BT3017 Project Report

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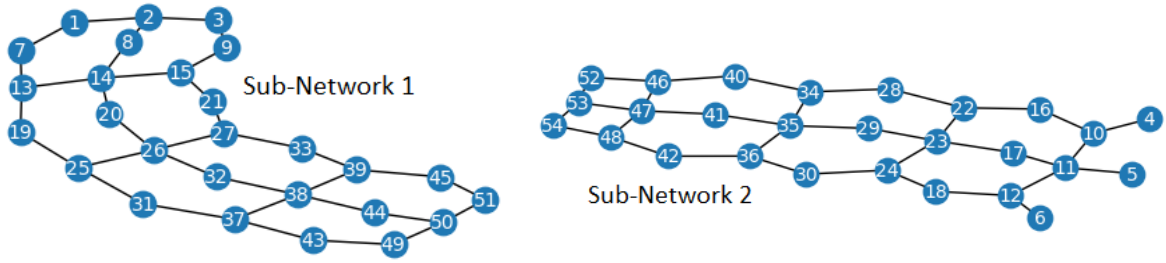
Objective 1

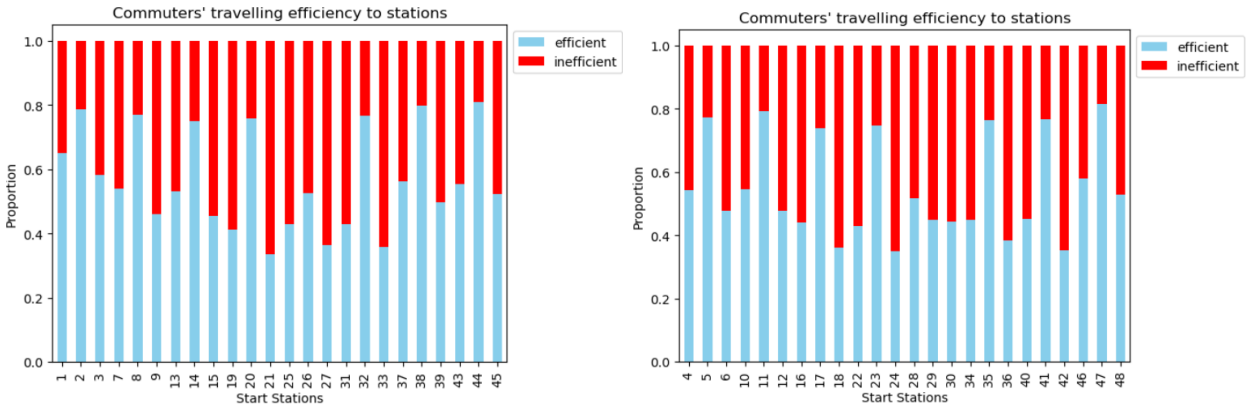
To shorten traveling time to allow commuters to reach their destination in the fastest possible time

Key Findings

By making use of graph techniques, the MRT network layout is established.



The MRT network is split into 2 separate sub-networks. With this information, it is now possible to find out the shortest time between any 2 stations or if any 2 stations are connected in the same sub-network.



Out of 100 000 commuters, 44 403 of them are not taking the most efficient route (not the shortest route) from their start to end point. This means that about 44.4% of commuters are taking a longer time to reach their destination. Moreover, the MRT network represents a rather dense graph, meaning that there may be multiple ways to get to the same station, thereby confusing commuters as to which stations to take.

Furthermore, from the graph, commuters that start from stations 21, 33, 27, 24, 42, 18 and 36 are more likely to take inefficient routes to their destination.

How can we use these findings to target Objective 1?

Inefficient traveling is a prevalent issue and this could be due to the lack of information on the MRT network layout. With the plot of the current network, MRT maps can be created to allow commuters to have a better understanding of the structure of the MRT

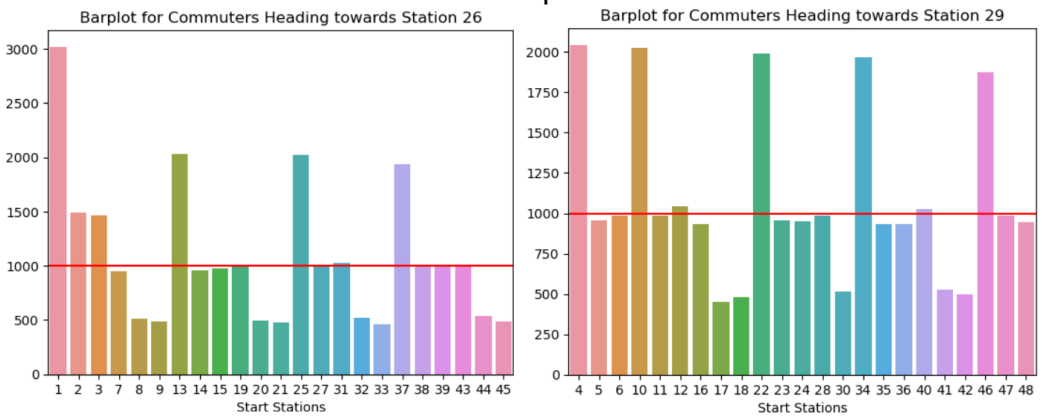
lines and stations. We also identified stations that commuters who take inefficient routes start from, more resources can be allocated to build directories in those stations to allow commuters to make more informed decisions about the most efficient route to take.

Objective 2

To reduce congestion during peak periods so that commuters will have a more comfortable journey

Key Findings

24.996% of commuters end their journey at Station 29 and 24.822% of commuters end their journey at Station 26. In their respective sub-network, around 50% of commuters end at stations 26 and 29. In other words, stations 26 and 29 are the most popular destination stations for commuters in their respective sub-networks.



For commuters who travel to station 26, a significant portion of them (>1000) start their trip from stations 1, 13, 25, 37, 2, 3, 31 and 43. For commuters who travel to station 29, a significant portion of them start their trip from stations 4, 10, 22, 34, 46,12 and 40.

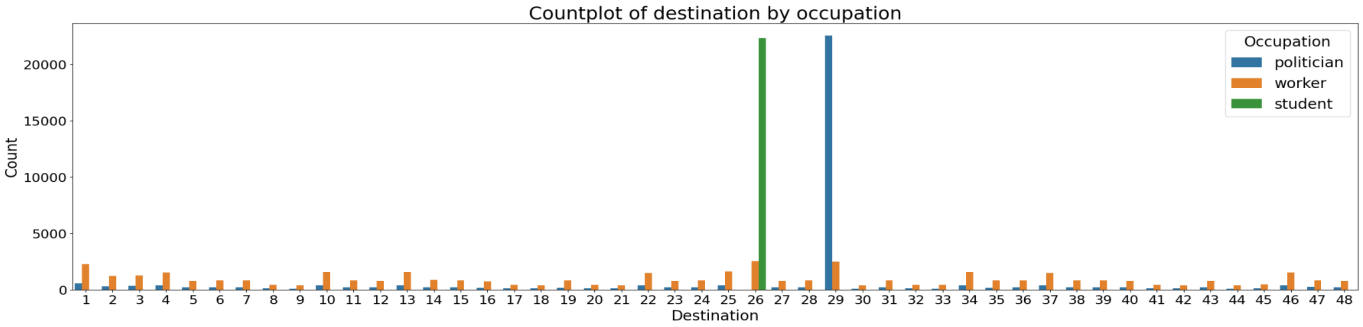
How can we use these findings to target Objective 2?

Through identifying the popular destinations of commuters (Station 29 & 26), new bus services can be launched to transport commuters to these 2 stations. By identifying the aforementioned stations, where most commuters with Station 29 & 26 as their destinations start from, bus service routes can be introduced, targeted at these stations, to lighten the load of MRTs and reduce congestion during peak periods. To properly plan the bus routes, more data on the geometric distance between stations is needed.

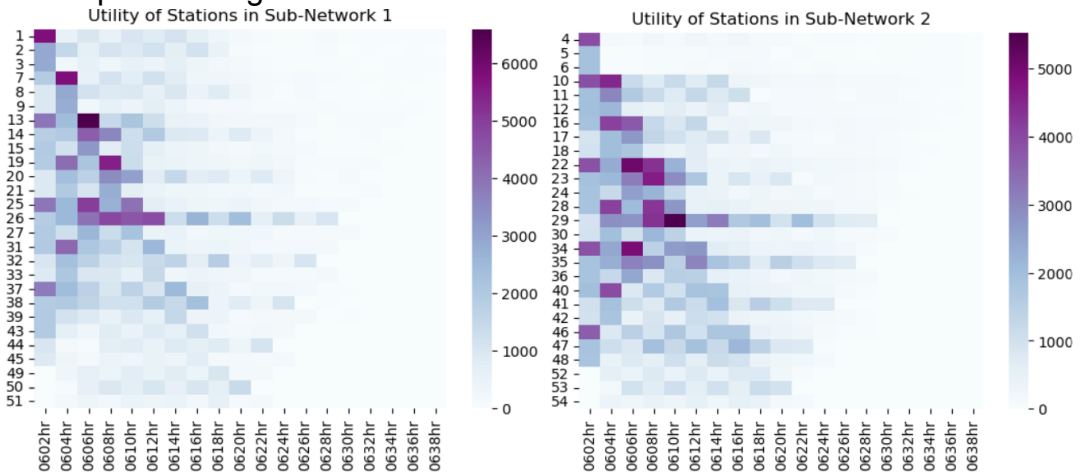
Objective 3

To increase connectivity and provide greater accessibility between MRT networks so that commuters can enjoy a wider range of facilities.

Key Findings



1. All 22306 students end their journey at Station 26, suggesting that a school is likely to be located in the vicinity of Station 26. This also means that all students only travel in the first sub-network. Students from sub-network 2 may not be taking the MRT as their sub-network does not allow them to reach Station 26. This can also mean that there may not be a school in the vicinity of a station in sub-network 2. Hence, they may choose alternative modes of transport such as PHV.
2. About 90% of commuters (24996) who end their journey at Station 29 are politicians (22504). We can infer that Station 29 is likely a government office where politicians go to work.



3. Station 51 and Station 54 are under-utilized in sub-network 1 and sub-network 2 respectively.

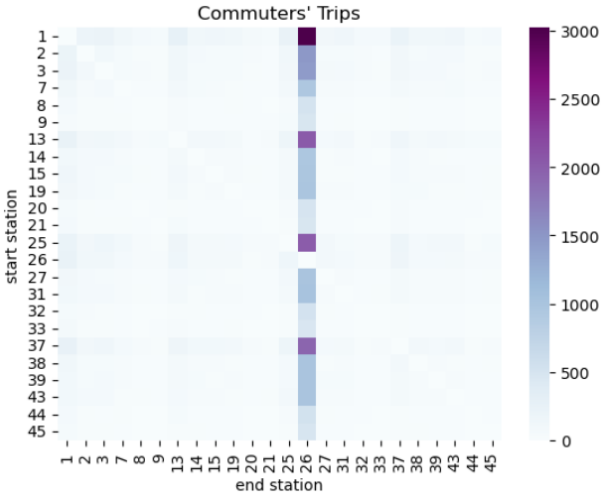
How can we use these findings to target Objective 3?

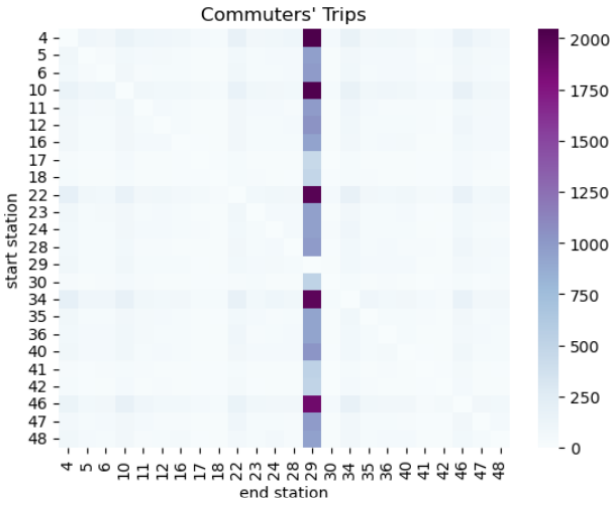
1. 25.84% of students start their journey from either station 2 or its adjacent station (1,3,8). With this information, schools can be build in the proximity of station 2 to shorten student's to school and reduce congestion during peak hours
2. The current MRT system seems to be 2 separate networks. It is inconvenient for commuters who want to travel from one sub-network to the other. With the information of under-utilized stations in each sub-network, Station 51 and 54 can be linked to improve connectivity and bring more traffic to under-utilized stations. Students living in sub-network 2 can access Station 26 and Politicians living in sub-network 1 can access Station 29.

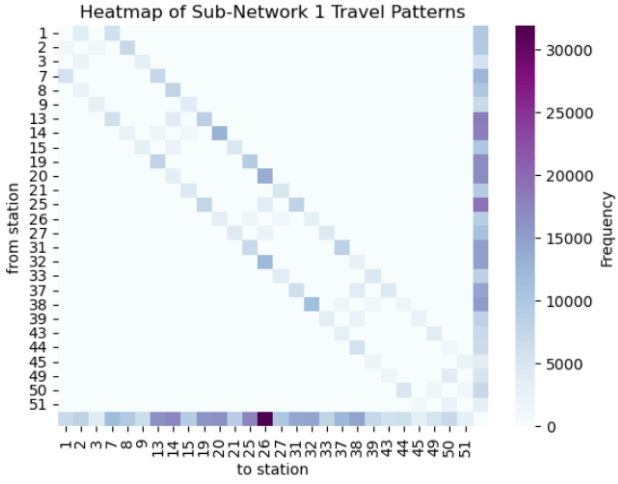
Appendix

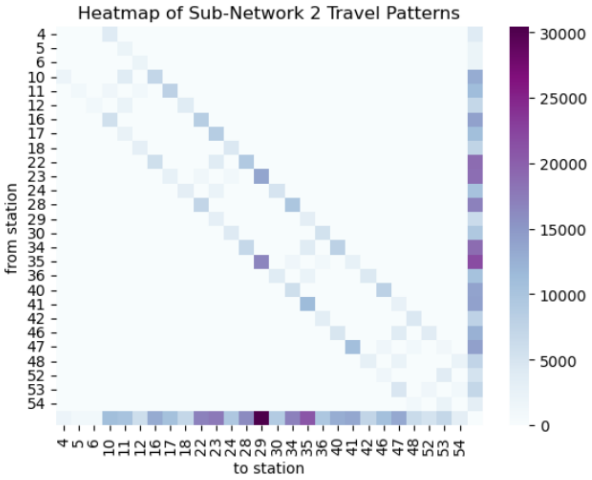
Libraries used:

1. Networkx (to plot MRT network)

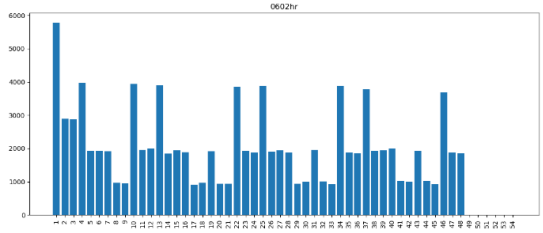








Peak Stations by timings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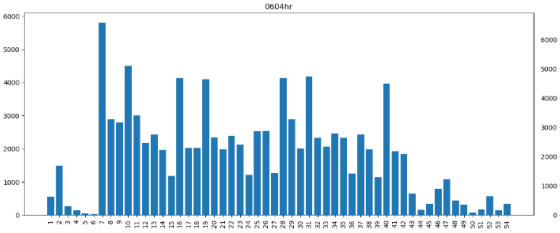
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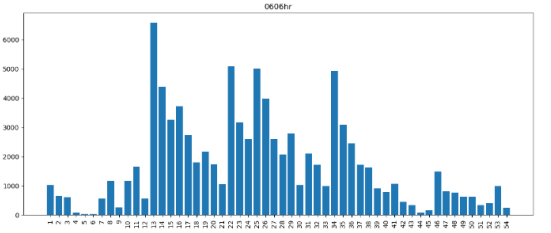
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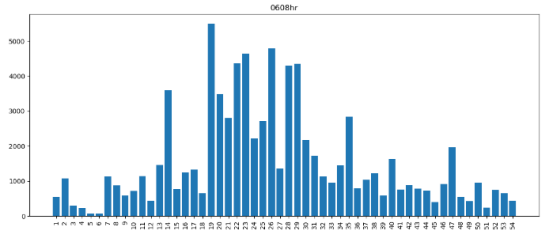
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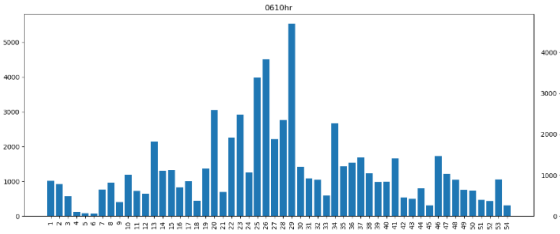
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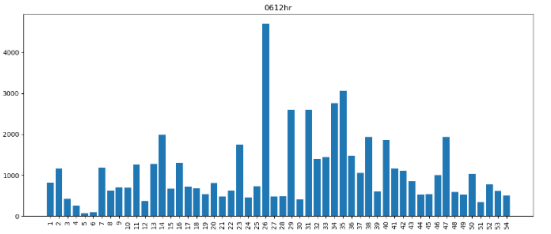
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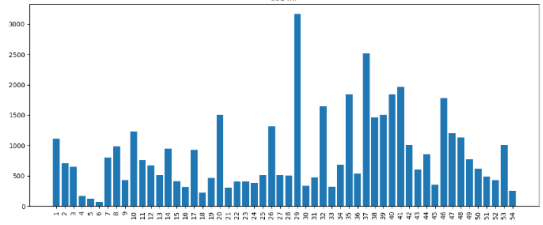
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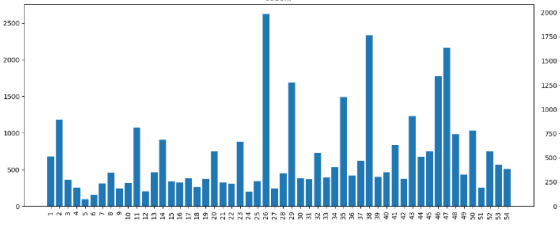
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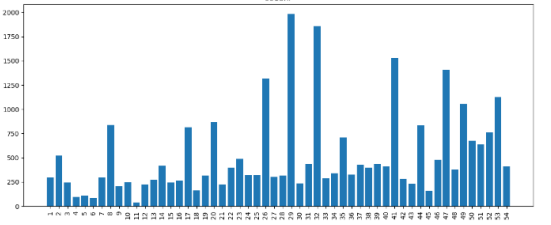
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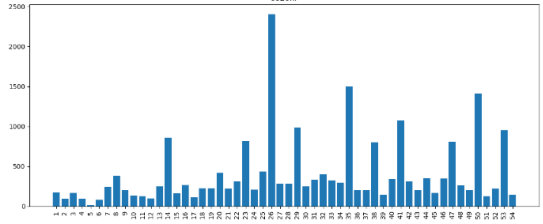
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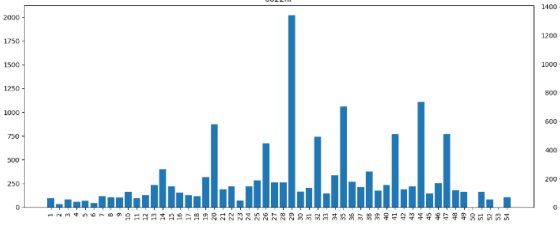
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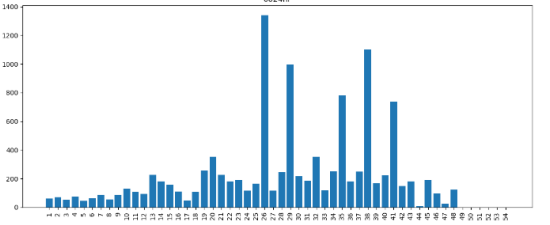
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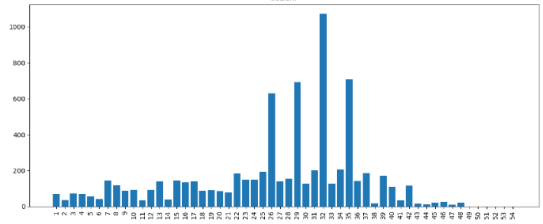
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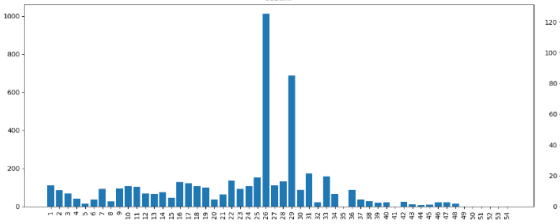
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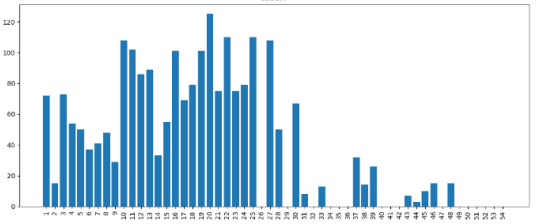
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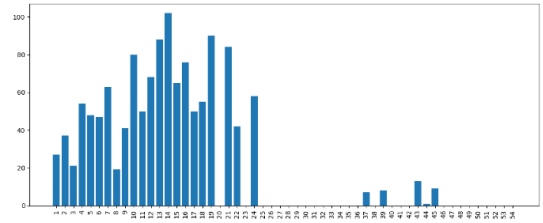
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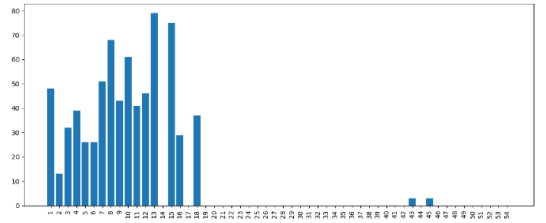
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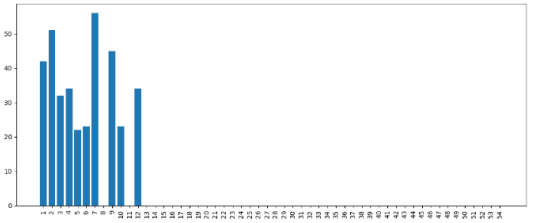
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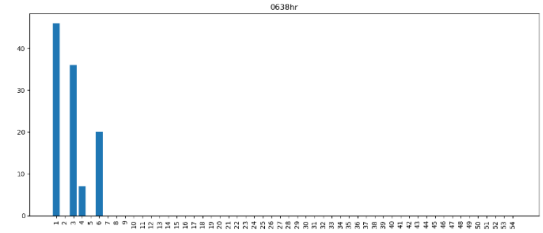
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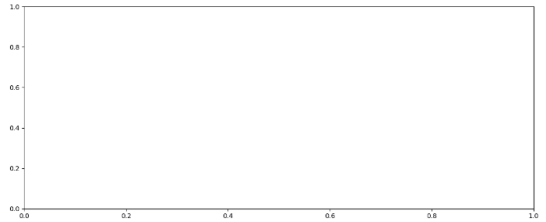

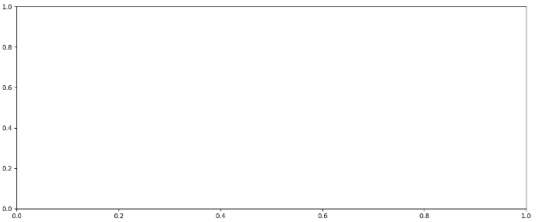

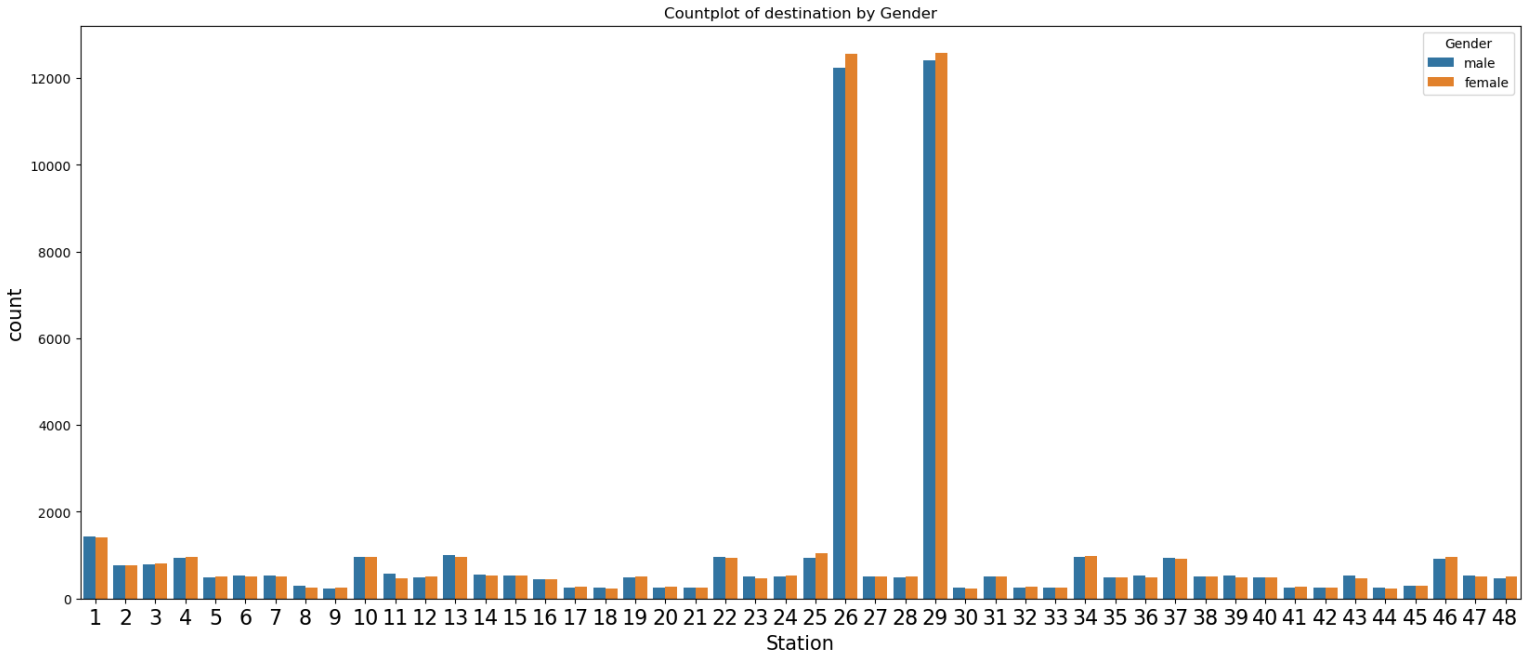

Limitations

The following assumptions were made:

- The commuters start their journey at 0602hr
- The data provided represents all the possible routes in the MRT network
- There is only 1 school at station 26
- Time taken to transit between lines are negligible
- It takes 2 minutes to travel from one station its adjacent station, there are no intermediate stations within the 2 minute timeframe