URBAN SENSING & analytics WHORKSOP

Finding urban spaces to implement veterinary clinics in CDMX using Spatial Data Science and Geomarketing

Diego Andrey[1] Iván A. Verduzco[2] Jesús G. Perea[3]

URBAN DATA APPLICATION

Motivation

- 99.8% of businesses in Mexico are small or medium-sized enterprises.
- The causes are due to lack of planning prior to the opening of the business, unfamiliarity with the target audience, and direct competition.

Introduction

The goal is to support emerging veterinary clinics in understanding the needs of their customers depending on the target area to place the establishment.
Spatial data science and geomarketing can help to collect information about pet owners, veterinary service preferences, and demographic factors in the target area.

Solution

Implement a big database considering sociodemographic, urban traffic and **affluence**, social perception, industry, population and crime data from open datasets of Mexico City, along with locations and reviews of veterinary clinics from Google Maps data, and historical traffic flow information.
The data connects to a dashboard and a machine learning model to provide important area-specific information to the user, helping the decision-making process.

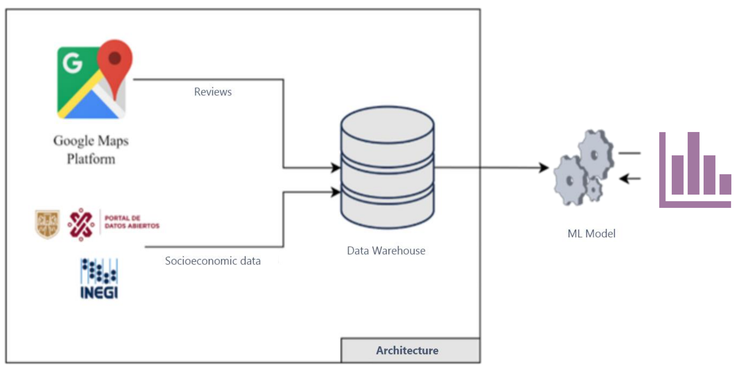

Figure 1. Architecture of the solution.

Spatial Data

- **Location Data**: Data was collected using the Google Maps API, dividing the city's territory into quadrants and querying veterinary clinics within a 1 km radius, including ratings and reviews. We considered economic activities data from INEGI.

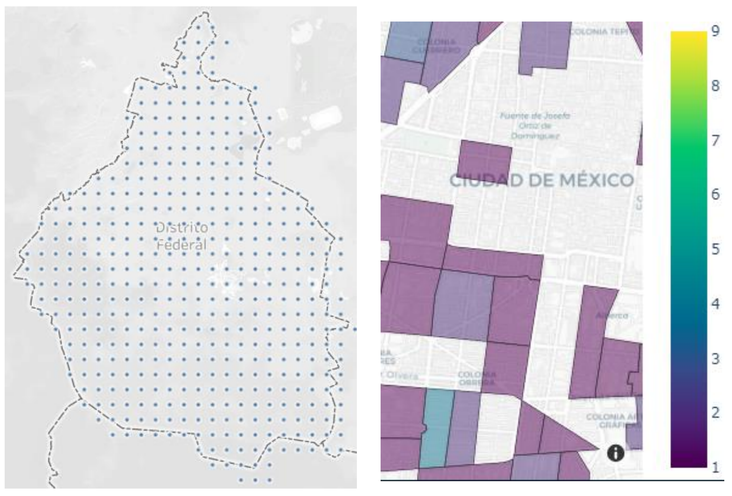

Figure 2. (a) Points of every request. (b) Count of veterinary clinics per AGEB.

- **Socioeconomic Data**: includes information on population, marginalization index, and social development index.
- **Crime Data**: Crime statistics were collected by neighborhood for the years 2020-2023 from open data provided by the City of Mexico.
- **Traffic Data**: collected with the TomTom's service, the city were divided in 5 zones and covering times from 9:00 AM to 8:00 PM.

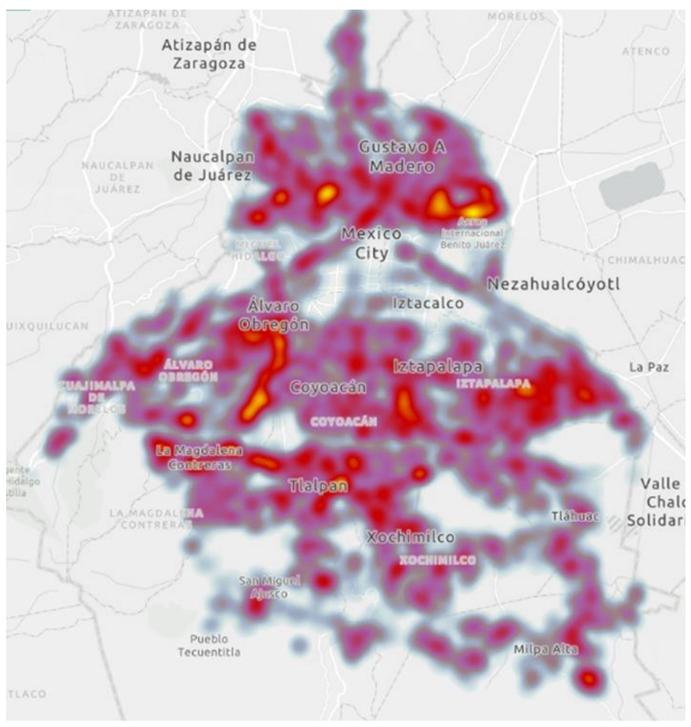

Figure 3. Historical traffic heatmap.

Optimizing Veterinary Clinic Locations

A machine learning classifier model is developed, capable of determining whether **a veterinary clinic is successful or not based on its geographical characteristics in the area**.
For labeling, veterinary clinics were selected as successful if they had been operational for a longer period since their start date and if their reviews on Google Maps remained active. This approach enables the identification of ideal areas for users to establish their own veterinary clinics.

Preliminary results

The number of veterinary clinics in a hood or AGEB is correlated with :

Positively	Negatively
Total population	Population without internet access.
Social development index	Economically inactive population
Single population	Number of robberies at commercial premises.

Table 1. Correlations with the number of veterinary clinics.

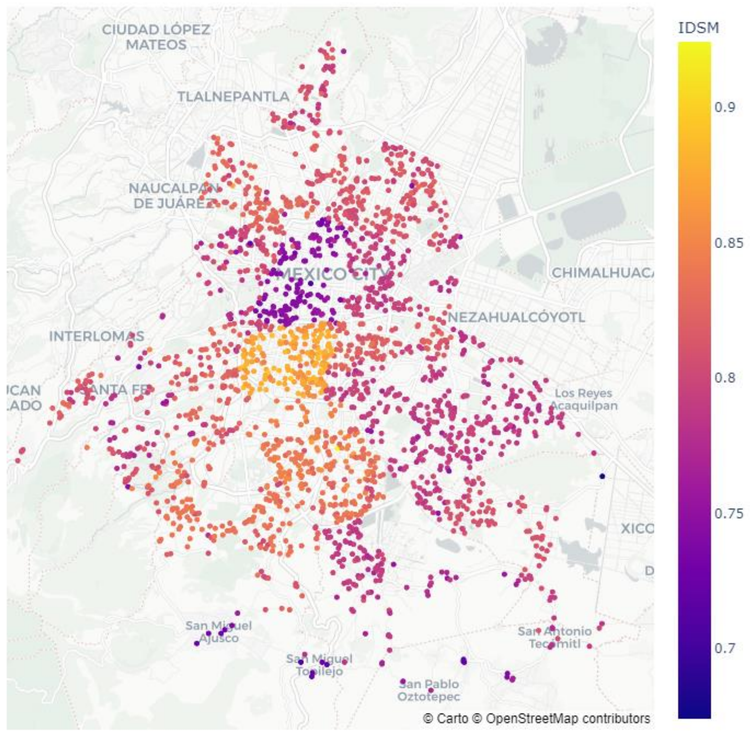

Figure 4. Veterinaries distribution with social development index.

Conclusions

- Our solution dynamically provides representative information about the area where one intends to establish a veterinary clinic business using machine learning models.
- Next, we'll involve data from Mexico's major cities to obtain a generalized classifier model.

References

- BBVA México, "¿por qué fracasan los negocios pequeños?." [Online]. Available: https://www.bbva.mx/educacion-financiera/blog/por-que-fracasan-los-negocios-pequenos.html, 2023.
- INEGI, "Directorio estadístico nacional de unidades económicas 2021." [Online]. Available: de https://www.inegi.org.mx/app/mapa/denue/default.aspx, 2020. 97

Roberto E. Zagal (rzagalf@ipn.mx) Uriel Bermúdez (ucoronab@ipn.mx)

diego.rz1611@gmail.com[1] iverduzcol1700@alumno.ipn.mx[2] jpereas1900@alumno.ipn.mx[3]