

# Hot.Spot.Bot

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# WHAT IS HOT.SPOT.BOT?

An interactive Slack bot that uses **NYC free public WiFi location data** across all 5 boroughs

Accepts queries by users about WiFi hotspots nearby, using the **user's inputted address**

Returns the locations of **the top three closest WiFi hotspots** around the user

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# Datasets

## Geocoder API

**Python Geocoder API by Dennis Carriere**

Takes as input an address and returns latitude and longitude coordinates

## NYC Free Public WiFi

**Dataset from NYC OpenData**

Contains 2,095 WiFi hotspots across the 5 boroughs and 29 different attributes for each, such as unique ID, name, provider, type of service, lat/lon coordinates, etc.

## NYC Neighborhood Population

**Dataset from NYC OpenData**

Contains 391 neighborhoods across the 5 boroughs and population for each

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## Sample API Call

```
address = "44 West 4th Street, New York, NY  
10012"
```

```
g = geocoder.google(address)  
g.latlng
```

```
[40.7288625, -73.99641319999999]
```

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## Sample WiFi JSON response

```
[ 'row-pjvf_3azf-tvqz',
  '00000000-0000-0000-EBEA-0A889D94CBB7',
  0,
  1493841594,
  None,
  1493841594,
  None,
  '{ }',
  'POINT (-73.80905000017083 40.77122899977465)',
  'Limited Free',
  '848',
  'QU',
  'SPECTRUM',
  'Bowne Park',
  '155th St between 29th Ave and 32nd Ave',
  '40.771229',
  '-73.80905',
  '1037140.16258',
  '220313.953779',
  'Outdoor TWC Aerial',
  '3 free 10 min sessions',
  'Queens',
  'GuestWiFi',
  '0',
  -2211753600]
```

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# Code

## Storing the Data

### STEPS:

1. Import data from NYC OpenData
2. Set up ‘WiFi’ database
3. Create ‘wifi\_info’ table
4. Store data into MySQL database

### CREATE TABLE:

```
create_table_query =  
    '''CREATE TABLE IF NOT EXISTS {0}.{1}  
        (objectid int,  
        boro_name varchar(250),  
        hotspot_type varchar(250),  
        provider varchar(250),  
        location varchar(250),  
        lat float,  
        lon float,  
        location_t varchar(250),  
        remarks varchar(250),  
        city varchar(250),  
        ssid varchar(250),  
        PRIMARY KEY(objectid)  
    )''' .format(db_name, table_name)
```

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## Calculate Distance

### STEPS:

1. Use the GeoCoder API to determine lat/lon of current location
2. Connect to MySQL database to access hotspot lat/lon coordinates
3. Calculate distance between current location and hotspot locations using Haversine's formula

### HAVERSINE'S FORMULA:

```
def distance(origin, destination):  
    lat1, lon1 = origin  
    lat2, lon2 = destination  
    radius = 3959  
    dlat = math.radians(lat2-lat1)  
    dlon = math.radians(lon2-lon1)  
    a = math.sin(dlat/2) *  
        math.sin(dlat/2) +  
        math.cos(math.radians(lat1)) \\  
        * math.cos(math.radians(lat2)) *  
        math.sin(dlon/2) *  
        math.sin(dlon/2)  
    c = 2 * math.atan2(math.sqrt(a),  
                      math.sqrt(1-a))  
    d = float("{0:.4f}").format(radius *  
                               c))
```

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## Slack Bot

### STEPS:

1. Import geocoder API
2. Use the expression 'I am at (.+), where are the closest WiFi hotspots?'
3. Pull location out from message
4. Return location in "current\_location"

### REGEX EXPRESSIONS:

```
import geocoder

def extract_location(message_text):
    regex_expression = 'I am at (.+), where
                        are the closest WiFi hotspots?'
    regex= re.compile(regex_expression)
    matches = regex.finditer(message_text)
    for match in matches:
        location_entered = match.group(1)
    g = geocoder.google(location_entered)
    current_location = g.latlng
    return current_location
```

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## PANDAS Plots

### STEPS:

1. Grab data from MySQL database
2. Generate summary statistics (bar + pie charts)
3. Create scatterplot maps
4. Compare NYC free wifi data with population density data

### CHLOROPLETH MAPPING:

```
geojson=open('nyc_neighborhood_tabulation_areas.json', 'r').read()
hoods_geojson =
    json.loads(geojson) ["features"]
df_hoods =
    gpd.GeoDataFrame.from_features(hoods_g
        eojson)
df_hoods.set_index(['NTACode'],inplace=True
    )
df_hoods.sort_index(inplace=True)

df_hoods.join(df_population).plot(figsize=(15,7),
    column='Population',
    cmap='YlGnBu', linewidth=0.2)
```

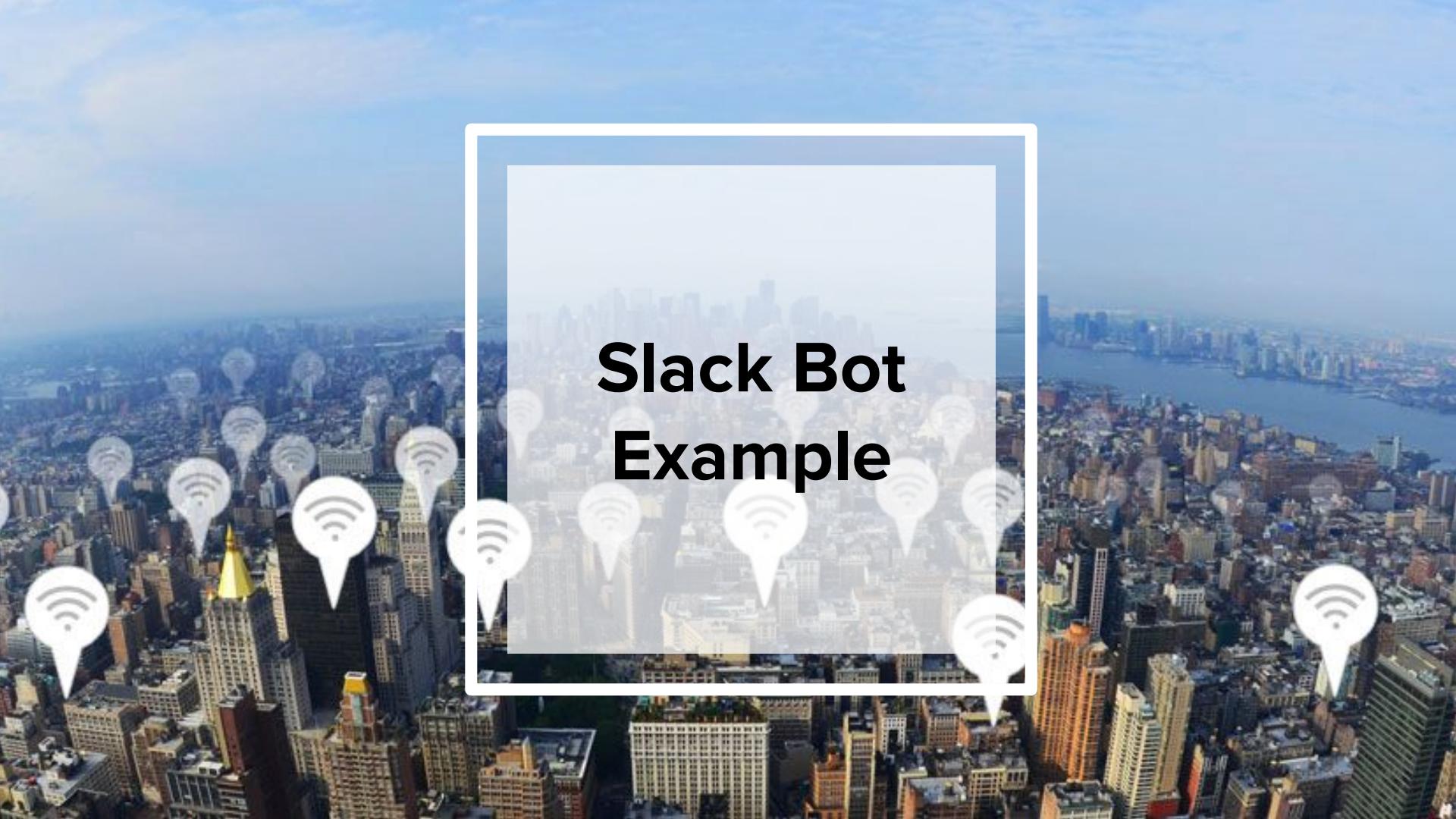
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The background image shows a wide-angle aerial view of the New York City skyline, featuring numerous skyscrapers and buildings. Overlaid on the cityscape are several white WiFi signal icons, which are semi-transparent and appear to be floating at different heights. The sky is clear and blue.

# Slack Bot Example

## Sample Response



**jcx204** 4:41 PM

@hotspot I am at 11 Stuyvesant Oval, New York, NY, where are the closest WiFi hotspots?



**hotspot APP** 4:41 PM

The closest WiFi hotspots near you are:

W Area off MacDougal St is 0.0113 miles away.

SW Area off Washington Sq S is 0.0309 miles away.

NW Area off Washington Sq N is 0.0319 miles away.

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## Sample Error Message



**Christopher Ma** 4:27 PM

@chrisma I am at hello, where are the closest WiFi hotspots?



**hotspot** APP 4:27 PM

Please ask in the format of: @hotspot bot I am at 'street address', New York, NY  
'zip code', where are the closest WiFi hotspots?

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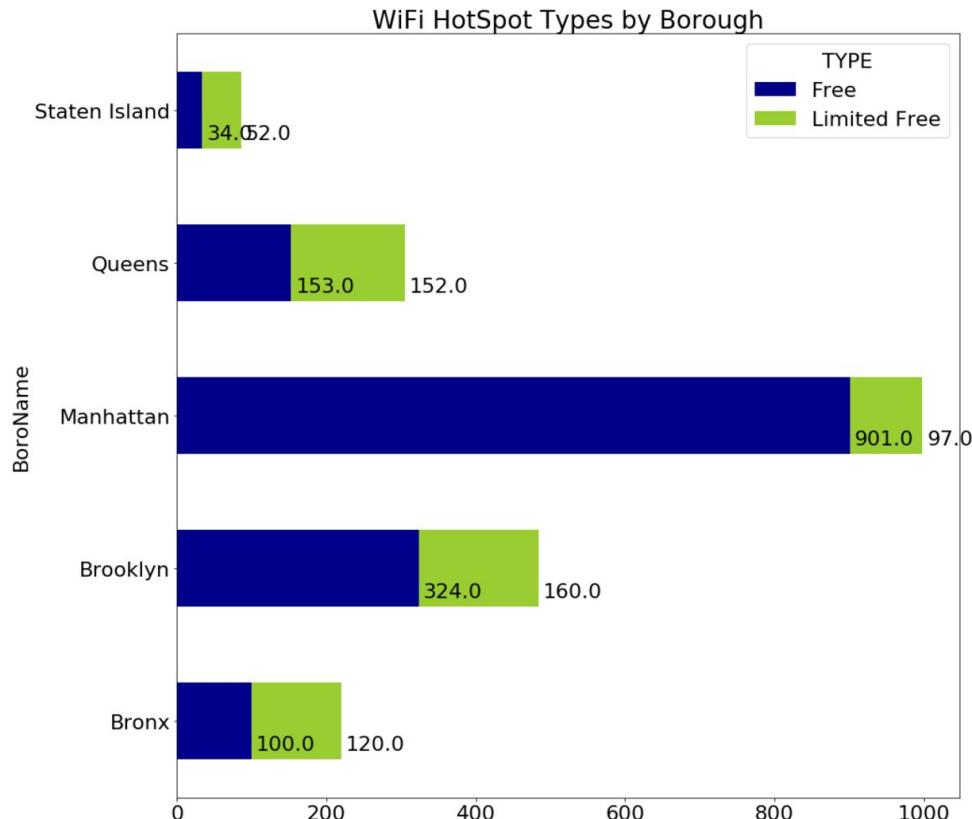
THE ANALYSES



# Analyses

# WiFi Hotspot Types by Borough

Free vs. Limited Free



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# WiFi Hotspots By Provider

15 Different  
Providers

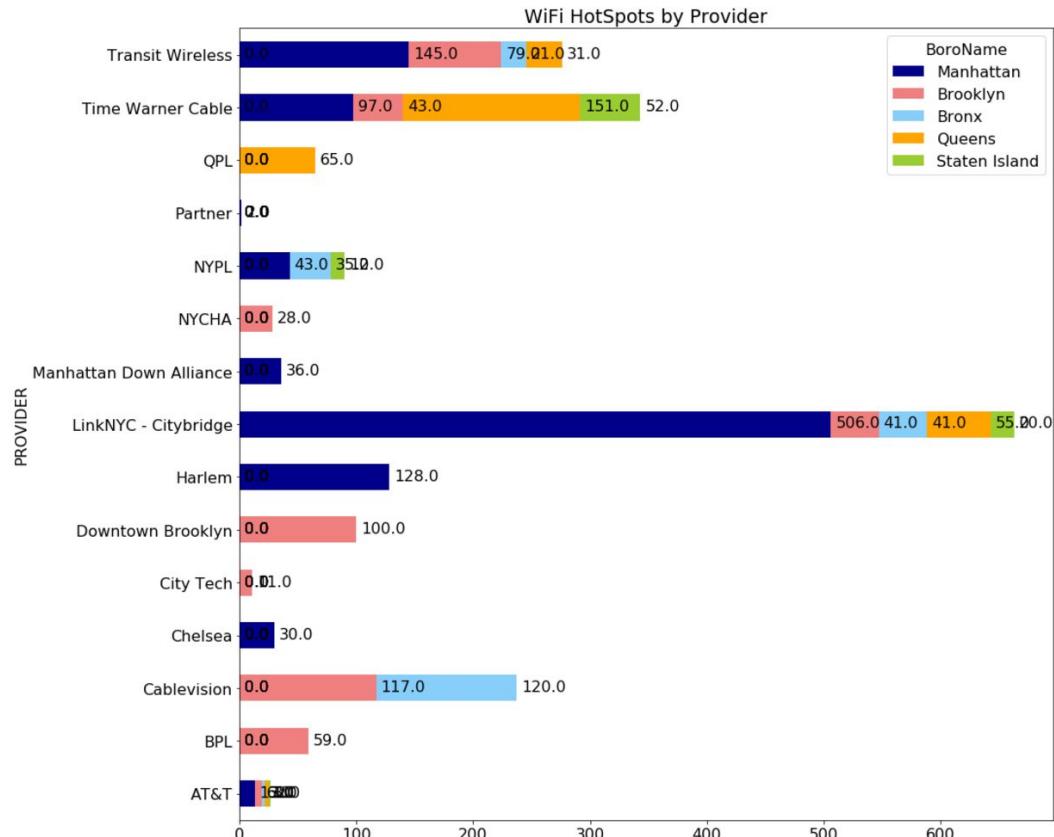
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# WiFi Hotspots By Location Type

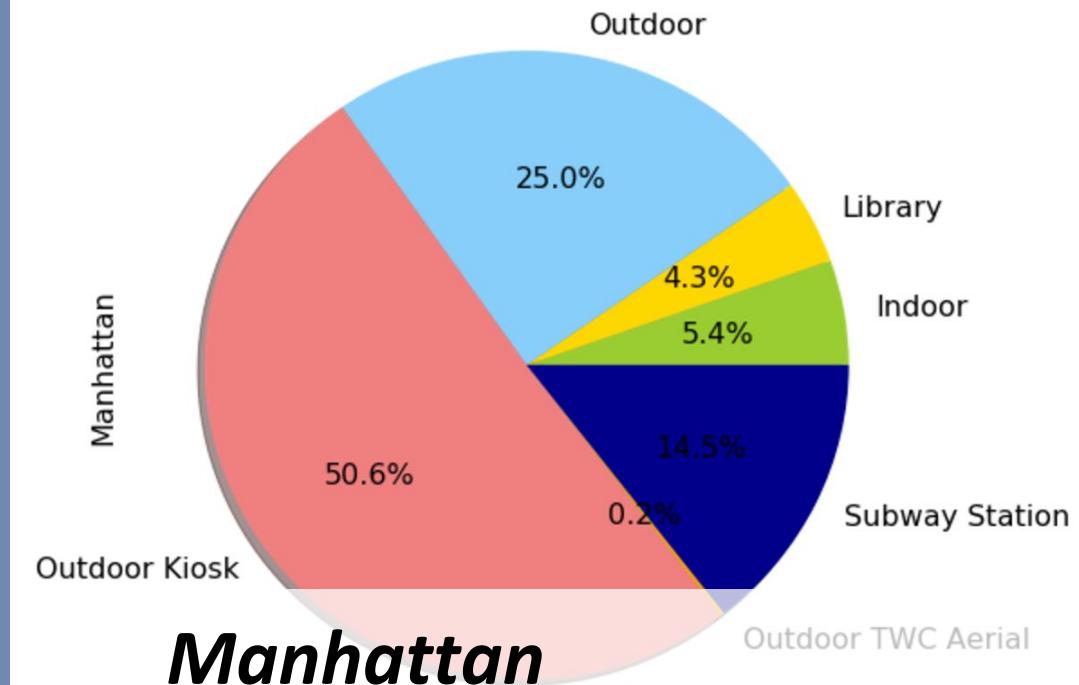
3 Types:

1. Subway Station
2. Outdoor  
(Kiosk, TWC Aerial)
3. Indoor (Library)

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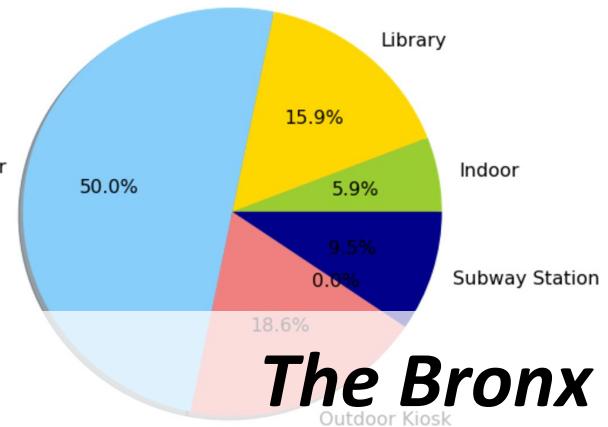
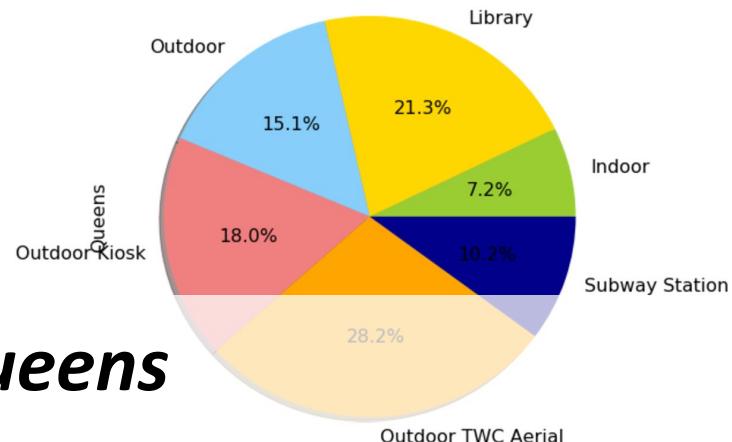
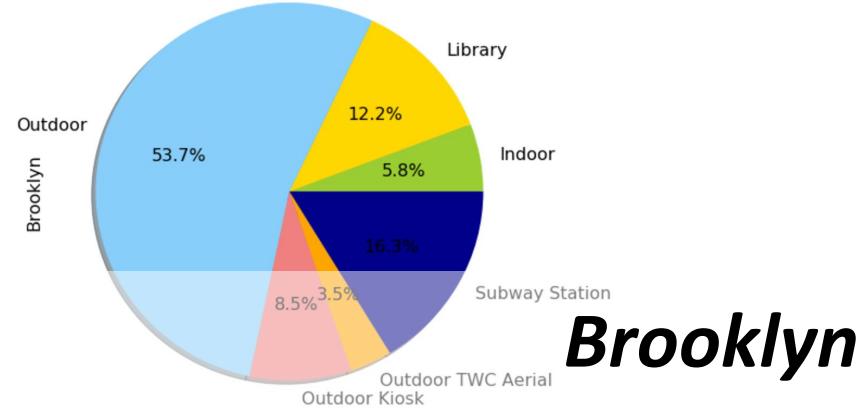
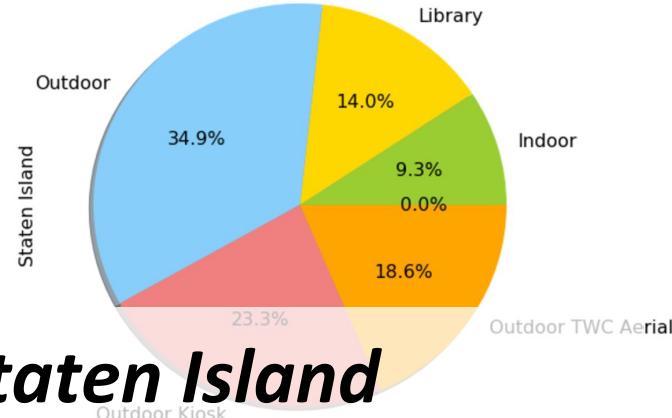
WiFi HotSpots Location Types across Boroughs



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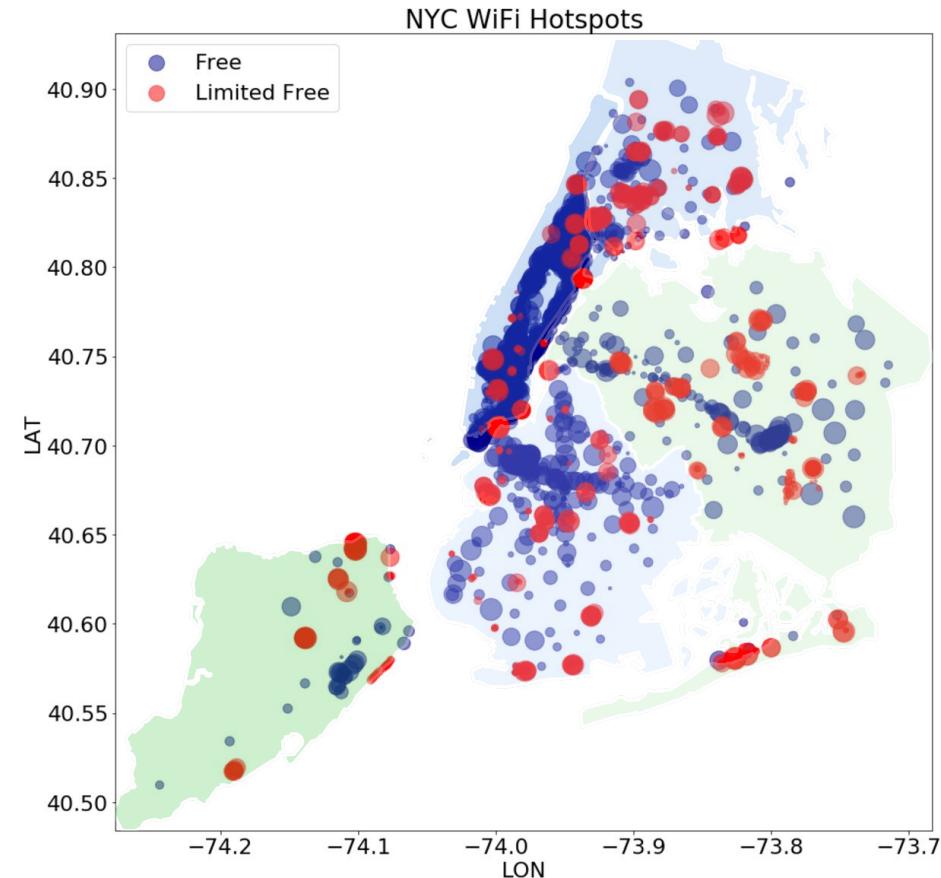
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# NYC Scatterplot Map

Most Serviced:

1. Dumbo, BK
2. Central Harlem, MN
3. Midtown, MN



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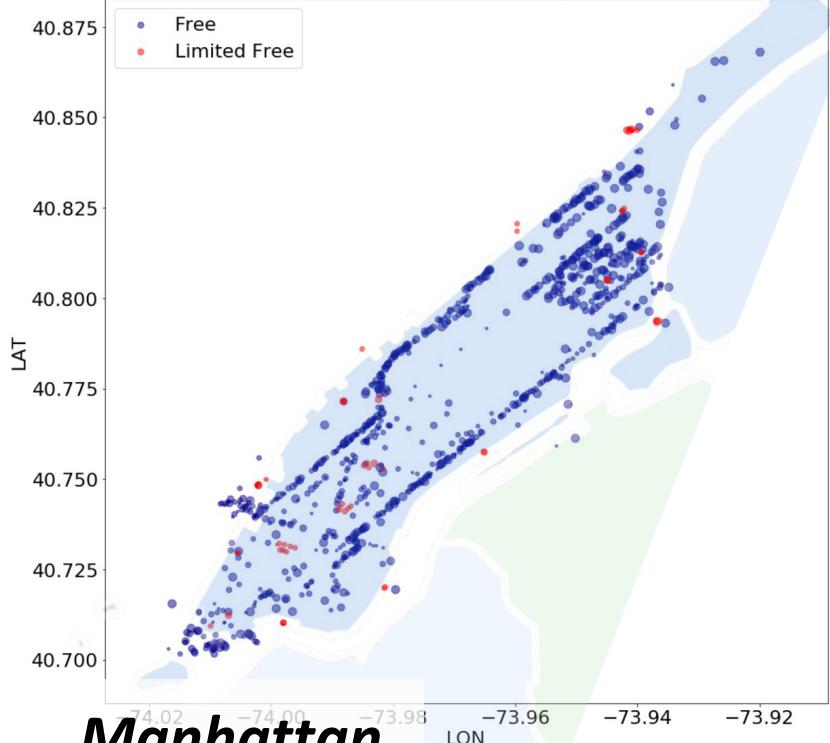
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### Manhattan WiFi Hotspots



*Manhattan*

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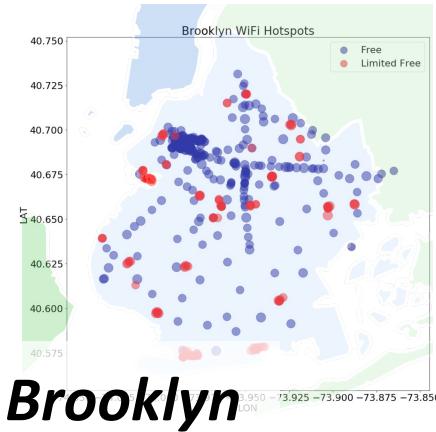
THE DATA

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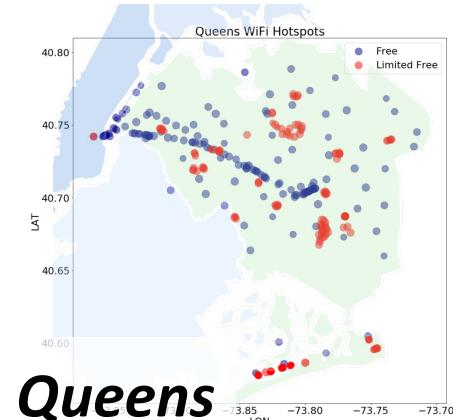
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### Brooklyn WiFi Hotspots



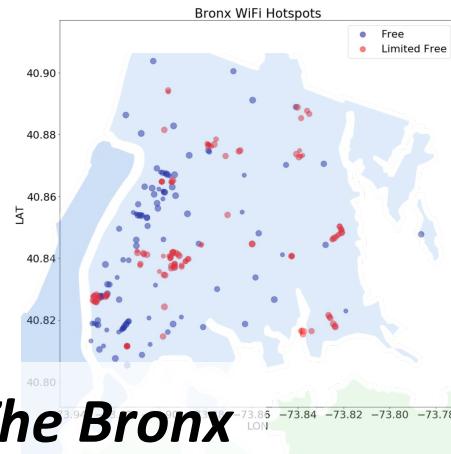
*Brooklyn*

### Queens WiFi Hotspots



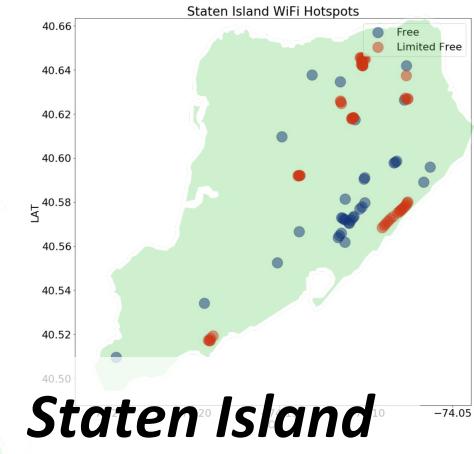
*Queens*

### Bronx WiFi Hotspots



*The Bronx*

### Staten Island WiFi Hotspots

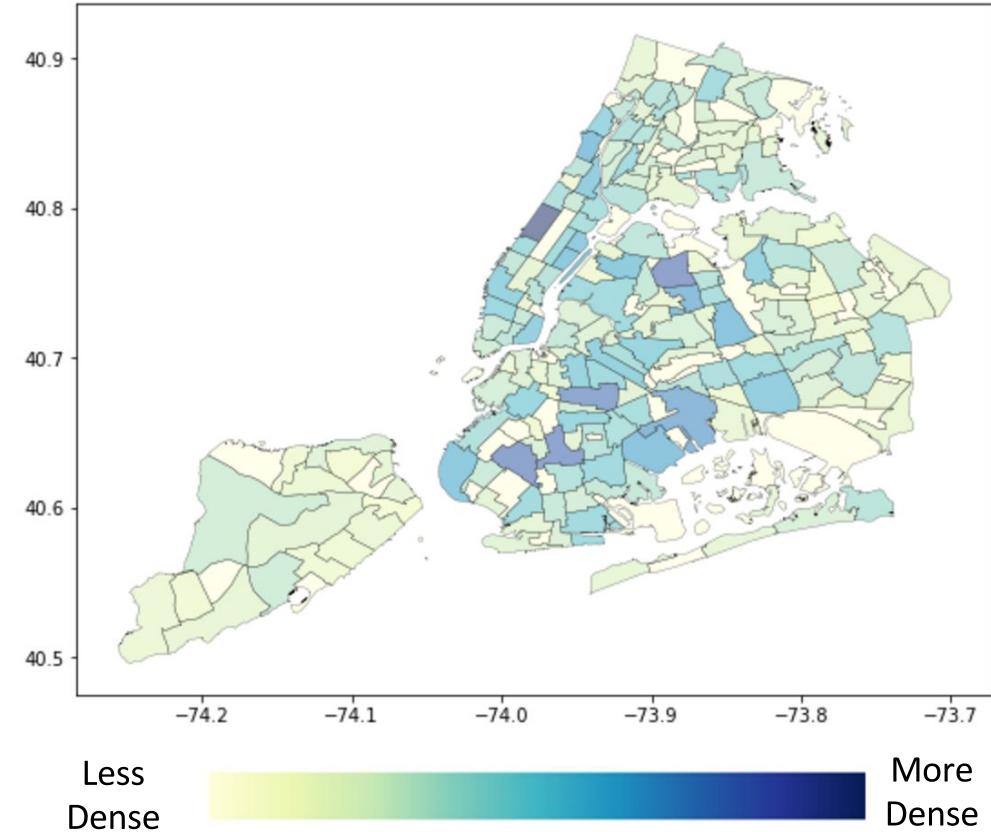


*Staten Island*

# WiFi Service v. NYC Population Density

Most Populated:

1. Upper West Side, MN
2. Jackson Heights, QN
3. Borough Park, BK



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Thank you!