



MC2: Finding Anomalies from Geospatio-temporal Patterns

Honorable Mention for Effective Detailed Analysis

Georgia Tech

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Overview

GPS
coordinates

(latitude, longitude)

Goal:

Find unusual events/patterns
Who, where, when, why?

Shops

e.g.,
Jack's Magical Beans
Nationwide Refinery

Cars

e.g.,
Car 1, 2
Truck 101

Employees

e.g., Sten Sanjorge Jr.

Data

GPS
coordinates

Shops

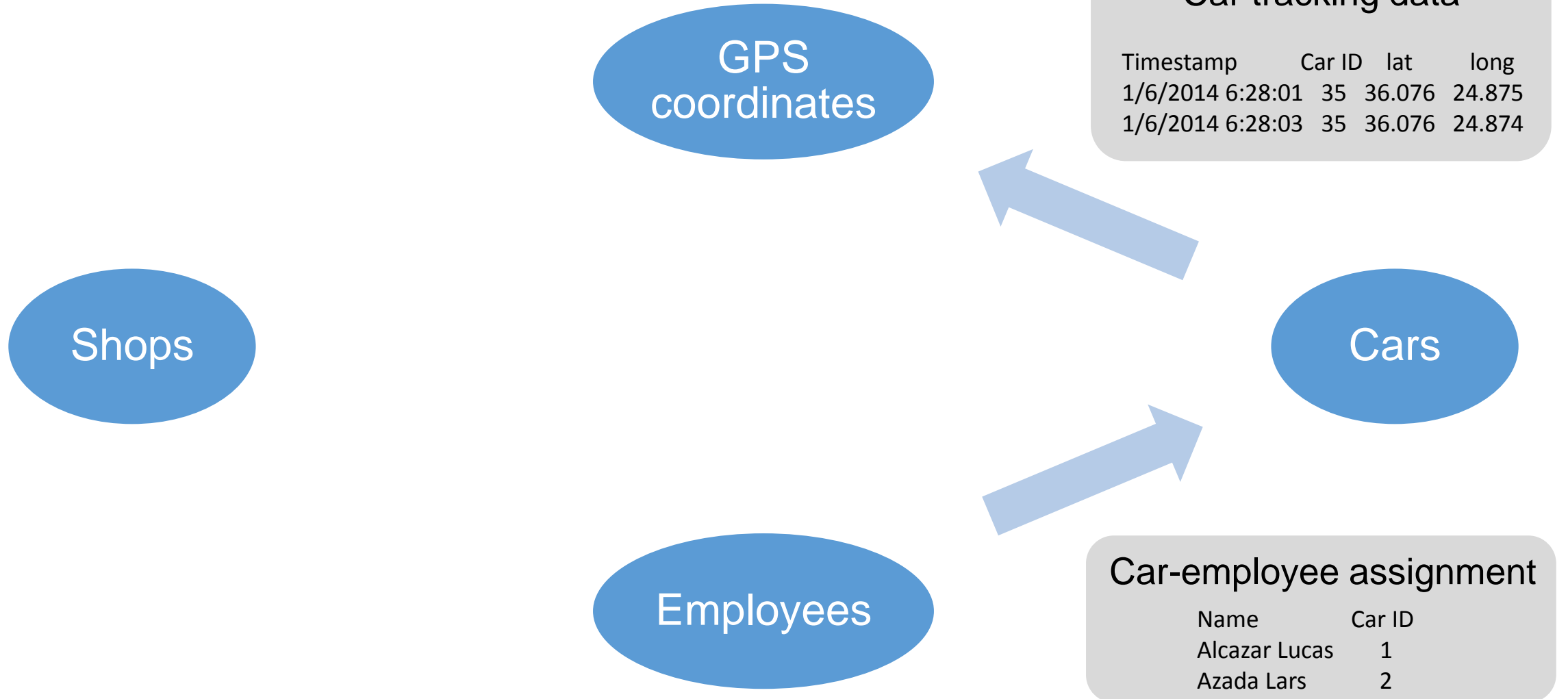
Cars

Employees

Car-employee assignment

Name	Car ID
Alcazar Lucas	1
Azada Lars	2

Data



Data

GPS
coordinates

Car tracking data

Timestamp	Car ID	lat	long
1/6/2014 6:28:01	35	36.076	24.875
1/6/2014 6:28:03	35	36.076	24.874

Shops

Cars

Employees

Card/loyalty spending data

Timestamp	location	price	Name
1/6/2014 12:00	Jack's Beans	18.59	Elsa

Car-employee assignment

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Data

GPS
coordinates

Car tracking data

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Shops

Cars

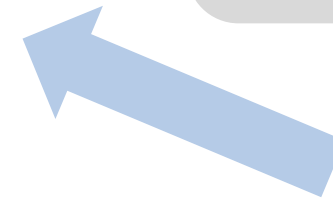
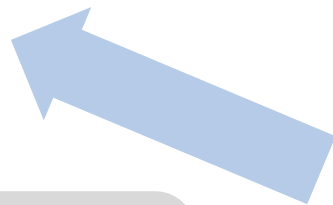
Employees

Card/loyalty spending data

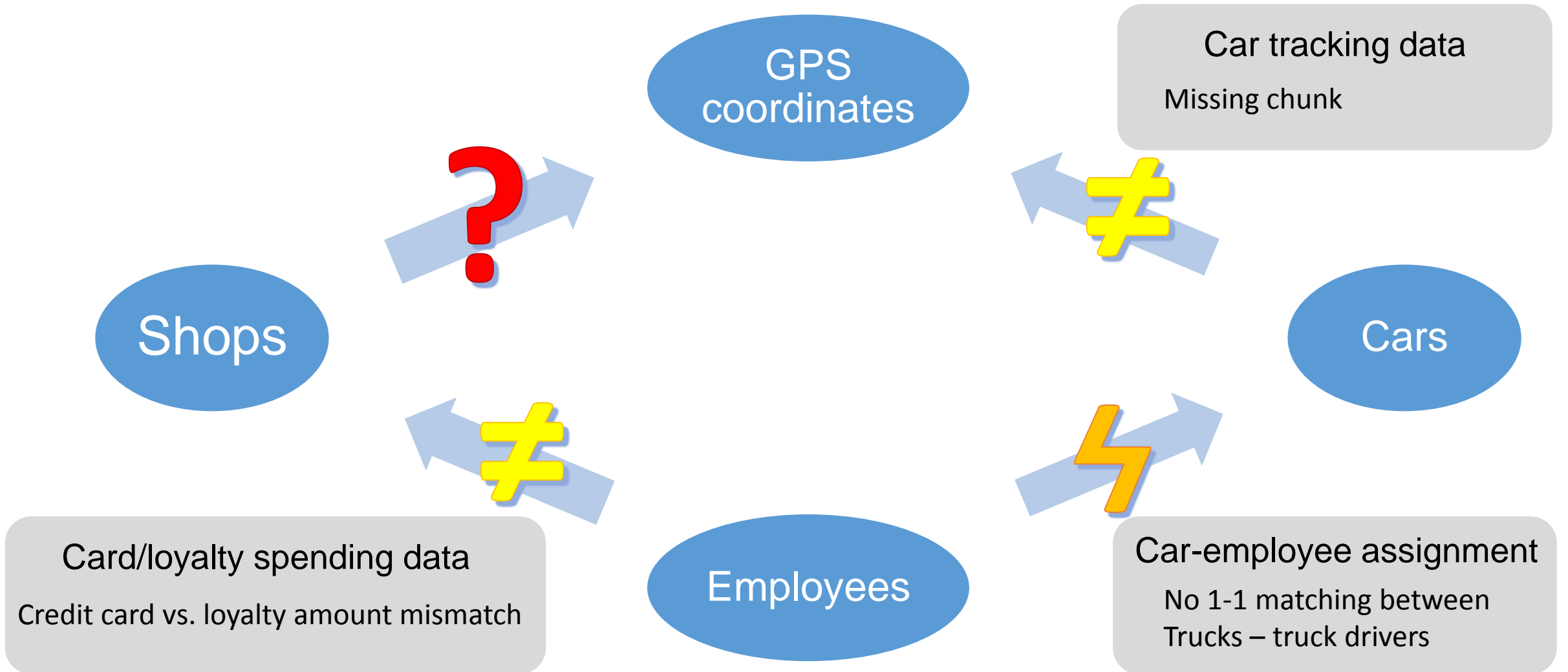
Timestamp	location	price	Name
1/6/2014 12:00	Jack's Beans	18.59	Elsa

Car-employee assignment

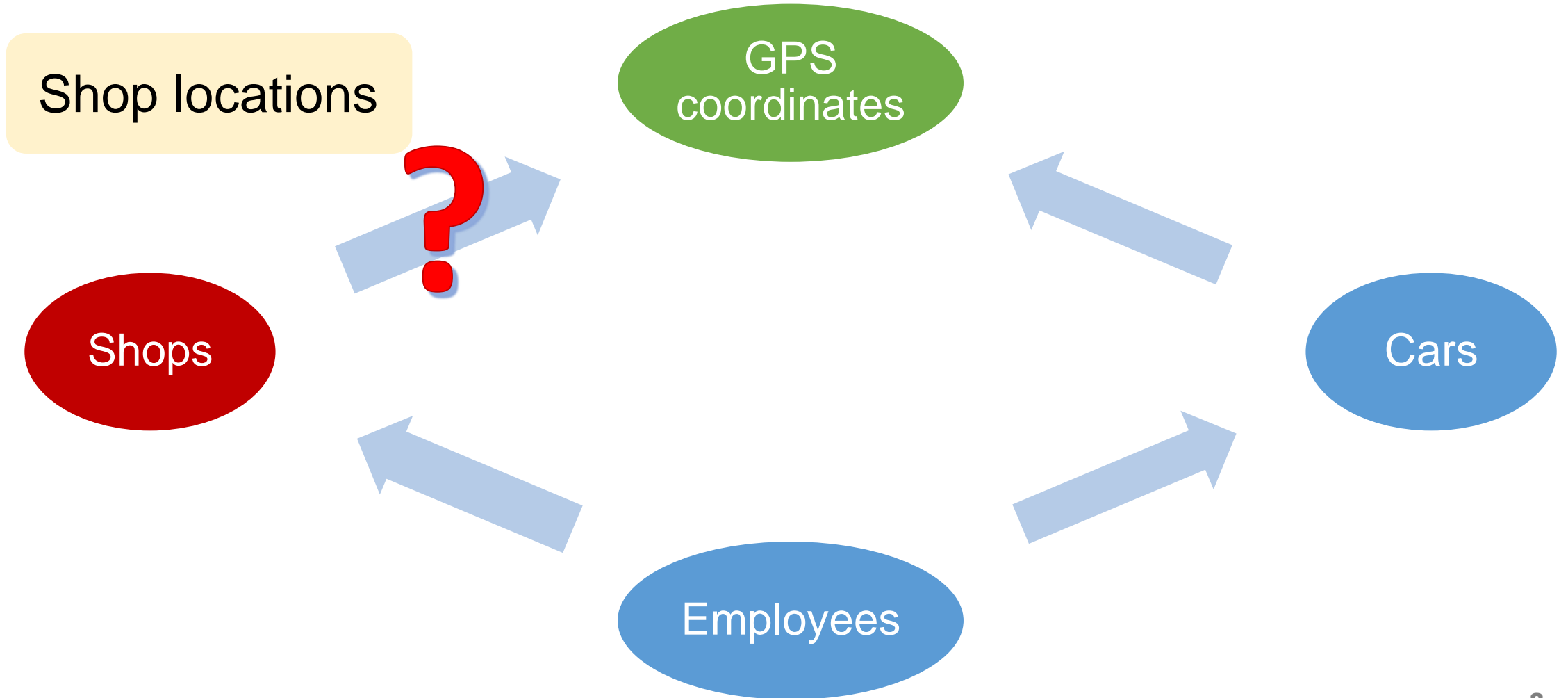
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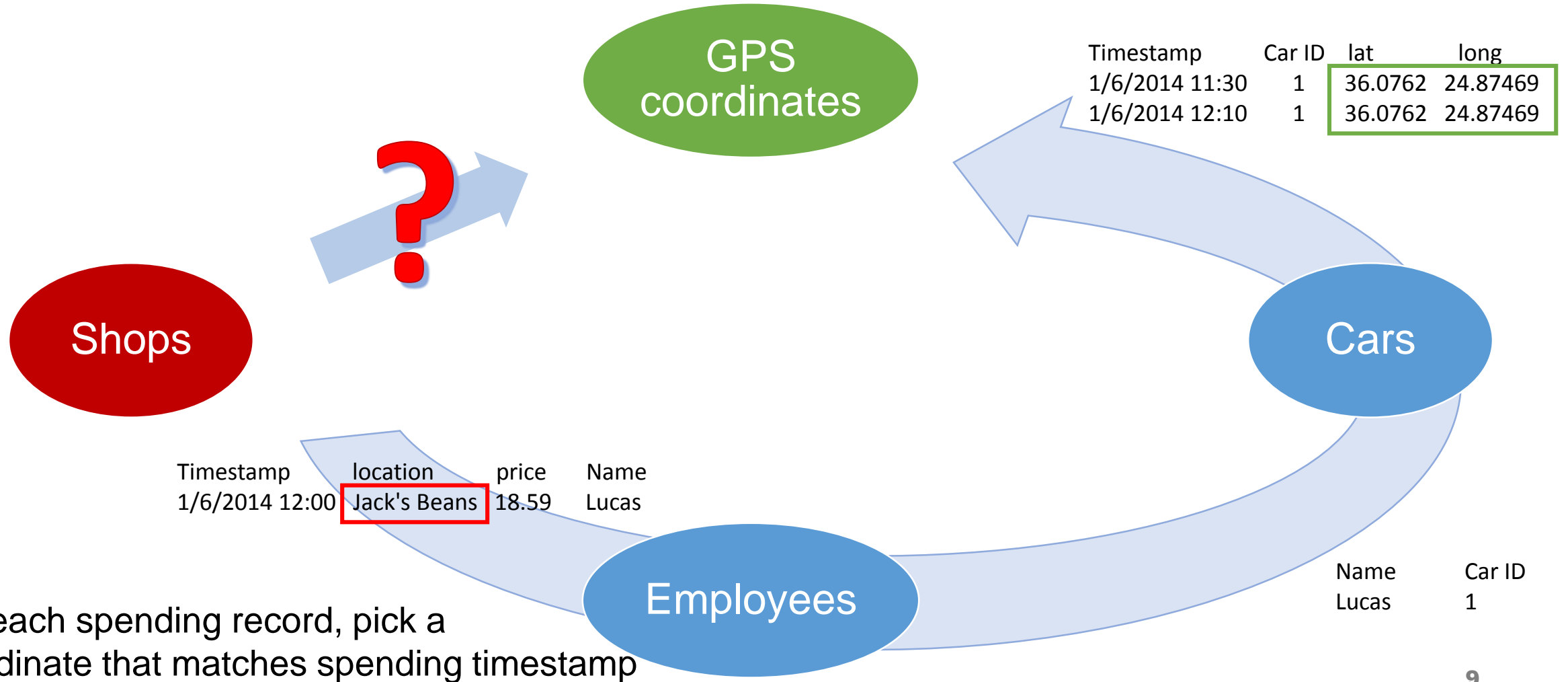
Missing/Conflicting Data



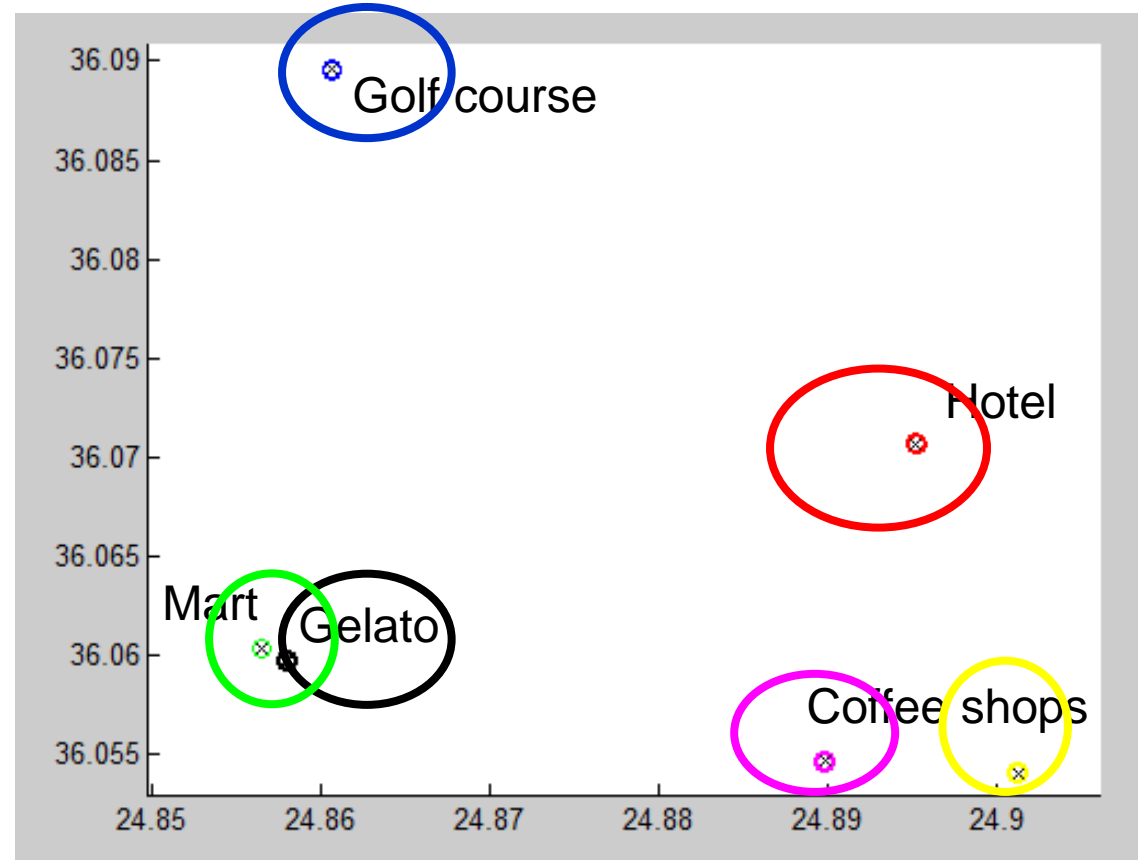
Identifying Shop Locations



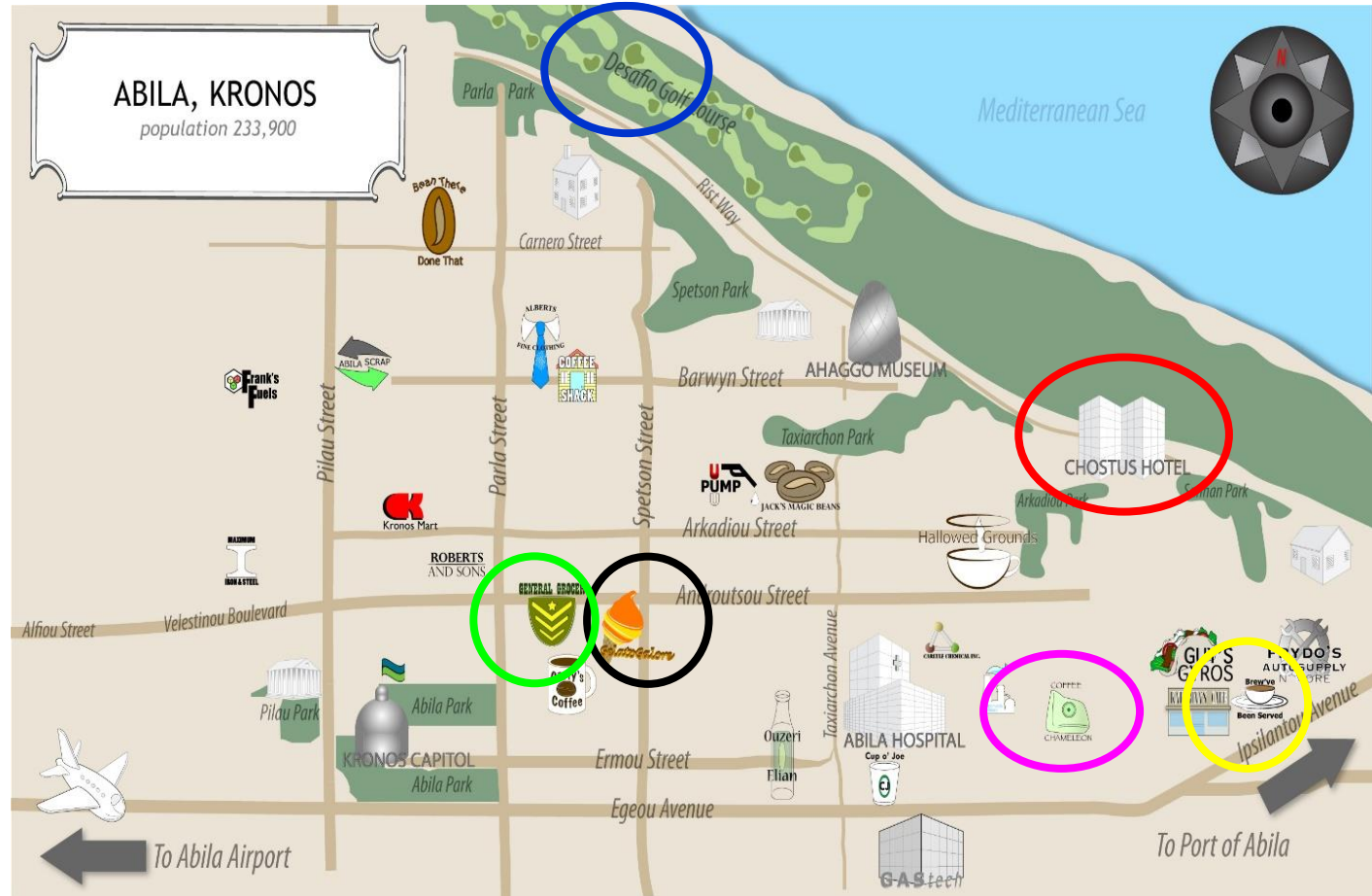
Identifying Shop Locations



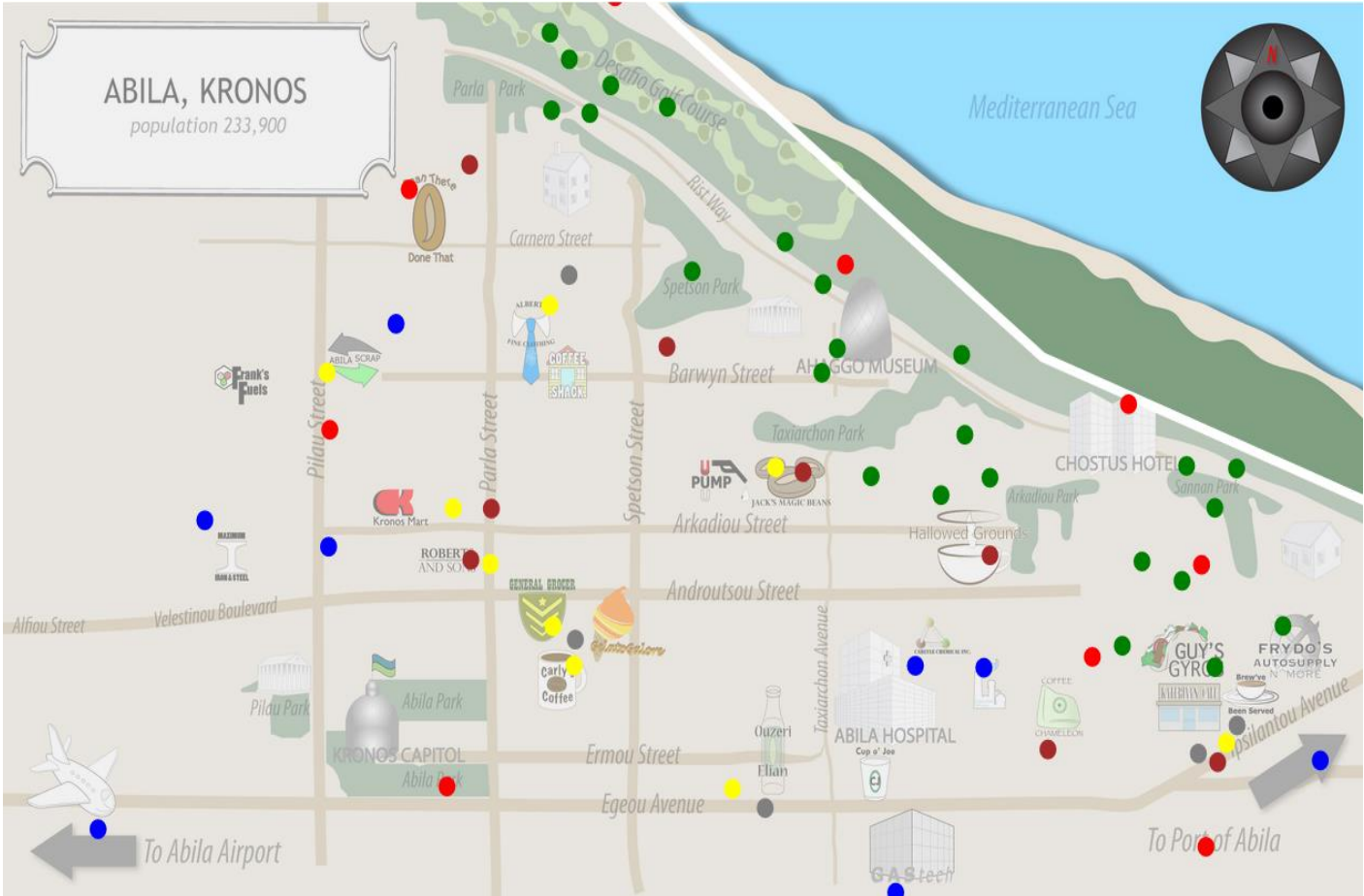
Identifying Shop Locations



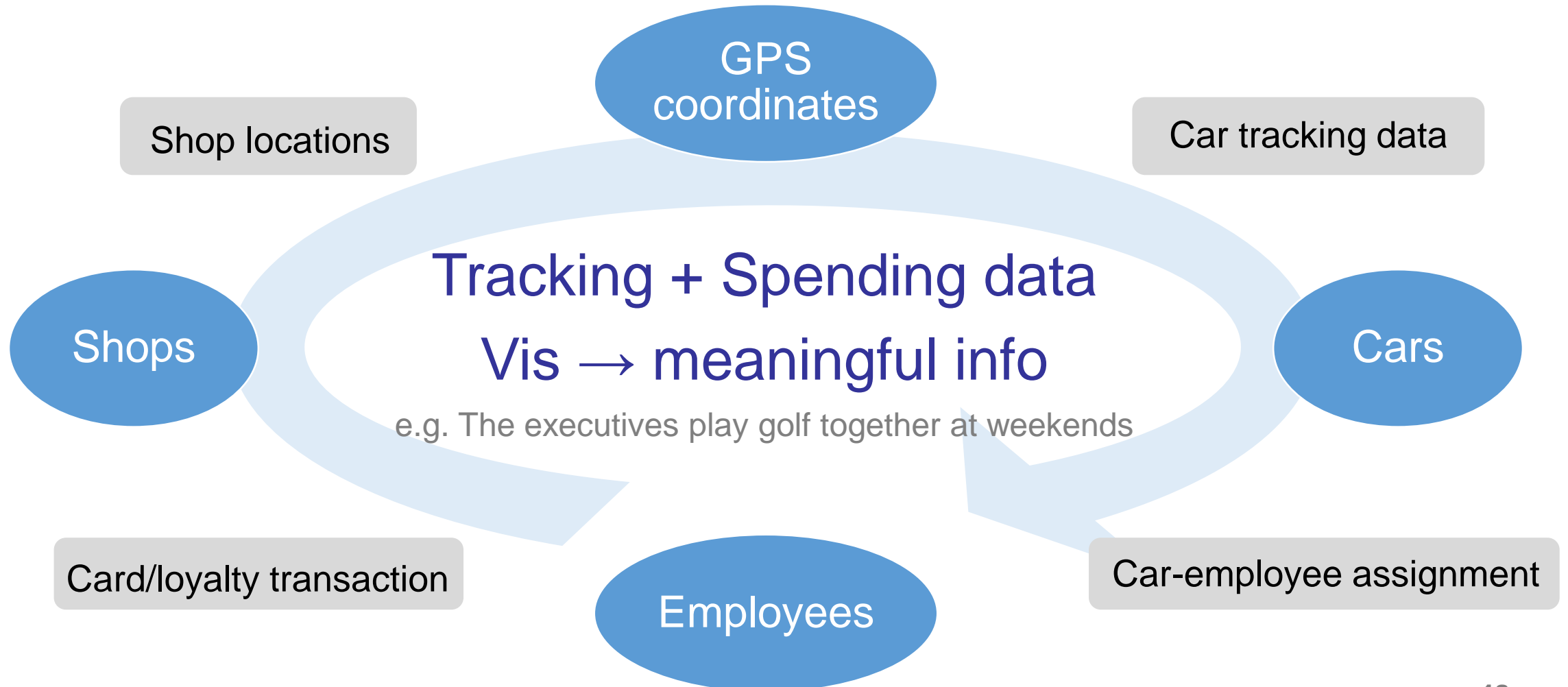
Identifying Shop Locations



Other Locations Identified

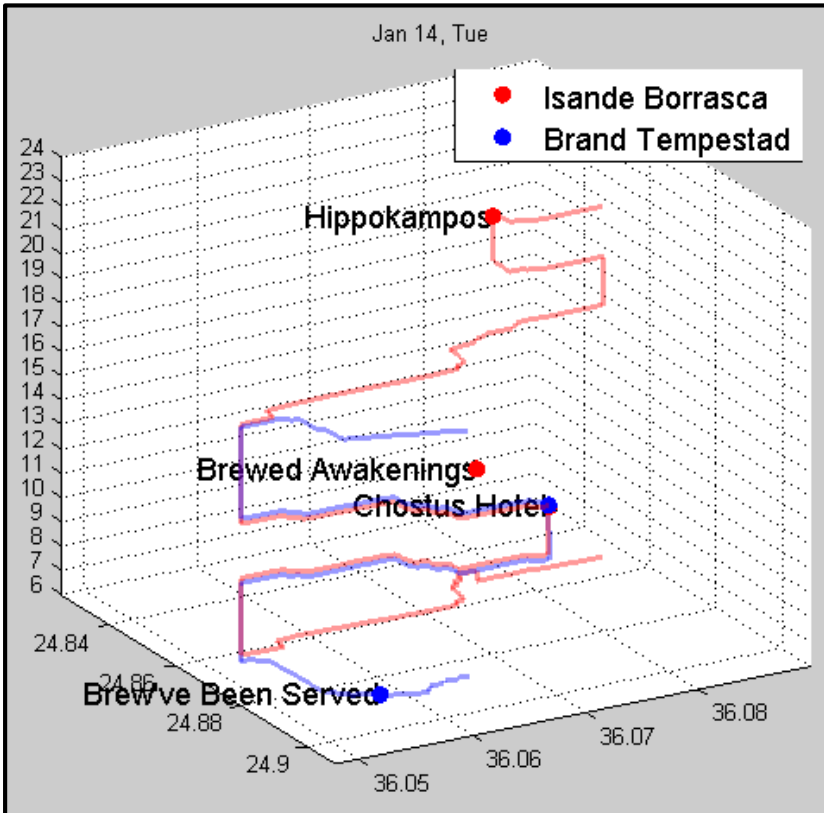


Processed Data



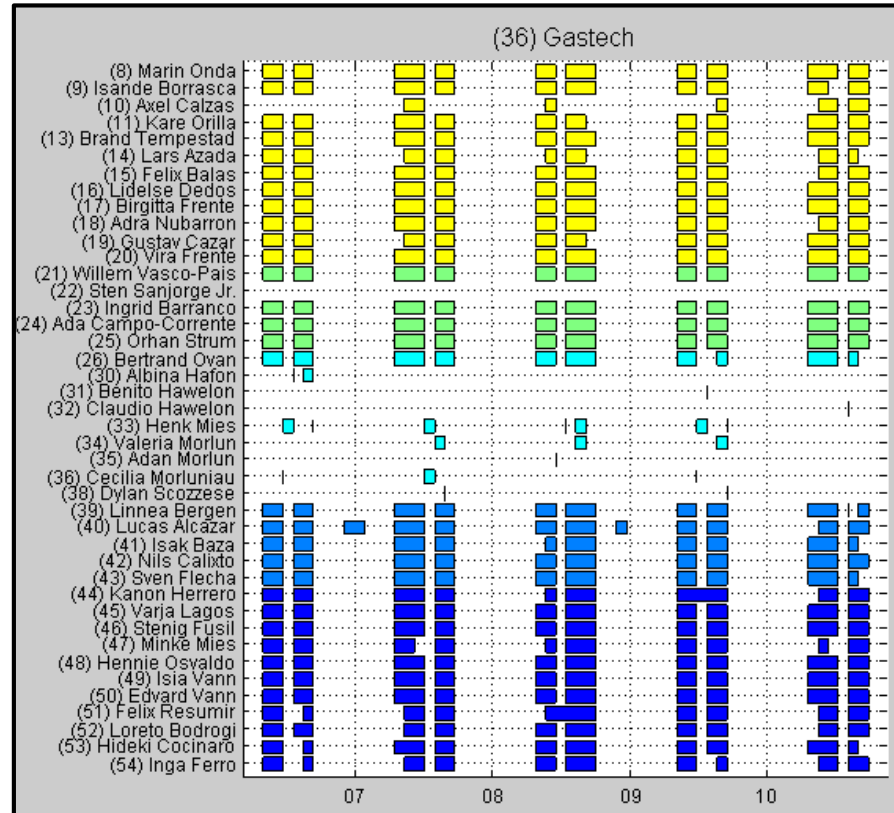
Our Tool

Space-time cube view



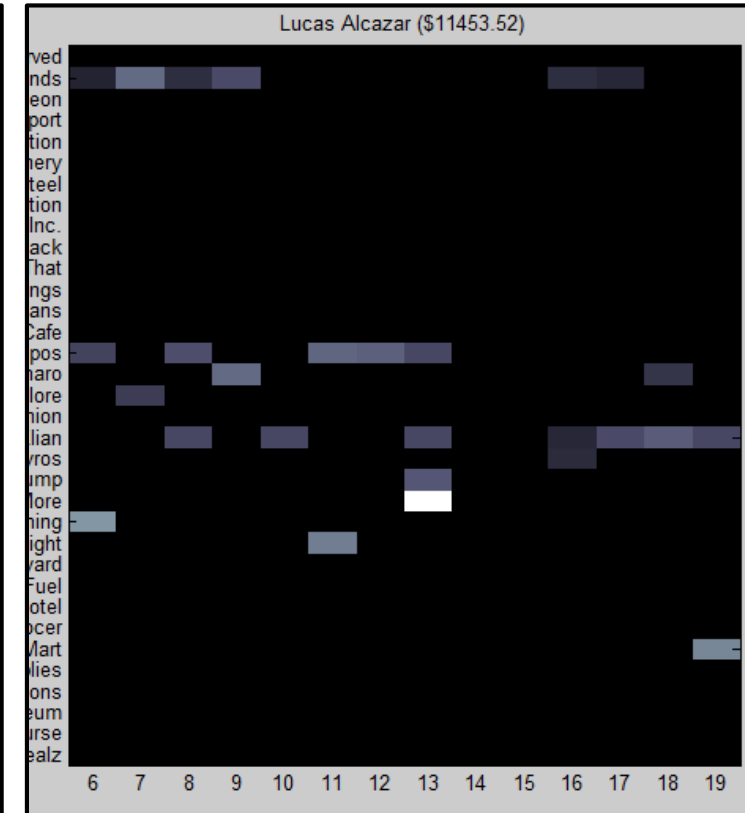
Geospatial trajectory over time

Timeline view



Staying (+spending) pattern at a particular location

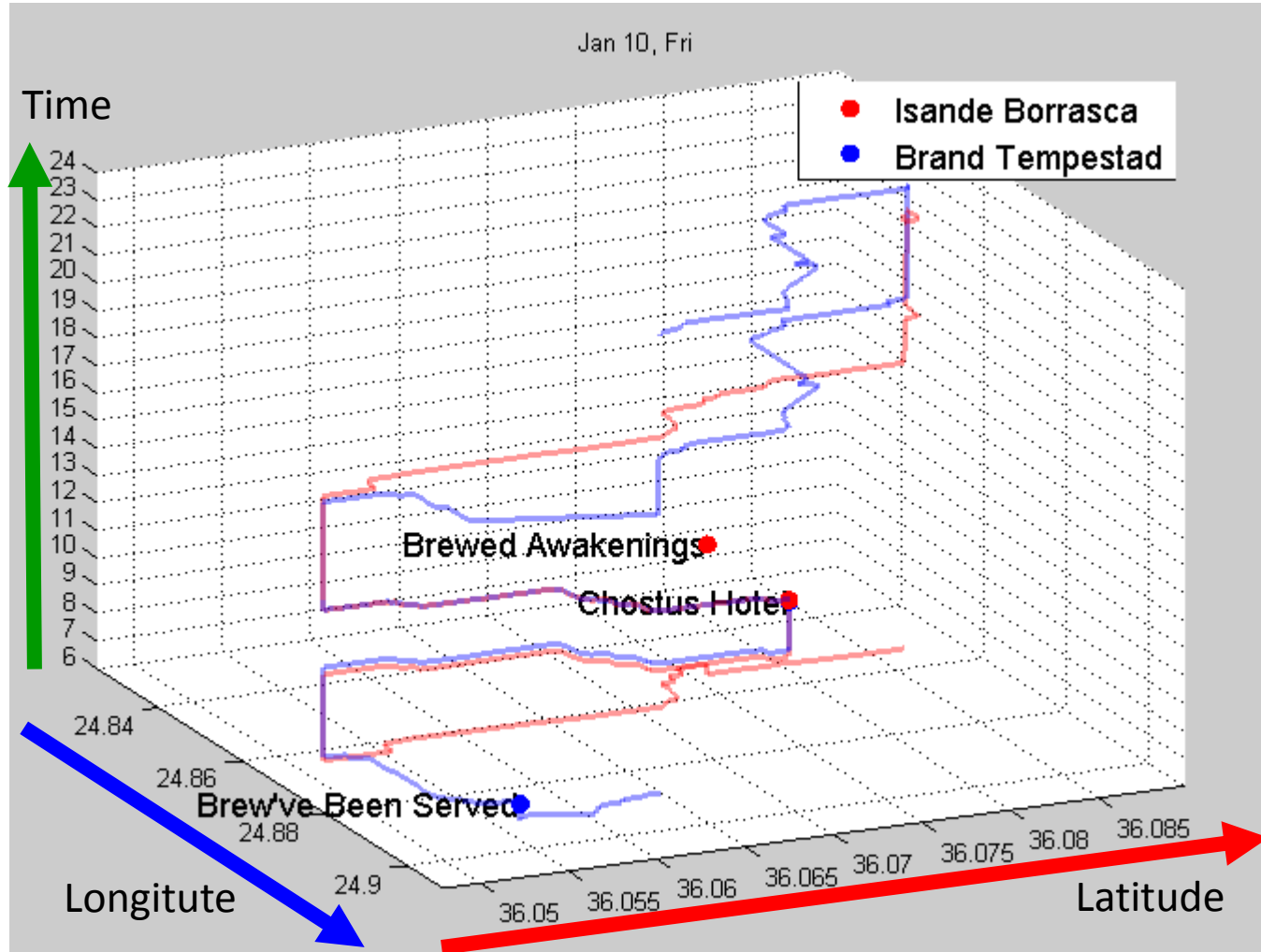
Matrix view



Spending amount (Shop or Employee) x Day

Our Tool

Space-time cube view



- Employees' trajectory over space and time
- Employee-focused

Demo

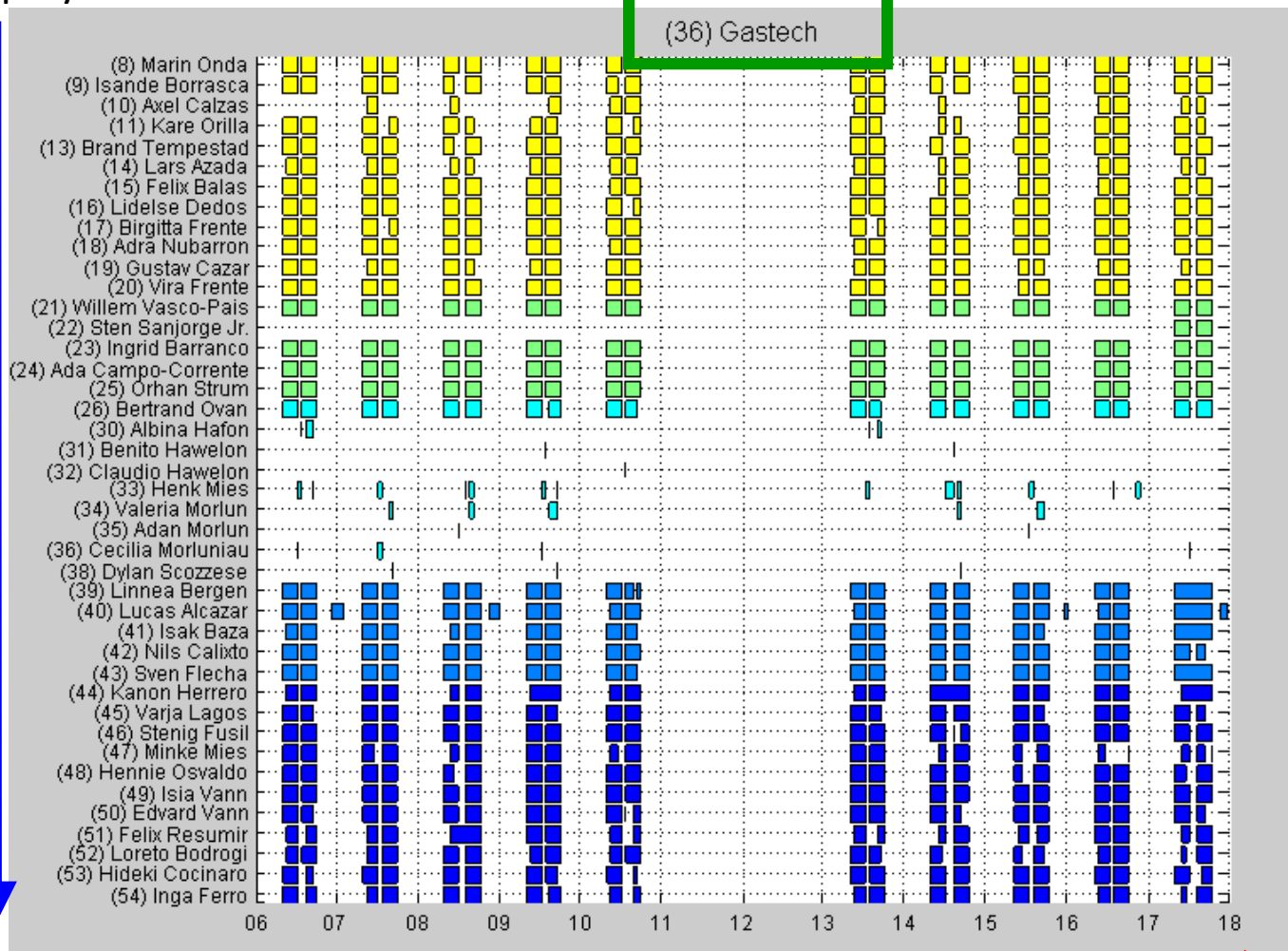
Brand and Isande at Chostus Hotel

Our Tool

Timeline view

Employee

Location



- Staying pattern (duration) for a particular location
- Location-focused

Timeline (date)

Demo

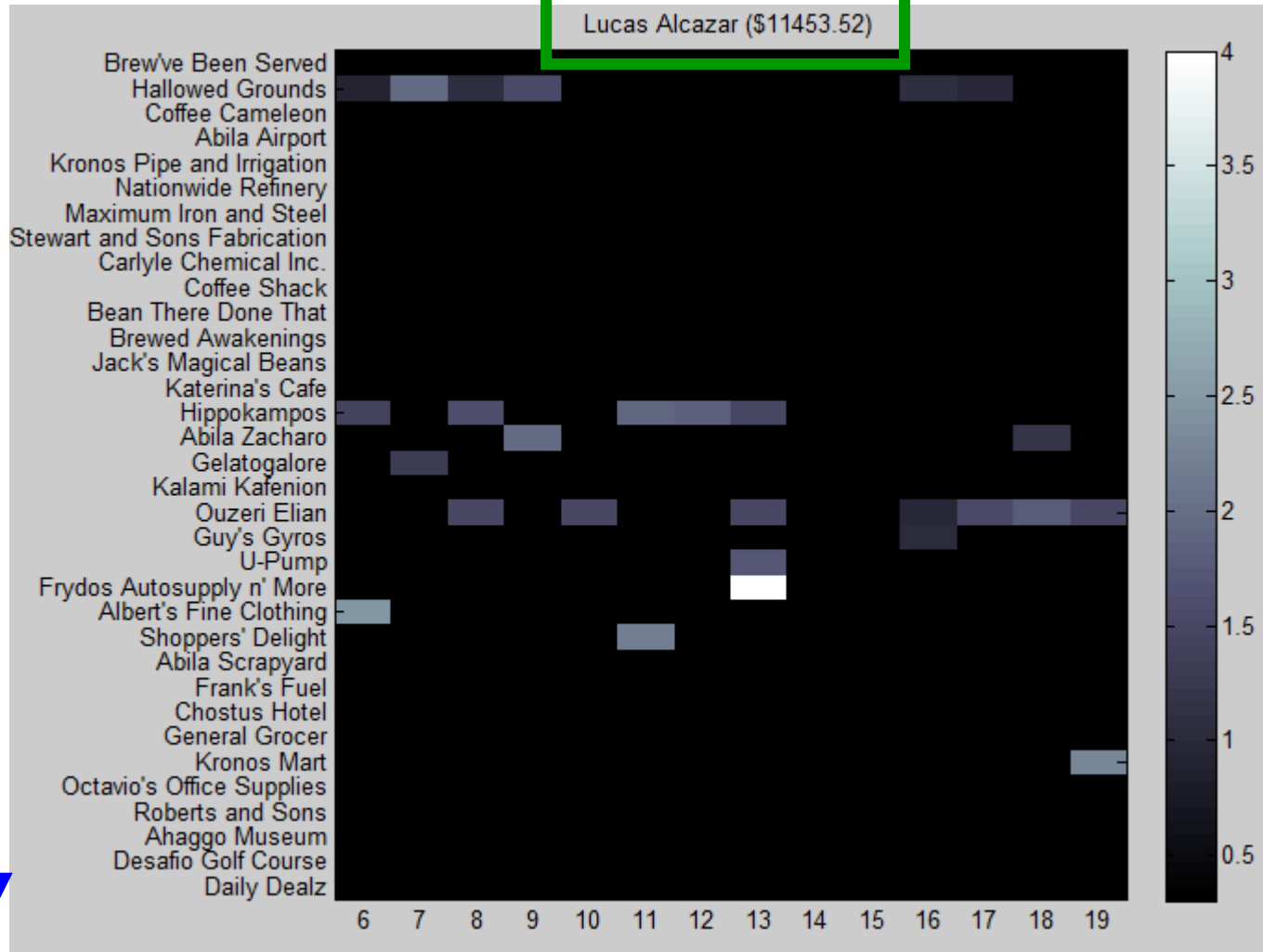
Suspicious visits on Gastech executives

Our Tool Matrix view

Shops

Employee

Lucas Alcazar (\$11453.52)



- Spending amount heatmap
- (Shop x Day) for a particular employee
- (Employee x Day) at a particular shop

Demo

Flexible interactions between three views

Lucas's unusual spending at Frydos Autosupply

Thank you!



Summary

MATLAB's built-in
interaction capabilities

Future Work

Interactive Visual MATLAB

Acknowledgements

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