**Technical Write for Project One**

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Rental Market vs Housing Market
The rise of Airbnb and tech companies like Amazon, Facebook, and Google has shocked the rental and housing market nearby their offices and surrounding neighborhoods. Leaving in the wake, housing shortages, price increases, and forced out non-tech laborers to migrate elsewhere. I thought it would be interesting to figure out where the most affordable place to live in within the US would be based renting vs owning.

The data I used came from Zillow's database of average rental listings and average sales I looked at the last three years of data due to incomplete payment gaps and for current data. Based on the cities I chose, I expected New York City would be the most expensive city for rent and housing sales, but the data showed otherwise. I was surprised to see coming in First place for Los Angeles and Second place for New York City for monthly mortgage payments. Another surprise was the difference between mortgage payments vs rental payments in Miami. The average rent in Miami is doubled of those paying a mortgage. This result could be due to a lot of factors such as HOA dues and home owner's insurance are considered high expenses not factored in the monthly mortgage payment dataset. Other expenses such as home maintenance and property taxes are other biases not factored that could change the conclusion per city. However tax deductions, property appreciation, and home ownership could negate those expenses and drive individuals to buy rather than rent based on their circumstances. Overall, all else being equal based on the cities chosen, owning beat out renting in all scenarios based on mortgage terms set-in long-term scenarios.
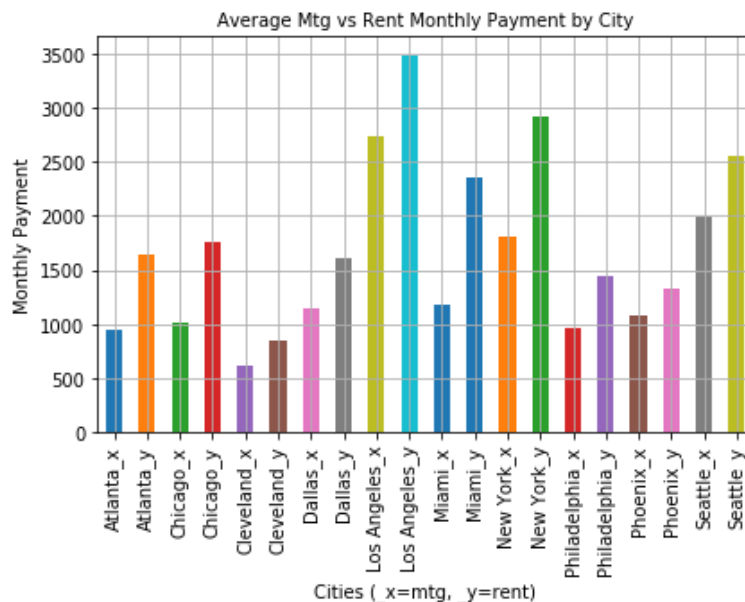
Analysis Write Up

Demographics
This question asked: is how do demographics affect the average price of houses in a city? Based on the racial data, taken from Zillow and the Census data, race has proved to show no effect on the price of houses. Age data, taken from the same two sources, prove different. Families with young children, between the age of 10 to 19, along with seniors over the age of 60, have a significant effect on the price of housing. This is likely to due to the up-sizing of homes for families with several children, and the desire to find a permanent place to live out retirement for those over 60. However, the data does only prove a correlation, so it could be the reverse, that young kids and seniors drive up the prices of surrounding areas. In conclusion, you may want to look at the age of neighbors when looking for houses, but race has no effect.
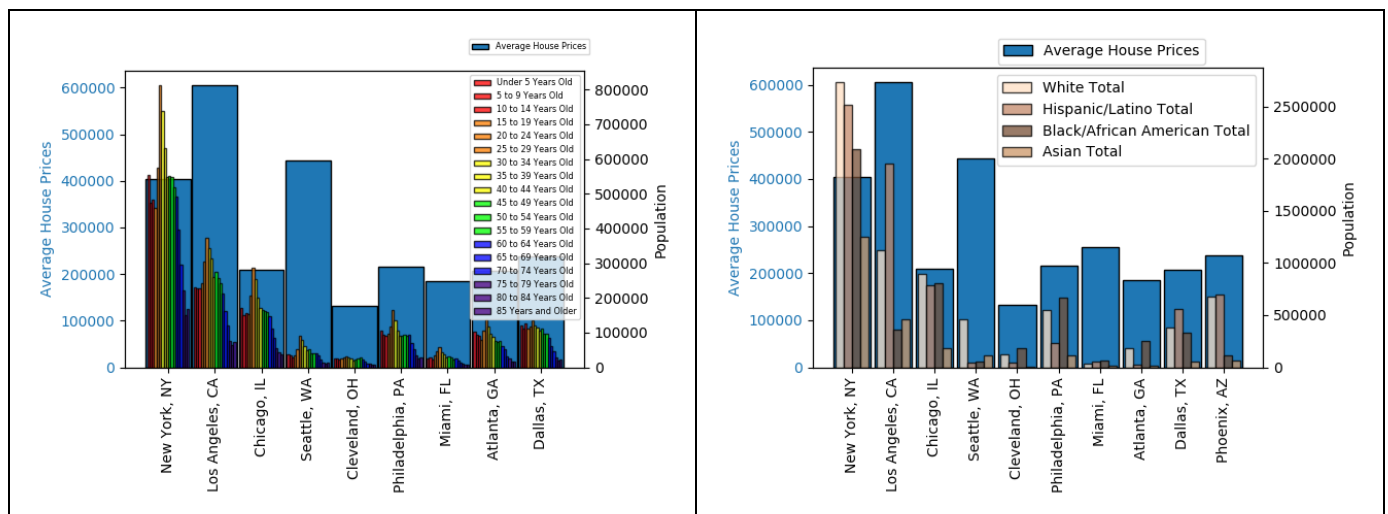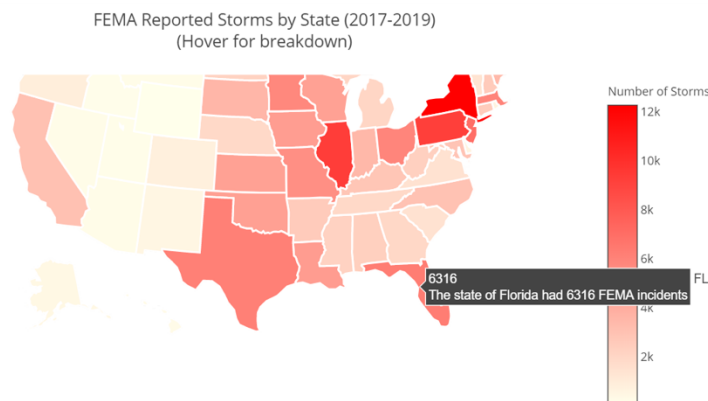

Severe Weather Events
Analysis for the Housing Pricing in correlation with weather climate.

One of the questions for this analysis is, how housing prices are affected by weather, we have suffered extreme climate events during the past years, those that have been recorded by FEMA, the impact and the losses in housing development are immense, ranking in the billions of dollars. So how much that reflect in the prices when to get a home in those areas?
The first step was to download FEMA information to evaluate the number of events (including: hurricanes, earthquakes, floods and fires among others), the data was represented in an interactive map (Choropleth Map) width the purpose to visualize the number of FEMA events and point the dangerous side of that state.
Second step was to prepare the cities to analysis in correlation with the state, county information. One approach was to learn how to plot using FIPS, FIPS is another government way to correlate state and county as with the zip codes. Therefore, data from census was downloaded to obtain the FIPS address of the cities under analysis, unfortunately I was not able to map the data into the FEMA plot. As a consequence, it was needed another plot with just

these states including they median house prices. After seeing the number of events versus the median prices in those selected states is clear to see that the prices are not decreasing due to the extreme weather conditions.

FEMA Reported Storms by State (2017-2019)
(Hover for breakdown)

Number of Storms
12k
10k
8k
6k
4k
2k

6316   FL
The state of Florida had 6316 FEMA incidents

Housing Layouts
In an effort to gain experience using a very large and very dirty dataset for this project, I selected a dataset that was provided by Zillow in a $1M machine learning contest to improve the Zillow "Zestimate" algorithm. The dataset contained housing amenities and information for nearly 3 million houses in Orange, Ventura, and LA counties in 2016.

For the project, I spent a lot of time doing exploratory analysis on the contents of the dataset and determined areas that could be cleaned. For example, I filtered out the datasets that contained either zero bedrooms or bathrooms, since those numbers were causing a lot of skewed results. Next, I created a box plot to determine the layout outliers (I'm sure there ARE 15-bedroom houses in SoCal, but for this analysis, I felt it was better to examine non-outliers). Due to the volume of data provided, I decided to focus on the number of bedrooms and bathrooms in a house.

As expected, the layout of a house does impact the value of the house. Specifically, as the number of bedrooms increases, the value of the house increases from $56k to $137k. We can take this a step further by creating a heatmap of the layout of the house and look at the number of bedrooms and bathrooms. The general trend that we observe is that as the number of bathrooms increase, so does the house value. Interestingly, the most valuable houses shown in the heatmap are those with the most bathrooms and less bedrooms. This prompted me to look at the sample size of each layout. As we can see by plotting the total percentage of each layout on a heatmap, the smaller sample size of 1 bedroom, 4-bathroom houses are likely contributing to the higher overall prices.

Number of Houses by House Layout

4.0	0.0033%	0.059%	0.6%	1.9%	1.2%	0.56%
3.5	0.00033%	0.019%	0.29%	0.58%	0.21%	0.023%
3.0	0.029%	2.1%	7.8%	9.5%	2.7%	0.52%
2.5	0.011%	0.99%	3.7%	2.5%	0.24%	0.016%
2.0	0.38%	9.3%	23%	10%	0.89%	0.13%

Number of Bathrooms

Percentage of Houses
20
16
12
8

Average House Price by House Layout

4.0	$1.04M	$1.05M	$1.04M	$0.84M	$0.77M	$0.56M
3.5	$1.10M	$1.09M	$1.06M	$0.90M	$0.73M	$0.57M
3.0	$0.63M	$0.48M	$0.48M	$0.49M	$0.48M	$0.41M
2.5	$0.44M	$0.40M	$0.46M	$0.47M	$0.42M	$0.43M
2.0	$0.39M	$0.32M	$0.31M	$0.30M	$0.32M	$0.35M

House Value ($M)
1.05
0.90
0.75
0.60