

# Spatial Analysis and Visualization

Veera Muangsin

# Spatial Analysis

Most human activities and interests are related to locations.

Areas and buildings have specific purposes.

So, most created data are related to location in some way.

Location-related data is also called spatial data or geospatial data.

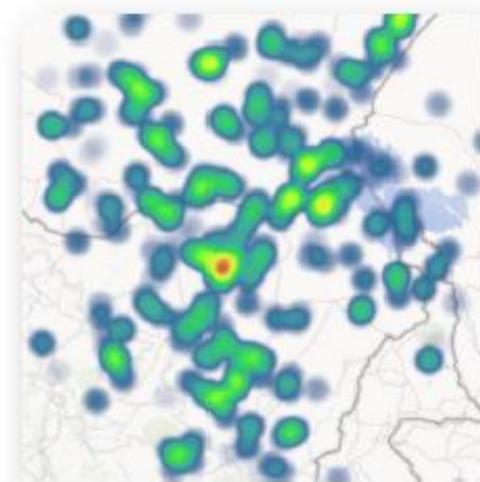
**Spatial analysis** is a process to gain insight from location-related data and solve location-related problems.

*“Everything is related to everything else, but near things are more related than distant things.”*  
*The first law of geography, Waldo Tobler, 1970.*

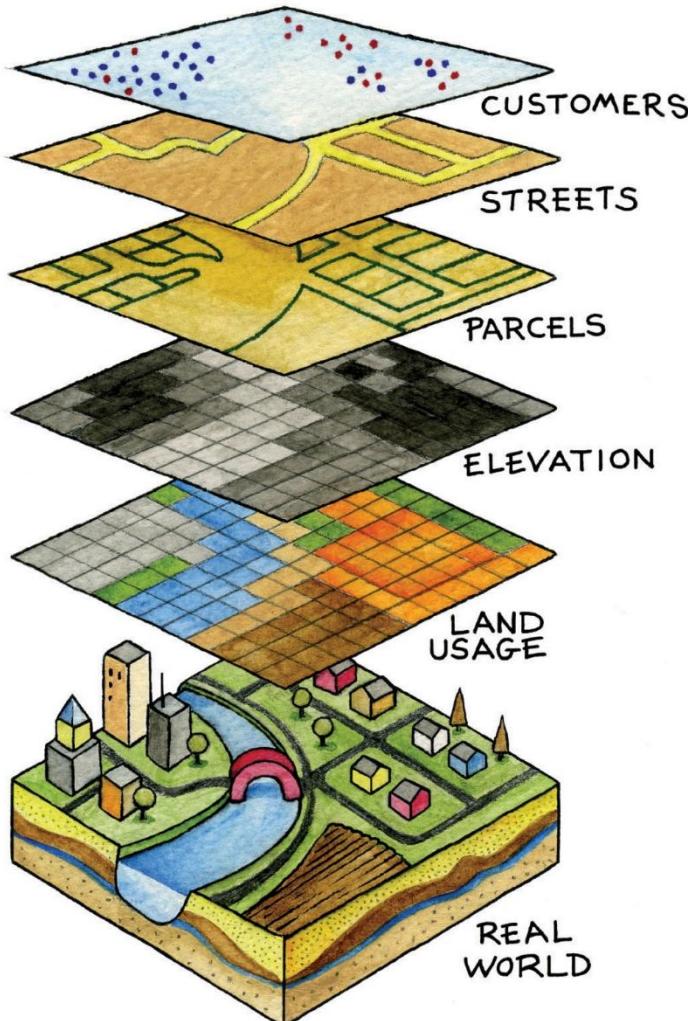
# Map

Map is the primary visualization method for spatial data and an effective tool for spatial analysis.

Latitude	Longitude	PlaceName	Death
13.58801	11.0956	P1	0
9.878124	12.55918	P2	4
14.65398	10.18044	P3	0
15.22057	9.993003	P4	5
13.16265	12.96319	P5	4
13.80617	8.889046	P6	2
13.10214	10.56081	P7	4
11.00403	11.86713	P8	2



# Geospatial Data Layers



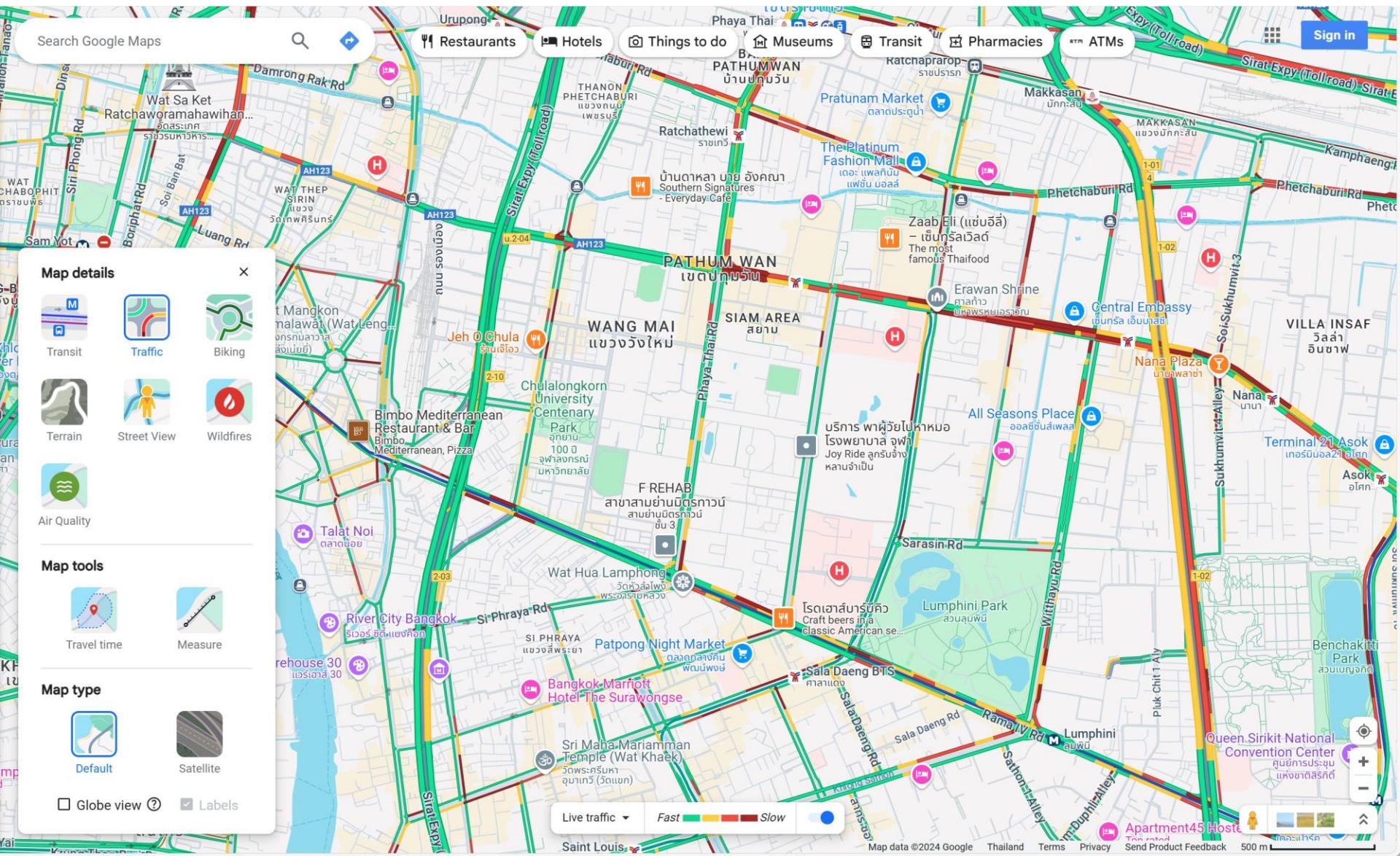
All geospatial datasets refer to locations on Earth.

So, they can be **overlaid**.

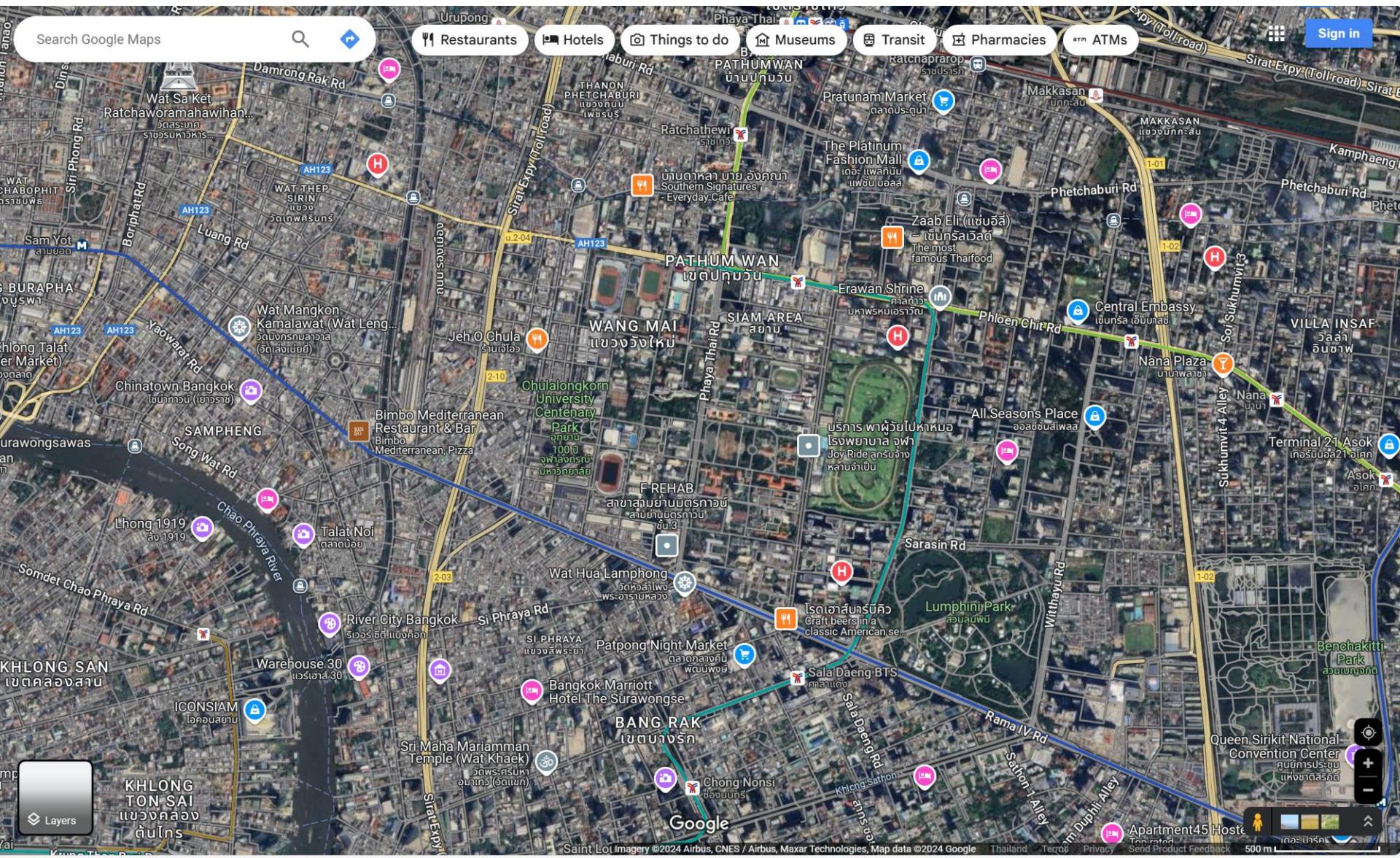
## Basic Types of Spatial Data

- Points
- Lines
- Polygons
- Raster (image)

# Google Maps



# Google Maps: Satellite Basemap



# Google StreetView: 360° images



# Google Earth: 3D Buildings



# ระบบค้นหารูปแปลงที่ดิน (กรมที่ดิน): Land Parcels

<https://landsmaps.dol.go.th/>

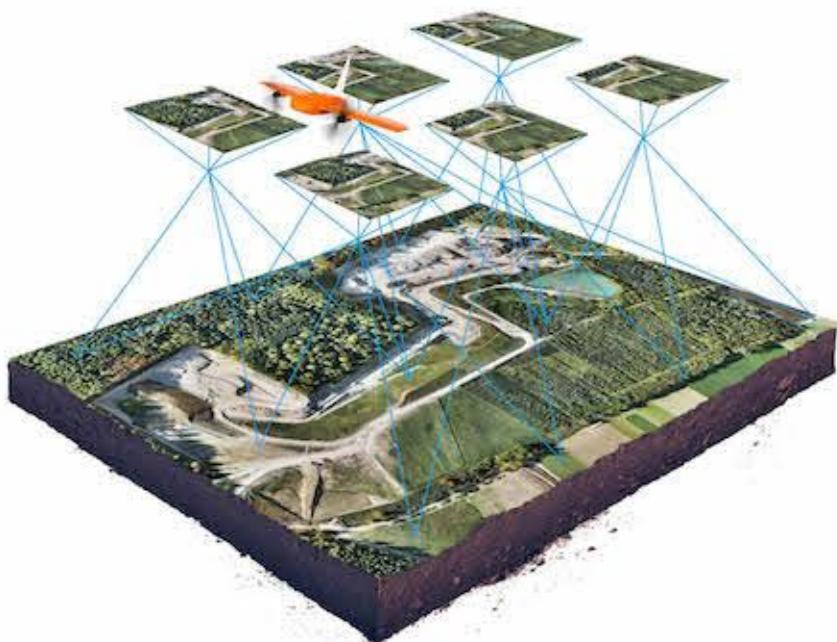
The screenshot shows a detailed map of a specific area in Bangkok, likely Chulalongkorn University or surrounding regions. The map features a grid of red-outlined land parcels. Overlaid on the map are various location markers and labels, including:

- Search Bar:** Shows "ค้นหา" (Search) and a placeholder "เลขที่โฉนด" (Land parcel number).
- Information Pop-up:** Displays details about a specific land parcel:
  - เลขโฉนดที่ดิน: xxxx15
  - หน้าสำรวจ: xxxx85
  - เลขที่ดิน: xxxx03
  - ระวัง: 5136 III 6418-15 (1000)
  - ตัวบล: บางรัก
  - อำเภอ: บางรัก
  - เขต: กรุงเทพมหานคร
  - เนื้อที่: 1 ไร 0 งาน 43.0 ตารางวา
  - ราคาประเมินที่ดิน (กรมที่ดิน): 350,000 บาทต่อตารางวา หรือต่อตร.ว. 300,000 บาทต่อตร.วา
  - ค่าพิจิตแลง: 13.73237654, 100.52647472
  - ข้อมูลการเดินทาง: จากที่นี่ไปยังแปลงที่ดิน
  - ข้อมูลสำนักงานที่ดิน: จากแปลงที่ดินไปยังสำนักงานที่ดิน
- Location Labels:** Samyan Mitrtown, Somboon Seafood, Sam Yan, Big C Foodplace, Nisit Clothing Store, Urban Jungle Hotel, Wat Hua Lamphong, Poo Tee Shrimp Wonton Noodle, Ashton Chula-Silom, Chamchuri Square, dtac Hall (5G), AKIYOSHI Japanese, and Chulalongkorn Business School.
- Roads and Streets:** Rama IV Rd, S. I. Phraya Rd, Sap Rd, Lang Wat Hua Lamphong Alley, and Soi Samyan.
- Other Elements:** A blue button labeled "เข้าสู่ระบบ/ลงทะเบียน" (Log in/Register) and language options "TH EN".

With modern mapping techniques,  
everywhere, out-door and in-door,  
will be on high-resolution map.

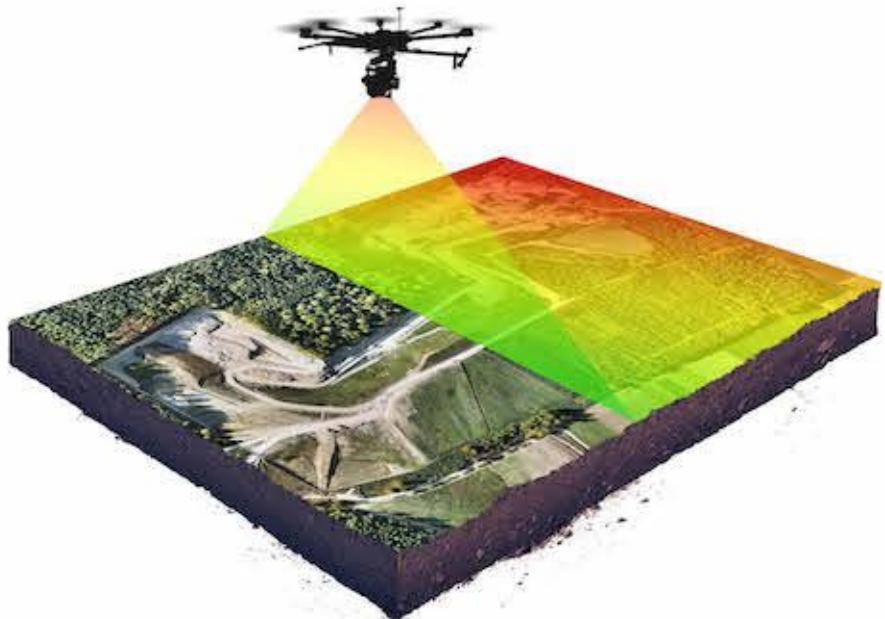


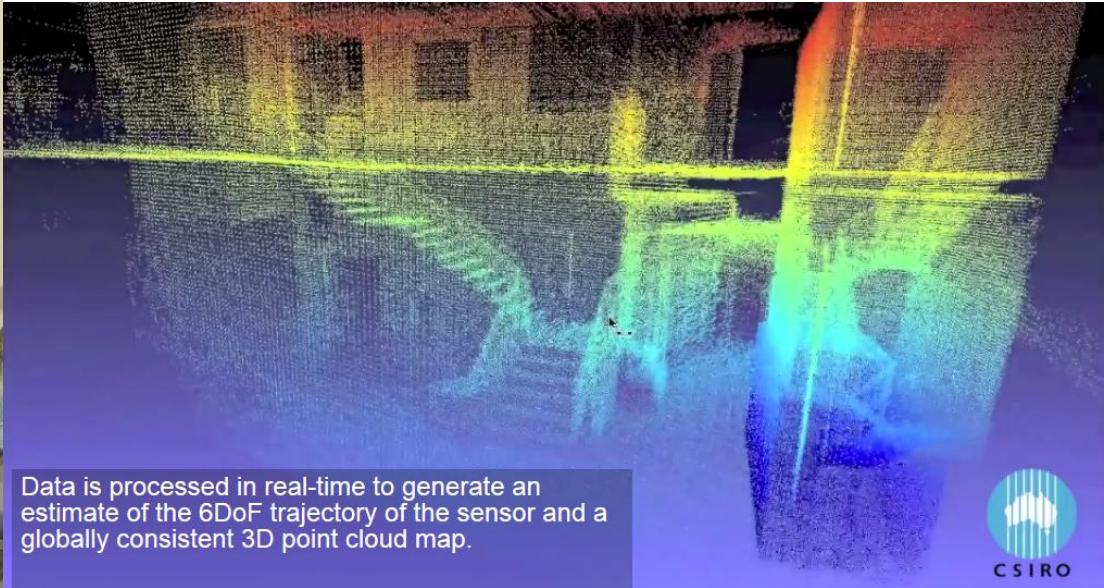
Photogrammetry



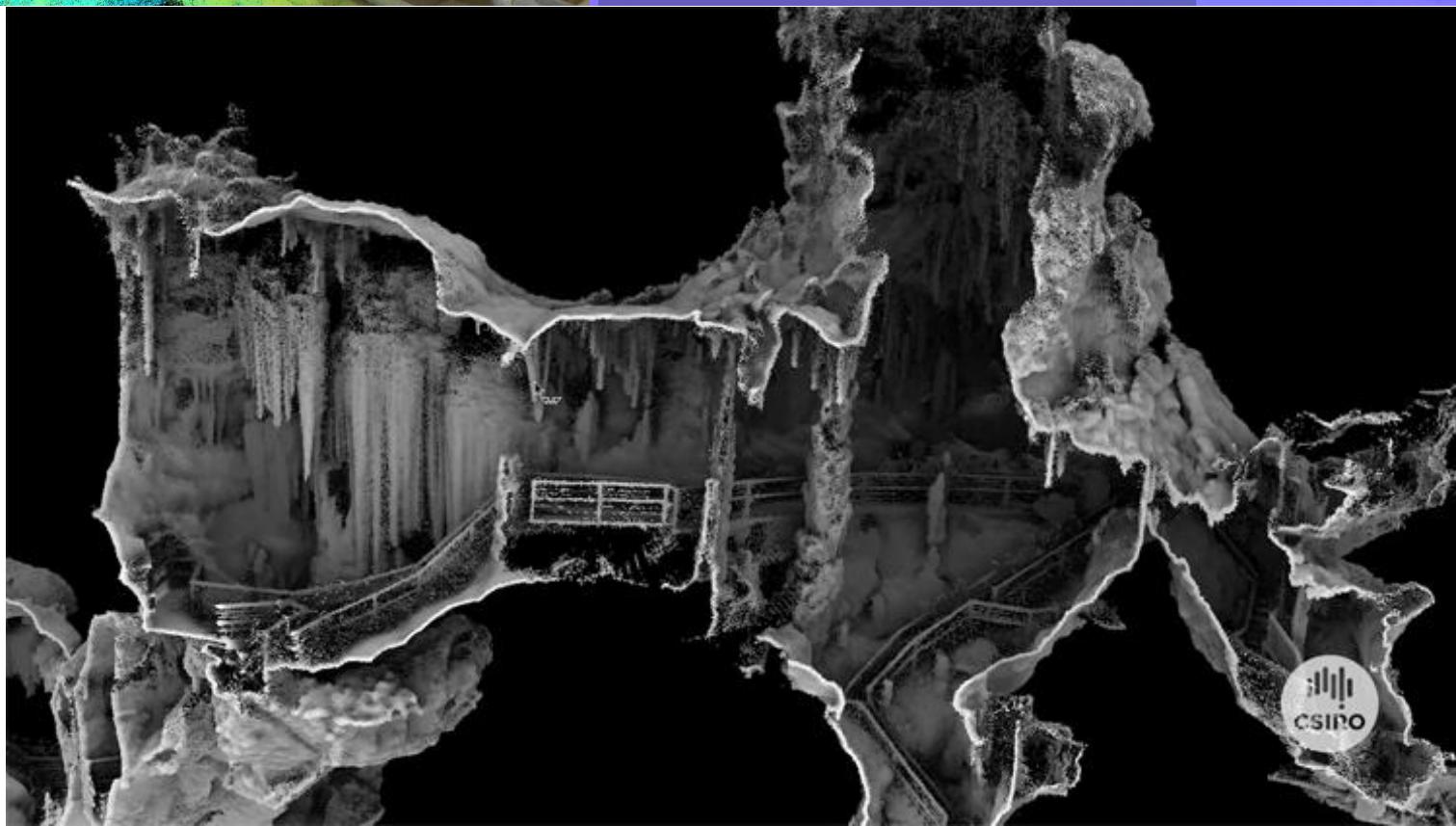
LiDAR

(Light Detection and Ranging)





Data is processed in real-time to generate an estimate of the 6DoF trajectory of the sensor and a globally consistent 3D point cloud map.



# OpenStreetMap

OpenStreetMap

Edit

History Export GPS Traces User Diaries Communities Copyright Help About PomVeera

Edit feature

Feature Type: Building

Fields:

- Name: อาคาร๔
- Multilingual Name:
  - English: Engineering 4 Building
- Building: yes
- Levels: 20
- Height (Meters): Unknown
- Address:
  - 123 Place
  - Street
  - Subdistrict
  - District

Point Line Area

Inspect Add Feature

Phaya Thai Road Chulalongkorn Road

Na Baromma Roop Lawn Prachumkorn ground

Parking Lot 7

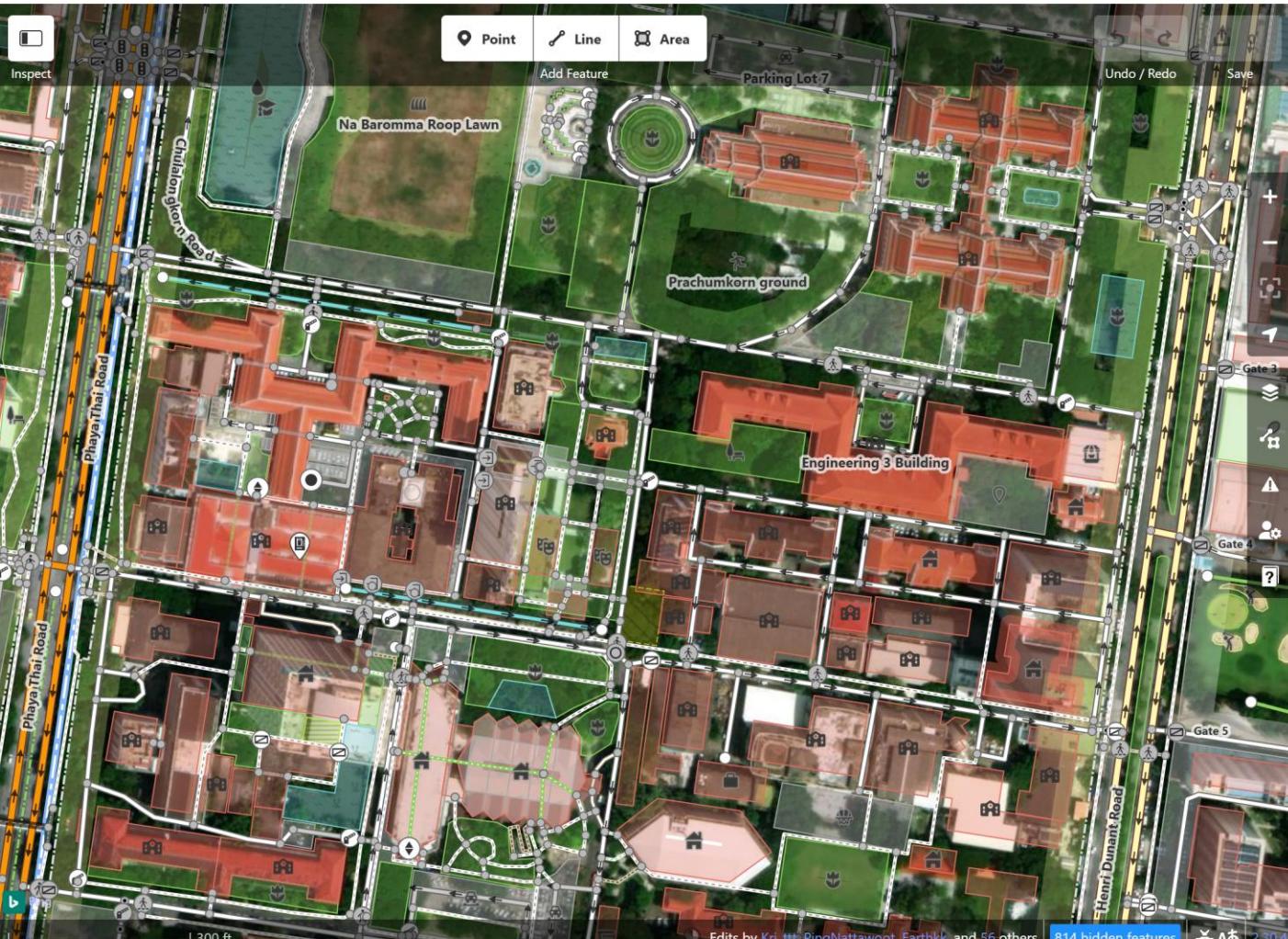
Engineering 3 Building

Gate 3 Gate 4 Gate 5

Honni Dunant Road

300 ft

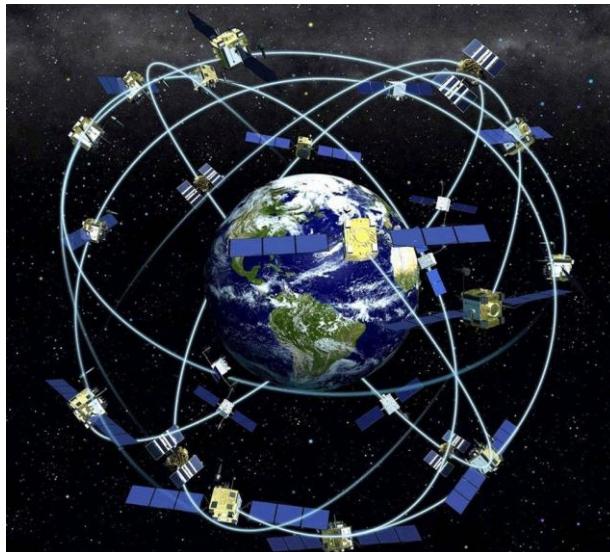
Edits by Kri\_itt, PingNattawoot, Earthkk, and 56 others 814 hidden features 2,304



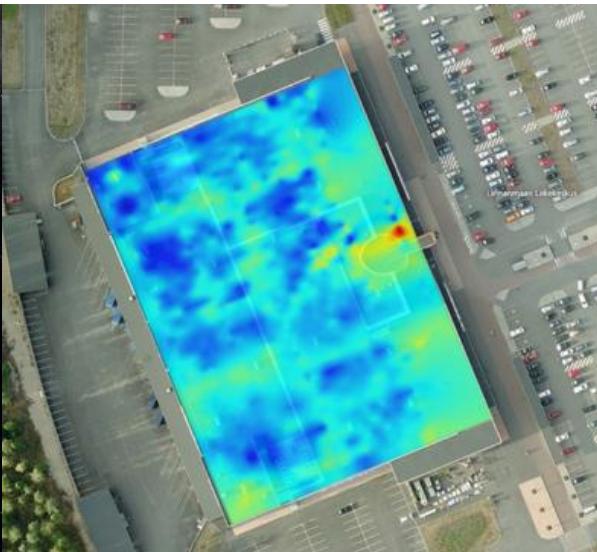
With modern positioning techniques,  
everything can be located.

# Location Technologies

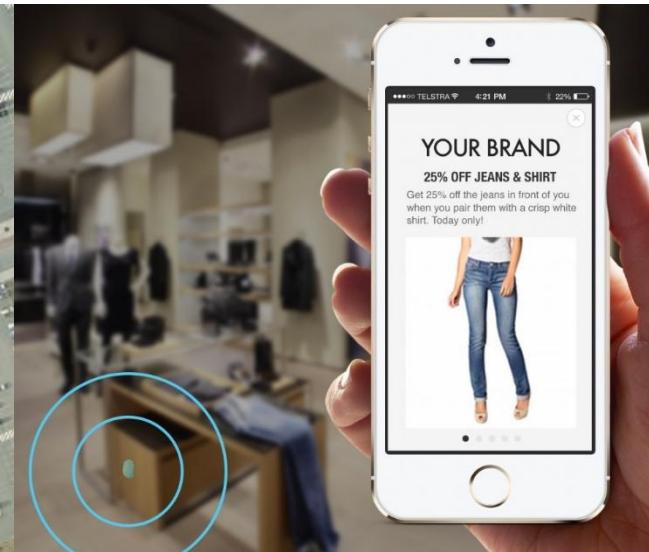
GPS



WiFi

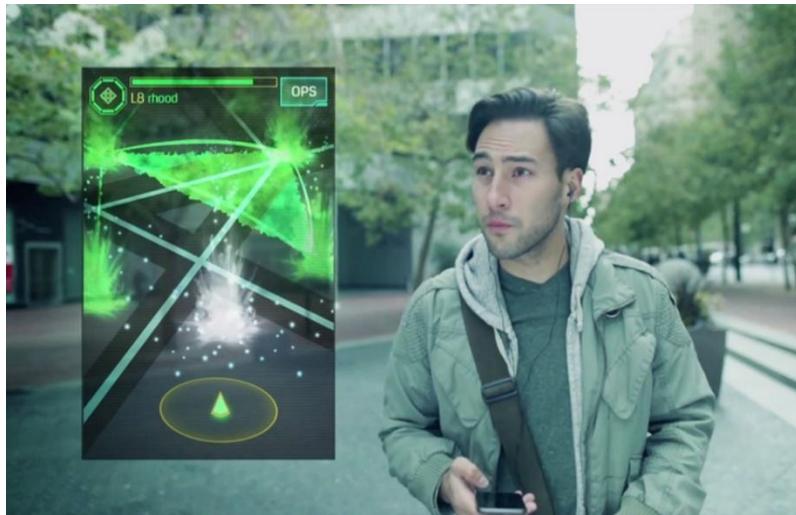
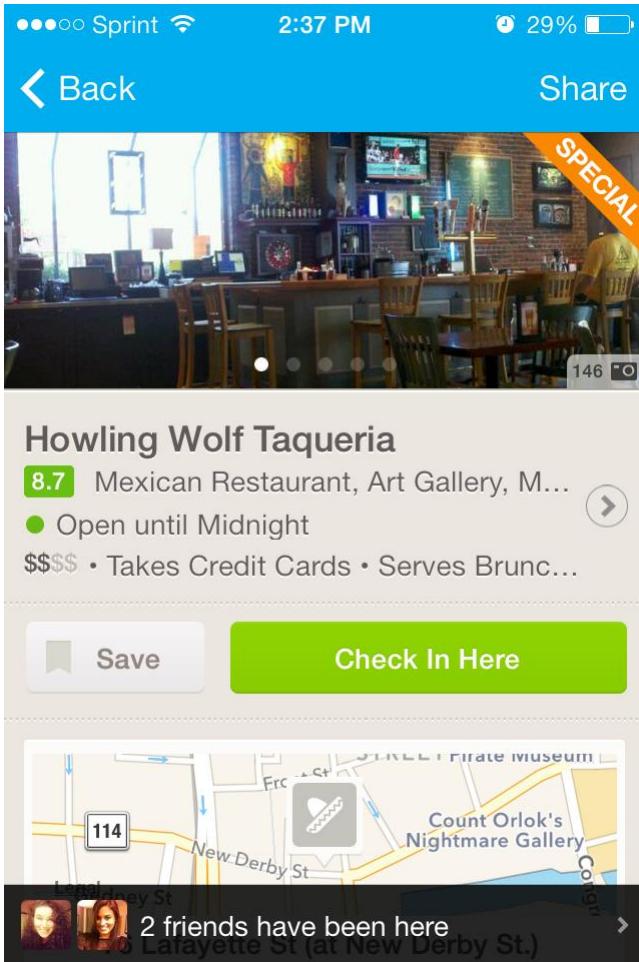


Bluetooth/Beacon



Any kind of smart devices with known locations can be used as **sensors** that collect geospatial data.

# People as Sensors



# Sensors in Transportation

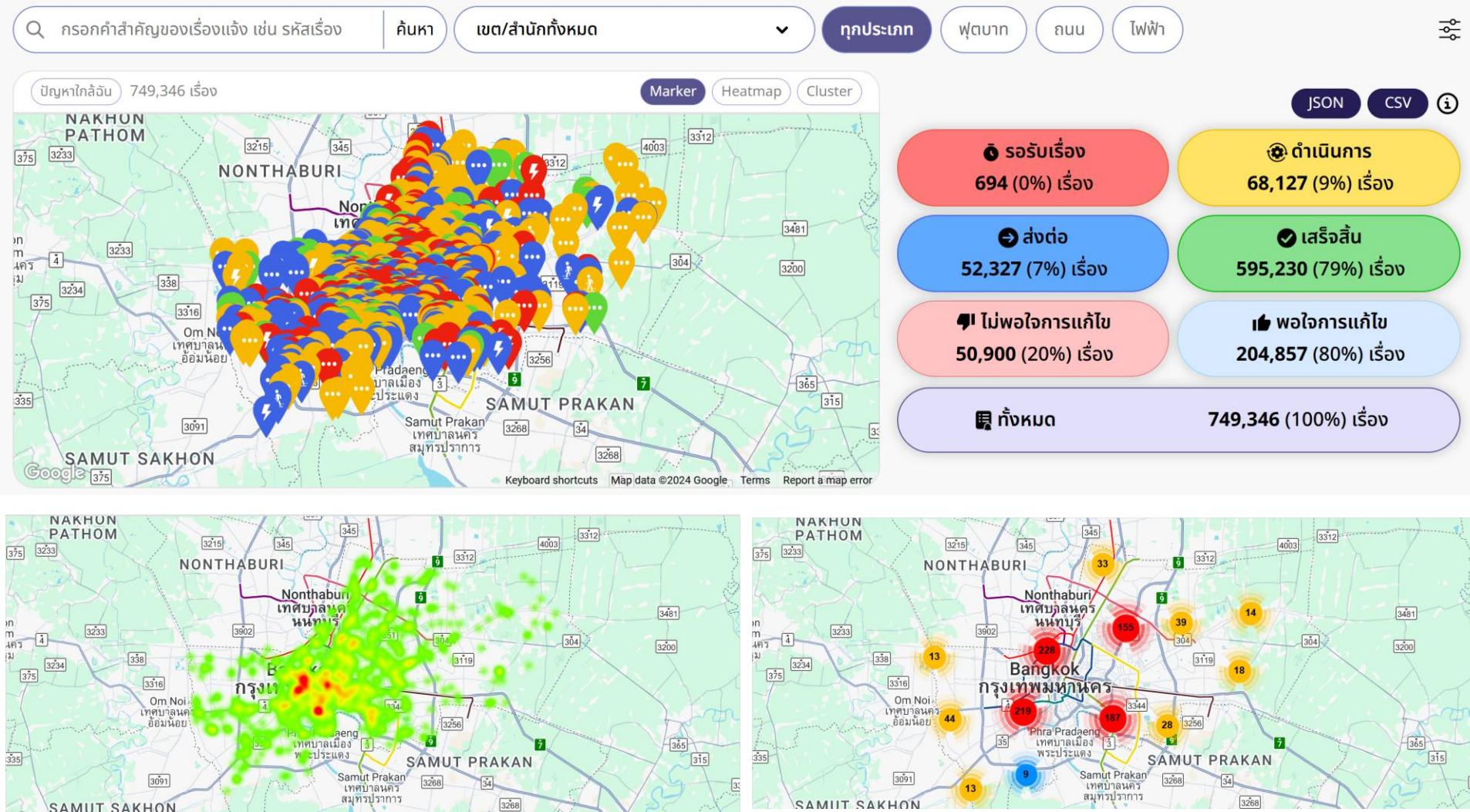


# Types of Location Data

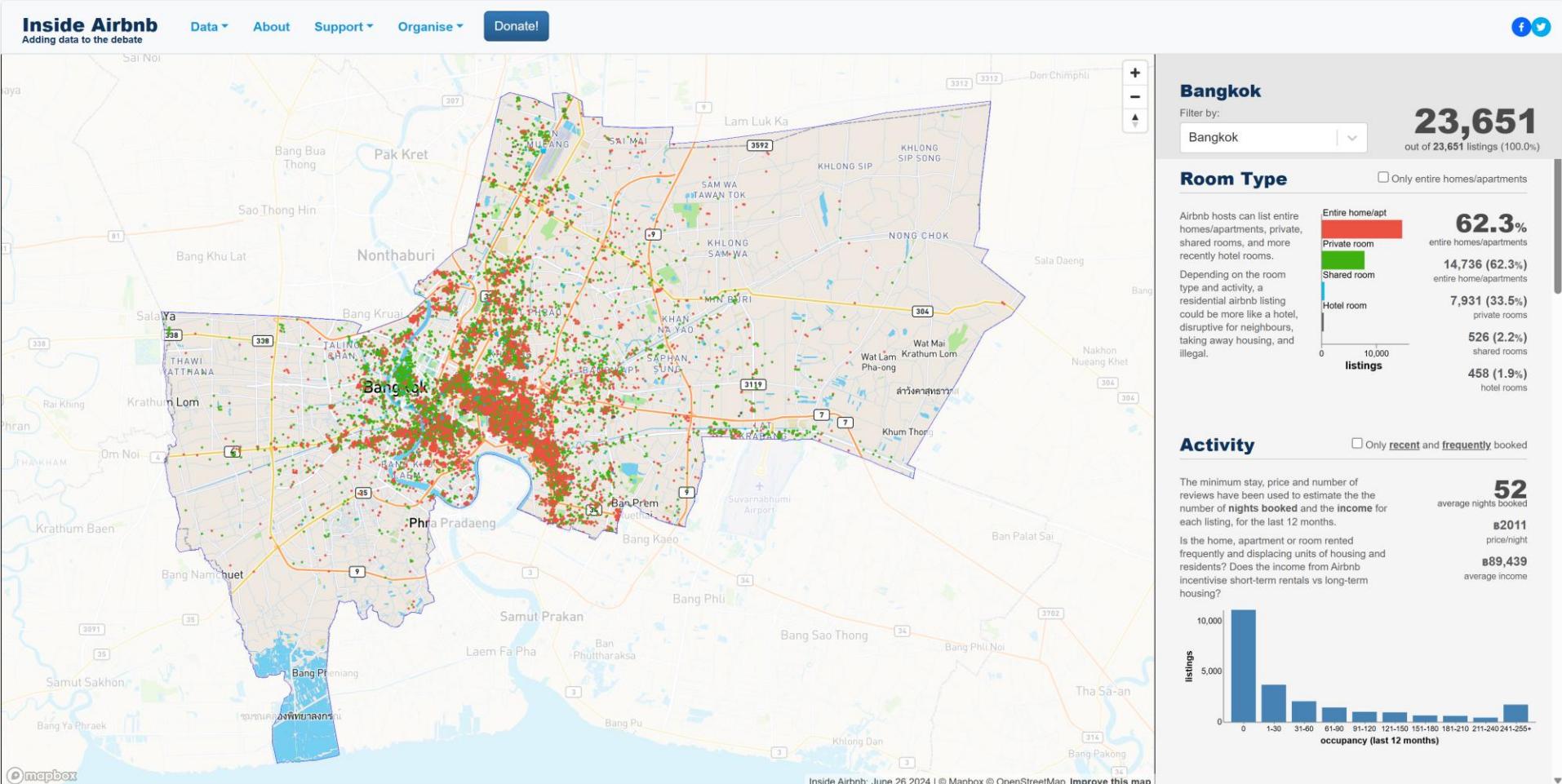
- Coordinates (latitude, longitude)
- Place name, street address
- Proximity of reference point (WiFi access point id, cell tower id)
- Location + Time → changes, movement

# Examples

# Traffy Fondue



# Airbnb



<https://insideairbnb.com/bangkok/>

# Taxi GPS Data

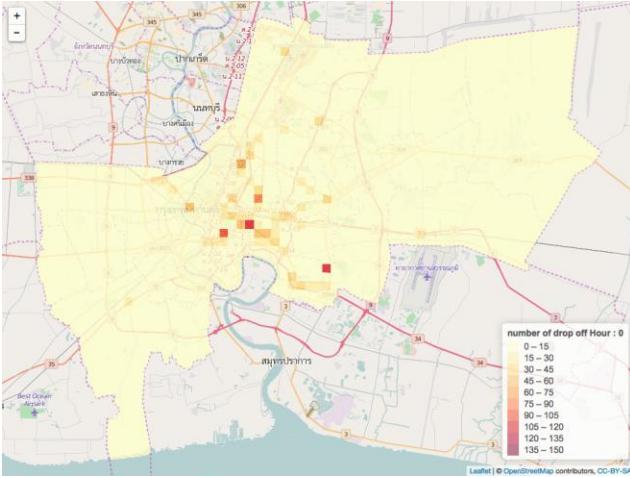


# Density map of taxis over time

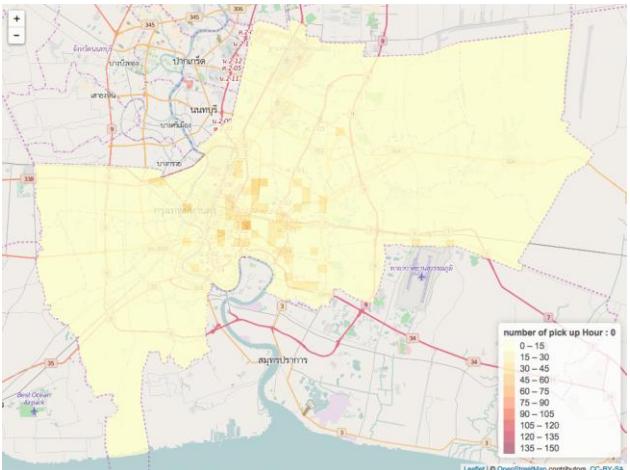


# Taxi Heatmap

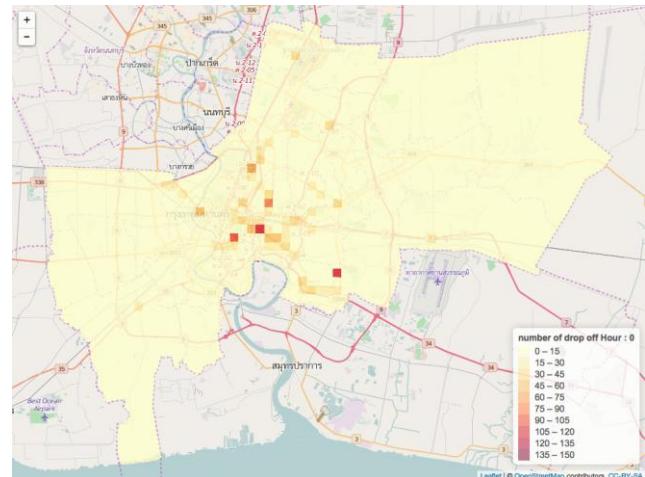
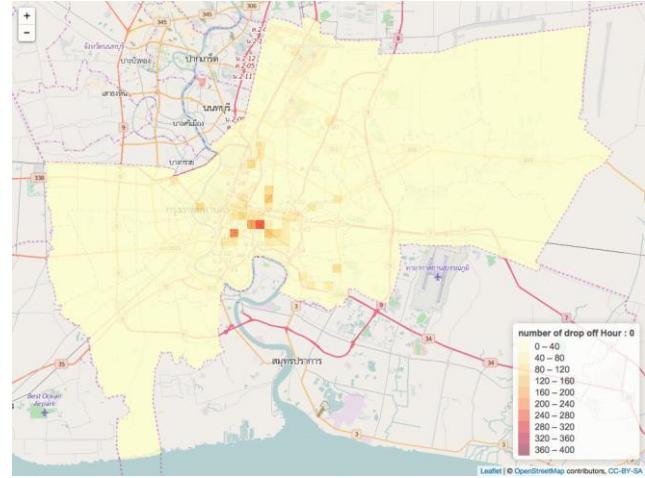
Weekdays



Weekends



Pick-up



Drop-off

# Traffic Analysis using Taxi GPS Traces

<https://public.tableau.com/app/profile/veera.muangsin/viz/CongestionbasedonTravelTimeIndex/TravelTimeIndexTTIDashboard>



# Geospatial Applications

- Navigation, route planning
- Customer geodemographic segmentation
- Targeted marketing
- Branch/facility location selection
- Real estate valuation / risk assessment
- ...

