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mapping economic change in New York City's telecommunications industry

with

Department of Information Technology and Telecommunications [DoITT]

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problem statement + deliverables

Is there is an optimal number of ISPs for New York City that can improve Internet accessibility in terms of coverage area, household adoption rates, and affordability?

policy white paper: maps, visuals | website | technical report | GitHub repo

literature review

Internet Access: Wired broadband | Mobile Broadband

Stakeholders:

- Regulators: Federal Communications Commission (FCC); DoITT
- ISPs: Verizon, Altice, NYC Mesh etc.
- Equipment Vendors: Crown Castle, Extenet, Empire Conduit System
- Consumers

literature review

dominant market structure:

- oligopolistic(Brake and Atkinson,2019)
- moderately concentrated market (NYS Department of Public Service Office of Telecommunication, 2015)

market characteristics:

- high capital, investment, R&D costs, with rapidly changing tech ~ high barriers to entry
- max. efficiency achieved with a few big firms willing and able to invest

implication:

- absolute number of competitors might not be the best way to measure market efficiency, optimality, and consumer welfare

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literature review

current regulatory framework:

- FCC and DoITT regulate, issue permits and franchises
- ISPs and vendors own the infrastructure AND sell internet access as a service

alternatives:

- City builds/owns fiber broadband network AND sells internet access to residents
- Ex: Santa Monica, CA | Chattanooga, TN

issues:

- long-term viability
- ability to scale up
- small sample size
- legal challenges

Data sources

Pricing Data

Geospatial: NTAs, Census Blocks, Census Tracts, NTA Equivalency Tables

Infrastructure: Empire City Subway Conduits, Antenna Installation Locations

Broadband: Internet Master Plan Adoption and Speed, FCC Form 477

Proposed analytical methods

- Geospatial
  - Geoprocessing, Spatial Autocorrelation
- Machine learning
  - K-Means Clustering
  - Bayesian Network
- Regression Analysis: Hedonic Price Theory
- Market (Econometric) Analysis

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market analysis

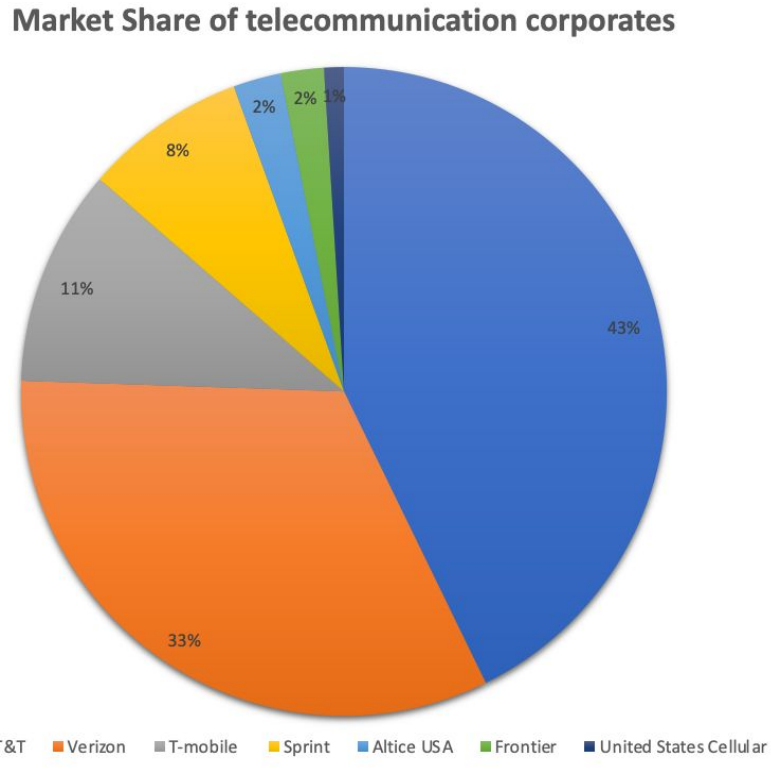
- Capital-intensive
- Oligopolistic

Using the total revenue of each company in 2018, we calculated Herfindahl Hirschman Index(HHI) to describe the market concentration

$$HHI = \sum_{i=1}^{n} S_i^2 = 3096$$

> 2500 highly concentrated

1500~2500 moderately concentrated



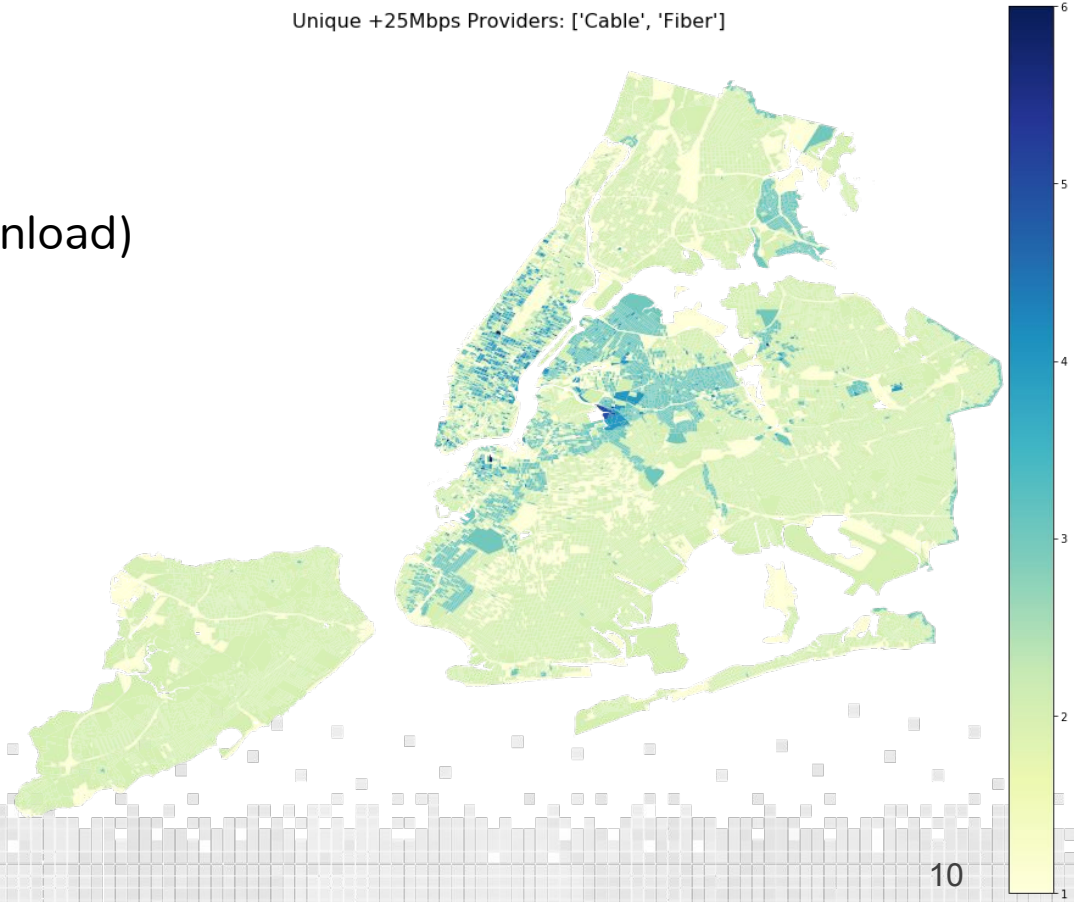
supply-side

FCC 477 Form: Jun 2019

Broadband Speed : +25 Mbps (download)

96.85% of blocks have any options

- 1 dist. provider(s): 18.69%
- 2 dist. provider(s): 66.35%
- 3 dist. provider(s): 10.65%
- 4+ dist. provider(s): 1.16%



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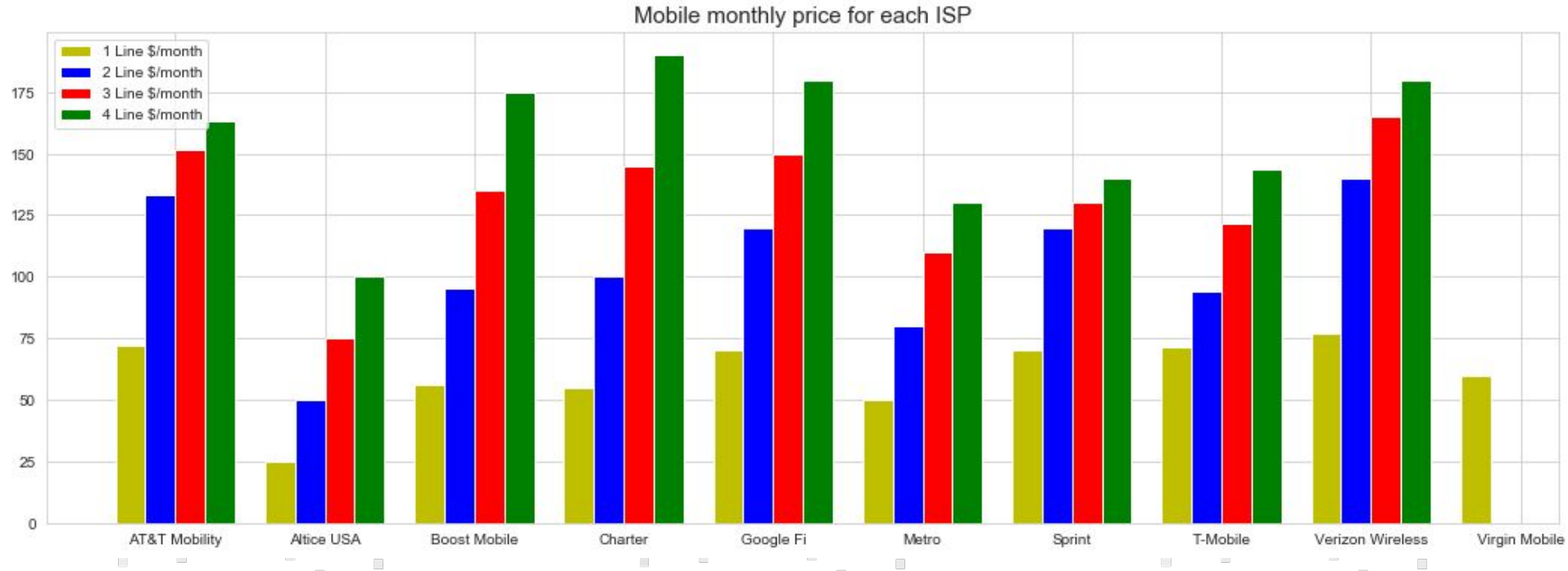
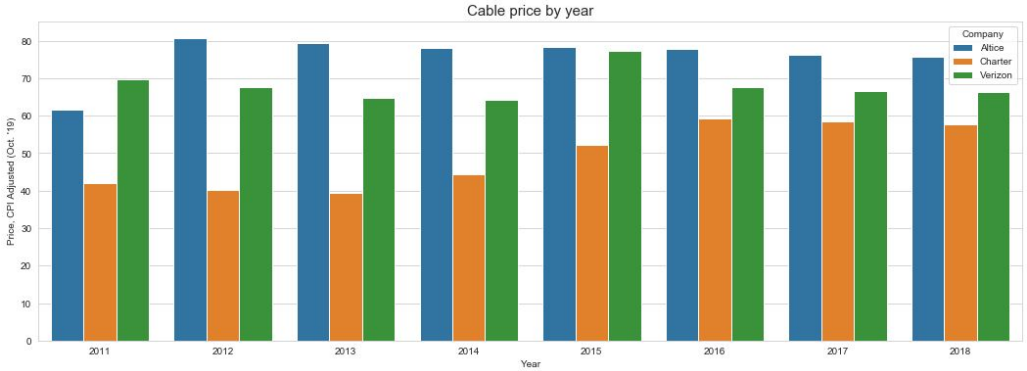
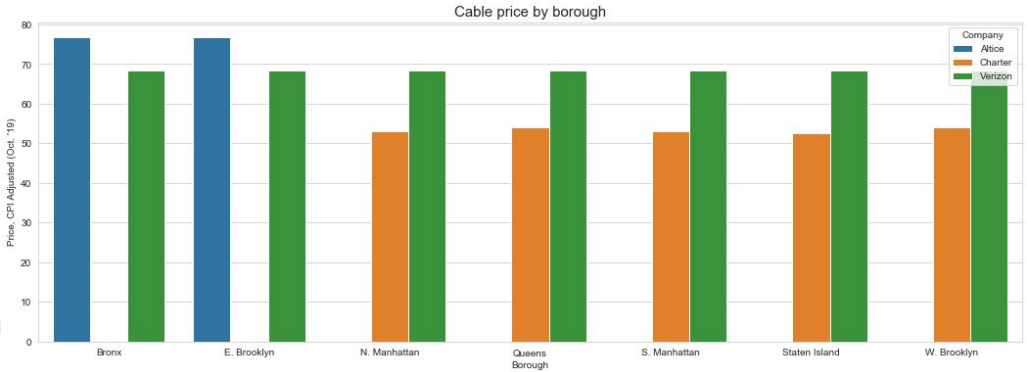
Mobile Broadband price



Cable price


Cable price by year
Company
Altice
Charter
Verizon
Price, CPI Adjusted (Oct. '19)
0
10
20
30
40
50
60
70
80
2011
2012
2013
2014
2015
2016
2017
2018
Year


Cable price by borough
Company
Altice
Charter
Verizon
Price, CPI Adjusted (Oct. '19)
0
10
20
30
40
50
60
70
80
Bronx
E. Brooklyn
N. Manhattan
Queens
S. Manhattan
Staten Island
W. Brooklyn
Borough

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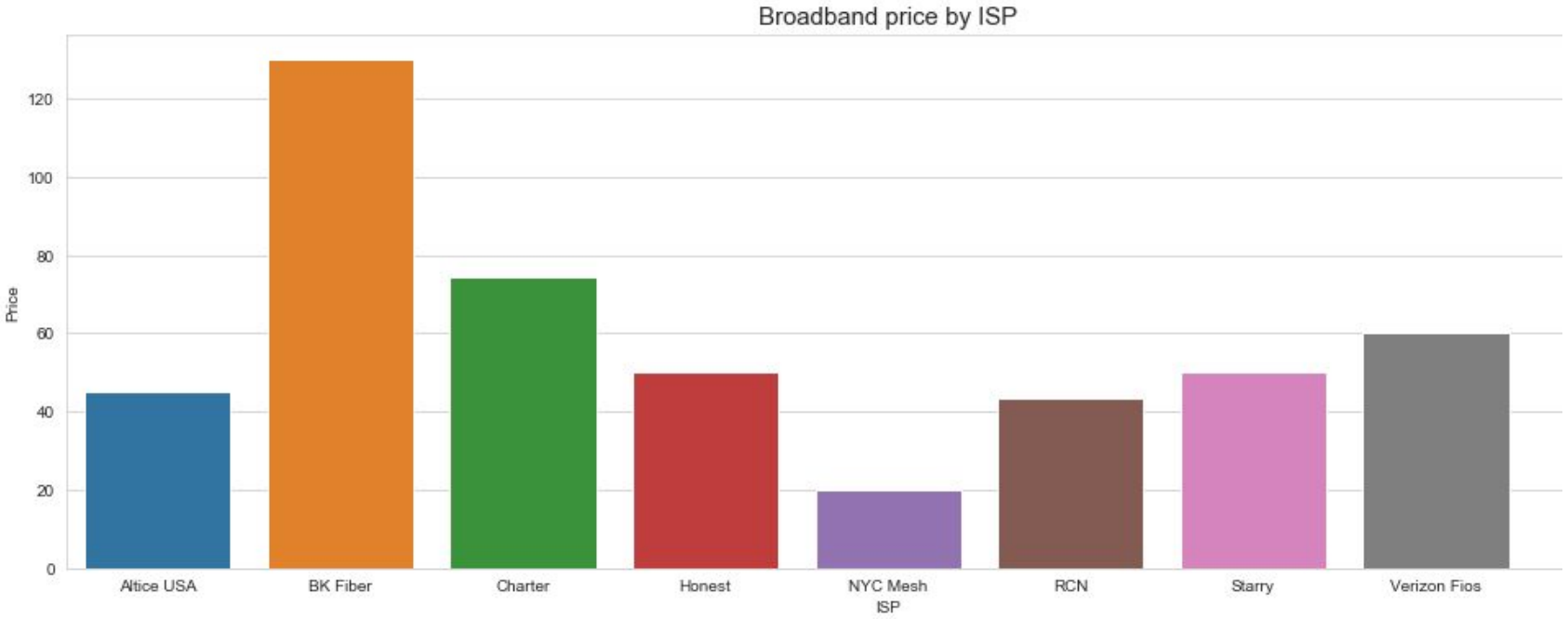
Fiber Broadband price



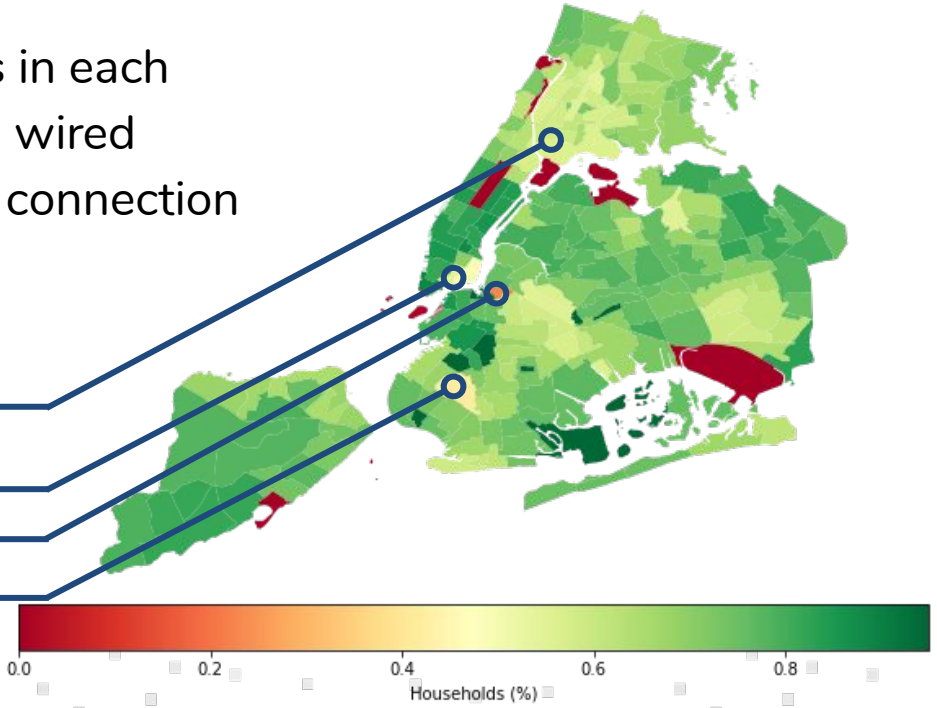
demand-side

Household Broadband Adoption Rate by NTA

68.7% households in each NTA with a wired broadband connection

NTAs with low connectivity:

- Belmont Park
- LES
- Williamsburg
- Borough Park



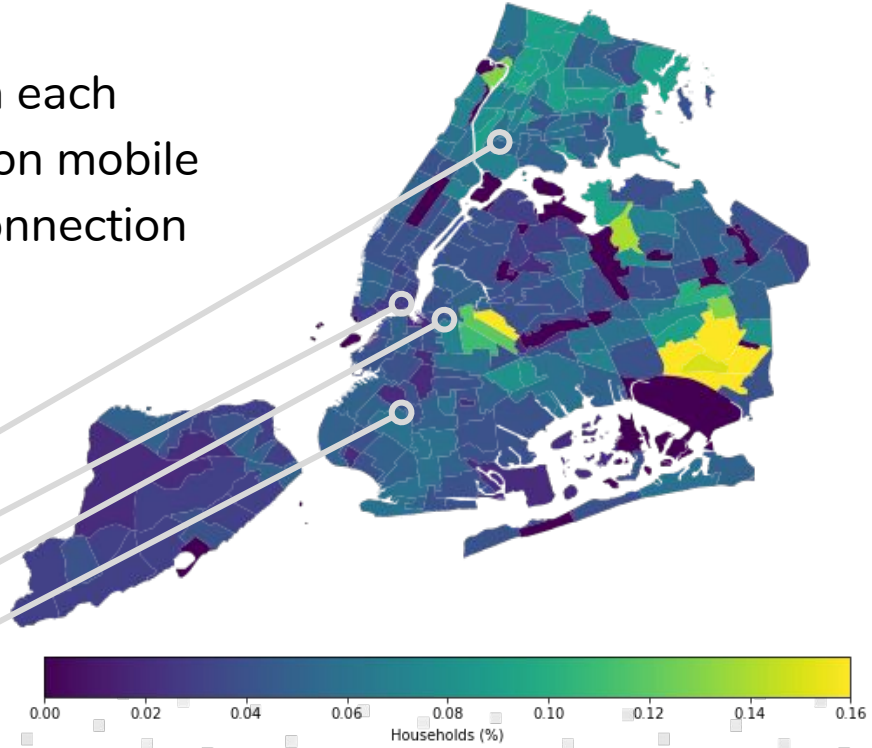
demand-side

Household Mobile Broadband Dependence Rate by NTA

< 10% households in each NTA depend on mobile broadband connection

Even in NTAs with low connectivity:

- Belmont Park
- LES
- Williamsburg
- Borough Park



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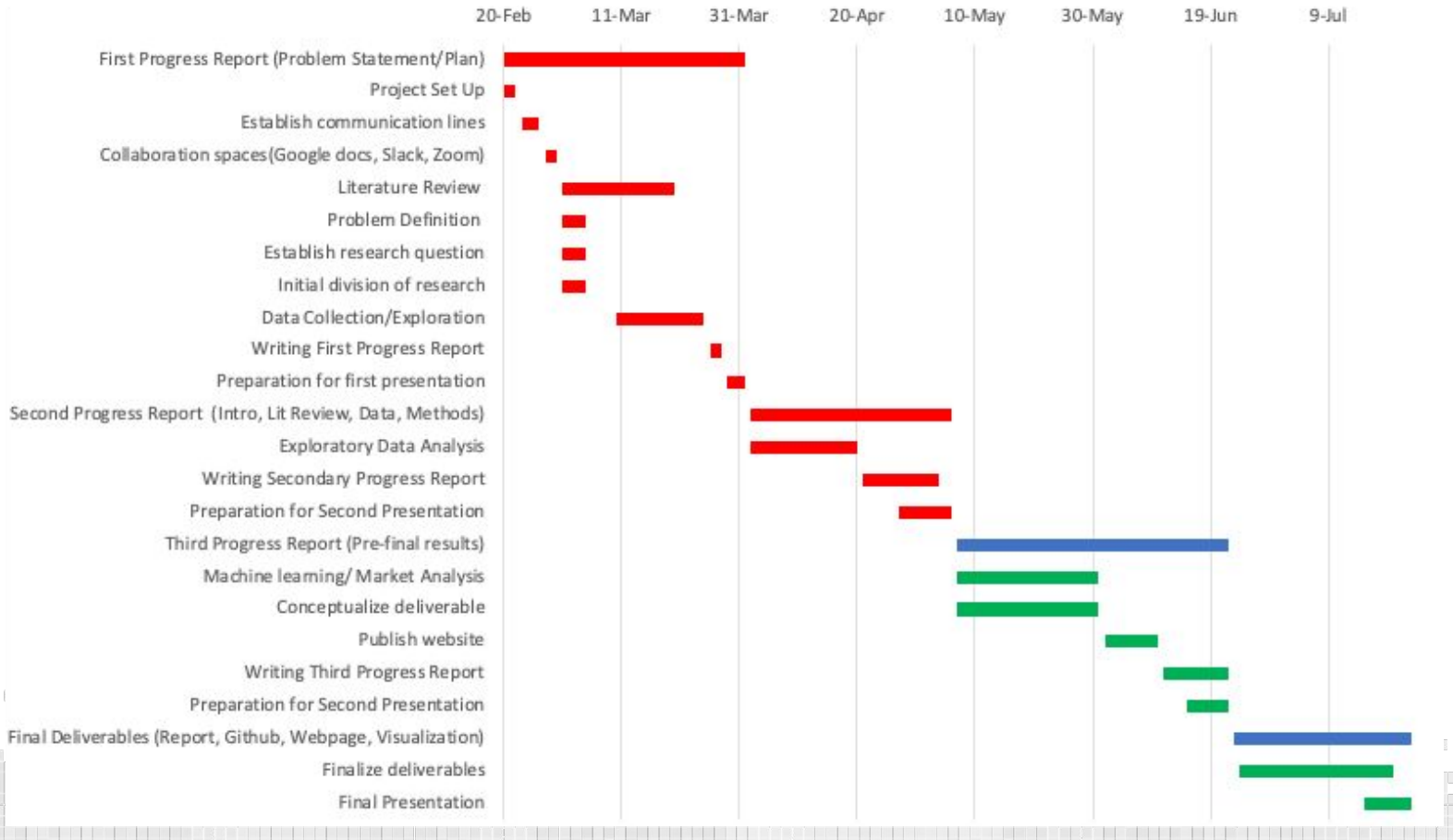
timeline



Risks and mitigations

- Data granularity
  - limited to Census Block
  - impacts accuracy of reports
- Proprietary data
  - Estimates from DoITT

Thank you