CTA "L" Lines and Stations

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Introduction

When we consider the traditional CTA network of the "L" lines and stations in Chicago, nodes in these networks cannot shifted or moved around because they are physical coordinates. Here, I change the way we think about the "L" lines and stations network which leads to different interpretation of how the city is connected via train.

Data Collection

data.cityofchicago.org

List of L Stations
- Stations names
- Identification number
- Color line(s)

L Station Entries, Daily Totals
- Station names
- Identification number
- Total daily rider entries at each station from 2001 to 2022
- Day type (weekday, Saturday, or Sunday/Holiday)

Data organization

- Column Data
  - Stations names
  - Station identification number
  - Line color
  - Average daily riders (M-F) in 2022
- 198 rows total – stations are repeated for each color line
- Note: Purple and purple express are treated as separate lines

Visualization

Edge weights are average station entries in 2022 (M-F)

Generated with Cytoscape
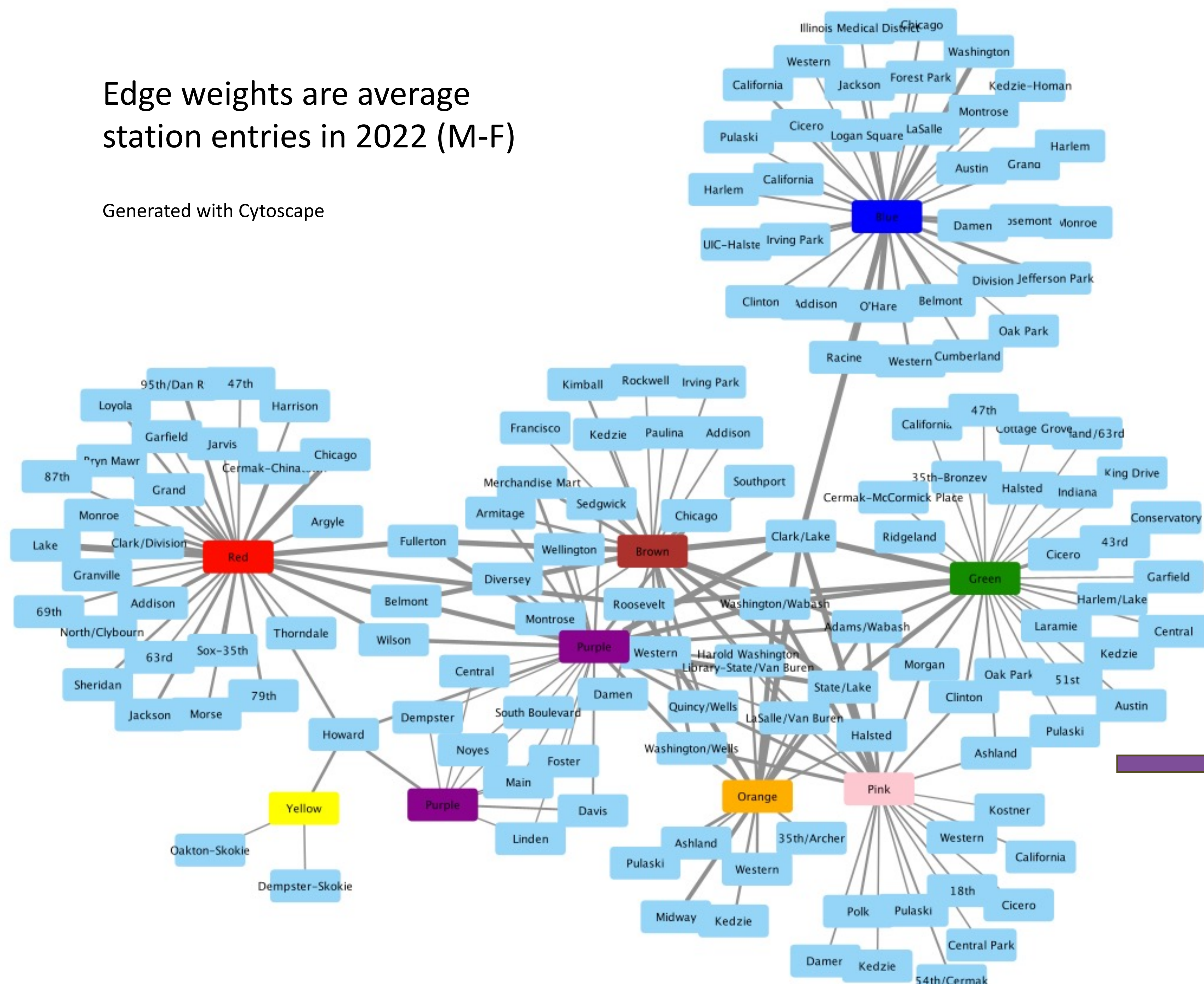
Network Properties and "L" Insights

Nodes & Links

$N_{lines} = 9$ — There are 9 L lines and 144 stations in Chicago

$N_{stations} = 144$

$L = 198$ — Total number of 198 links between lines and stations
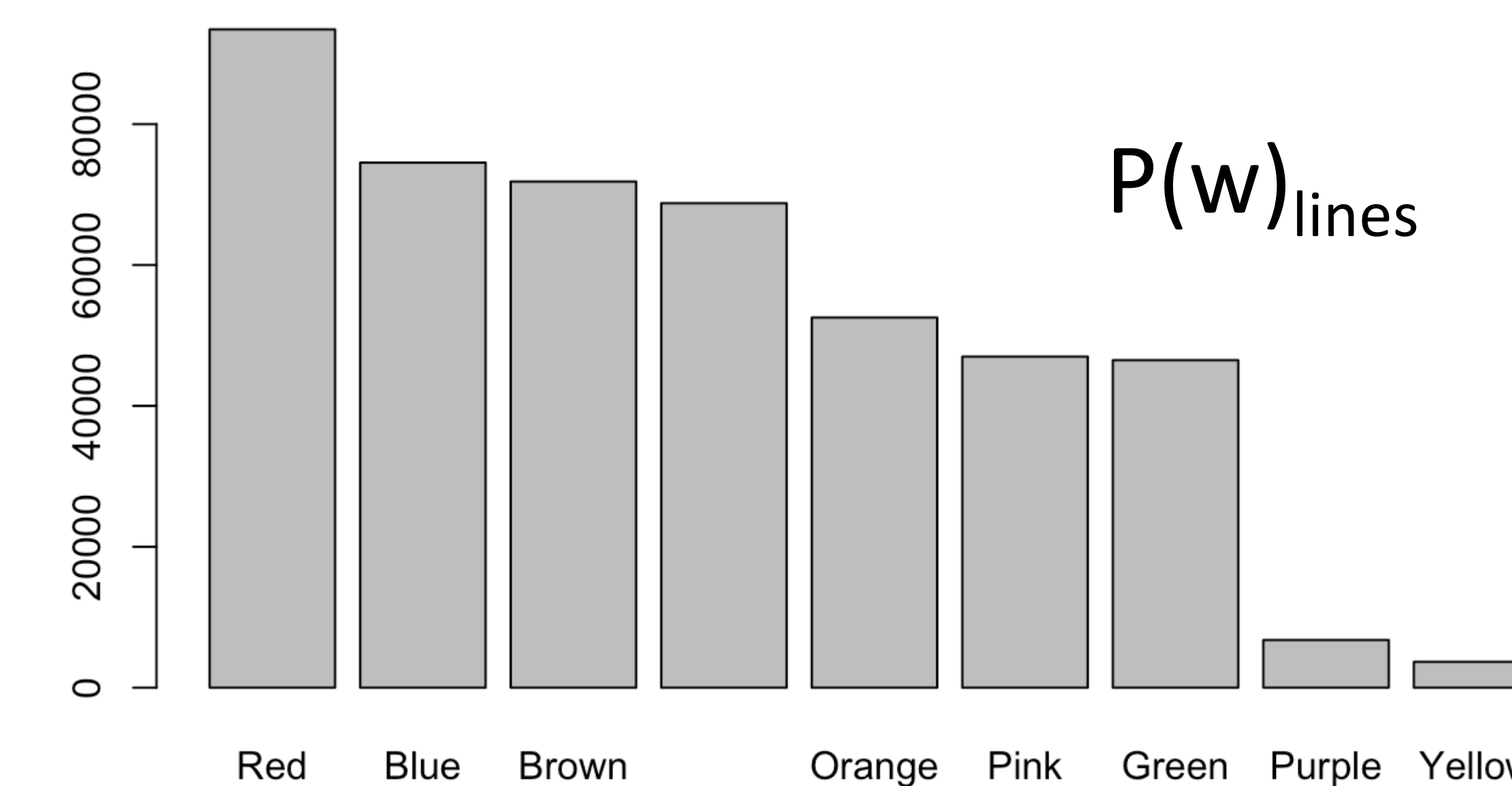
Path Lengths

Average path length includes lines and stations in this bipartite graph $\langle l \rangle = 3.72$

Network diameter = 6

To calculate average number of lines needed to get between two stations $\langle l \rangle / 2 = 1.86$

The greatest number of transfers to get between two stations is 3.

Weight Distribution

$P(w)_{lines}$

- Although the Red line has fewer stops than the Blue line, it has a greater average daily ridership during weekdays in 2022
- The Purple Express Line is much more popular than the Purple line
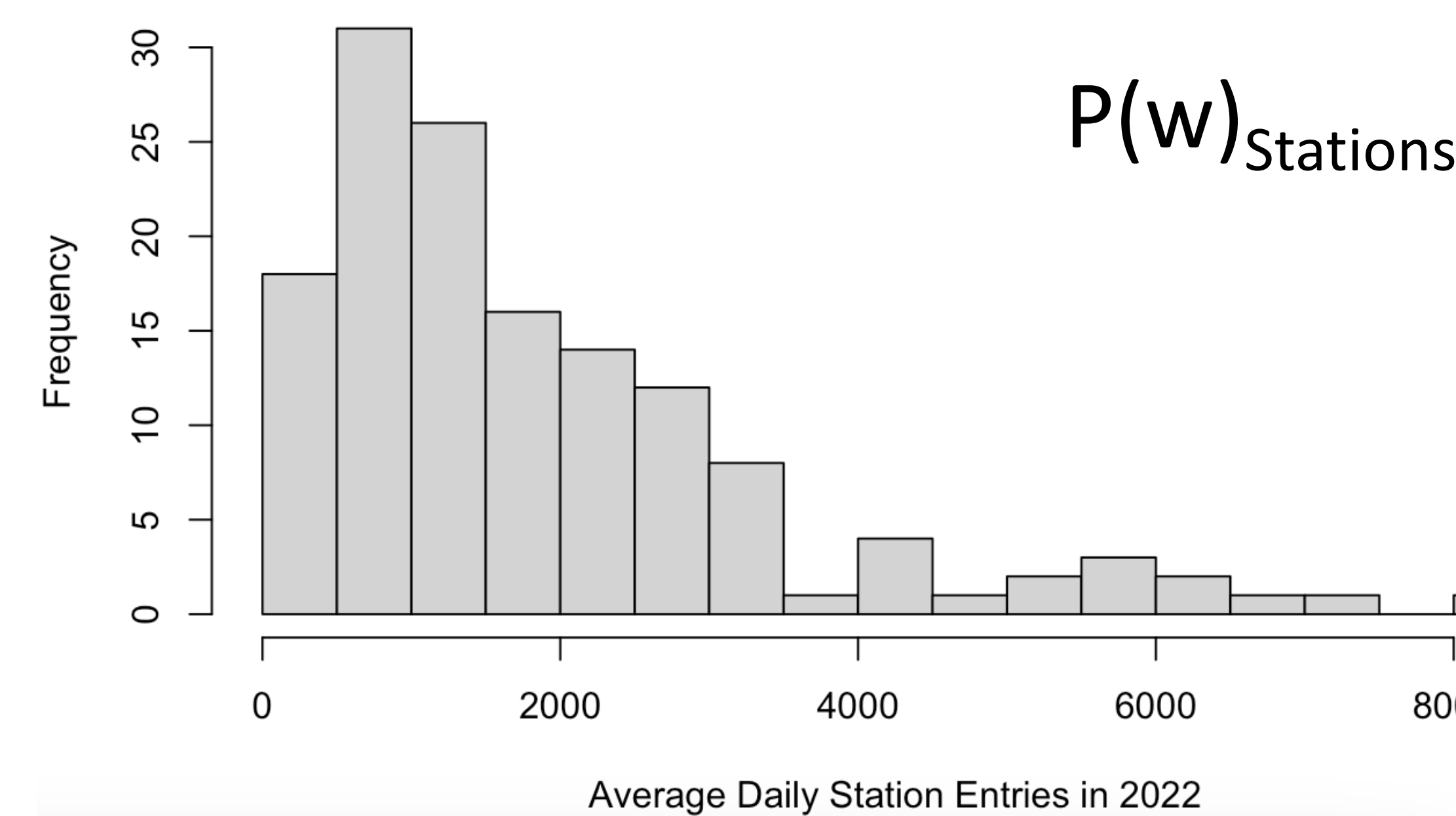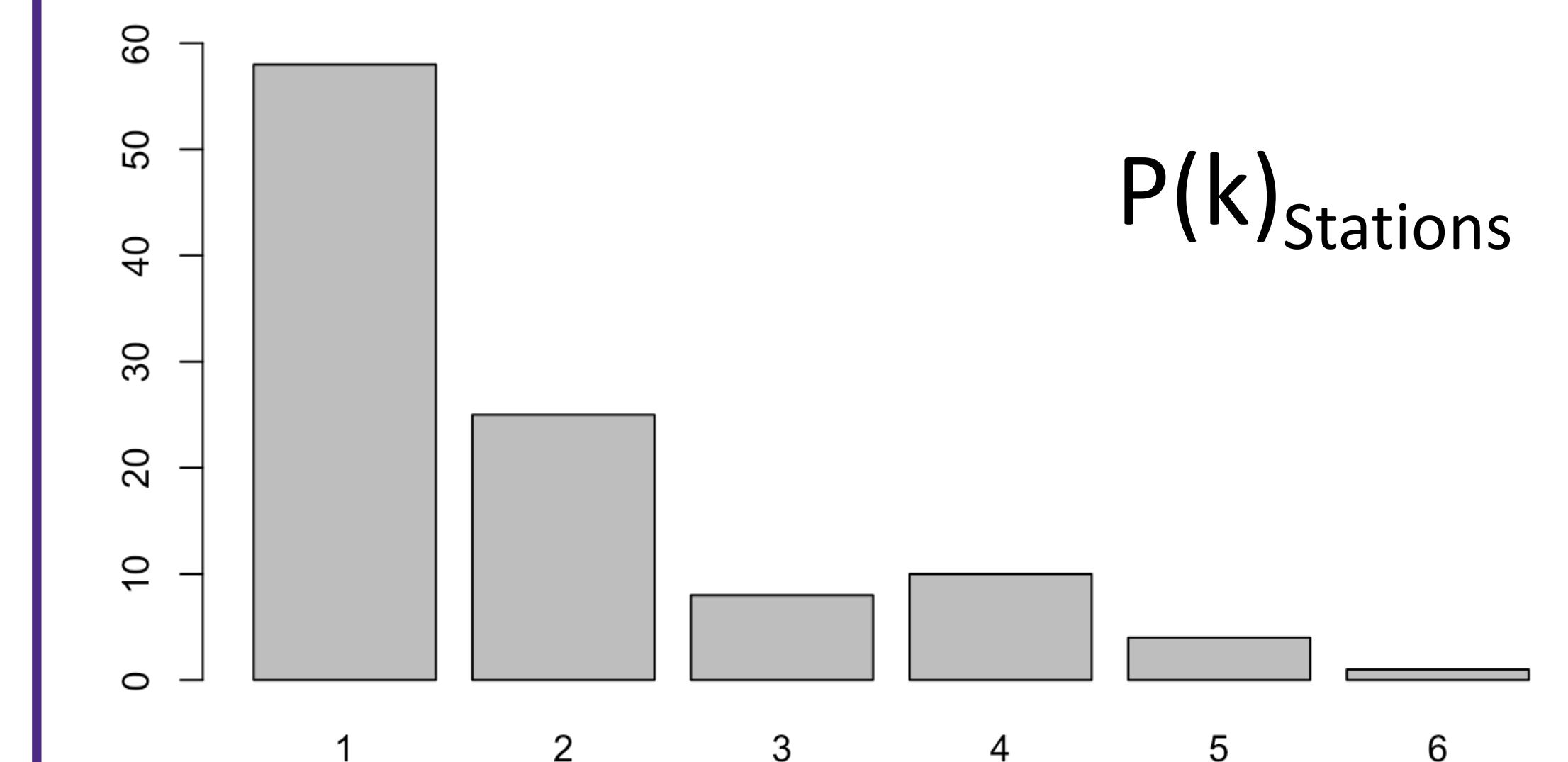

$P(w)_{Stations}$

- Most stations have fewer than 3500 daily entries
- The most popular station is Lake (Red Line) with over 8000 entries followed by Clark/Lake (6 lines)

Degree Distribution

$P(k)_{lines}$
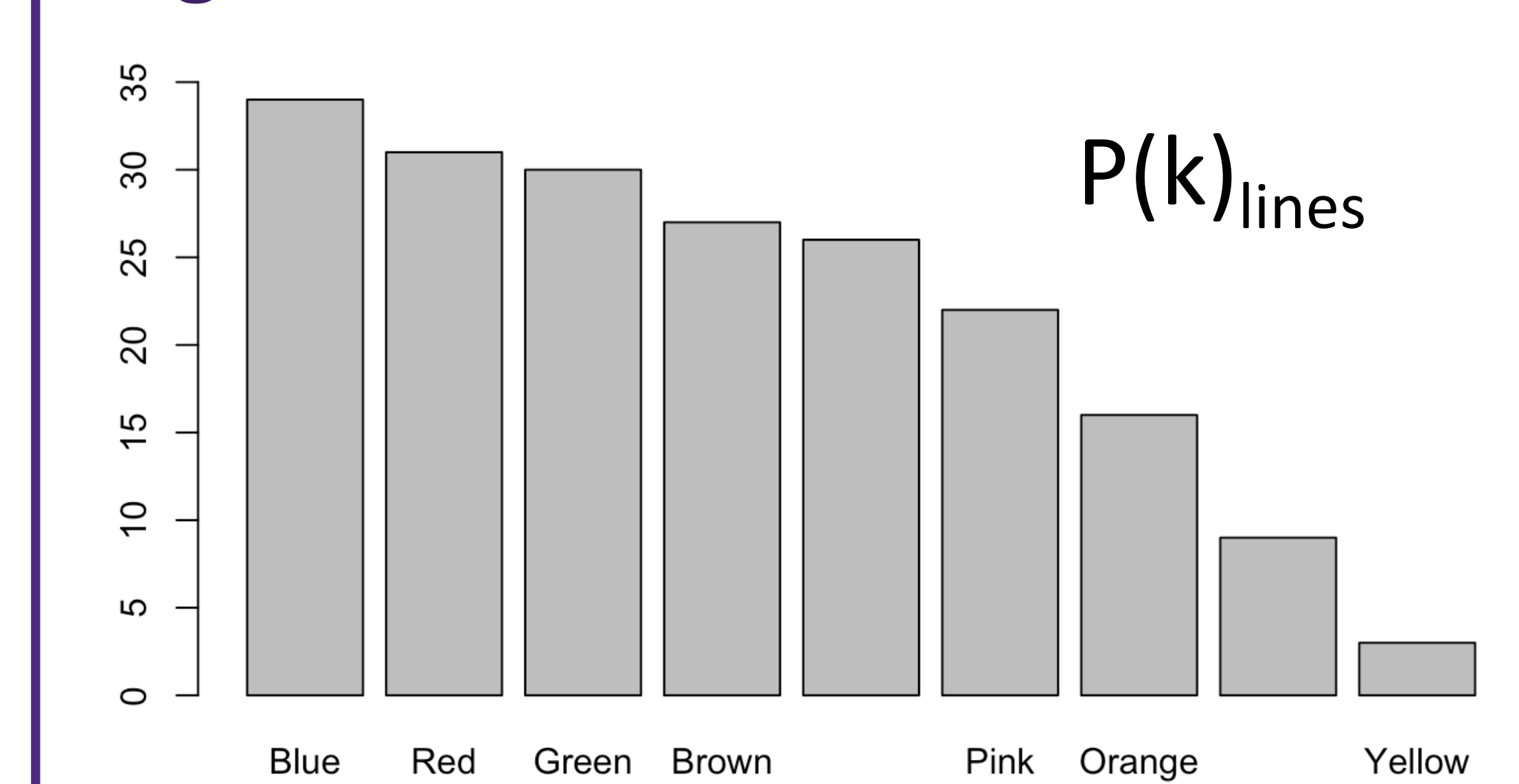
- The Blue line has the greatest number of stops with 34
- The Yellow line has the least number of stops with 3

$P(k)_{Stations}$

- 57 stations are only connected to one line
- One station (Clark/Lake) is connected to 6 different lines!

Observations

- Greater number of entries at stations where multiple train lines are accessible
- Community boundaries are clearer for Blue, Red, and Green lines, compared to Brown, Purple, or Purple Express lines
- Yellow line has only three stops

Conclusions

By investigating the CTA "L" lines and stations in a bipartite graph and adding edge weights of ridership, we can draw conclusions that summarize the different lines and stations separately.