

| In [18]: | <pre>num_top_venues = 5 # function with neghbor goods top 5 most common venues for hood in denver_grouped['Neighborhood']:     print(""+hood+"")     temp = denver_grouped[denver_grouped['Neighborhood'] == hood].T.reset_index()     temp.columns = ['venue','freq']</pre>   |
|----------|--|
|          | <pre>temp = temp.iloc[1:]   temp['freq'] = temp['freq'].astype(float)   temp = temp.round({'freq': 2})   print(temp.sort_values('freq', ascending=False).reset_index(drop=True).head(num_top_venues))   print('\n') Athmar Park</pre>  |
|          | Brewery 0.1  Construction & Landscaping 0.1 Auraria venue freq Print Shop 0.07 Pharmacy 0.07 Café 0.07 Café 0.07 Café 0.07 Cagm 0.07   |
|          | venue freq  Pizza Place 0.33  Flower Shop 0.33  Scenic Lookout 0.33  Yoga Studio 0.00  Paper / Office Supplies Store 0.00  |
|          | venue freq  0 Park 0.33  1 Disc Golf 0.33  2 Locksmith 0.33  3 Paper / Office Supplies Store 0.00  4 Nightclub 0.00 Barnum venue freq  0 Print Shop 0.07   |
|          | 1 Pharmacy 0.07 2 Café 0.07 3 Taco Place 0.07 4 Gym 0.07 Bear Valley  venue freq 0 Furniture / Home Store 0.5 1 Trail 0.5 2 Paper / Office Supplies Store 0.0  |
|          | Music Venue 0.0  New American Restaurant 0.0  The state of the staurant of the |
|          | Berkeley venue freq  Coffee Shop 0.06 Pizza Place 0.04 Grocery Store 0.04 Breakfast Spot 0.04  |
|          | venue freq  Next to the freq   |
|          | Nightclub 0.11  I Italian Restaurant 0.08  Coffee Shop 0.08  Bar 0.08  Pizza Place 0.08 Central Park  venue freq  Breakfast Spot 0.25  American Restaurant 0.25  |
|          | Coffee Shop 0.25 Gym 0.25 Yoga Studio 0.00 Chaffee Park venue freq Brewery 0.2 Construction & Landscaping 0.2 Baseball Field 0.2 Business Service 0.2  |
|          | 4 Café 0.2 Cheesman Park venue freq 0 Park 1.0 1 Indian Restaurant 0.0 2 New American Restaurant 0.0 3 Nightclub 0.0 4 Noodle House 0.0  |
|          | venue freq  Pizza Place 0.33  Flower Shop 0.33  Scenic Lookout 0.33  Yoga Studio 0.00  Paper / Office Supplies Store 0.00  |
|          | venue freq  0 Coffee Shop 0.13  1 Park 0.13  2 Asian Restaurant 0.07  3 Hardware Store 0.07  4 Track 0.07 City Park  venue freq  0 Park 0.22   |
|          | 1 Dog Run 0.11 2 Trail 0.11 3 Food 0.11 4 Grocery Store 0.11 Civic Center venue freq 0 Hotel 0.05 1 American Restaurant 0.04 2 Mexican Restaurant 0.04   |
|          | 3  |
|          | Cole venue freq Park 0.22 Dog Run 0.11 Trail 0.11 Food 0.11 Grocery Store 0.11   |
|          | College View / South Platte venue freq  0 Furniture / Home Store 0.07  1 Coffee Shop 0.07  2 Big Box Store 0.07  3 Fast Food Restaurant 0.07  4 Pizza Place 0.04 Congress Park venue freq  |
|          | O Park 1.0  1 Indian Restaurant 0.0  2 New American Restaurant 0.0  3 Nightclub 0.0  4 Noodle House 0.0 Cory-Merrill venue freq  0 Sandwich Place 0.07  1 Japanese Restaurant 0.07   |
|          | 1 Japanese Restaurant 0.07 2 Café 0.07 3 Coffee Shop 0.07 4 Breakfast Spot 0.07 Country Club venue freq 0 Coffee Shop 0.13 1 Park 0.13 2 Asian Restaurant 0.07 3 Hardware Store 0.07   |
|          |  |
|          | East Colfax venue freq  Mexican Restaurant 0.17  Coffee Shop 0.17  Grocery Store 0.17  Doctor's Office 0.08  Pizza Place 0.08  |
|          | venue freq  0 Gay Bar 0.2  1 Pharmacy 0.2  2 Bar 0.2  3 Park 0.2  4 Alternative Healer 0.2 Five Points venue freq  0 Hotel 0.10  |
|          | 0  |
|          |  |
|          | 4 Noodle House 0.0 Globeville  venue freq 0 Gay Bar 0.2 1 Pharmacy 0.2 2 Bar 0.2 3 Park 0.2 4 Alternative Healer 0.2   |
|          | Goldsmith  venue freq  Cosmetics Shop 0.5  Train Station 0.5  Park 0.0  New American Restaurant 0.0  Nightclub 0.0   |
|          |  |
|          |  |
|          | <del>-</del>   |
|          | venue freq  Park 0.33  Disc Golf 0.33  Locksmith 0.33  Paper / Office Supplies Store 0.00  Nightclub 0.00  |
|          | venue freq  Coffee Shop 0.06  Pizza Place 0.04  Grocery Store 0.04  Brewery 0.04  Breakfast Spot 0.04  venue freq  venue freq  |
|          | O Park 0.50  1 Pool 0.25  2 Gym / Fitness Center 0.25  3 Outdoor Supply Store 0.00  4 New American Restaurant 0.00 Indian Creek venue freq  0 Liquor Store 0.17  1 Pizza Place 0.17  |
|          | 2 Flower Shop 0.17 3 Golf Course 0.17 4 Sandwich Place 0.17 Jefferson Park venue freq 0 Marijuana Dispensary 0.14 1 Breakfast Spot 0.09 2 Chinese Restaurant 0.09 3 Convenience Store 0.09   |
|          | Diner 0.05 Lincoln Park venue freq  Print Shop 0.07  Pharmacy 0.07  Café 0.07  Taco Place 0.07  Gym 0.07   |
|          | venue freq  Necreation Center 0.14  Beer Garden 0.14  Doctor's Office 0.14  History Museum 0.14  Athletics & Sports 0.14   |
|          | venue freq  venue freq  park 0.33  Disc Golf 0.33  Locksmith 0.33  Paper / Office Supplies Store 0.00  Nightclub 0.00  venue freq  Shipping Store 0.25   |
|          | 1 Construction & Landscaping 0.25 2 Art Gallery 0.25 3 Business Service 0.25 4 Performing Arts Venue 0.00 Montbello venue freq 0 Park 0.67 1 Mexican Restaurant 0.33 2 Music Venue 0.00  |
|          | Nightclub 0.00 Noodle House 0.00  Noodle House 0.00 Montclair venue freq  Mexican Restaurant 0.17 Coffee Shop 0.17 Grocery Store 0.17 Doctor's Office 0.08 Pizza Place 0.08  |
|          | North Capitol Hill venue freq  Coffee Shop 0.13 Park 0.13 Asian Restaurant 0.07 Hardware Store 0.07 Track 0.07   |
|          | venue freq  Rock Club 0.33  Arts & Entertainment 0.33  Park 0.33  Yoga Studio 0.00  Paper / Office Supplies Store 0.00   |
|          | venue freq  0  |
|          | Sports Bar 0.1 Park 0.1 Brewery 0.1 Construction & Landscaping 0.1 Platt Park venue freq Print Shop 0.07 Pharmacy 0.07 Café 0.07   |
|          | 3 Taco Place 0.07 4 Gym 0.07 Regis venue freq 0 Coffee Shop 0.06 1 Pizza Place 0.04 2 Grocery Store 0.04 3 Brewery 0.04 4 Breakfast Spot 0.04  |
|          | Rosedale venue freq Sandwich Place 0.07 Japanese Restaurant 0.07 Café 0.07 Coffee Shop 0.07 Breakfast Spot 0.07  |
|          | venue freq  venue freq  Construction & Landscaping 0.2  Baseball Field 0.2  Business Service 0.2  Café 0.2 Skyland  venue freq  Park 0.22  |
|          |  |
|          | Brewery 0.04  Breakfast Spot 0.04 South Park Hill venue freq  Mexican Restaurant 0.17  Coffee Shop 0.17  Grocery Store 0.17  Doctor's Office 0.08  |
|          | Doctor's Office 0.08  Pizza Place 0.08 Southmoor Park venue freq  Thai Restaurant 0.11  Park 0.11  Sports Bar 0.11  Mobile Phone Shop 0.11  Smoke Shop 0.11  |
|          | Speer venue freq Nightclub 0.11 Italian Restaurant 0.08 Coffee Shop 0.08 Bar 0.08 Pizza Place 0.08   |
|          | venue freq  0 Print Shop 0.07  1 Pharmacy 0.07  2 Café 0.07  3 Taco Place 0.07  4 Gym 0.07 Sunnyside  venue freq  0 Marijuana Dispensary 0.14  1 Breakfast Spot 0.09   |
|          | 1 Breakfast Spot 0.09 2 Chinese Restaurant 0.09 3 Convenience Store 0.09 4 Diner 0.05 Union Station (Lodo) venue freq 0 Hotel 0.05 1 American Restaurant 0.04 2 Mexican Restaurant 0.04 3 Coffee Shop 0.04   |
|          |  |
|          | University Park  venue freq  Sandwich Place 0.07  Japanese Restaurant 0.07  Café 0.07  Coffee Shop 0.07  Breakfast Spot 0.07   |
|          | venue freq  0 Sandwich Place 0.07  1 Japanese Restaurant 0.07  2 Café 0.07  3 Coffee Shop 0.07  4 Breakfast Spot 0.07 Valverde  venue freq  0 Convenience Store 0.2  |
|          | O Convenience Store 0.2  1 Sports Bar 0.1  2 Park 0.1  3 Brewery 0.1  4 Construction & Landscaping 0.1 Villa Park venue freq  O Print Shop 0.07  1 Pharmacy 0.07  2 Café 0.07  |
|          |  |
|          | 4 New American Restaurant 0.00 Washington Park West  venue freq 0 Pizza Place 0.33 1 Flower Shop 0.33 2 Scenic Lookout 0.33 3 Yoga Studio 0.00 4 Paper / Office Supplies Store 0.00  |
|          | Washington Park  venue freq  Pizza Place 0.33  Flower Shop 0.33  Scenic Lookout 0.33  Yoga Studio 0.00  Paper / Office Supplies Store 0.00 Washington Virginia Vale venue freq   |
|          | venue freq  0 Park 0.50  1 Pool 0.25  2 Gym / Fitness Center 0.25  3 Outdoor Supply Store 0.00  4 New American Restaurant 0.00 Wellshire venue freq  0 Sandwich Place 0.07  1 Japanese Restaurant 0.07   |
|          |  |
|          |  |
|          | Diner 0.05 Westwood  venue freq Park 0.33  Disc Golf 0.33  Locksmith 0.33  Paper / Office Supplies Store 0.00 Nightclub 0.00   |
|          | venue freq 0   |
| In [19]: | 1 Construction & Landscaping 0.2 2 Pool 0.2 3 Bar 0.2 4 Yoga Studio 0.0   def return_most_common_venues(row, num_top_venues):     row_categories = row.iloc[1:]     row_categories_sorted = row_categories.sort_values(ascending=False)  |
| In [42]: | <pre>return row_categories_sorted.index.values[0:num_top_venues]  num_top_venues = 10  indicators = ['st', 'nd', 'rd']  # create columns according to number of top venues columns = ['Neighborhood'] for ind in np.arange(num_top_venues):     try:</pre>   |
|          | <pre>try:         columns.append('{}{} Most Common Venue'.format(ind+1, indicators[ind])) except:         columns.append('{}th Most Common Venue'.format(ind+1))  # create a new dataframe neighborhoods_venues_sorted = pd.DataFrame(columns=columns) neighborhoods_venues_sorted['Neighborhood'] = denver_grouped['Neighborhood']  for ind in np.arange(denver_grouped.shape[0]):         neighborhoods_venues_sorted.iloc[ind, 1:] = return_most_common_venues(denver_grouped.iloc[ind, :], num_top_venues)</pre>   |
| Out[42]: | neighborhoods_venues_sorted    Neighborhood  |
|          | 1AurariaConvenience StoreDistilleryMexican RestaurantSpaPharmacyBaseball FieldTaco PlaceCaféLight Rail StationDiscount Store2BakerPizza PlaceScenic LookoutFlower ShopWine BarDistilleryFast Food RestaurantEye DoctorEvent SpaceDog RunDoctor's Office3Barnum WestLocksmithDisc GolfParkWine BarDive BarFlea MarketFast Food RestaurantEyeEvent SpaceDog Run4BarnumConvenience StoreDistilleryMexican RestaurantSpaPharmacyBaseball FieldTaco PlaceCaféLight Rail StationDiscount Store   |
|          | 72West ColfaxConvenience StoreDistilleryMexican RestaurantSpaPharmacyBaseball FieldTaco PlaceCaféLight Rail StationDiscount Store73West HighlandMarijuana DispensaryConvenience StoreChinese RestaurantBreakfast Spot BreakfastBed & Gym / Fitness CenterGrocery StoreLiquor Store RestaurantMexican Event Space74WestwoodLocksmithDisc GolfParkWine BarDive BarFlea MarketFast Food RestaurantEye DoctorEvent SpaceDog Run75WhittierParkFood French RestaurantRental Car LocationTrailBarDog RunGrocery StoreDive BarFast Food Restaurant76WindsorLakeBarPoolConstructionCycleDeli / CosmeticsFlea Fast FoodEye   |
| In [21]: | 76 Windsor Lake Bar Pool Construction & Cycle Deli / Cosmetics Flea Fast Food Eye Doctor  77 rows × 11 columns  Clustering Neighborhoods  # set number of clusters kclusters = 5   |
|          | <pre>kclusters = 5  denver_grouped_clustering = denver_grouped.drop('Neighborhood', 1)  # run k-means clustering kmeans = KMeans(n_clusters=kclusters, random_state=0).fit(     denver_grouped_clustering)  # check cluster labels generated for each row in the dataframe kmeans.labels_ array([1, 1, 4, 2, 1, 0, 4, 1, 1, 1, 1, 1, 2, 4, 1, 0, 1, 0, 0, 1, 2, 1,</pre>   |
|          | <pre>array([1, 1, 4, 2, 1, 0, 4, 1, 1, 1, 1, 1, 1, 2, 4, 1, 0, 1, 0, 0, 1, 2, 1,</pre>   |
| Out[50]: | <pre>denver_merged.dropna(inplace=True) denver_merged["Cluster Labels"] = kmeans.labels_ denver_merged.drop(['lat', 'lng'], inplace=True, axis = 1) denver_merged.head() # check the last columns!</pre> 1st Most 2nd 3rd Most 4th Most 5th Most 6th Most 7th Most 8th Most 9th Most Most 10th |
|          | Neighborhood zip Common Venue V |
|          | 2 Valvardo 90223 CONVENIENCE Cum Dharmagy Citatining Park Proyecty 9 Sports Home Disc Colf   |
|          |  |
|          |  |

In [23]: map\_clusters = folium.Map(location=[lat, lng], zoom\_start=11) # set color scheme for the clusters x = np.arange(kclusters)ys = [i + x + (i\*x)\*\*2 **for** i **in** range(kclusters)] colors\_array = cm.rainbow(np.linspace(0, 1, len(ys))) rainbow = [colors.rgb2hex(i) for i in colors array] # add markers to the map markers colors = [] for lat, lon, poi, cluster in zip(denver merged['lat'], denver merged['lng'], denver\_merged['Neighborhood'], denver\_merged['Cluster Labels']): label = folium.Popup(str(poi) + ' Cluster ' + str(cluster), parse html=True) folium.CircleMarker( [lat, lon], radius=5, popup=label, color=rainbow[cluster-1], fill=True, fill color=rainbow[cluster-1], fill opacity=0.7).add to(map clusters) map\_clusters Out[23]: + Leaflet | Data by © OpenStreetMap, under ODbL. In [24]: denver\_merged.loc[denver\_merged['Cluster Labels'] == 0, denver\_merged.columns[[0] + list(range(4, denver\_merged)) r\_merged.shape[1]))]] Out[24]: 7th Most 1st Most 2nd Most 3rd Most 4th Most 5th Most 6th Most 8th Most 9th Most 10th M Common Common Neighborhood Common Common Common Common Common Common Common Comn **V**enue **V**enue **Venue** Venue **Venue** Venue Venue Venue Venue Vei Mexican Convenience Baseball Light Rail Disco Lincoln Park Distillery Taco Place 5 Spa Pharmacy Café Field Station Store Restaurant Flea Fast Food Event Disc Golf 15 Barnum West Locksmith Park Wine Bar Dive Bar Eye Doctor Dog I Market Restaurant Space Fast Food Locksmith Dive Bar Market Restaurant Space Flea **Event** Fast Food Westwood Wine Bar Eye Doctor 18 Locksmith Disc Golf Park Dive Bar Dog I Space Market Restaurant Convenience Italian Pizza Mexican Karaoke Mariju Nightclub Coffee Shop 25 Speer Bar Jazz Club Restaurant Dispens Place Restaurant Store Bar Gym / Hardware ۷i۰ Asian Grocery Pet Store 27 City Park West Coffee Shop Park Pilates Studio **Fitness** Track Restaurant Store St Store Center New CBD Mexican American Seafood Asian Cocl 29 Hotel Coffee Shop Plaza American Bar (downtown) Restaurant Restaurant Restaurant Restaurant Restaurant American Breakfast Flea Fast Food **Event** 32 Central Park Gym Coffee Shop Wine Bar Eye Doctor Dog I Market Space Restaurant Spot Restaurant French Rental Car Grocery Fast Fo 37 Park City Park Food Trail Bar Dog Run Dive Bar Restau Restaurant Store Location Sandwich Coffee Performing Burrito Chin Breakfast Japanese Ice Cream 47 University Park Café Bar Arts Venue Restaurant Place Spot Place Shop Shop Restaui Breakfast Sandwich Japanese Coffee Ice Cream Performing Burrito Chin 48 Wellshire Café Bar Restaurant Arts Venue Place Spot Place Shop Shop Restau Mexican Pizza Clothing Chinese Asian Doctor's Liquor South Park Hill Coffee Shop **Grocery Store** Dive 54 Office Restaurant Restaurant Place Store Store Restaurant Sandwich Flower Athletics & Dessert D 67 Indian Creek Pizza Place Liquor Store Diner Disc Golf Course Bod Place Shop Shop Sports Gym / Convenience Breakfast Bed & Liquor Еν Marijuana Chinese Grocery Mexican 70 West Highland **Fitness** Dispensary Store Restaurant Spot **Breakfast** Store Store Restaurant Sp Center Flea Arts & Fast Food Event North Park Hill Rock Club Park Wine Bar Distillery Eye Doctor Dog I Entertainment Market Restaurant Space In [25]: denver\_merged.loc[denver\_merged['Cluster Labels'] == 1, denver\_merged.columns[[0] + list(range(4, denver\_merged)) r\_merged.shape[1]))]] Out[25]: 2nd Most 3rd Most 6th Most 10th M 1st Most 4th Most 5th Most 7th Most 8th Most 9th Most Neighborhood Common Common Common Common Common Common Comm Venue Venue Venue Venue Venue Venue Venue Venue Venue Ver Construction Convenience Clothing Home 0 Athmar Park Gym Pharmacy Park **Brewery** Sports Bar Disc 6 Store Store Service Landscaping Construction Clothing Convenience Home 1 Overland Pharmacy Park Brewery Gym Sports Bar Disc 6 Store Store Service Landscaping Disco Convenience Baseball Light Rail Mexican Barnum Pharmacy Taco Place Café Distillery Spa Store Restaurant Field Station Disco Light Rail Mexican Baseball Convenience 7 Sun Valley Taco Place Distillery Spa Pharmacy Café Store Restaurant Field Station Disco Light Rail Mexican Baseball Convenience 8 Villa Park Pharmacy Taco Place Café Distillery Spa Store Restaurant Station Light Rail Disco Baseball Mexican Convenience 9 West Colfax Distillery Pharmacy Spa Taco Place Café Store Restaurant Station Docto Fast Food Scenic Event 10 Baker Pizza Place Wine Bar Eye Doctor Dog Run Flower Shop Distillery Lookout Restaurant Space Off Scenic Fast Food Event Docto Distillery 11 Pizza Place Dog Run Belcaro Flower Shop Wine Bar Eye Doctor Lookout Restaurant Space Off Washington Fast Food Scenic Event Docto Distillery Pizza Place Dog Run 14 Flower Shop Wine Bar Eye Doctor Park West Lookout Restaurant Space Off Fast Food Flea Event Wine Bar Dive Bar Eye Doctor Dog F 16 Harvey Park Locksmith Disc Golf Park Market Restaurant Space Docto Fast Food Furniture / Flea Event Distillery Dog Run 19 Bear Valley Trail Wine Bar Eye Doctor Home Store Market Restaurant Space Gy Mexican Breakfast Sushi Music Liquor Grocery 21 Highland Coffee Shop Pizza Place Brewery Fitne Restaurant Venue Restaurant Spot Cer Gy Grocery Breakfast Sushi Music Mexican Liquor Pizza Place Fitne 22 Regis Coffee Shop Brewery Store Restaurant Venue Restaurant Spot Store Cer Pizza Mexican Italian Convenience Karaoke Marijua Coffee Shop 24 Capitol Hill Nightclub Bar Jazz Club Restaurant Place Restaurant Store Dispens Gym / Hardware North Capitol **Pilates** Asian Grocery Fitness Video St 26 Coffee Shop Park Pet Store Track Hill Restaurant Studio Store Store Center New Seafood Coffee Mexican American Asian Cock Civic Center 30 Plaza Bar Hotel American Shop Restaurant Restaurant Restaurant Restaurant Restaurant New Cock **Union Station** Coffee Mexican American Seafood Asian 31 Hotel Plaza American Bar Restaurant (Lodo) Shop Restaurant Restaurant Restaurant Restaurant Construction Baseball **Business** Flea Fast Food Event 33 Chaffee Park Brewery Café Eye Doctor Dog F Field Service Market Restaurant Space Landscaping Construction Baseball **Business** Flea Fast Food Event Ruby Hill 34 Café Brewery Eye Doctor Dog F Field Service Market Restaurant Space Landscaping Flea Fast Food Event Docto 36 Congress Park Park Wine Bar Dive Bar Flower Shop Eye Doctor Dog Run Restaurant Market Space Off French Rental Car Grocery Fast Fc 38 Clayton Park Food Trail Bar Dog Run Dive Bar Restaurant Location Store Restaur Grocery Fast Fc French Rental Car 39 Cole Park Food Trail Bar Dog Run Dive Bar Restaurant Location Store Restaur Rental Car French Grocery Fast Fo 40 Skyland Park Food Trail Bar Dog Run Dive Bar Restaurant Location Store Restaur Fast Fc French Rental Car Grocery Whittier 41 Park Food Trail Bar Dog Run Dive Bar Location Restaurant Store Restaur Mobile Harvey Park Salc Fast Food Big Box Furniture / Pizza 43 Pharmacy Coffee Shop Bakery Pet Store Phone South Restaurant Store Home Store Place Barbersh Shop Coffee Performing Sandwich Ice Cream Chine Breakfast Japanese Burrito 45 Rosedale Café Bar Arts Venue Place Restaurant Shop Shop Place Restaur Spot Performing Coffee Ice Cream Breakfast Sandwich Japanese Burrito Chine 46 University Café Bar Place Restaurant Shop Shop Arts Venue Place Spot Restaur Flea Convenience Fast Food Event Docto 49 DIA **Burger Joint** Wine Bar Flower Shop Eye Doctor Dog Run Restaurant Store Market Space Off Gateway / Fast Food Flea Convenience Event Docto 50 Green Valley Wine Bar Flower Shop Eye Doctor Dog Run **Burger Joint** Store Market Restaurant Space Off Ranch Mexican Coffee Grocery Clothing Chinese Doctor's Asian Liquor 51 East Colfax Pizza Place Dive I Restaurant Restaurant Office Shop Store Store Restaurant Store Mexican Coffee Clothing Chinese Doctor's Grocery Asian Liquor 52 Hale Pizza Place Dive I Store Office Store Restaurant Shop Store Restaurant Restaurant Coffee Grocery Clothing Chinese Liquor Mexican Asian Doctor's 53 Montclair Pizza Place Dive I Shop Store Store Restaurant Office Restaurant Store Restaurant Alternative Fast Food Elyria-Doctor's Flea 55 Pharmacy Gay Bar Park Bar Wine Bar Eye Doc Swansea Office Restaurant Healer Market Alternative Flea Fast Food Doctor's 56 Globeville Pharmacy Gay Bar Park Bar Wine Bar Eye Doc Restaurant Healer Office Market Healt Cocktail Shipping Music Mexican Tea Room 57 Five Points Brewery Bank Bea Steakhouse Hotel Bar Store Venue Restaurant Serv Flea Other Repair Baseball Moving Fast Food Event 58 Fort Logan Park Dive Bar Eye Doctor Dog F Shop Stadium **Target** Market Restaurant Space Flea Cosmetics Train Flower Fast Food Event Eye Doctor 59 Goldsmith Wine Bar Dive Bar Dog F Shop Restaurant Station Shop Market Space Train Flea Cosmetics Flower Fast Food Event 60 University Hills Wine Bar Dive Bar Eye Doctor Dog F Shop Shop Market Restaurant Station Space Mobile Sporting Discount Liquor Thai Chinese Dess Hampden Park Pnone Goods Shop Store Store Restaurant Sł Restaurant Shop Mobile Southmoor Discount Sporting Liquor Thai Chinese Dess 62 Park Sports Bar Smoke Shop Phone Park Goods Shop Store Store Restaurant Restaurant Sł Shop Gym / Hampden Flea Fast Food Docto Event 63 Park Pool **Fitness** Distillery Eye Doctor Dog Run South Market Restaurant Space Off Center Gym / Flea Fast Food Event Docto Hilltop Dog Run 64 Park Pool **Fitness** Distillery Eye Doctor Market Restaurant Space Off Center Gym / Flea Fast Food Docto Event Distillery Dog Run 65 Virginia Village Park Pool **Fitness** Eye Doctor Market Restaurant Space Off Center Gym / Washington Flea Fast Food Event Docto Park Pool 66 **Fitness** Distillery Eye Doctor Dog Run Virginia Vale Market Restaurant Space Off Center Gym / Deli / Athletics & History Doctor's Dessert Recreation 72 Lowry Field Beer Garden Skating Rink **Fitness** Di Center Office Sports Museum Bodega Shop Center Construction Shipping **Business** Flea Fast Food Event 73 Marston Art Gallery Dive Bar Eye Doctor Dog F Store Market Restaurant Service Space Landscaping Flea Mexican Fast Food Event Docto 74 Montbello Dive Bar Flower Shop Eye Doctor Dog Run Park Restaurant Market Restaurant Space Off Construction Deli / Cycle Cosmetics Flea Fast Food 77 Windsor Lake Bar Pool Eye Doc Studio Bodega Shop Market Restaurant Landscaping denver\_merged.loc[denver\_merged['Cluster Labels'] == 2, denver\_merged.columns[[0] + list(range(4, denver\_merged)) In [26]: r\_merged.shape[1]))]] Out[26]: 3rd Most 6th Most 7th Most 8th Most 10th Most 1st Most 2nd Most 4th Most 5th Most 9th Most Clus Neighborhood Common Lak Venue Light Rail Discount Convenience Mexican Baseball Taco 3 Auraria Distillery Spa Pharmacy Café Restaurant Field Place Station Store Store Scenic Flower Fast Food Eye Event Doctor's 12 Cherry Creek Pizza Place Wine Bar Distillery Dog Run Office Lookout Shop Restaurant Doctor Space Gym / Grocery Sushi Pizza Music Mexican Breakfast Liquor 20 Coffee Shop Berkeley Brewery Fitness Place Store Restaurant Store Venue Restaurant Spot Center Doctor's Cheesman Flower Flea Fast Food Eye Event Dive Bar 35 Park Wine Bar Dog Run Park Shop Office Market Restaurant Doctor Space Furniture / Mobile Pizza Salon / College View / Fast Food Big Box 42 Coffee Shop Pharmacy Home Bakery Pet Store Phone Restaurant Barbershop South Platte Store Place Store Shop Ice Breakfast Japanese Performing Sandwich Coffee Burrito Chinese 44 Cory-Merrill Café Bar Cream Restaurant Shop Place Place Spot Arts Venue Restaurant Shop Northeast Park Flea Fast Food Eye Event Doctor's 75 Trail Park Wine Bar Dog Run Distillery Market Office Restaurant Doctor Space In [27]: denver\_merged.loc[denver\_merged['Cluster Labels'] == 3, denver\_merged.columns[[0] + list(range(4, denver\_merged)) r\_merged.shape[1]))]] Out[27]: 10th 2nd Most 4th Most 5th Most 8th Most 9th Most 1st Most 3rd Most 6th Most 7th Most Cluster Most Neighborhood Common Labels Venue Gym / Grocery Coffee Mexican Liquor Sushi Pizza Music **Breakfast** 23 Sloan Lake Brewery **Fitness** 3 Shop Store Restaurant Place Restaurant Spot Store Center Gym / **Pilates** Hardware Coffee Asian Grocery Video Restaurant Store Store Shop Studio Store Center denver\_merged.loc[denver\_merged['Cluster Labels'] == 4, denver\_merged.columns[[0] + list(range(4, denver\_merged)) In [28]: r\_merged.shape[1]))]] Out[28]: 10th 3rd Most 4th Most 5th Most 1st Most 2nd Most 6th Most 7th Most 8th Most 9th Most Most Common Neighborhood Common Common Common Common Common Common Common Common Common Venue Construction Clothing Convenience Sports Home 2 Valverde Pharmacy Park Disc Golf Gym Brewery Store Store Bar Service Landscaping Convenience Mexican Baseball Light Rail Discount 6 Platt Park Distillery Pharmacy Taco Place Café Spa Restaurant Station Store Store Field Washington Scenic Flower Fast Food Doctor's Event 13 Pizza Place Wine Bar Distillery Eye Doctor Dog Run Shop Restaurant Park Office Lookout Space Gym / Marijuana Breakfast Convenience Chinese Bed & Grocery Liquor Mexican Event 68 Jefferson Park **Fitness** Dispensary Restaurant Store Spot Breakfast Store Store Restaurant Space Center Gym / Marijuana Convenience Chinese Breakfast Bed & Grocery Liquor Mexican Event 69 Sunnyside **Fitness** Dispensary Breakfast Store Restaurant Spot Store Store Restaurant Space Center **K Nearest Neighbor** In [84]: df dg = pd.merge(denver grouped, df, on='Neighborhood') df dg.drop(['lat', 'lng'], inplace=True, axis = 1) cols = df dg.columns[1:162] features matix = df dg.iloc[:,1:162].values knn = NearestNeighbors(n\_neighbors=1).fit(features\_matix) **Logistic Regression** In [239]: f = denver merged.iloc[:,2:5]f df hot = pd.get dummies(f.iloc[:,[0,1,2]], prefix="", prefix sep="") df hot = df hot.merge(denver merged['zip'], left index=True, right index=True) X = df hot.iloc[:, 0:74]y = df hot['zip'] lr model = LogisticRegression() lr model.fit(X,y) df hot.columns cols = df hot.columns[0:74] 0,0,0,0,0,0] i = 0for x in venues: for y in x print(cols[i]) **if** y == 0: venues[0][i] = 1else: venues[0][i] = 1venues[0][i-1] = 0y\_pred = lr\_model.predict(venues) print(y pred) i+=1 Alternative Healer [80216] Beer Garden [80216] Breakfast Spot [80210] Burger Joint [80210] Coffee Shop [80210] Construction & Landscaping [80210] Convenience Store [80204] Cosmetics Shop [80204] Furniture / Home Store [80204] Gym [80204] Hotel [80210] Lake [80210] Locksmith [80210] Marijuana Dispensary [80210] Mexican Restaurant [80210] Nightclub [80210] Other Repair Shop [80210] Park [80210] Pizza Place [80204] Rock Club [80204] Sporting Goods Shop [80204] Trail [80204] Art Gallery [80123] Bar [80247] Baseball Stadium [80236] Café [80221] Cocktail Bar [80221] Coffee Shop [80220] Convenience Store [80220] Disc Golf [80219] Discount Store [80219] Distillery [80204] Fast Food Restaurant [80204] Food [80204] Grocery Store [80204] Gym [80205] Italian Restaurant [80205] Mexican Restaurant [80205] Park [80205] Pharmacy [80205] Pool [80204] Recreation Center [80204] Sandwich Place [80204] Scenic Lookout [80204] Trail [80204] Train Station [80204] Wine Bar [80204] American Restaurant [80238] Arts & Entertainment [80207] Baseball Field [80221] Big Box Store [80110] Café [80210] Chinese Restaurant [80210] Coffee Shop [80210] Convenience Store [80210] Dive Bar [80210] Flower Shop [80210] French Restaurant [80210] Gay Bar [80210] Grocery Store [80210] Gym / Fitness Center [80210] Liquor Store [80210] Mexican Restaurant [80204] Moving Target [80204] Park [80204] Pharmacy [80204] Pilates Studio [80204] Pool [80204] Shipping Store [80204] Skating Rink [80204] Sports Bar [80204] Steakhouse [80204] Sushi Restaurant [80204] Wine Bar [80204] In [241]: df\_hot = pd.get\_dummies(denver\_merged.iloc[:,2], prefix="", prefix\_sep="") X = df dg.iloc[:, 1:162]df\_hot = df\_hot.merge(denver\_merged['zip'], left\_index=True, right\_index=True) df hot X = df hot.iloc[:,0:22]y = df hot['zip'] lr model = LogisticRegression() lr model.fit(X,y) df hot.columns cols = df hot.columns.drop('zip') venues = [[1,0,0,0,0,0,1,0,0,0,0,0,0,1,0,0,1,0,0,0,0]]y\_pred = lr\_model.predict(venues) print(y pred) [80204] Methodology / Results Some of the exploratory data analsis that I completed was learning a little more about the data I had create. I found out a little about each city, the size of the dataframe, and learning more about the data types. I obersved some of the dublicate values that were in the data set and was able to handle them accordingling. Some of the machine learning algorithms that I conduct were clustering and logistic regression. Some of the things that I noticed when clustering neighborhoods that were similar were that cluster 0 had a lot of different places you could buy alcohol /drugs or just hang out at night like at bars or not night clubs. Cluster 1 had a lot of grocery stories/places you could buy different things. There were quite a lot of retail stores which we dont see in other clusters. We can presume there might be a shopping mall around those. There were many parks and scenic routes so this tells us these areas might have beautiful landscapes and sights compared to the other neighborhoods in other clusters. In Cluster 2, the neighborhoods most popular venues were mostly places like resturants and coffee shops. These neighborhoods have a lot of dinning and food options around them. Cluster 3 was the smallest of the 5. The nieghborhoods here had a lot of dining but also had a lot of exercise and healthy venues likes gyms and pilates studios. In Cluster 4, looks like Cluster with a lot of venues that sell alcohol and drugs but there are more resturants. I also used logistic regression in order to find the best zipcode to build a certain venue depending on what venue was most likely to be in each zipcode. A lot of the neighborhoods have the same zipcodes. What I found was that some of the more popular zipcodes were 80210 and 80204. 80210 had a lot of dining and groceries stores in it. 80204 was lisited most of the time. It had a lot of resturants and shops. As well as out door places like trails and pools. This zipcode has a lot of venues that are a lot of fun and could be great for kids. 80247 has a lot of bars. This means the demand for them is definetly there so you can't go wrong with building bar in that zip code. 80221 is popular for cafes and building one there would be optimal. If you were looking to set up a physical therapy business or other health related business, 80216 is a popular choice for alternative healers. **Discussion** Like we discussed previously, many zipcodes are ideal for different businesses. From the logistic regression model predictions, we see exactly which zipcodes are best for each business. For any business related to food. 80204 is perfect since it has a lot of food related venues that include: mexican, sushi, sports bar, and sandwich. The night time life here also is good so any business that carter towards night time clients would be ideal. We see that 80204 has a lot of nightclubs and sports bars. 80210 also is a good option for dining especially if you want to make a burger business, coffee shop, or a french restaurent. It has a lot of liquor stores and also marijuana shops. Marijuana being something super popular is a perfect business for this zip code. I would say these two zipcodes are the most popular and really encompass a lot of different areas. Conclusion Neighborhoods in Denver are a really good place to start businesses. There is a constant flow of new people, new housing being built, and more demand for different people. Creating a business is a big dream many people have. The dream of being your own boss and in charge of your own schedule. It can provide financial freedom to some; however, it can also be burden and a money dump. That is why it is important to find the most optimal place for your business. A change in a couple of numbers in a zipcode can make a big difference for a business in revenue. Thats why this report is so important so people can make the right choice.