

The Business Expansion Guide to the Neighborhoods of Philadelphia

Finding Compatible Locations in Philadelphia

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Table of Contents

Executive Summary.....3

Introduction.....4

Data & Methodology.....4

Results.....5

Discussion.....5

Conclusion.....5

Acknowledgments.....5

References.....5

Appendices.....5

 1. Unique Venue Categories.....5

 2. Venue Category Groups.....8

Executive Summary

Wilmington, Delaware and Philadelphia, Pennsylvania city centers are only 32 miles (52 km) apart. Philadelphia is home to 1.5 million people, nearly 20 times the population of Wilmington, at 77 thousand. A successful business in Wilmington may consider expanding into Philadelphia due to its proximity and its market size. The goal of this project is to aid in business site selection. Data from *Foursquare* is used to build a model of the neighborhoods of Philadelphia. Then, given an arbitrary neighborhood of a candidate business outside of Philadelphia, we can use the model to find the neighborhood(s) of Philadelphia that are most similar to the given neighborhood.

Introduction

A city has a character owing in part to the mix of neighborhoods that make up the city. Similarly, neighborhoods have character due to the mix of establishments found in those neighborhoods. In a city the size of Philadelphia, there are over 150 distinct neighborhoods in 12 districts. Finding a neighborhood that is suitable for some intended purpose is no small task – but this project will show how data science can help.

Let's illustrate the business problem with an example. Suppose you know a successful small business owner in a small city, like Wilmington, Delaware. Business is so good that the owner is looking to expand in a larger, nearby market – Philadelphia, Pennsylvania for example. The owner believes much of the success of the business is due to its home neighborhood, and wants to find a comparable neighborhood in the new market to provide the best chance of success.

Data & Methodology

The data for the project was gathered from a few sources. The neighborhoods and planning zones of Philadelphia were found on this [Wikipedia page](#). The neighborhoods were geocoded with the [Geocoder](#) python package using the [ArcGIS](#) provider to obtain their lat, long coordinates. The *Foursquare* venue search API was used to compile categories of venues corresponding to each neighborhood. The relative frequency of the venue categories are the values for the features used for analysis.

Foursquare provided 525 distinct venue categories in the 164 neighborhoods. The venue categories were too fine grained in some respects. For example, there are dozens of individual restaurant categories represented in the data. While no one can argue that Japanese, Italian, vegan and seafood restaurants are not the same, different neighborhoods that contain any type of restaurant are similar in some respect. For example, if neighborhood A is home to a steakhouse, and neighborhood B has a Vietnamese restaurant, A and B are similar in that they both contain eating establishments. I added a feature, called **restaurants**, that represented **any** restaurant venue category and gave it a numeric value of the total of all restaurants (regardless of category) in the neighborhood.

Restaurants are one example, but are many others. Retail establishments and train and bus stations, for example. I identified 23 such groups of similar venue categories, and added corresponding features to the data set for each. The appendix lists these groups of venue categories. The resulting data set has 164 rows corresponding to the neighborhoods, and 549 columns: 1 for **neighborhood id**, 525 for **venue categories**, and 23 **category groups**. The values in the venue category columns are the counts of the corresponding venues in each category in the neighborhood. The values in the category group columns are the counts of the venues in each category group in the neighborhood.

For the raw feature score, I used relative frequency of each feature. Specifically, for the 525 venue category features, the count of venues represented in the value of the column was divided by the total number of venues in the neighborhood, that is the sum of all of the venue category feature columns. I used a similar calculation for the 23 category group columns, each value in the column was divided by the sum of the 23 category group columns. Note that not all venue categories fall into category groups, so the divisor for the category feature columns (1-525) is likely not the same as the divisor for the category group feature columns (526-549).

Results

Discussion

Conclusion

Acknowledgments

References

https://en.wikipedia.org/wiki/List_of_Philadelphia_neighborhoods

<https://geocoder.readthedocs.io/>

<https://geocoder.readthedocs.io/providers/ArcGIS.html>

Appendices

1. Unique Venue Categories

ATM,Accessories Store,Acupuncturist,Adult Boutique,Advertising Agency,African Restaurant,Airport,Airport Gate,Airport Lounge,Airport Service,Airport Terminal,Alternative Healer,American Restaurant,Amphitheater,Animal Shelter,Antique Shop,Arcade,Arepa Restaurant,Argentinian Restaurant,Art Gallery,Art Museum,Art Studio,Arts & Crafts Store,Arts & Entertainment,Asian Restaurant,Assisted Living,Athletics & Sports,Auditorium,Auto Dealership,Auto Garage,Auto Workshop,Automotive Shop,BBQ Joint,Baby Store,Bagel Shop,Baggage Claim,Bakery,Ballroom,Bank,Bar,Baseball Field,Baseball Stadium,Basketball Court,Basketball Stadium,Beach,Beach Bar,Bed & Breakfast,Beer Bar,Beer Garden,Beer Store,Big Box Store,Bike Rental / Bike Share,Bike Shop,Bike Trail,Bistro,Board Shop,Boat or Ferry,Bookstore,Border Crossing,Botanical Garden,Boutique,Bowling Alley,Brazilian Restaurant,Breakfast Spot,Brewery,Bridal Shop,Bridge,Bubble Tea Shop,Buddhist Temple,Building,Burger Joint,Burrito Place,Bus Line,Bus Station,Bus Stop,Business Center,Business Service,Butcher,Cable Car,Cafeteria,Café,Cajun / Creole Restaurant,Cambodian Restaurant,Camera Store,Campaign Office,Campground,Candy Store,Capitol Building,Car Wash,Caribbean Restaurant,Casino,Caucasian Restaurant,Cemetery,Check Cashing Service,Cheese Shop,Chinese Restaurant,Chiropractor,Chocolate Shop,Church,City Hall,Clothing Store,Club House,Cocktail Bar,Coffee Shop,College Academic Building,College Administrative Building,College Arts Building,College Auditorium,College Baseball Diamond,College Basketball Court,College Bookstore,College Cafeteria,College Classroom,College Communications Building,College Cricket Pitch,College Football Field,College Gym,College Hockey Rink,College Lab,College Library,College Quad,College Rec Center,College Residence Hall,College Science Building,College Soccer Field,College Stadium,College Technology Building,College Tennis Court,College Theater,College Track,Comedy Club,Comfort Food Restaurant,Community Center,Community College,Concert Hall,Conference Room,Construction & Landscaping,Convenience Store,Convention Center,Corporate Cafeteria,Cosmetics Shop,Courthouse,Coworking Space,Credit Union,Creperie,Cuban Restaurant,Cultural Center,Cupcake Shop,Currency Exchange,Dance Studio,Daycare,Deli / Bodega,Dentist's Office,Department Store,Design Studio,Dessert Shop,Diner,Discount Store,Distillery,Distribution Center,Dive Bar,Dive Shop,Doctor's Office,Dog Run,Donut Shop,Driving School,Drugstore,Dry Cleaner,Duty-free Shop,Eastern European Restaurant,Egyptian Restaurant,Electronics Store,Elementary School,Emergency Room,Empanada Restaurant,English Restaurant,Entertainment Service,Ethiopian Restaurant,Event Service,Event Space,Exhibit,Eye Doctor,Fabric Shop,Factory,Fair,Falafel Restaurant,Farm,Farmers Market,Fast Food Restaurant,Field,Filipino Restaurant,Financial or Legal Service,Fire Station,Fish & Chips Shop,Fishing Store,Flea Market,Flower Shop,Food,Food & Drink Shop,Food Court,Food Stand,Food Truck,Football Stadium,Fountain,Frame Store,Fraternity House,French Restaurant,Fried Chicken Joint,Frozen Yogurt Shop,Fruit & Vegetable Store,Funeral Home,Furniture / Home Store,Gaming Cafe,Garden,Garden Center,Gas Station,Gastropub,Gay Bar,General College & University,General Entertainment,General Travel,German Restaurant,Gift Shop,Gluten-free Restaurant,Golf Course,Gourmet Shop,Government

Building, Greek Restaurant, Grocery Store, Gun Range, Gym, Gym / Fitness Center, Halal Restaurant, Harbor / Marina, Hardware Store, Hawaiian Restaurant, Health & Beauty Service, Health Food Store, Herbs & Spices Store, High School, Historic Site, History Museum, Hobby Shop, Hockey Arena, Hockey Rink, Home Service, Hookah Bar, Hospital, Hospital Ward, Hostel, Hot Dog Joint, Hot Spring, Hotel, Hotel Bar, Hotel Pool, Housing Development, Hunan Restaurant, IT Services, Ice Cream Shop, Indian Restaurant, Indie Movie Theater, Indie Theater, Indonesian Restaurant, Indoor Play Area, Insurance Office, Internet Cafe, Intersection, Irish Pub, Island, Italian Restaurant, Japanese Restaurant, Jazz Club, Jewelry Store, Jewish Restaurant, Juice Bar, Karaoke Bar, Kids Store, Kingdom Hall, Korean Restaurant, Lake, Latin American Restaurant, Laundromat, Laundry Service, Law School, Lawyer, Lebanese Restaurant, Library, Light Rail Station, Lighthouse, Lighting Store, Lingerie Store, Liquor Store, Locksmith, Lounge, Luggage Store, Mac & Cheese Joint, Marijuana Dispensary, Market, Martial Arts Dojo, Massage Studio, Maternity Clinic, Mattress Store, Medical Center, Medical Lab, Medical School, Mediterranean Restaurant, Meeting Room, Memorial Site, Men's Store, Mental Health Office, Metro Station, Mexican Restaurant, Middle Eastern Restaurant, Middle School, Military Base, Miscellaneous Shop, Mobile Phone Shop, Molecular Gastronomy Restaurant, Monastery, Mongolian Restaurant, Monument / Landmark, Mosque, Motel, Motorcycle Shop, Motorsports Shop, Mountain, Movie Theater, Moving Target, Multiplex, Museum, Music School, Music Store, Music Venue, Nail Salon, National Park, New American Restaurant, Newsstand, Night Market, Nightclub, Nightlife Spot, Non-Profit, Noodle House, Notary, Nursery School, Office, Opera House, Optical Shop, Organic Grocery, Other Great Outdoors, Other Nightlife, Other Repair Shop, Outdoor Gym, Outdoor Sculpture, Outdoor Supply Store, Outdoors & Recreation, Palace, Paper / Office Supplies Store, Park, Parking, Pawn Shop, Pedestrian Plaza, Performing Arts Venue, Peruvian Restaurant, Pet Café, Pet Service, Pet Store, Pharmacy, Photography Lab, Photography Studio, Physical Therapist, Piano Bar, Pilates Studio, Pizza Place, Planetarium, Platform, Playground, Plaza, Poke Place, Police Station, Polish Restaurant, Pool, Pool Hall, Pop-Up Shop, Portuguese Restaurant, Post Office, Prayer Room, Preschool, Print Shop, Private School, Professional & Other Places, Pub, Public Art, Public Bathroom, Racetrack, Radio Station, Real Estate Office, Record Shop, Recording Studio, Recreation Center, Recycling Facility, Rehab Center, Rental Car Location, Rental Service, Residential Building (Apartment / Condo), Resort, Rest Area, Restaurant, River, Rock Club, Roller Rink, Roof Deck, Rugby Pitch, Russian Restaurant, Sake Bar, Salad Place, Salon / Barbershop, Salsa Club, Salvadoran Restaurant, Sandwich Place, Sausage Shop, Scenic Lookout, School, Science Museum, Sculpture Garden, Seafood Restaurant, Shipping Store, Shoe Repair, Shoe Store, Shop & Service, Shopping Mall, Shopping Plaza, Shrine, Skate Park, Skating Rink, Ski Area, Ski Lodge, Ski Trail, Smoke Shop, Smoothie Shop, Snack Place, Soccer Field, Social Club, Sorority House, Soup Place, South American Restaurant, Southern / Soul Food Restaurant, Souvenir Shop, Spa, Spanish Restaurant, Speakeasy, Spiritual Center, Sporting Goods Shop, Sports Bar, Sports Club, Stables, Stadium, Steakhouse, Storage Facility, Street Art, Strip Club, Student Center, Summer Camp, Supermarket, Supplement Shop, Surf Spot, Sushi Restaurant, Swiss Restaurant, Synagogue, TV Station, Taco Place, Tailor Shop, Tanning Salon, Tapas Restaurant, Tattoo Parlor, Tea Room, Tech Startup, Temple, Tennis Court, Thai Restaurant, Theater, Theme Park, Theme Park Ride /

Attraction,Thrift / Vintage Store,Tour Provider,Tourist Information Center,Toy / Game Store,Track,Trade School,Trail,Trailer Park,Train Station,Transportation Service,Travel & Transport,Travel Agency,Travel Lounge,Tunnel,Turkish Restaurant,Ukrainian Restaurant,University,Urgent Care Center,Vacation Rental,Vegetarian / Vegan Restaurant,Veterinarian,Video Game Store,Video Store,Vietnamese Restaurant,Vineyard,Volleyball Court,Voting Booth,Warehouse,Warehouse Store,Waste Facility,Watch Shop,Water Park,Waterfront,Wedding Hall,Weight Loss Center,Wine Bar,Wine Shop,Winery,Wings Joint,Women's Store,Yoga Studio,Zoo,Zoo Exhibit

2. Venue Category Groups

bars, restaurants, houses of worship, parks, theaters & music halls, education, lodging & travel, sports venues, transportation, fitness & well being, medical care, animals & pets, art & museums, automotive, retail, liquor & wine stores, outdoor attractions, government services, beauty, banks & ATMs, media outlets, residential facilities and commercial facilities.