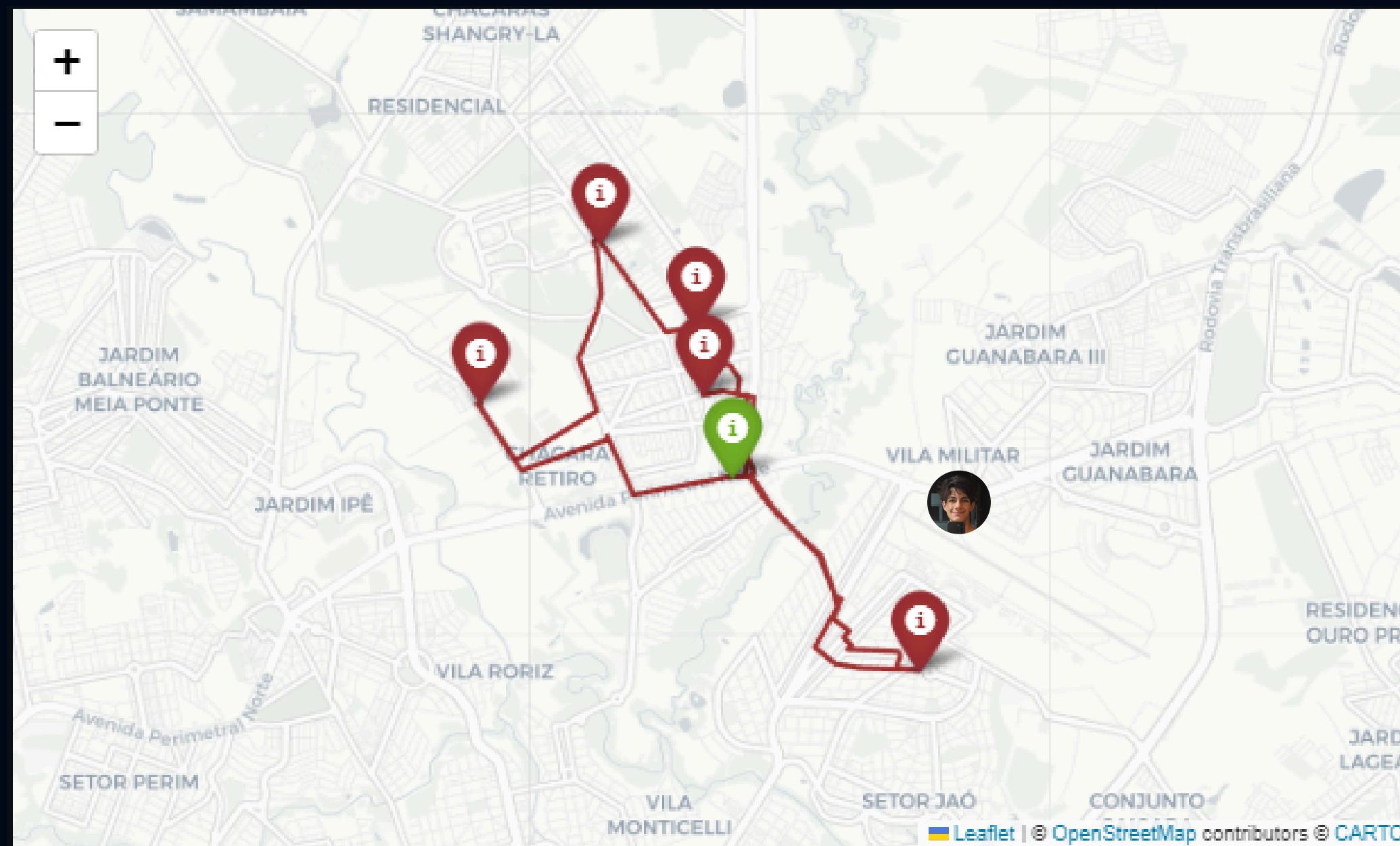


Num_vehicles = 3

Num_Pontos = 5



Pontos de interesse:



Cliente

```
SELECT * FROM products_data  
WHERE status = 'Entregue'  
order by product_name asc;
```

Status: Entregue!

Status: Não Entregue!

ABC UUID_produto	ABC product_name	123 quantity	123 price	ABC status
94089205-1f1f-4319-9618-922615fa4d9b	product_151	22	889,98	Entregue
db0e8fe0-feab-4604-8606-9c05a3fb88fa	product_233	76	728,45	Entregue
edf8badf-b542-4136-a1d3-a45ce8106b50	product_268	3	206,11	Entregue
2fbcc9031-4e9b-49f8-8749-b6115bc7e4e4	product_550	65	360,01	Entregue
dd1fd943-16d6-44c8-9417-28e092afb5ba	product_670	60	850,02	Entregue
ce10b66f-f40b-421a-a9fa-edc56d7a3167	product_780	91	255,18	Entregue
3d161ea1-c4ed-44d4-8ea9-dfcf195ab555	product_816	74	790,97	Entregue
abc65f44-d1e5-47c2-b1f1-2bfa54bd3304	product_825	12	61,82	Entregue
279eae26-4864-4d0e-af83-d12c04d94bca	product_961	44	437,87	Entregue

Grade	UUID_produto	product_name	quantity	price	status
1	8ade3d95-3f61-4c88-b995-6e69cca672c2	product_1	34	936,38	Não entregue
2	0a046fd3-d0b5-447e-9539-211ecef143e7	product_10	70	135,51	Não entregue
3	e75a6aba-471b-4083-91ea-c79cead68ecd	product_100	76	261,07	Não entregue
4	2cf1c8fd-0f7f-4eeb-ada4-5041cfa9c7ee	product_1000	46	694,28	Não entregue
5	53e73d72-b13f-4996-948a-e6a295ab5eb8	product_101	86	966,47	Não entregue
6	b67b00bd-8b61-43e8-80b3-02dfe286c230	product_102	66	256,15	Não entregue
7	53417e4f-8c52-4165-a3ba-a307e18cb491	product_103	9	908,8	Não entregue
8	6a4dabb5-0ed1-4796-8ee3-15783ad57b4a	product_104	26	434,87	Não entregue
9	2c83b40d-bb26-4be4-827b-f70ac6e4e620	product_105	90	446,38	Não entregue
10	85861dad-d44e-4ecd-adb0-c59e81dbd87c	product_106	97	495,67	Não entregue
11	2b2daa47-e14b-4487-8073-9d7be7403ce3	product_107	9	193,33	Não entregue
12	ce4bd84f-b042-4502-b48d-241ba11fb4c6	product_108	38	136,16	Não entregue
13	c005fc6-bbe8-46b1-8b58-1baf31493e0e	product_109	67	152,63	Não entregue
14	6142bd12-7063-432b-9545-680f396d3c48	product_111	51	367,22	Não entregue
15	4b4ddc1c-3aa3-4917-b019-a2770fc9cab4	product_110	21	113,14	Não entregue
16	4cc503eb-443e-4782-9a8d-a82ecc7474ec	product_111	10	120,41	Não entregue
17	04eebcc4-f22e-4d6b-86f9-48f7f8010d04	product_112	49	30,1	Não entregue
18	9b479340-b653-4566-a0e6-e06a7a9a1467	product_113	85	773,09	Não entregue
19	69a579a2-5e60-4e25-9bf4-78af90fdc51d	product_114	99	333,86	Não entregue

Mostrando na prática!

Configuração do Algoritmo

Latitude: -16,60

Longitude: -49,26

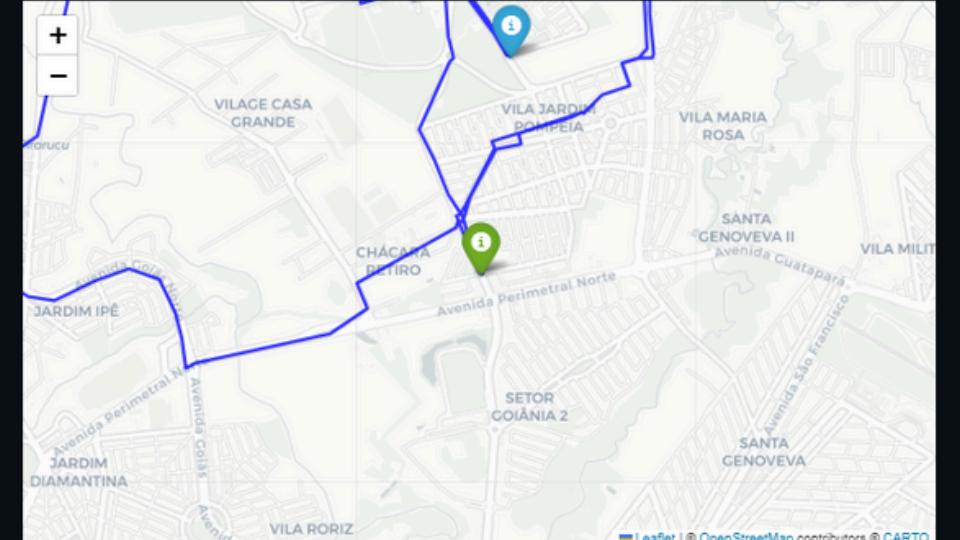
Número de Veículos: 3

Número de Pontos: 5

Executar

EntregaAI

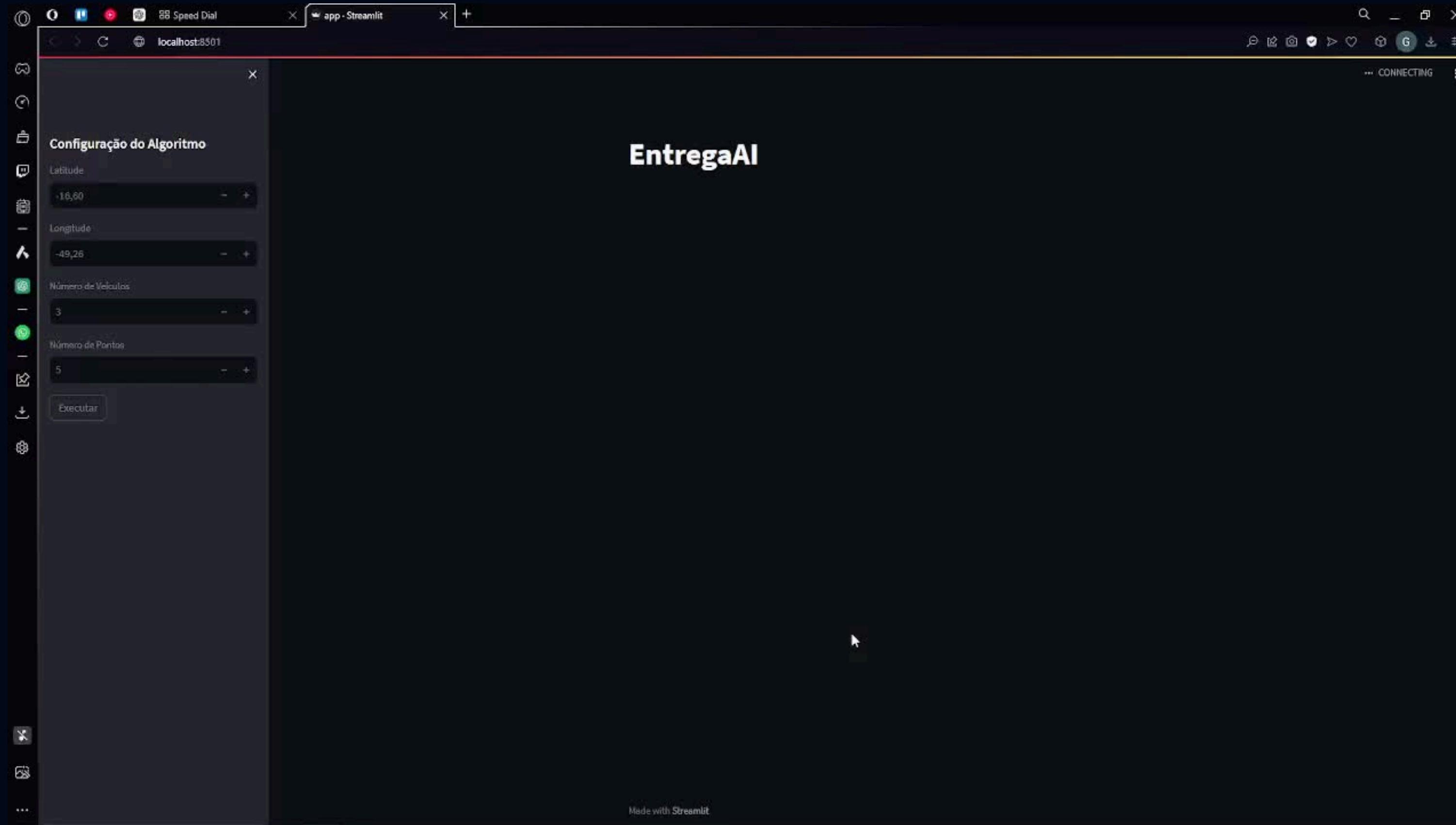
Selecionar Mapa: 0



Banco de dados das entregas realizadas:

	0	1
0	('Jonathan Guzman')	('product_602', 35, 271.09, 'Entregue')
1	('Marcus Johnson')	('product_311', 96, 977.91, 'Entregue')
2	('Shannon Pugh')	('product_83', 93, 475.03, 'Entregue')
3	('Paul Rivera')	('product_934', 58, 646.82, 'Entregue')

Mostrando na prática!



Validando?

The screenshot shows a PostgreSQL client window with a dark theme. In the top-left corner, there's a white curved graphic element. On the right side, there are several decorative circular icons: a large white circle containing a brown dog icon, and three smaller blue circles stacked vertically below it.

The main area displays a SQL query in the top-left pane:

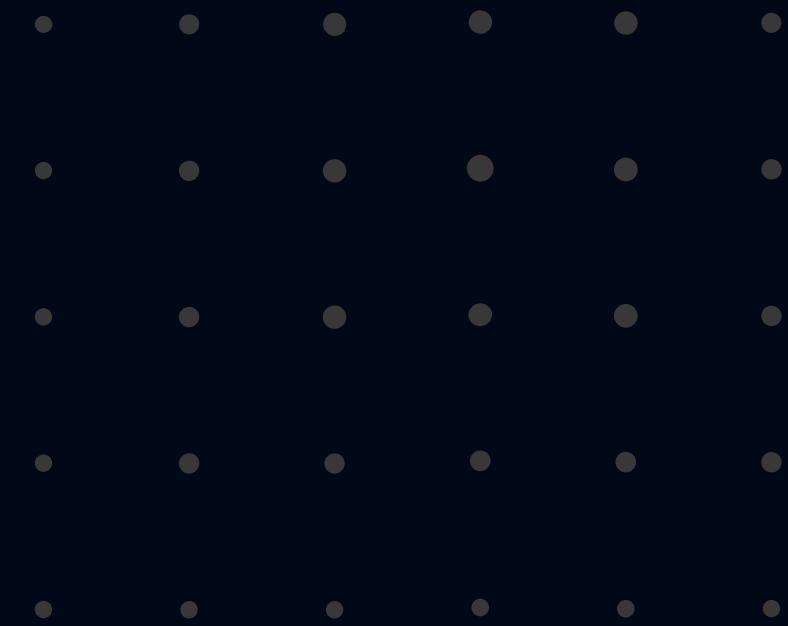
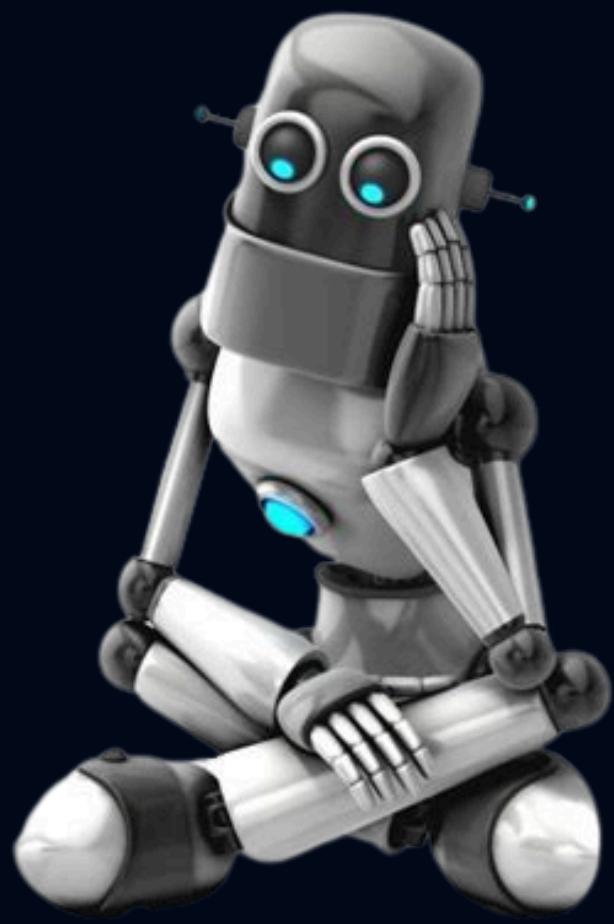
```
SELECT * FROM products_data
WHERE status = 'Não entregue'
order by product_name asc;
```

The bottom-left pane shows the results of the query in a table format:

	UUID_produto	product_name	quantity	price	status	horário_entrega
1	8ade3d95-3f61-4c88-b99	product_1	34	936,38	Não entregue	00:00
2	0a046fd3-d0b5-447e-953	product_10	70	135,51	Não entregue	00:00
3	e75a6aba-471b-4083-91e	product_100	76	261,07	Não entregue	00:00
4	2cf1c8fd-0ff7-4eeb-ad4	product_1000	46	694,28	Não entregue	00:00
5	53e73d72-b13f-4996-948	product_101	86	966,47	Não entregue	00:00
6	b67b00bd-8b61-43e8-80	product_102	66	256,15	Não entregue	00:00
7	53417e4f-8c52-4165-a3ba	product_103	9	908,8	Não entregue	00:00
8	6a4dabb5-0ed1-4796-8ee	product_104	26	434,87	Não entregue	00:00
9	2c83b40d-bb26-4be4-827	product_105	90	446,38	Não entregue	00:00
10	85861dad-d44e-4ecd-ad	product_106	97	495,67	Não entregue	00:00
11	2b2daa47-e14b-4487-807	product_107	9	193,33	Não entregue	00:00
12	ce4bd84f-b042-4502-b48	product_108	38	136,16	Não entregue	00:00
13	c005fc6-bbe8-46b1-8b5	product_109	67	152,63	Não entregue	00:00
14	6142bd12-7063-432b-954	product_11	51	367,22	Não entregue	00:00
15	4b4ddc1c-3aa3-4917-b01	product_110	21	113,14	Não entregue	00:00
16	4cc503eb-443e-4782-9a8	product_111	10	120,41	Não entregue	00:00
17	04ebcca-f22e-4d6b-86f9	product_112	49	30,1	Não entregue	00:00
18	9b479340-b653-4566-a0el	product_113	85	773,09	Não entregue	00:00
19	69a579a2-5e60-4e25-9bf4	product_114	99	333,86	Não entregue	00:00

A tooltip window titled "Valor" is open on the right, showing the value of the first row's UUID column: 8ade3d95-3f61-4c88-b995-6e69cca672c2.

Duvidas?





Obrigado!