Data Visualisation Assignment 5

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1. Introduction

The Galway City Council has provided 2 datasets to tackle the immense traffic congestion in the junction outside the Insight building. One of the dataset provided is about the traffic related to the N59 Moycullen road and the other Dataset is about the turning count at the junction. The given task is to identify the traffic congestion in the area and the various vehicle types that contribute for it. Then based on this findings, it is needed to be suggested to provide new bus route recommendation and frequency suggestion from the Moycullen road to the University via the Insight centre. Finally, a case has to be provided to suggest a greenway cycle path for this same route for the commuters. In order to achieve these visualisation tasks, Tableau is used.

2. Data Pre-processing

The given dataset is not in a suitable format which can be accessed by Tableau. Therefore, adequate data transformation has to be done in order to make it executable. Now, the various methodologies that were considered and performed for successful pre processing of the two datasets are to be discussed below.

2.1 For Site 9 Moycullen Road Dataset

There are 3 sheets present in it namely Summary, Eastbound and Westbound.

In this, Summary provides the overall details about the total traffic in Moycullen road from 18th to 24th November 2016. The eastbound represents the traffic moving towards the Galway city from the Moycullen road and the westbound represents the opposite traffic moving towards the Moycullen road from Galway City. There are 11 different vehicle classes identified in the traffic which are as follows,

Class	Description
1	Cyclist
2	M/Cycle
3	Car
4	Van
5	Rigid 2 Axle
6	Rigid 3 Axle
7	Rigid 4 Axle
8	3 Axle HGv
9	4 Axle HGV
10	5+Axle HGV
11	Bus

In the Summary, the data is broadly split into 3 types, traffic from 7 am to 7 pm, morning peak hour 8 to 9 am traffic and evening peak hour traffic from 5 to 6 pm.

In order to perform minute analysis properly, along with this broad time range, the traffic per each 15 minute interval is found for all 7 days in both eastbound and westbound. This is done with the intention to get accurate traffic congestions.

2.2 For Junction Turning count dataset

In this dataset, there is a junction with four roads which are as follows,

The main road through the junction is the N59. Traffic coming from direction B is from the (North Western) townlands around the N59 and the larger towns of Clifden, Oughterard and Moycullen.

Traffic turning into A is going to the IDA Business Park, including the Data Science Institute (Insight)

Traffic turning towards C can head toward the central part of the university campus and Galway city

Traffic heading towards D can enter the northern part of the university campus at Corrib village. This traffic also goes to the city.

There are 10 vehicles considered in this dataset namely,

PCL: Pedal Cycle

MCL: Motorcycle

Car: Cars, 'people carriers' and other passenger vehicles

Taxi : Taxi Vehicles
LGV: Light Goods Vehicle; All car type delivery vans and those of the next larger carrying capacity such as transit vans.
OGV1:(Ordinary Goods Vehicle 1) All larger rigid vehicles with two or three axles including larger ambulances with double rear wheels, tractors (without trailers), road rollers for tarmac pressing, box vans, similar large vans and middle-sized trucks which have double rear wheels
OGV 2 (Ordinary Goods Vehicle 2) all rigid vehicles with four or more axles and all articulated vehicles. Also included in this class are OGV1 goods vehicles towing a caravan or trailer.

CDB: City Direct Bus

BEB: Bus Eireann Bus

OB : Other Bus

This dataset is for only the 22nd November 2016 Tuesday. Now in order to make it executable, the columns are transformed in such a way that time is considered as one column and route is considered as one column with the 10 vehicles as each column and a total of them as one. This is considered for all the roads to and from the Moycullen road in order to make future suggestions.

3. Periods of Traffic Congestion

In order to find the periods of the traffic congestion , one needs to understand the total traffic in the area first.
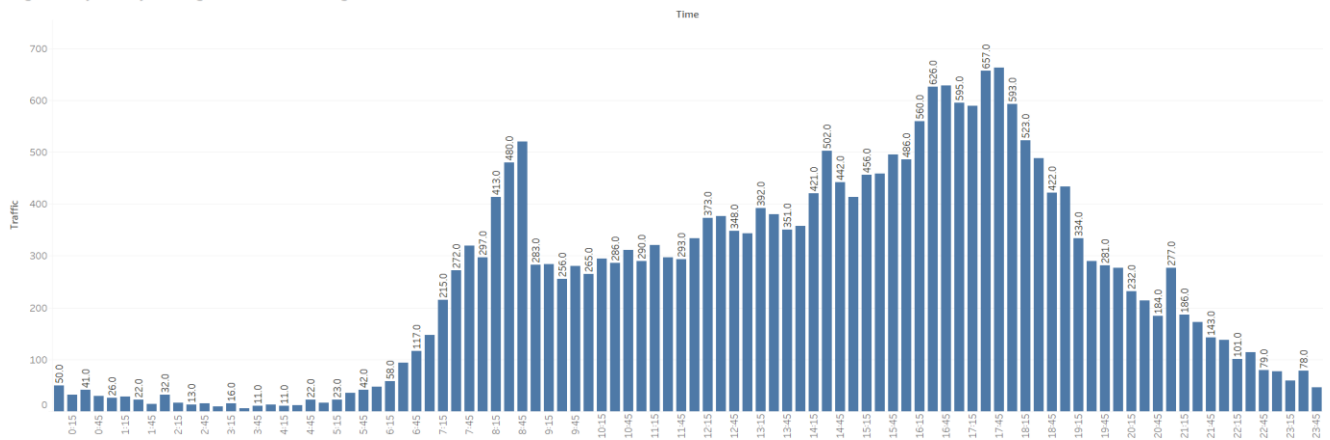
From the fig 1 below, one can get the total traffic in the moycullen road for the 7 days both in the eastbound and westbound directions. This initially gives an outlook of how much are the traffic in a daily routine. From the initial impressions, it is seen that the traffic in the weekends are much less when compared to the weekdays for both the directions. Also, it is seen that the traffic towards the eastbound is always slightly greater than the one towards the westbound. In this, 19th and 20th are Saturday and Sunday respectively which influences us to consider it as weekend.

Fig 1-Total Traffic in Site 9 Moycullen Road

Figure showing Total Traffic by Date and Measure Names (Eastbound, Westbound) for 18–24 November 2016.
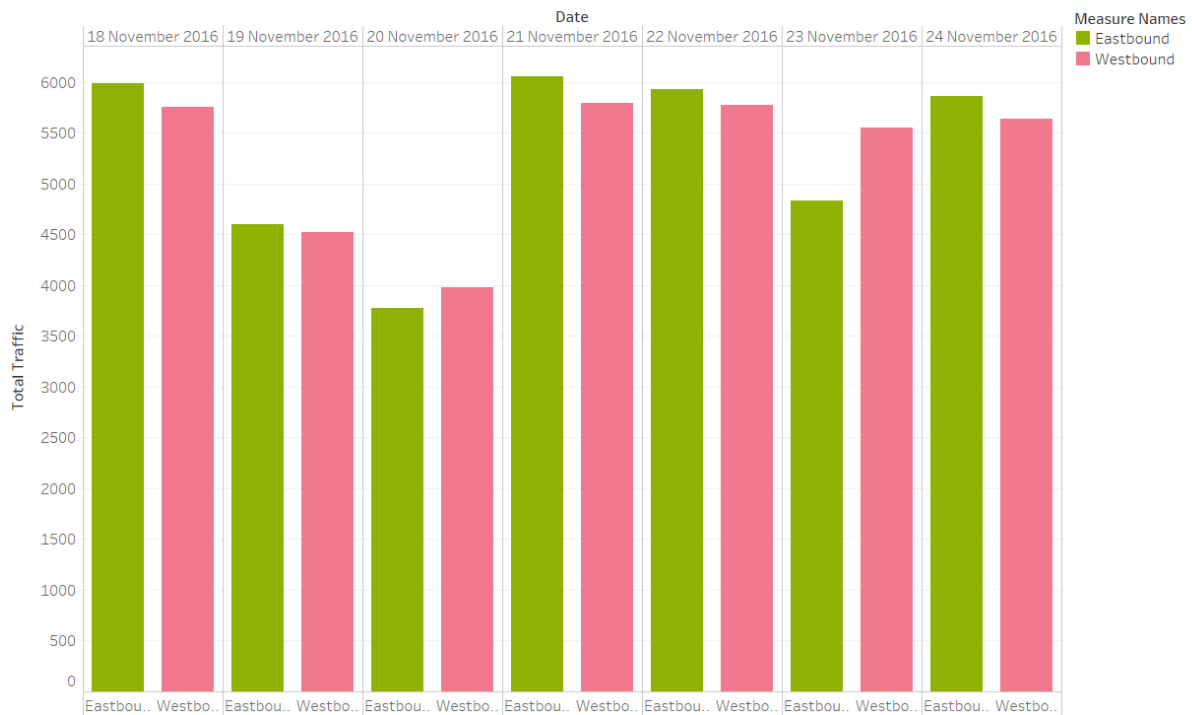
3.1 For East Bound

Fig 2-7 day hourly average Traffic according to time - Eastbound

From fig 2, it is seen that the traffic congestion is minimal from 11 pm till 7 am in the early morning. Most traffic congestion occurs in the evening time from 4 pm to 6 pm respectively followed by the morning traffic from 8 to 9 am. It is seen that there is a steady traffic during the noon and afternoon which indicates that there is regular vehicular movement in the area.

3.2 For westbound

From fig 3, it is seen that that the traffic is similar to eastbound in the early morning and late night. But the traffic begins to grow rapidly for the morning 7 to 9 am and evening 5 to 6 pm hours respectively with maintaining a steady flow of traffic for the afternoon period. Here, it is seen that the night traffic reduces rapidly when compared to east bound which suggest that it is going towards a residential area where people will either go away from it for activities or stay back at home once after office.

Fig 3-7 day hourly average Traffic according to time - Westbound
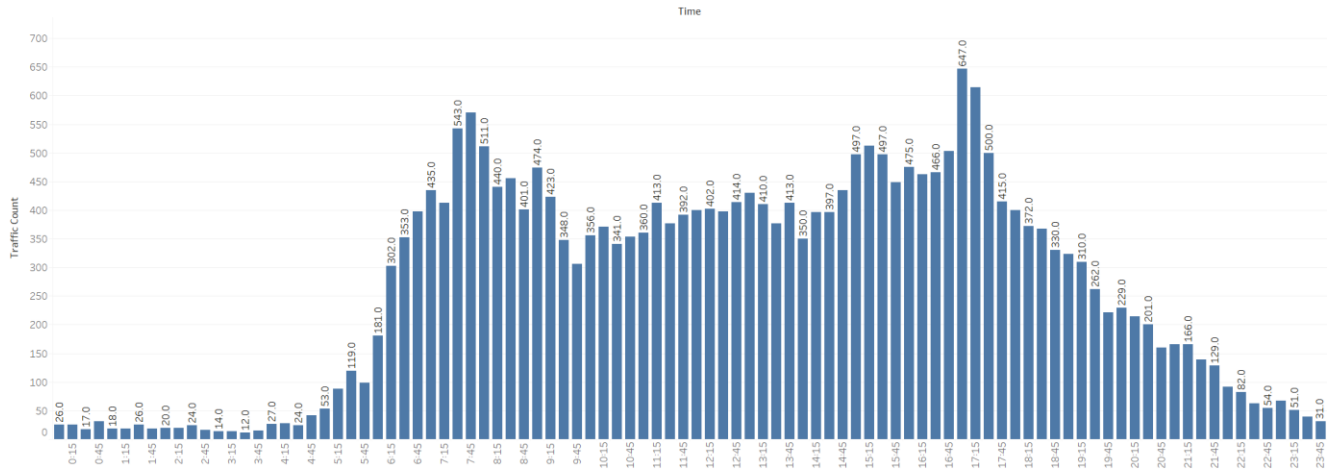
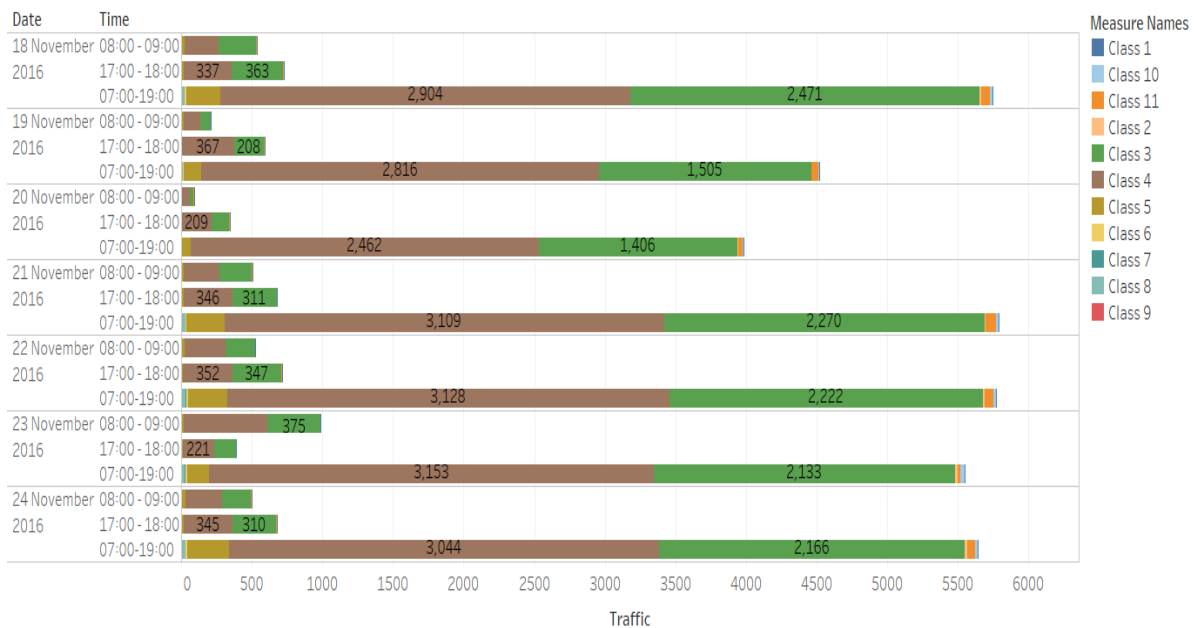## 4. Distributions of vehicle types contributing to daily traffic

In the above figures, the traffic congestion is provided only for the total count. Now, the individual classes split is being tried now to understand the various commuters that contribute towards the traffic.

Fig 4.1-Traffic towards- Eastbound
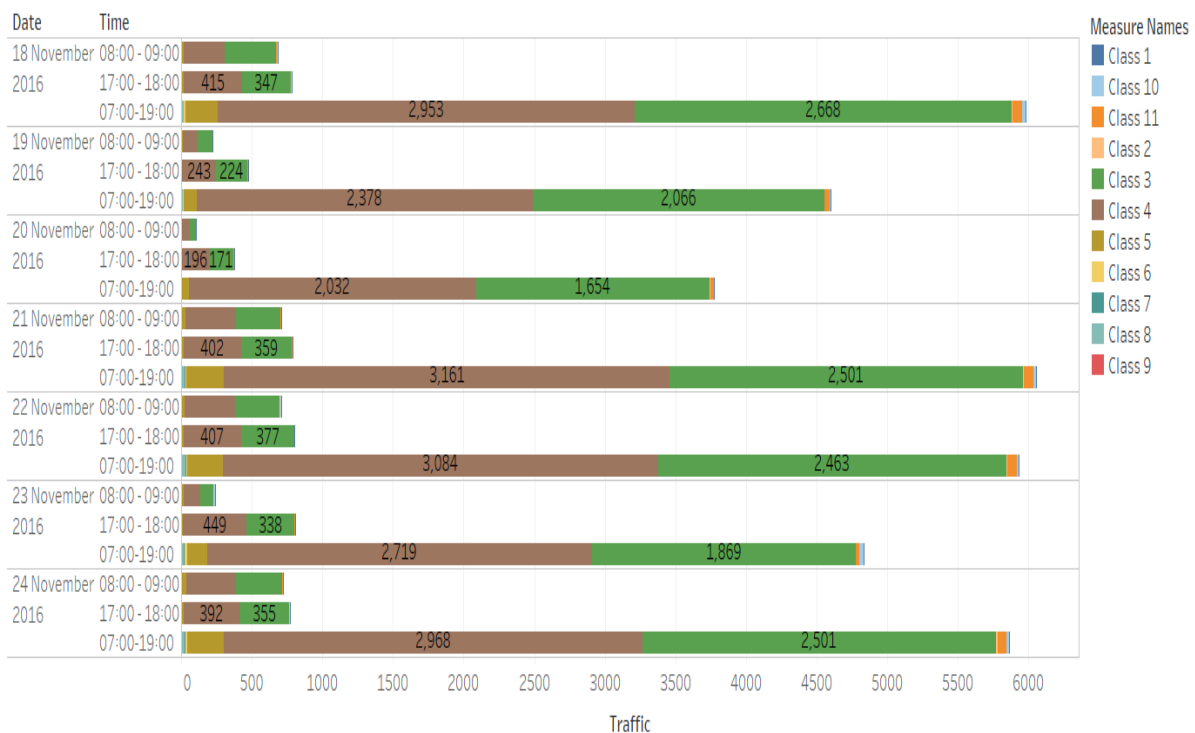
In the fig 4.1, time is split based on the summary sheet in which 3 cases of morning peak hour of 8 to 9 am , evening peak hour of 5 to 6 pm and overall time 7 am to 7 pm is considered. In the east bound it is seen that the traffic in the evening peak hour is always higher than the morning peak hour . For all the 3 days and across 7 days, the class 3 and 4 are the major contributors to the traffic. There are seen to be as car and van respectively.
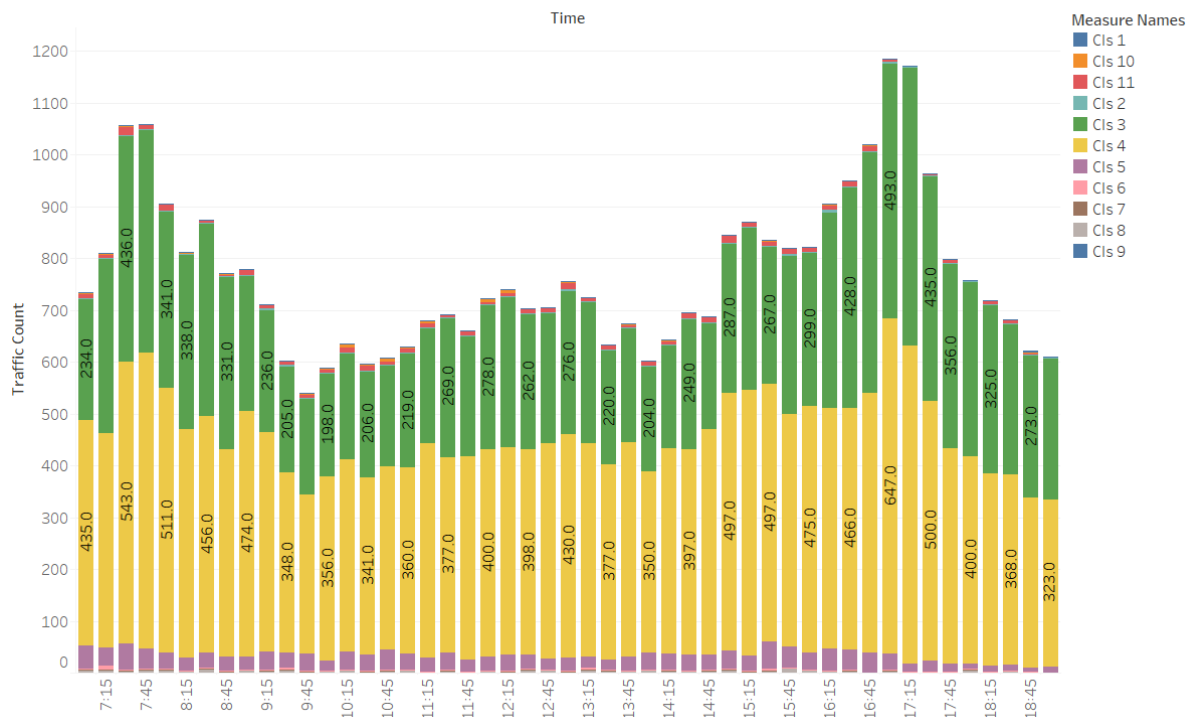
Fig 4.2-Traffic towards- Westbound

In the fig 4.2, the similar pattern is seen again like it was in the case of eastbound. Here also evening peak hour traffic is greater than morning and the class 3 and 4 are the major traffic contributors.

4.1 Hourly distribution of vehicle types for traffic

Fig 5-Hourly Traffic Westbound based on vehcile types

From the fig 5, it is seen for westbound that the overall traffic is maximum at the evening peak hour from 5 to 6 pm followed by morning peak hour of 8 to 9 am. It is seen that class 4 fan is the major contributor to the traffic followed by cars and others being negligible.

Fig 6-Hourly Traffic for Eastbound based on vehcile types
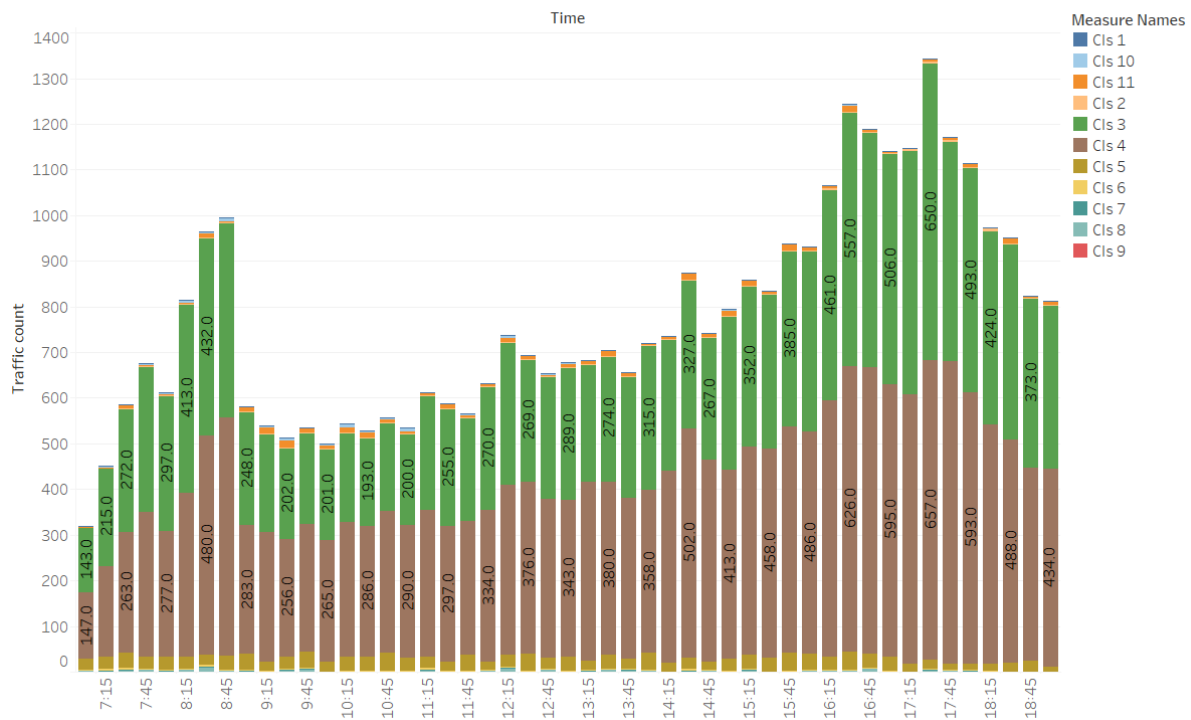
In the fig 6, it is seen that overall traffic pattern is similar to east bound with the highest traffic congestion in the evening peak hour followed by morning and the classes 4 and 3 namely van and car being the most frequent traffic creator like in the above cases.

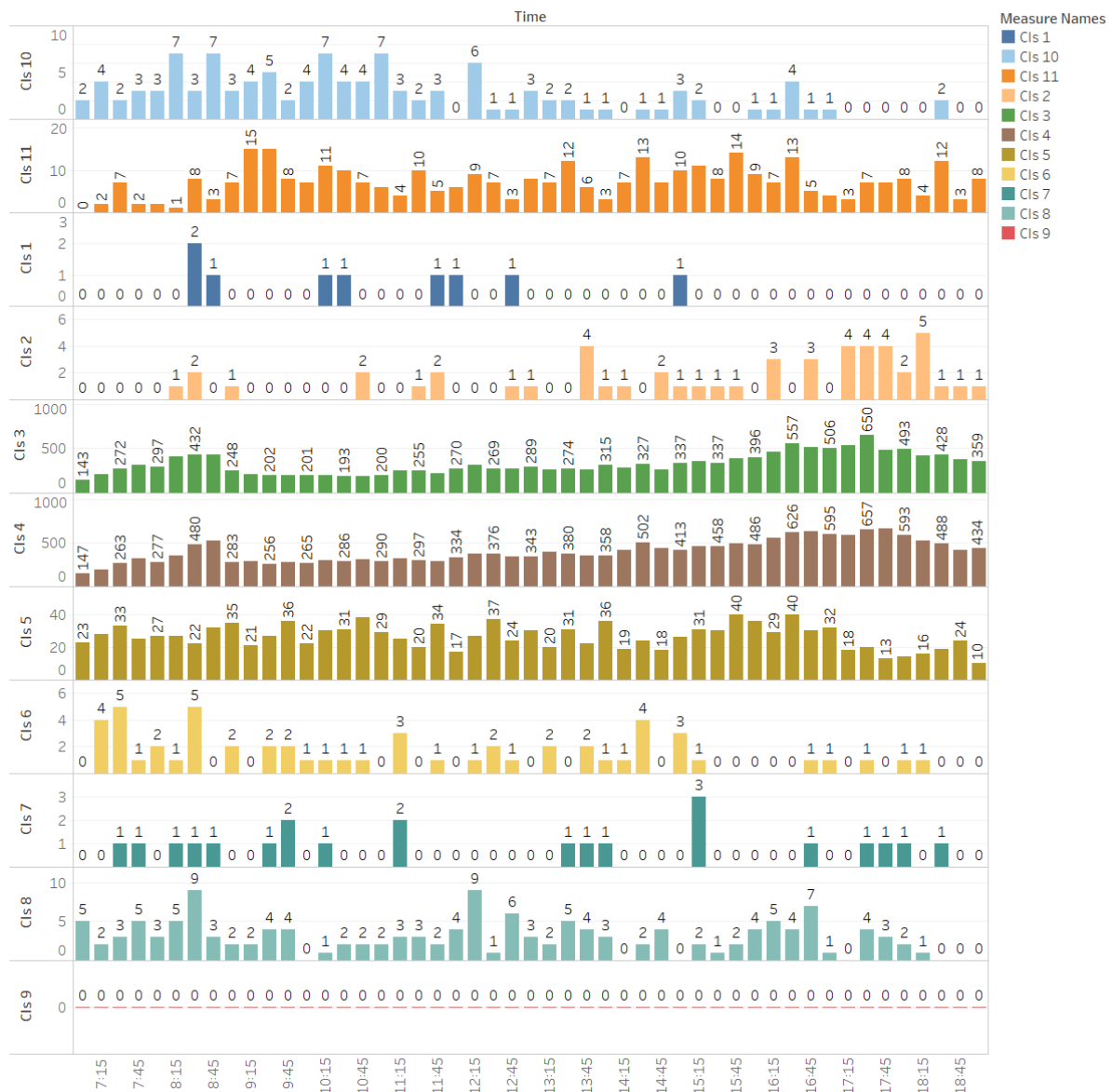**4.2 Each vehicle type contribution to traffic congestion in eastbound**

From the figure 7, the traffic congestion based on each vehicle type count is obtained for the 7 day values. In this it is seen that the classes 3 and 4 are the major contributors .They are car and van respectively and they contribute nearly 90% of the total traffic.

Class 5 to 10 are for various multi axils which are seen.

Class 1 is cycle and it is seen that it is very low in number due to the absence of separate lane.

Class 11 is for bus and it is seen that it is less in number.

Fig 7-Traffic Congestion based on vechile type for east bound

4.3 Each vehicle type contribution to traffic congestion in westbound

In fig 8, the vehicle type traffic congestion in westbound is seen. The classes are similar to the one in the east bound and the similar pattern is seen here also. Therefore it can be concluded that cars and vans are the major contributor to the traffic congestion in both the cases across all the days and time respectively.

Fig 8-Traffic Congestion based on vechile type for west bound
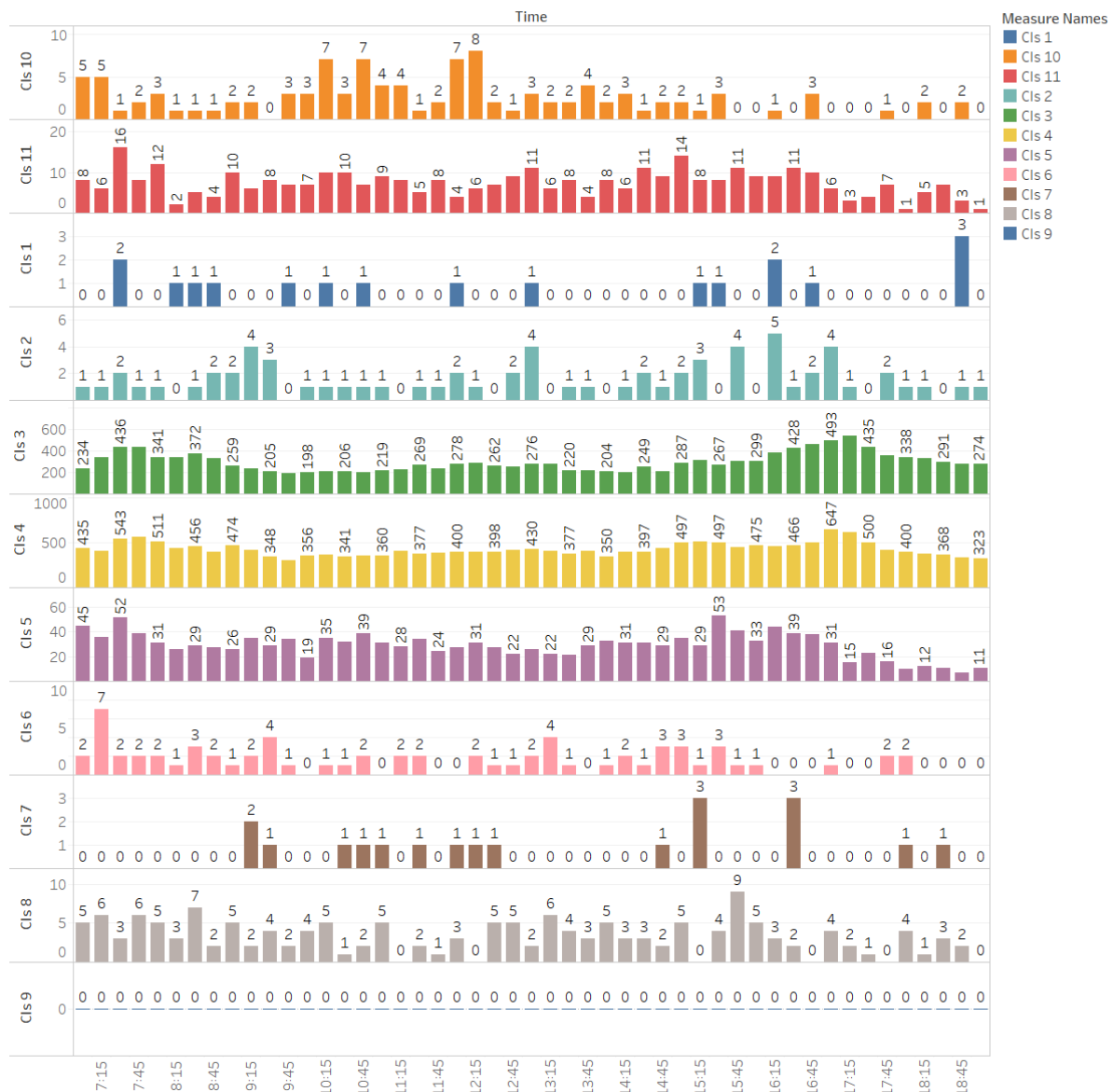
5. Bus route suggestion

Now, bus route has to be suggested from the Moycullen road to the University through the Insight data centre. In order to perform this, certain assumptions are to be made. From the figure 9, the total turning count to and fro the moycullen road and insight centre and university is seen. This is taken from the Tuesday November 22nd 2016. From this it is seen first hand that car commuters are maximum throughout from 7 am till 7 pm. It is also seen that the bus Eireann is minimal and other buses also is minimal and city direct bus frequency is zero. There is also a small amount of commuters who consider using taxi in the day.

Fig 9- hourly junction turning count
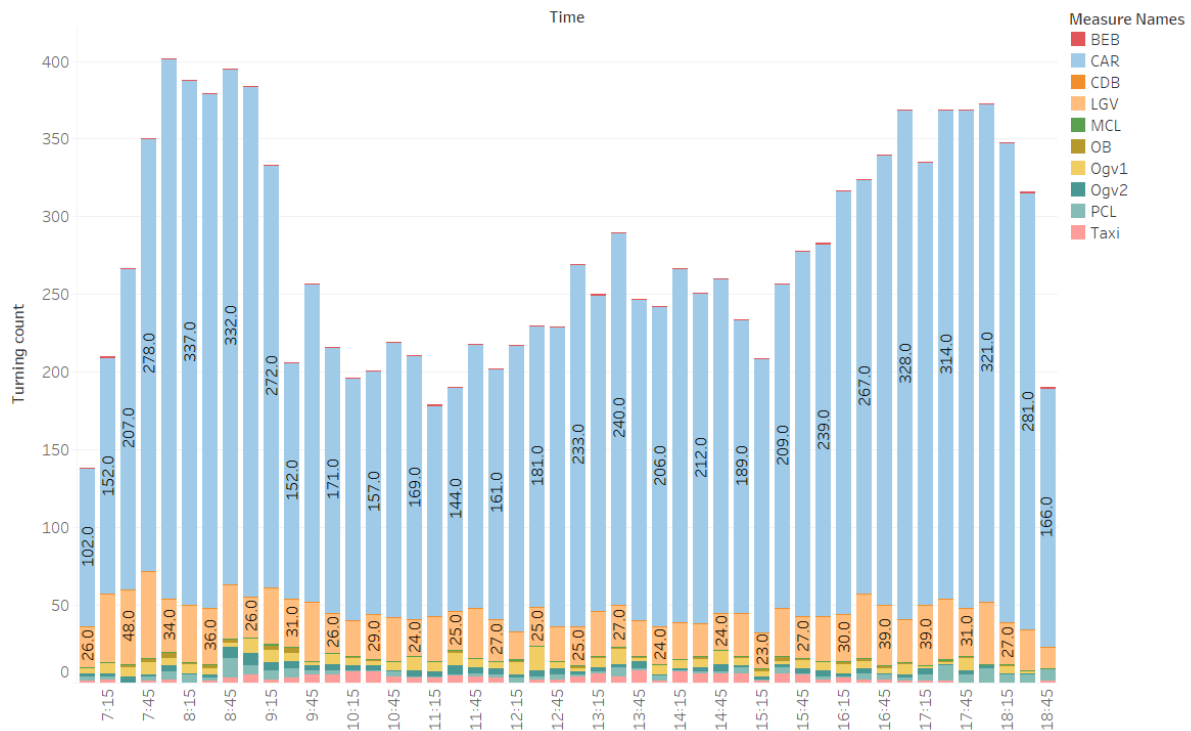
5.1 Assumptions

- Car is the major contributor to the traffic and therefore it has to be reduced by bringing in bus service.
- Considering an average of 2 people travelling in a car.
- One standard bus can carry around 40. If it is a double decker bus then it can carry around 80 people.
- The bus will stop at Insight data centre on way towards the university.
- More frequency will be needed in weekdays than weekends
- More frequency will be needed in peak hours. Preferably even double deckers.
- Only people travelling in car, motorbike and taxi can be made to travel in bus and not others like using multi axils as it can be for business and export purposes.

5.2 Findings from the Turning Count dataset

From fig 8, the overall count for each type is found. From this it is decided to omit the multi axil types and consider only MCL,PCL,Car,taxi,BEB,OB and CDB for future purposes.

Fig 10- hourly junction turning count based on vechile type

In the fig 11, the above assumption of considering only the six types is implemented. It is seen that very less buses are present and therefore the count now for each route is seen in order to get the overall picture correctly.

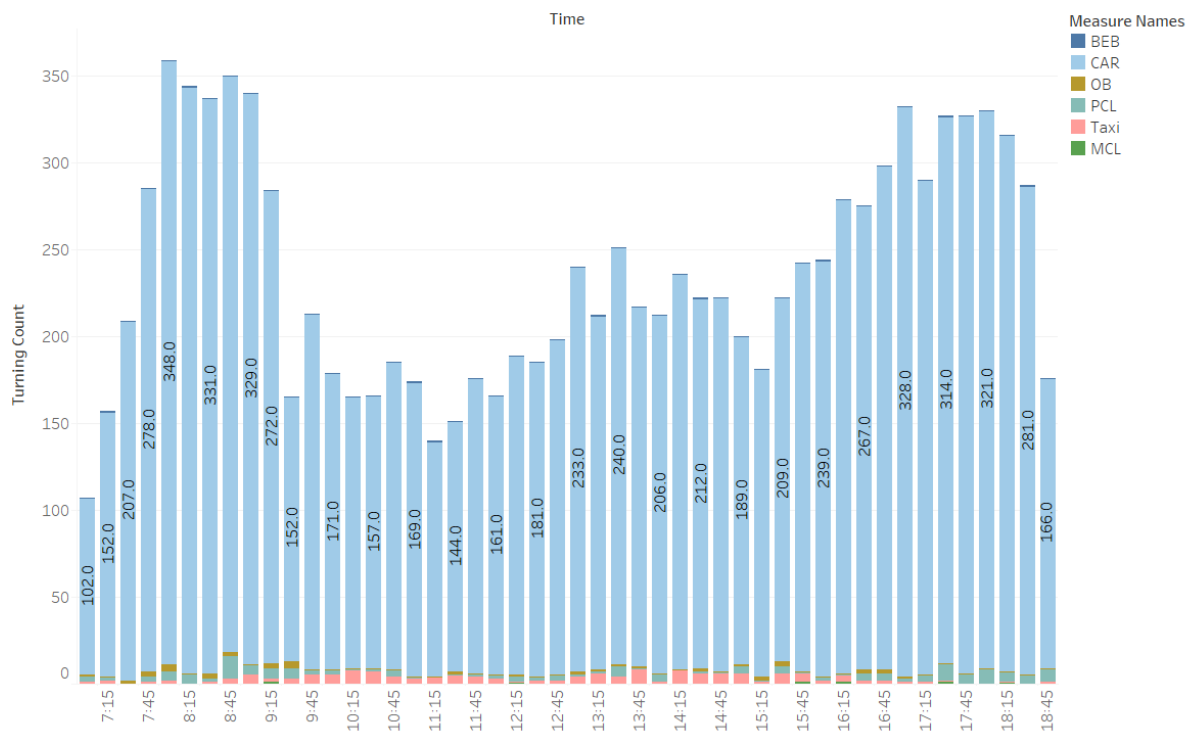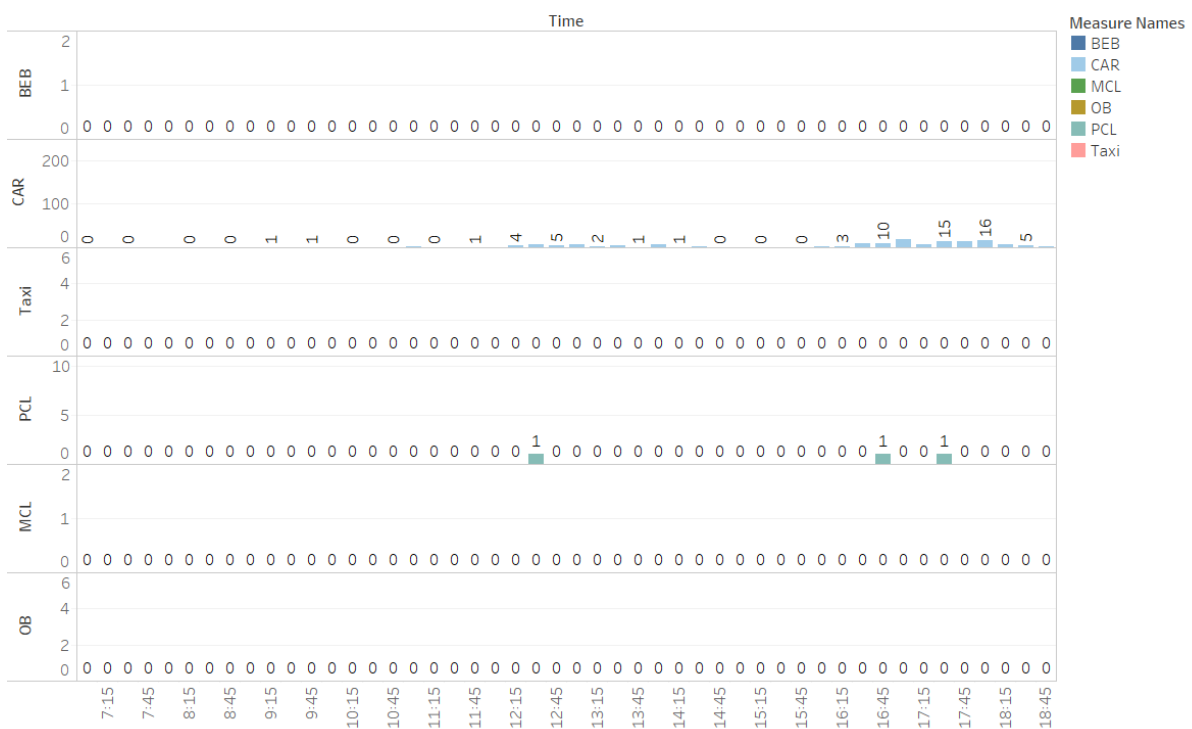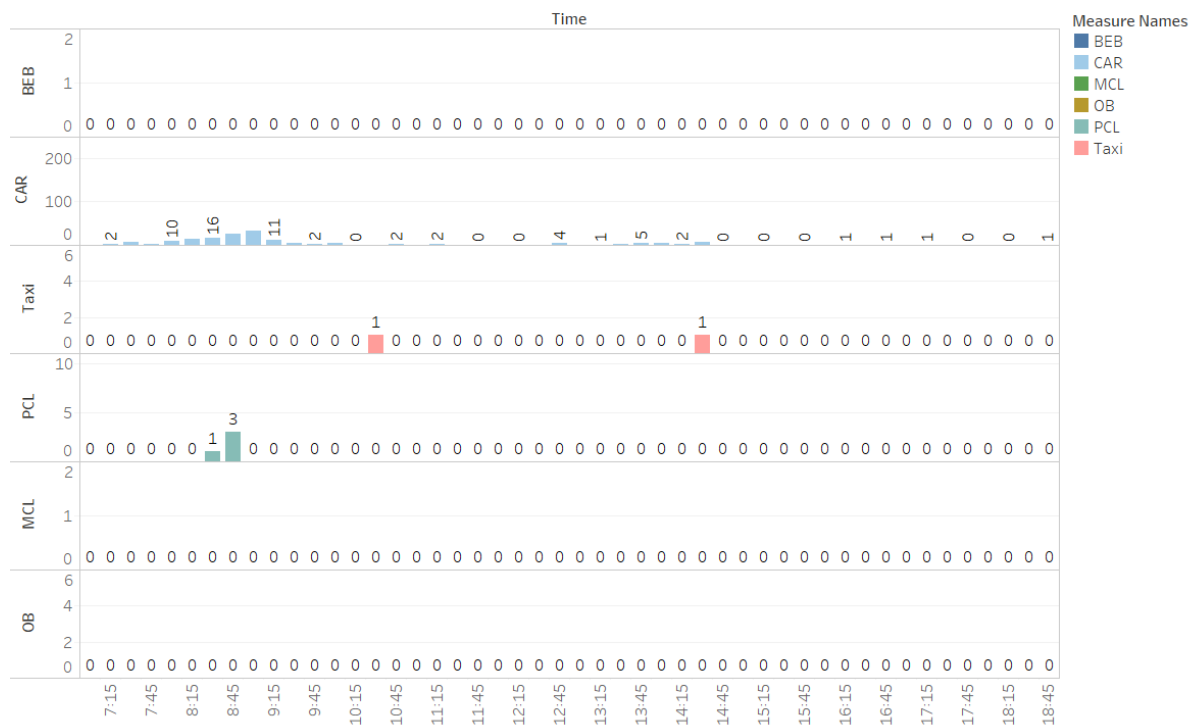## Fig 11- hourly junction turning count for Cars,Buses and Cycles

Fig 12.1- hourly junction turning count for Cars,Buses and Cycles for A to B


From fig 12.1, it is seen that people use car only to commute away from insight. The cars are in evening which denotes that people are leaving after finishing their day's work in the office.

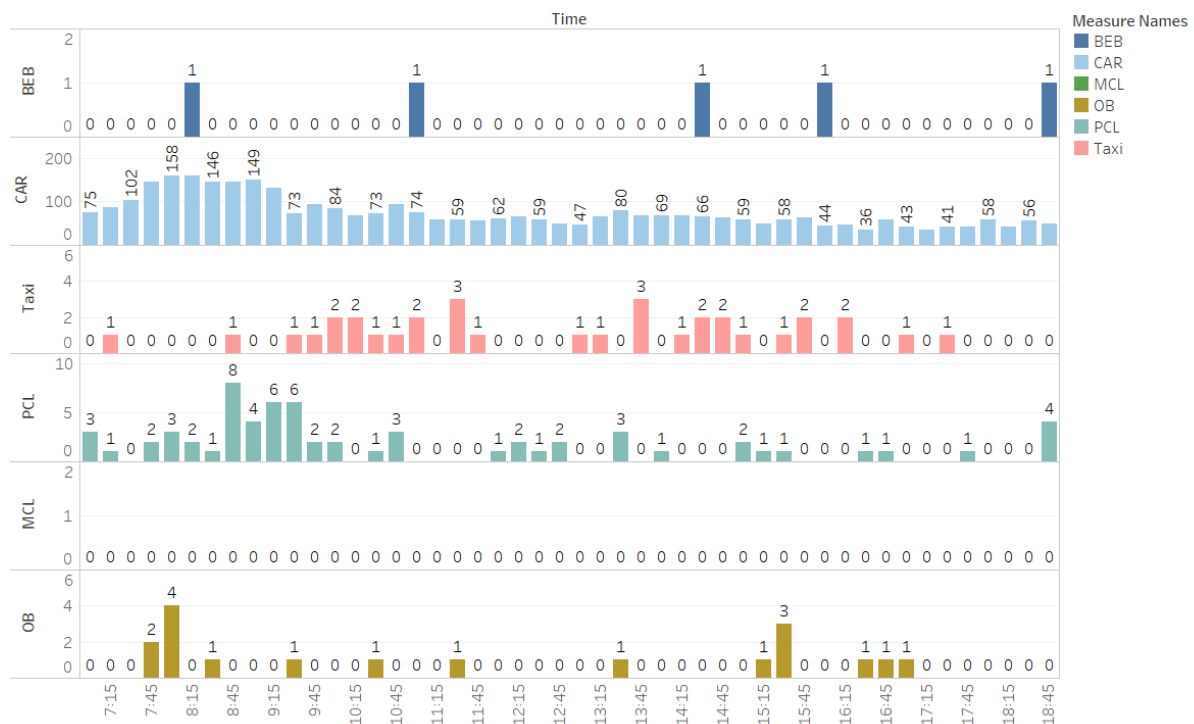Fig 12.2- hourly junction turning count for Cars,Buses and Cycles for B to A

From fig 12.2, it is seen that people commute to insight with car in the morning to start their day's work in the office and some do come in car and cycle.

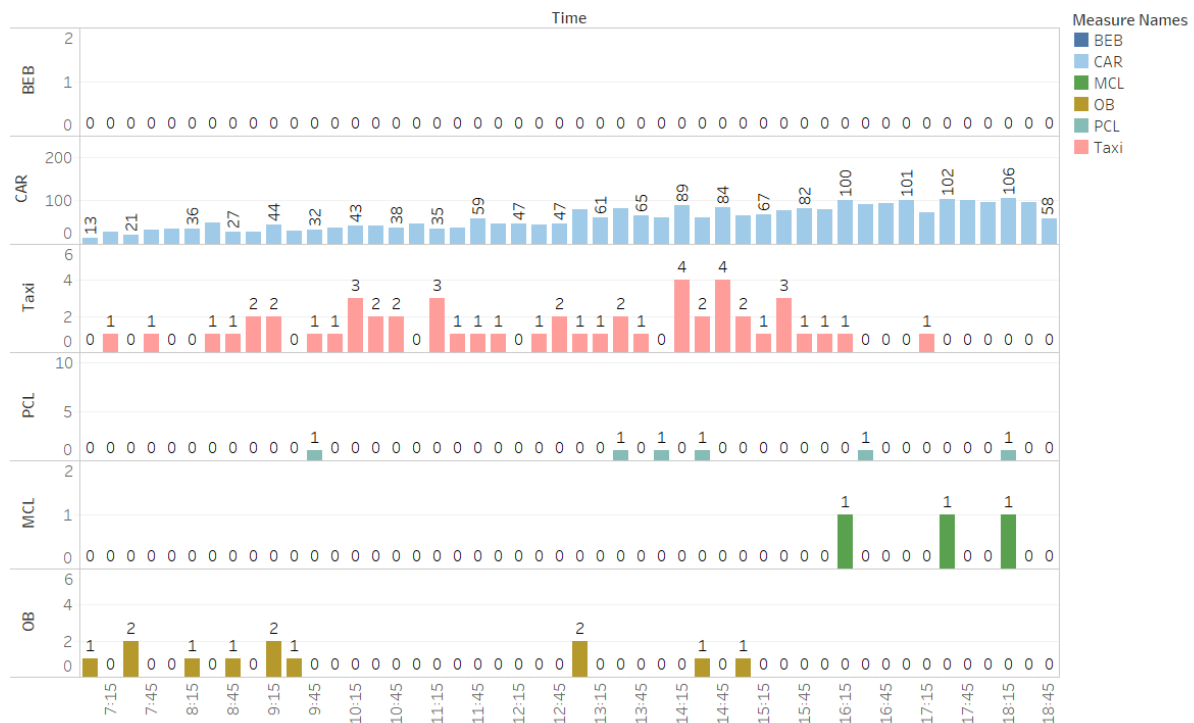Fig 12.3- hourly junction turning count for Cars,Buses and Cycles for B to C
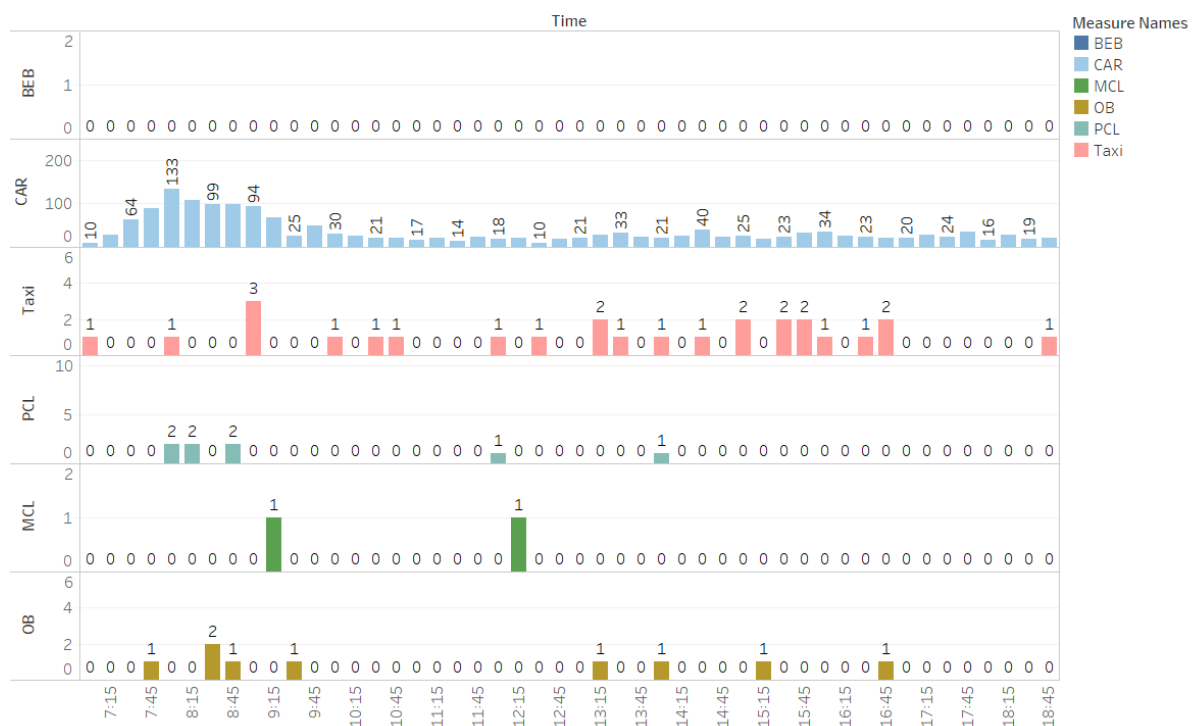
From fig 12.3, it is seen that there is peak car usage in the morning with regular low car usage throughout the day with some taxi and bike. Only sparse other buses are present. This is seen for B to C

Fig 12.4- hourly junction turning count for Cars,Buses and Cycles for B to D

For B to D, it is seen that similar pattern is obtained as per figure 12.4. One notable change is the slight increase in cycle count compared to others.

Fig 12.5- hourly junction turning count for Cars,Buses and Cycles for C to B

From fig 12.5, it is seen that the evening car traffic is more from C to B which indicates that people are returning back from their work and healthy taxi frequency in the afternoon.

Fig 12.6- hourly junction turning count for Cars,Buses and Cycles for D to B
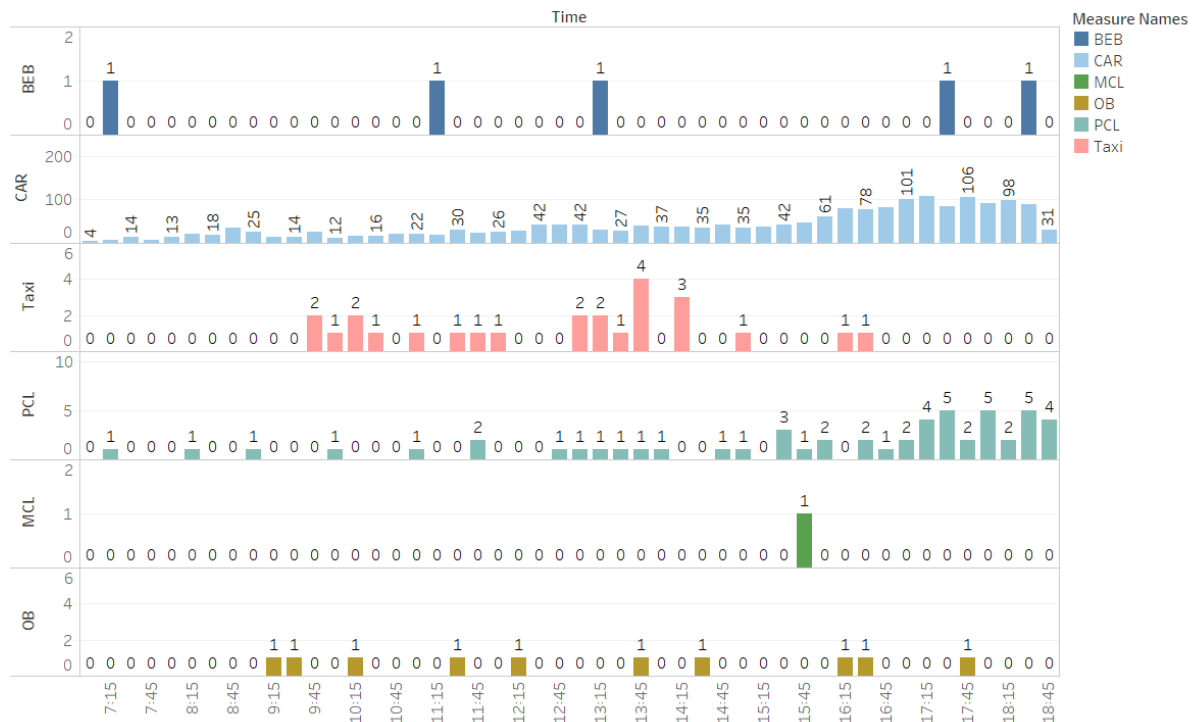
From fig 12.6, it is seen that a similar pattern is present in D to B as in C to B with few more buses present compared to it.

5.3 Recommendations

- Two bus routes can be provided from B.
- One is from B with a stoppage in front of A at the junction and going towards C.
- Another is from B with a stoppage in front of A at the junction and going towards D.
- Bus frequency can be varied based on peak hour and non-peak hour in the weekdays.
- The bus route B-A-C can be given at 30 minutes per once in the morning from 7 to 10 am. This can be coupled up with a double decker bus at every 60 minutes in the morning. This means that there will be one standard bus after which a double decker will come and so.
- For the non-peak hours in noon and afternoon, bus frequency can be for 1 for every 45 minutes and so. The service is considered from morning 7 am till night 9 pm.
- For the evening peak hours from 5 to 7 pm the same pattern like in morning can be followed for the time frequency and the rotation of standard and double decker bus.
- This route will help in cutting around more than 200 cars off the road as a result of more than 25 trips each way. This will help in controlling the traffic both the sides.
- Similarly, another route B-A-D can be given at 20 minutes per once in the morning 7 am to 10 am and evening 5 to 7 pm. For other timing it can be for 40 minutes once each. The same concept of standard and double decker bus rotation can be followed here also. The service is considered from morning 7 am till night 11 pm
- This route will help in cutting around more than 300 cars off the road as a result of more than 40 trips each way respectively. This will help in reducing traffic both the sides.
- This will also ensure that commuters to insight can get down in their way and the once who want to travel via C can go that route bus and D can go that route bus.

6. Case for providing a greenway cycle path from Moycullen to Galway city via the IDA Business Park and the University

- From the above analysis, it is seen that cycle count is very less.
- This is because there is no separate bike lane and the turns are sharp.
- We can assume that there are certain fitness minded people who would love to cycle
- Also, there are environment friendly people who would love to not use car as to curtail the pollution caused by them.
- It can also be noted that the cost of maintaining a cycle is cheap
- Also, students tend to travel in cycles as they might not have a car for their own use.
- Cycle doesn't require much of the parking spaces and it is better to create a small cycle lane in order to provide smooth access and quicker travel.
- But the irish weather is one that is difficult in riding cycles. This is because of the strong winds and heavy rains.
- Also, even if the cycle path is laid out, it will not reduce the overall traffic in a significant way.
- But, it is important to consider having cycle lane in such busy junction as it will give commuters more option to choose from and will also help them keep fit and environment friendly if they intend to be so.
- Therefore, even if it is not significant to reduce traffic, it is recommended to have a cycle path to help the students reach the university safe from the home and also other commuter who intend to be fit and eco friendly and economical. This can be provided from B-A-D route as already there are some good foundation present for it based on which it can be improved successfully.