Identifying Ideal Neighborhoods for Fitness Centers

Phoenix, Arizona Metro Area Research

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# Introduction

## Overview

The [metro region of Phoenix, Arizona](https://en.wikipedia.org/wiki/Phoenix_metropolitan_area) is one of the fastest growing community in the United States of America. Compromising of many communities all butting up against each other, Phoenix is an incredibly diverse metro area. Since 2000, there was an increase of an estimated 1.5 million residents. With the population growth, there is also a strong growth of businesses, including restaurants and breweries, all serving the needs of the population.

This is a live and active scenario, which present a number of opportunities for an investor looking for underserved markets that can be fed. This research is focused on the needs of establishing fitness centers in the metro area.

## Problem

There is a massive boom of restaurants and breweries in the area, providing plenty of calories to our patrons that needs to be burned off.

Despite the excellent climate with sun present for over 300 days of the year, the metro area of Phoenix also has to deal with high temperatures for a significant portion of the year. Conducting intensive exercise outdoor is ill-advised due to the high temperatures. So there lies a need in the market for fitness centers to supply customers with a well-regulated environment to burn off desired calories and improve quality of life.

As a businessperson, we need to determine where to best locate a fitness center. As a gut feeling, we should be locating a fitness center where there is no competition. But we need to locate it near where our customers are. We want to ensure that our fitness center is located in a region that does not have as many fitness centers relative to restaurants. The theory goes that the more customers frequent an area to eat, the more they will frequent the same area to work out. "Let's burn some calories we just ate" is a common refrain.

## Interest

The interested parties would be investors who wishes to establish a fitness center presence in the Phoenix metro area.

# Data Source and Cleansing Methodology

## Data Source

To achieve this objective, we need to identify locations with the number of restaurants, relative to number of fitness centers in the same area. We do not know exactly what a fair evaluation scale is, so we will treat this in an iterative manner.

We will be using information from [Foursquare.com](https://foursquare.com/). Foursquare is a premiere source of location data, yielding detailed information on the variety of regions around the world. We will be tracking the number of businesses in specific categories for the Phoenix metro area. The data is live, and active. There is no historical research done for this project.

According to [LatLong.net](https://www.latlong.net/place/phoenix-az-usa-18409.html) website, the center location for the city of Phoenix, Arizona is 33.448376 (latitude), -112.074036 (longitude). We will be using this as our general starting point in our grid formation.

## Initial Cleansing Methodology

We will be building out a grid matrix in the Phoenix metro area. The grid area will be built out in a 90-degree format - North/East/South/West direction from the central location. We plan to plot a point every approximately 500 meters in every direction as long as there is are businesses in the area. We do have to deal with the curvature of Earth, but we can ignore this for the most part, as we are dealing with a city located far from the poles. The formula to calculate new location are as following:

def find\_location(longitude, latitude, direction, distance)

earth = 6378.137 # kilometers.

m = (1 / ((2 \* pi / 360) \* earth)) / 1000

if direction = 'N' then

new\_latitude = latitude + (distance \* m)

new\_longitude = longitude

else if direction = 'S' then

new\_latitude = latitude + (-(distance) \* m)

new\_longitude = longitude

else if direction = 'W' then

new\_latitude = latitude

new\_longitude = longitude + (distance \* m) / cos(latitude \* (pi / 180));

else if direction = 'E' then

new\_latitude = latitude

new\_longitude = longitude + (-(distance) \* m) / cos(latitude \* (pi / 180));

else

# Throw error.

To determine the distance between the two points, we can use the [Haversine Formula](https://kanoki.org/2019/02/14/how-to-find-distance-between-two-points-based-on-latitude-and-longitude-using-python-and-sql/). The following code can be used:

from math import radians, cos, sin, asin, sqrt

def haversine(lon1, lat1, lon2, lat2):

# convert decimal degrees to radians

lon1, lat1, lon2, lat2 = map(radians, [lon1, lat1, lon2, lat2])

# haversine formula

dlon = lon2 - lon1

dlat = lat2 - lat1

a = sin(dlat/2)\*\*2 + cos(lat1) \* cos(lat2) \* sin(dlon/2)\*\*2

c = 2 \* asin(sqrt(a))

r = 6371 # Radius of earth in kilometers.

return c \* r

The following logic to build out the grid are as following:

With a starting spot,

- if no restaurant, abort.

- Otherwise, spawn new search out in all 4 directions, spaced out 500 meters

For every following location:

If this location was already done, stop.

Retain direction where it came from.

Generate a list of number of businesses, restaurants, and fitness centers within the radius of 1, 2, 3, 4, and 5 kilometers.

If this location is more than 100 kilometers away from the starting point, stop.

If this location has business,

- Spawn new search out in 3 remaining directions.

- Otherwise, stop.

Done.

With the resulting values, we can calculate the ratio of fitness centers to restaurants, and businesses. Then we should use a heat map overlaid with the actual map of Phoenix metro area to display the strength of each ratios.

We also should detail the top 10 areas where there is the lowest ratio of fitness centers to restaurants. This kind of evaluation should consider whether there is a 'desert' of fitness center (where there is no fitness center regardless of the restaurants/business presence). In that case, we should seek the highest collection of restaurants/businesses if there are such deserts of fitness centers.

Finally, we should evaluate further from the data gathered whether there are any other categories that may negatively impact the necessity of a fitness center.

This will be an iterative process, and the above will obviously be expanded in the final results.