Team #40: The Californians

Georgia Tech College of Computing

Regional Home Profitability in a Sharing Economy

Ali Kafagy (akafagy3) John-Michael Burke (jburke65) Thomas Tillman (ttillman9) Shuo Wang (swang765)

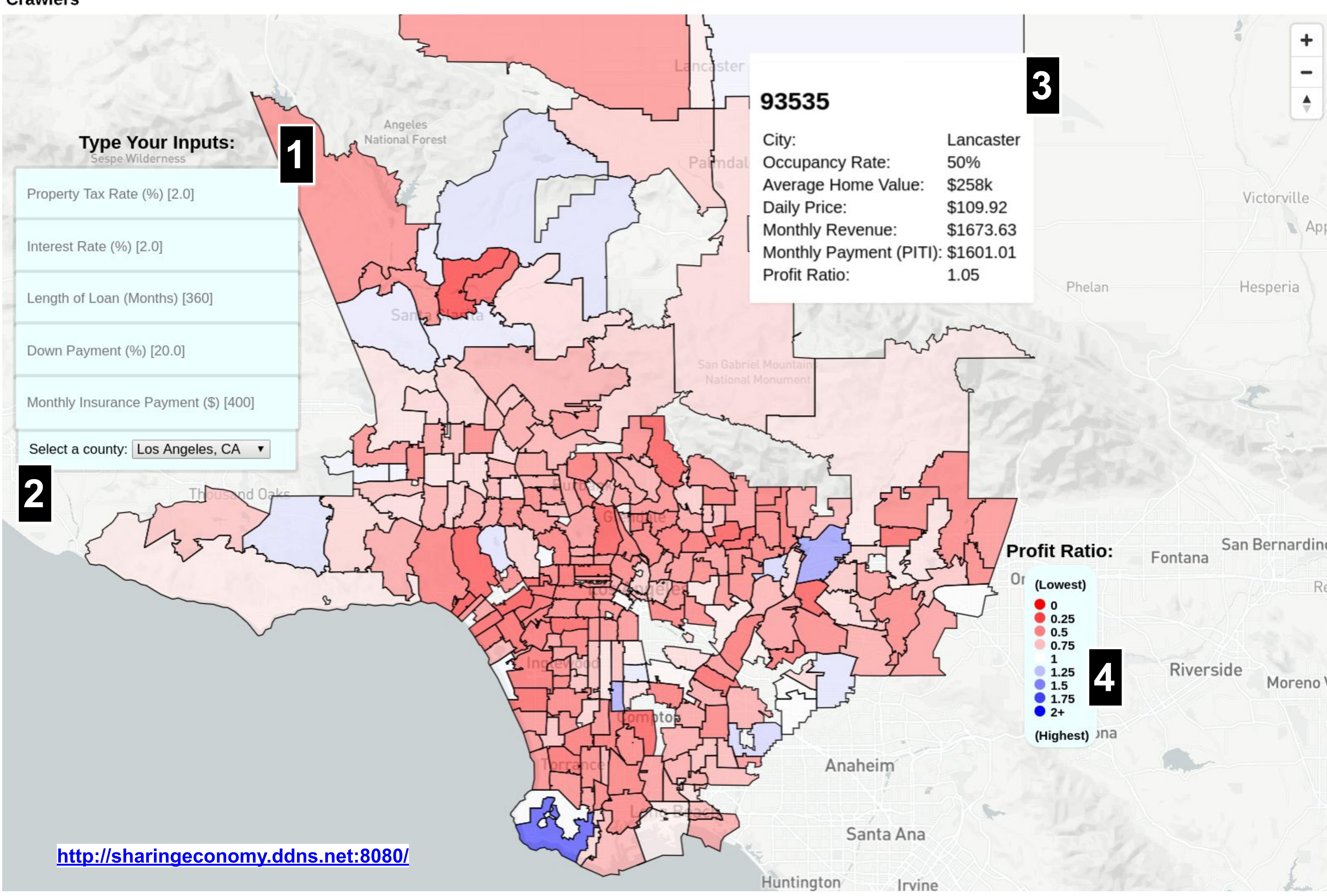
Summary

How profitable is it to purchase a home to rent out on Airbnb? Our project sets out to find the profitability of such a venture in several different metropolitan areas of California. By consolidating the home values and Airbnb listing data, we attempt to find which zip codes offer the most return on investment.

Data Gathering/Processing

We scraped the internet to retrieve multiple datasets for major metropolitan areas in California from insideairbnb.com and zillow.com and stored the data on our PostgreSQL database. We had a total of 4 million records which were then processed and cleansed by SQL. We removed outliers and grouped data into the yearly basis. Once the data is ready for visualizations, the frontend web application then loads the region's topojson and queries the PostgreSQL DB for the current locale. After filtering out the unwanted zip codes, it then calculates the profit ratio of each zip code and displays it on the choropleth heat map, whilst checking every second for new user input values to recalculate profit ratios.

Application Flow Chart



The web frontend shows a choropleth of varying counties in California (Los Angeles County shown as above) differentiated by a calculated **Profit Ratio**.

Type Your Inputs: **(1)** The user is currently viewing the map with default values as seen in brackets in the textboxes along with a description and type for each input, upon entering new values the choropleth updates immediately. **(2)** The user may also choose to view different counties by selecting one from the drop down list in which the map jumps to that county and updates the choropleth. **(3)** This user has already selected a polygon correlating to a zip code in the map, 92394, and a tooltip is being displayed. In that tooltip, the associated city, average occupancy rate, average home value, average daily price, calculated monthly payment, and profit ratio are shown as well for all other zip code polygons upon click. **(4)** The legend for profit ratio is shown with lower numbers being less profitable, higher being most profitable, and 1.0 marked as the break even point.

Algorithm Implementation

With the Airbnb listing data and Zillow estimated home value prices, we wanted to use a simple, common sense metric to display the profitability of the different zip code regions, and a ratio of estimated revenue to estimated costs seemed like a natural option.

First we used the average Airbnb daily price, the average occupancy rate, and the number of days per month to calculate the estimated revenue per zip code:

$$\textit{Estimated Monthly Revenue} = \textit{Mean Airbnb Daily Price} \times \textit{Mean Occupancy Rate} \times \textit{Number of Days Per Month} \times \frac{365}{12}$$

Next, the monthly cost uses the mean home values, a loan length (360 months), and interest rate to calculate a monthly mortgage payment. To this we add an estimated monthly insurance and property tax to arrive a the estimated monthly cost:

$$\textit{Estimated Monthly Cost} = \textit{Payment}\left(\frac{\textit{Annual Int Rate}}{12}, \textit{360 months}, \textit{Loan Amount}\right) + \textit{Insurance} + \textit{Property Tax}$$

The profit ratio index is calculated by dividing the expected monthly revenue by the expected monthly cost, so that a ratio of 1.0 represents the "break even" point. Anything above this generates some profit, and anything below this operates at a loss.

$$\textit{Profit Ratio Index} = \frac{\textit{Expected Monthly Revenue}}{\textit{Expected Monthly Cost}}$$

Evaluation

There will always be unseen factors that affect the profitability of housing investments; however, purely looking at calculated monthly revenue over calculated total monthly payments derives a functional profit ratio. The frontend web app successfully allows for the visual observation of these profit ratios geographically. The visualization of the data we collected here can give potential investors an idea of profitability of a region with just a quick glance rather than poring through spreadsheets. There were some interesting insights from the data: (1) high home values somewhat negatively correlated with profit ratio (-0.30), and (2) there was some positive correlation with year-over-year increasing home values and profit ratio (0.21), suggesting potential beneficial investment opportunities.