ABC Telecom

Commercial Wi-Fi hotspot deployment opportunities in NYC

Exploratory data analysis of commuter traffic and existing wireless telecom infrastructure

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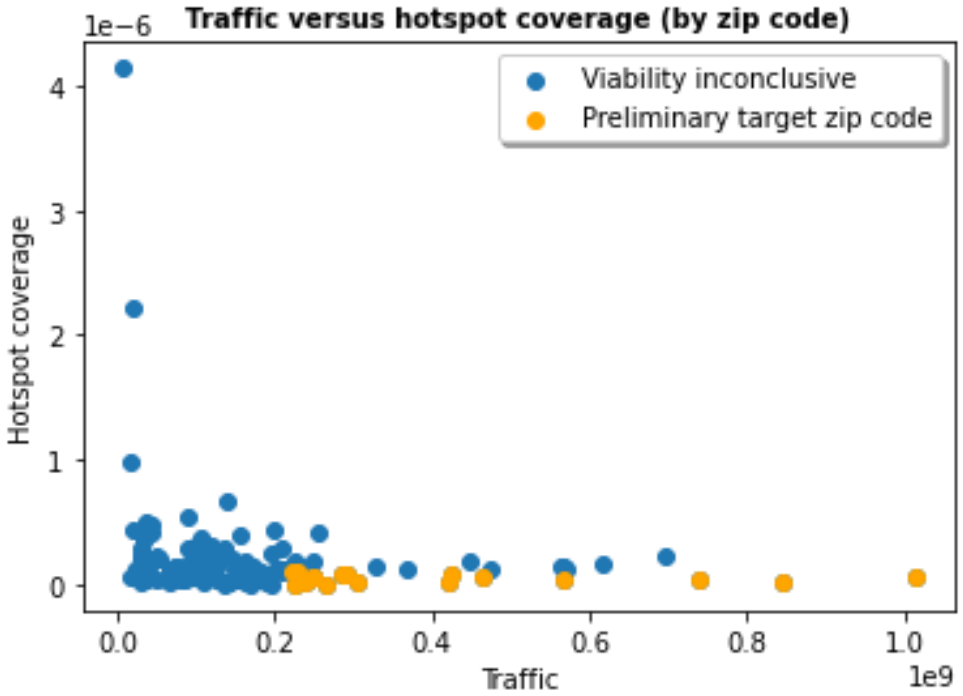
Executive summary

- **Motivation:** ABC Telecom suspects a majority of New York commuters are unsatisfied with free public Wi-Fi bandwidth, and would be willing to supplement their cellular data plans with a paid subscription for fixed-access public Wi-Fi for $5-10/month.
- **Objective:** Identify underserved NYC zip codes, as defined by lowest Wi-Fi hotspot density relative to commuter traffic.
- **Conclusion:** 18 NY zip codes identified.
  - — High-volume traffic but low hotspot coverage zip codes identified
  - — Analyzed existing hotspot density / commuter traffic ('coverage')
  - — High-traffic priority vs. low coverage priority deployment strategies

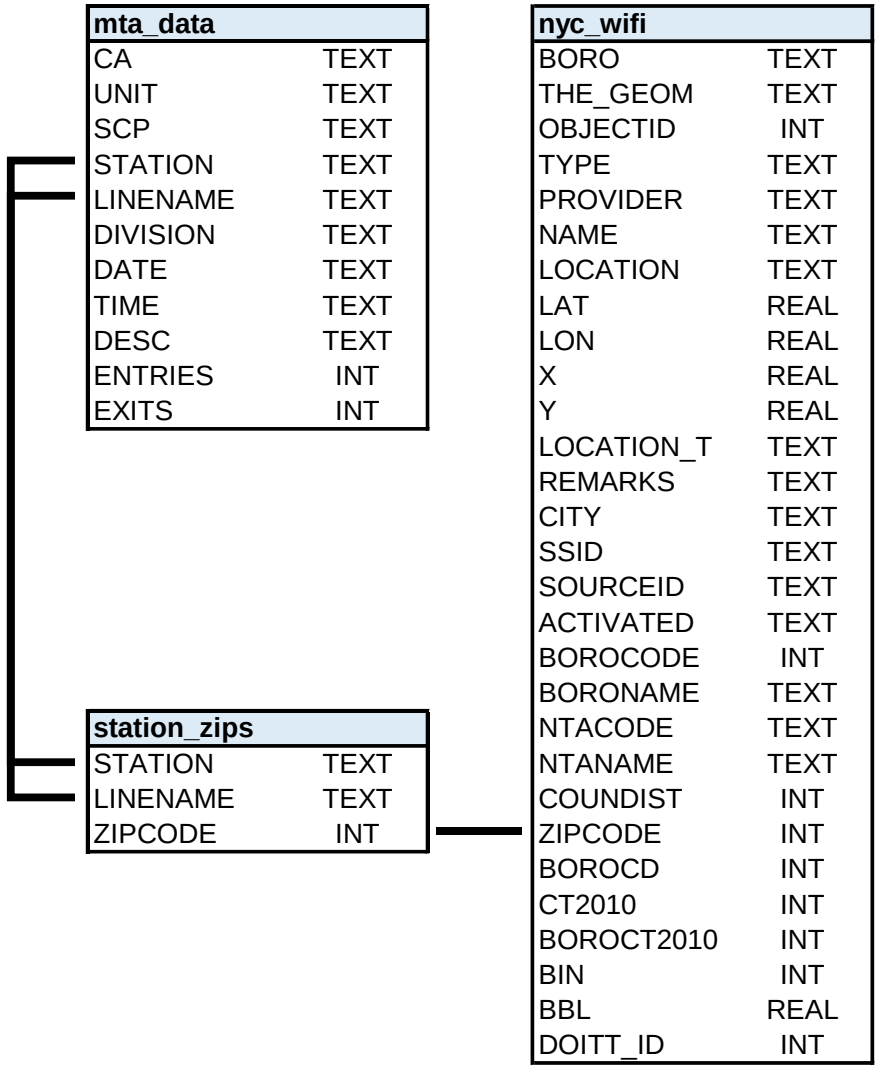


Modest adoption could produce a ~$16mm revenue opportunity for trial zip codes, >3x for broader city deployment

NOTES:
Traffic equates to cumulative turnstile entries for a given time period (e.g., the summer/fall of 2018), and is calculated as the aggregate of (Apr'21, May'21, Jun'21, Jul'21, Jul'18 & '19, Aug'18 & '19, Sept'18 & '19) where not specified

Methodology

- **Data**
  - NYC MTA turnstile data (mta_data)[1]
  - NYC Wi-Fi hotspot locations (nyc_wifi)[2]
  - Proprietary database of NYC subway station zip codes[3]
  - 264 days (~9 months) of MTA data analyzed; hotspot/zip code data is cross-sectional
- **Tools**
  - SQLite database for data aggregation
  - SQLAlchemy querying into Python environment
  - Python Pandas for data cleaning
  - Matplotlib, MS Excel for visualization and supplemental figures
- **Metrics**
  - 'Commuter traffic' (aggregate and daily) based on turnstile turns by unit, station, and zip code
  - 'Hotspot coverage' as calculated by number of hotspots for a given zip code divided by traffic for a given period

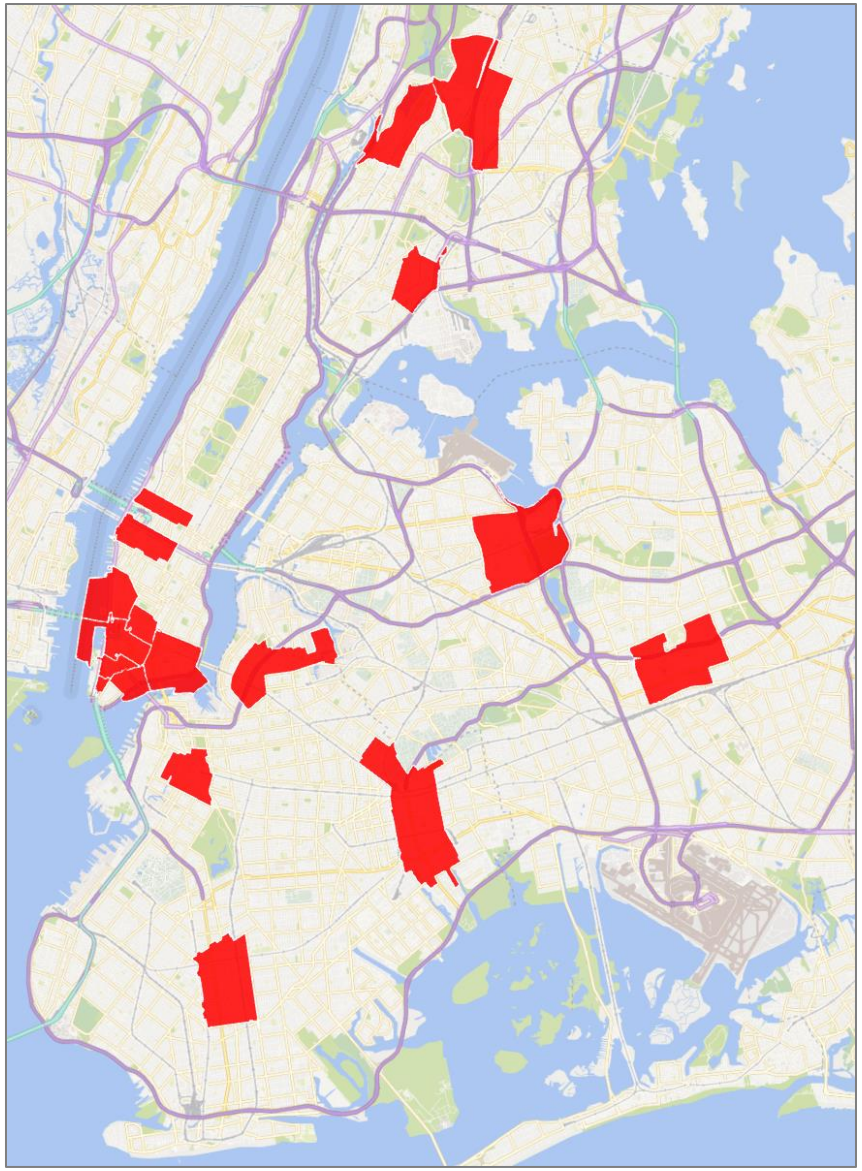


[1] Metropolitan Transportation Authority <http://web.mta.info/developers/turnstile.html>
[2] NYC OpenData <https://data.cityofnewyork.us/Social-Services/NYC-Wi-Fi-Hotspot-Locations/a9we-mtpn>
[3] Created cooperatively with Varsha Garla (Metis)

Results

- **Target zips:** Preliminary screens identified potential zip codes for deployment with criteria of:
  - >75% percentile for commuter traffic
  - <50% percentile for Wi-Fi hotspot coverage
- **Target zip code output = ~30% of traffic**

  - 10001 (Manhattan)
  - 10002 (Manhattan)
  - 10006 (Manhattan)
  - 10007 (Manhattan)
  - 10012 (Manhattan)
  - 10013 (Manhattan)
  - 10014 (Manhattan)
  - 10036 (Manhattan)
  - 10038 (Manhattan)
  - 10459 (Bronx)
  - 10467 (Bronx)
  - 10468 (Bronx)
  - 11207 (Brooklyn)
  - 11211 (Brooklyn)
  - 11217 (Brooklyn)
  - 11230 (Brooklyn)
  - 11368 (Queens)
  - 11432 (Queens)



NOTES:
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'Traffic' equates to cumulative turnstile entries for a given time period (e.g., the summer/fall of 2018), and is calculated as the aggregate of (Apr'21, May'21, Jun'21, Jul'21, Jul'18 & '19, Aug'18 & '19, Sept'18 & '19) where not specified

Conclusions

- **Potential deployment strategies**
  - — **High-volume zips priority (Manhattan):** Deployment begins with the target Manhattan zip codes to ensure the commuter market is there, irrespective of current density
  - — **Low coverage priority (indiscriminate):** Deployment begins with the lowest coverage zip codes with the logic that they are most severely underserved, though they are not the highest traffic
- **Market opportunity**
  - — 15% adoption at $7/mo yields ~$16mm/yr for commuters in target zip codes
  - — Broader city deployment could produce over 3x the opportunity

Annual market opportunity ($mm)

Subscription price/mo ($)	Penetration rate (%) 5%	10%	**15%**	20%	25%
$1	$0.8	$1.5	$2.3	$3.0	$3.8
$2	$1.5	$3.0	$4.5	$6.0	$7.5
$3	$2.3	$4.5	$6.8	$9.0	$11.3
$4	$3.0	$6.0	$9.0	$12.0	$15.0
$5	$3.8	$7.5	$11.3	$15.0	$18.8
$6	$4.5	$9.0	$13.5	$18.0	$22.5
$7	$5.3	$10.5	**$15.8**	$21.0	$26.3
$8	$6.0	$12.0	$18.0	$24.0	$30.0
$9	$6.8	$13.5	$20.3	$27.0	$33.8
$10	$7.5	$15.0	$22.5	$30.0	$37.5
$11	$8.3	$16.5	$24.8	$33.0	$41.3
$12	$9.0	$18.0	$27.0	$36.0	$45.0
$13	$9.8	$19.5	$29.3	$39.0	$48.8
$14	$10.5	$21.0	$31.5	$42.0	$52.5
$15	$11.3	$22.5	$33.8	$45.0	$56.3

Assumes 1,250,000 daily commuters in target zip codes

Further due diligence/future work

- **Vet assumptions**
  - **Commuter habits:** Can we be certain that commuters are the most significant consumer stakeholders for publicly available Wi-Fi?
  - **Post-COVID 19 traffic:** Commuter traffic to-date (for periods analyzed) largely mirrors pre-COVID patterns, but this analysis should expand on potential changes in commuter traffic with incremental data as city commutes normalize.
  - **Seasonality:** This analysis doesn't account for seasonality outside of the late summer/early fall time frame that this data set contemplates; there may be seasonal traffic patterns that could influence commercial deployment of hotspots.

- **Data cleaning**
  - **Contact MTA representative for data due diligence:** Are there qualitative aspects to the data that could be better understood?
  - **Decommissioned/new stations:** This analysis does not account for decommissioned stations or pro-rated volume from new stations. This could dramatically affect volume of a certain zip code.

- **Data incorporation**
  - **Income levels:** It could be constructive to incorporate company location data into destination zip codes to understand what kind of workforce is commuting into which zip codes (i.e., can this labor population easily afford more bandwidth?).

- **Economics**
  - **Unit economics:** How profitable could this venture be given fully-loaded cost structure of deployment to the target zip codes, and eventually all zips in NYC?

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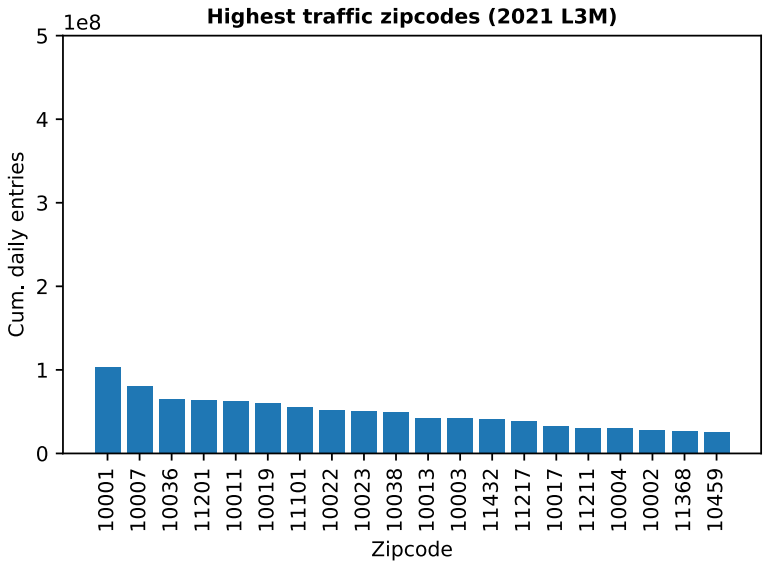
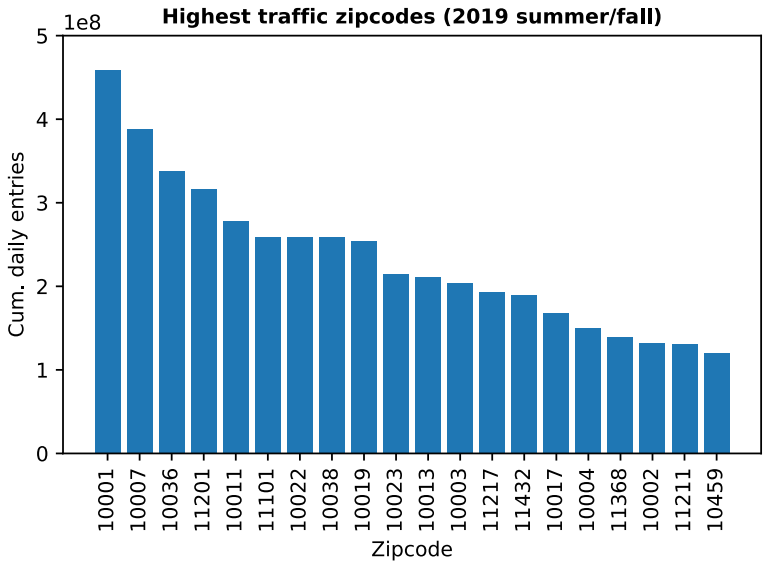
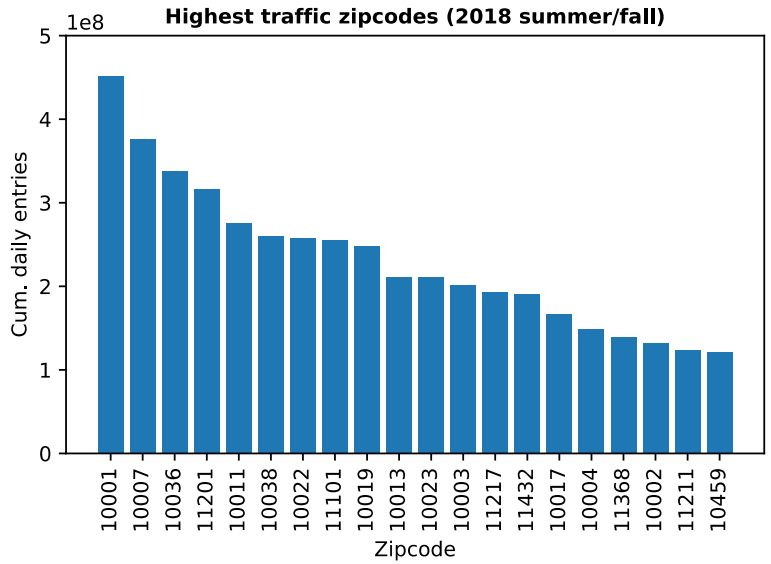
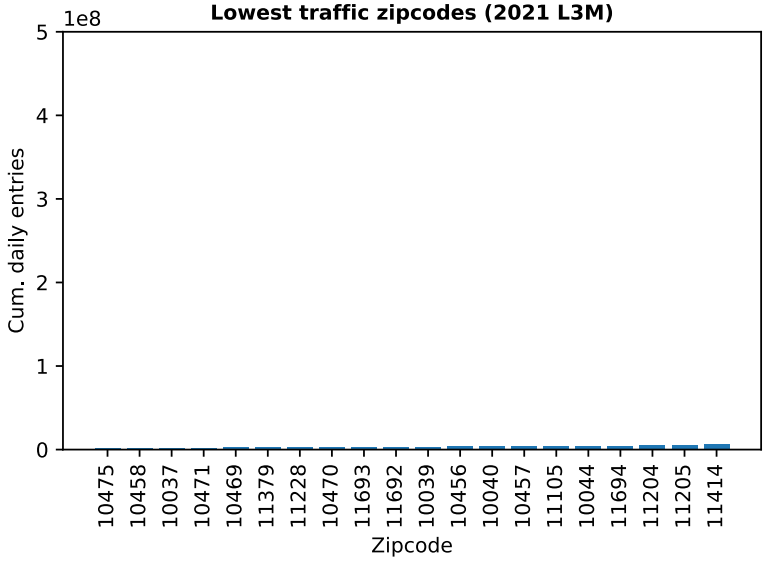
Appendix

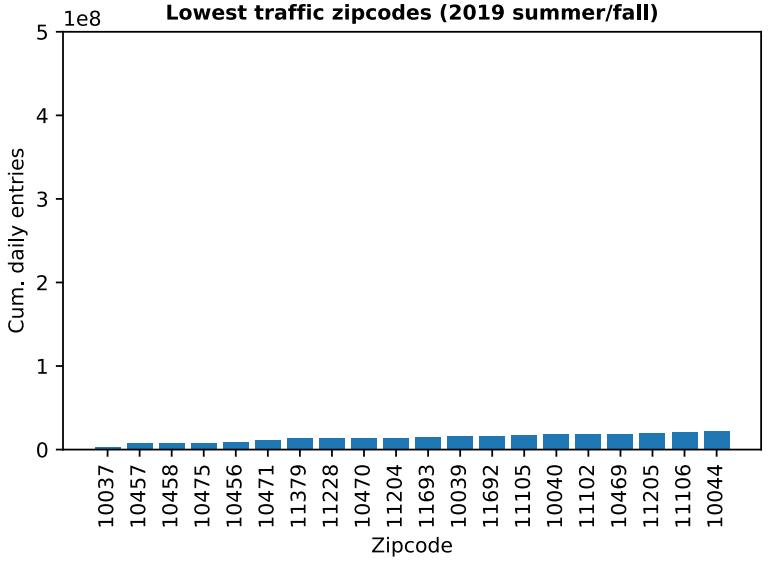
MTA traffic by time period analyzed

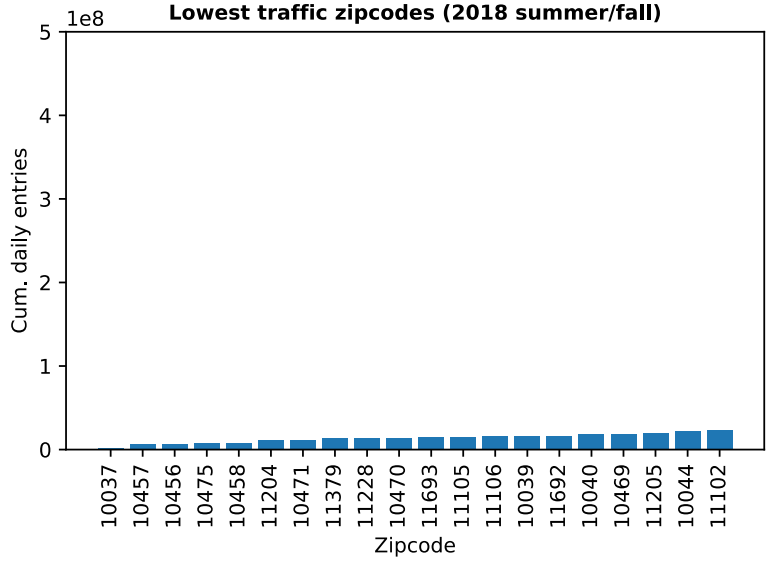




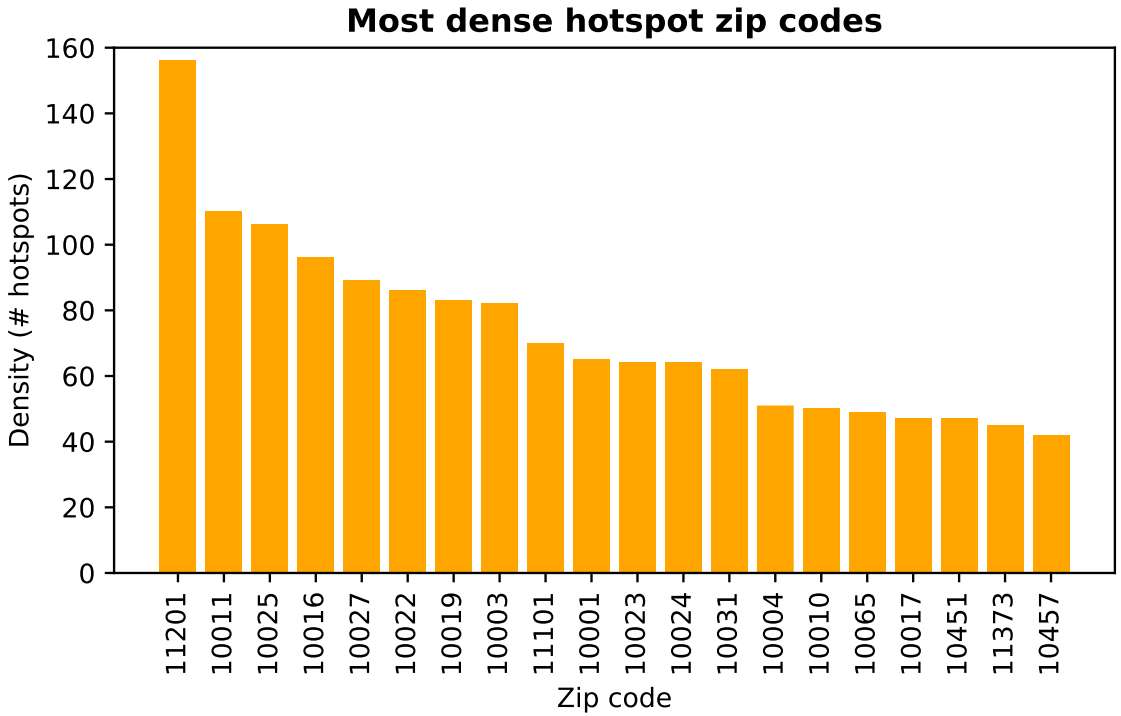


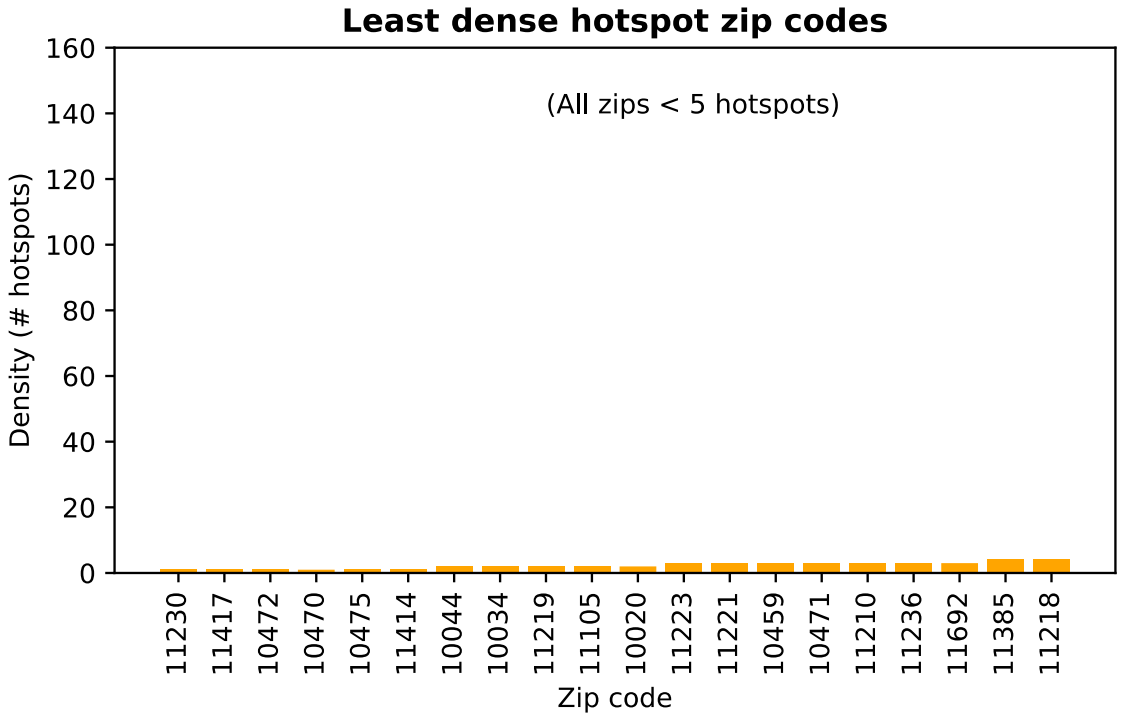




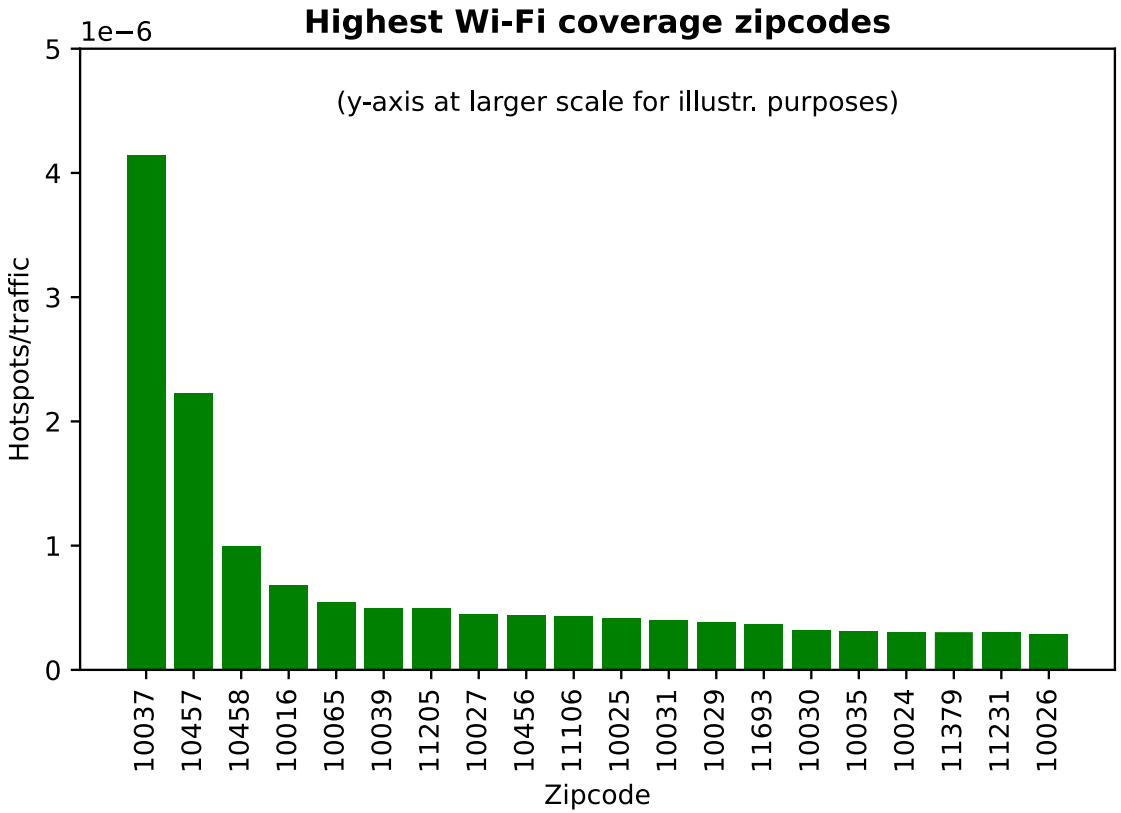


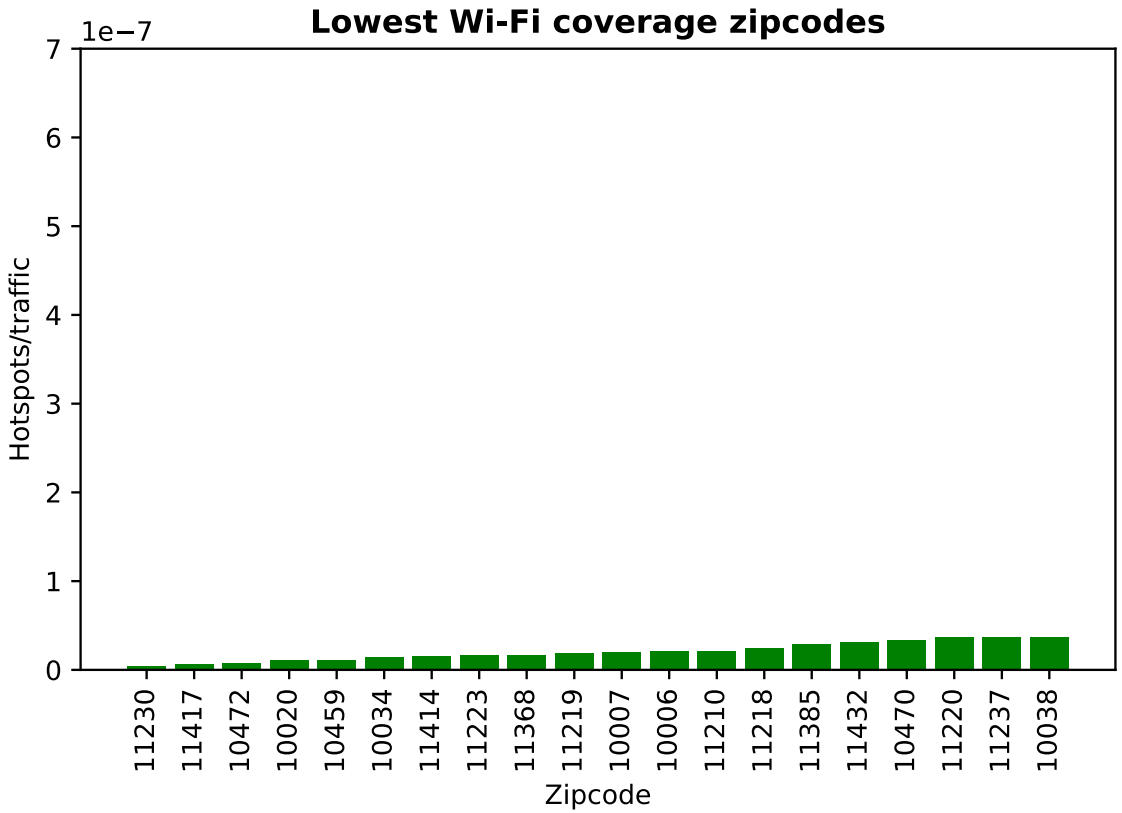
Manhattan and Brooklyn have the highest number of hotspots





Wi-Fi coverage for agg. of latest 3mo, summer/fall ’18 and ‘19





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Target zip codes based on screen criteria of coverage and traffic

```
In [31]:  1 target_zips
```

Out[31]:

	ZIPCODE	DAILY_ENTRIES
0	10001	1.014902e+09
1	10002	2.928593e+08
2	10006	2.382040e+08
3	10007	8.451176e+08
4	10012	2.436263e+08
5	10013	4.645207e+08
6	10014	2.293982e+08
7	10036	7.404685e+08
8	10038	5.673270e+08
9	10459	2.670912e+08
10	10467	2.476248e+08
11	10468	2.210074e+08
12	11207	2.493683e+08
13	11211	2.849629e+08
14	11217	4.254954e+08
15	11230	2.242856e+08
16	11368	3.059955e+08
17	11432	4.205698e+08

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Time periods analyzed in this analysis

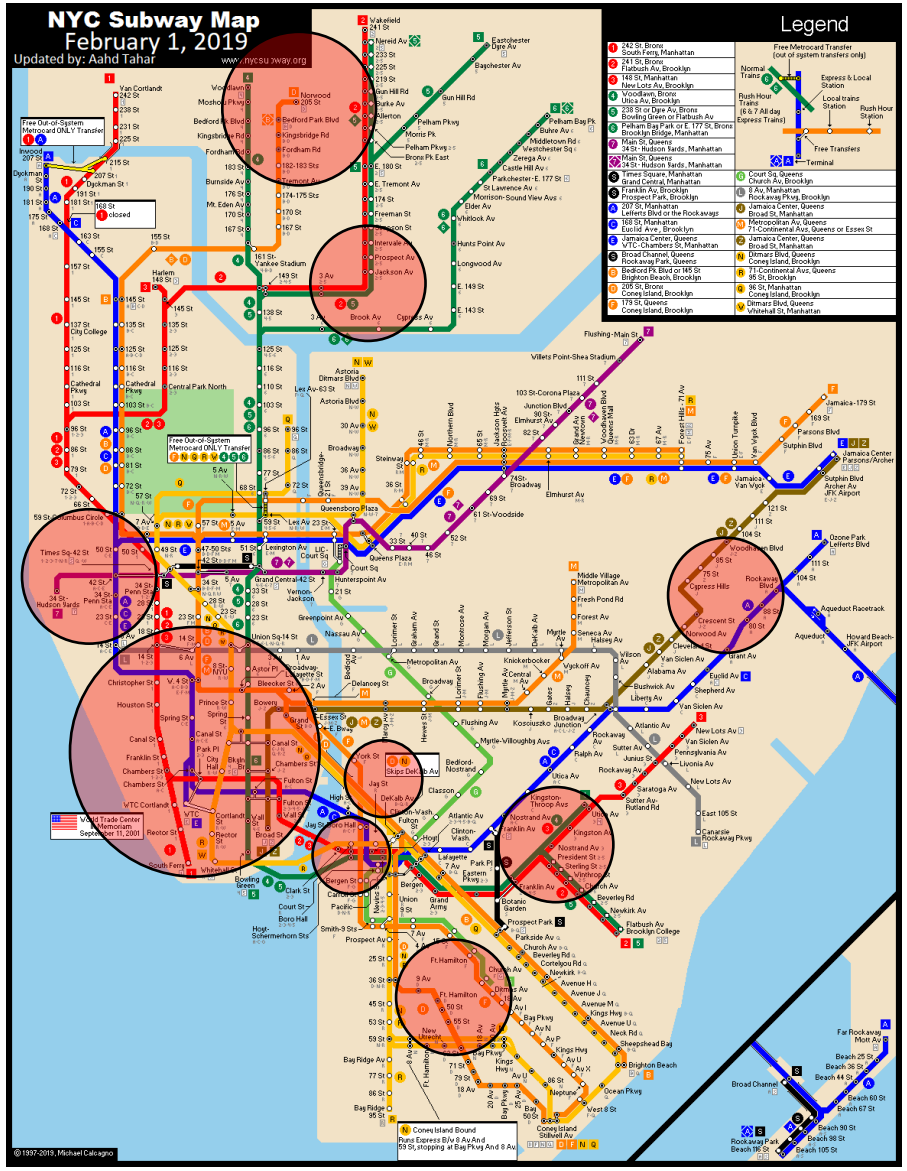
2021: Apr 25 – Jul 16 (82 days)

2019: Jul 1 – Sept 21 (91 days)

2018: Jul 1 – Sept 21 (91 days)

In aggregate, 264 days of commuter traffic were analyzed in this analysis

NYC subway map with approx. target zip zones



SOURCE: <nycsubway.org>