EXPLORATORY ANALYSIS OF REAL TRAFFIC DATA

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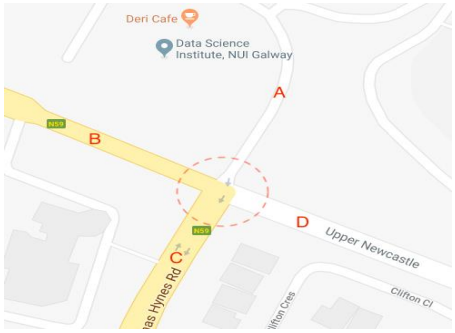
1.INTRODUCTION:

The real traffic data on traffic on the N59 just before and at junction outside the Insight building in Dangan have been collected from Galway City Council. This report visualises and analyses the reason for severe congestion in the morning and evening at the junction.

1.1 Prerequisite data:

Two datasets is provided namely 'Galway ATC-Site Moycullen Road 2016 traffic count' which consists of traffic count of all the vehicles collected from both Eastbound and Westbound for the period of 18th November 2016 to 24th November 2016 and another file named 'v2Junction Turning counts 2016 outside Insight' consists of total count of all the vehicles taken at the junction from all the major four locations(A,B,C,D). The N59 junction and four points have been described below:



- The main road through the junction is the N59. Traffic coming from direction B is from the Clifden, Oughterard and Moycullen.
- Traffic turning into A leads to the IDA Business Park.
- Traffic turning towards C heads to the central part of the university campus and Galway city.
- Traffic heading towards D enters the Corrib village and also leads to the city.

2. Data Pre-processing:

2.1 File 1: 'v2Junction Turning counts 2016 outside Insight' consists of total count of all the vehicles taken at the junction from all the major four locations(A,B,C,D)

IDASO

REF: IDA-16-221 Galway Annual Survey

SITE: 20

LOCATION: Thomas Hynes Rd / Moycullen Rd(N59)

DAY: Tuesday

DATE: 22 November 2016

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, bo
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 Bus
BEB: battery electric bus
OB : Ordinary Bus

	A -> A											A -> B											A -> C											A -> D										
TIME	PCL	MCL	CAR	TAXI	LGV	OGV1	OGV2	CDB	BEB	OB	TOT	PCU	PCL	MCL	CAR	TAXI	LGV	OGV1	OGV2	CDB	BEB	OB	TOT	PCU	PCL	MCL	CAR	TAXI	LGV	OGV1	OGV2	CDB	BEB	OB	TOT	PCU	PCL	MCL	CAR	TAXI	LGV	OGV1	OGV2	CDB	BEB	OB	TOT	PCU
7:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
7:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
7:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2	1.1	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	3	2.1	0	0	0	0	1	0	0	0	0	1	1
8:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2	2	0	0	1	0	0	0	0	0	0	1	1
8:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2	2
8:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	3	0	0	0	0	0	0	0	3	3	2	0	3	0	2	0	0	0	0	7	5.2
8:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2	2	0	0	0	0	1	0	0	0	0	1	1
H/TOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	4	2	1	0	0	0	0	0	7	7	2	0	5	0	4	0	0	0	0	11	9.2
9:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	2	0	0	0	0	5	5.1	0	0	1	0	1	0	0	0	0	2	2
9:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	2	2	0	0	0	0	3	0	0	0	0	3	3
9:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	4	2	2	0	0	0	0	0	8	8	0	0	1	0	1	0	0	0	0	2	2
9:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2	2	0	0	2	1	0	0	0	0	0	0	3	3	0	0	3	0	1	0	0	0	0	4	4
H/TOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	4	4	1	0	10	3	2	2	0	0	0	0	18	18.1	0	0	5	0	6	0	0	0	0	11	11
10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3	3	0	0	1	0	0	0	0	0	0	1	1
10:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	2	1	1	0	0	0	0	0	4	4	0	0	3	0	0	0	0	0	0	3	3
10:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	3	1	0	0	0	0	0	0	4	4	0	0	1	0	2	0	0	0	0	3	3
10:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	3	2.1	1	0	1	0	1	0	0	0	0	3	2.1

Fig.1 Original 'v2Junction Turning counts 2016 outside Insight' file with junction traffic count

All the data cleaning and pre-processing were done in excel. In the file containing total traffic count at junction, the columns consisting of same node information like A to A, B to B, etc were removed. A new column was added with the traffic route and the count of every vehicles in that route along with the timings. The hourly total row is removed and the PCU in vehicle type shows the weighted count which is included in the dataset but is not considered while plotting in Tableau.

	A	B	C	D	E
1	**Time**	**Traffic Route**	**Vehicle Type**	**Count**	
2	07:00	A2B	PCL	0	
3	07:00	A2B	MCL	0	
4	07:00	A2B	CAR	0	
5	07:00	A2B	TAXI	0	
6	07:00	A2B	LGV	0	
7	07:00	A2B	OGV1	0	
8	07:00	A2B	OGV2	0	
9	07:00	A2B	CDB	0	
0	07:00	A2B	BEB	0	
1	07:00	A2B	OB	0	
2	07:00	A2B	TOT	0	
3	07:00	A2B	PCU	0	
4	07:00	A2C	PCL	0	
5	07:00	A2C	MCL	0	
6	07:00	A2C	CAR	0	

Fig.2 Pre-processed 'v2Junction Turning counts 2016 outside Insight' file with junction traffic count

2.2 File 2: 'Galway ATC-Site Moycullen Road 2016 traffic count' consists of traffic count of all the vehicles collected from both Eastbound and Westbound for the period of 18th November 2016 to 24th November 2016.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	**Site 9- Moycullen Road**																					
2																						
3																						
4	**18 November 2016**																					
5																x						
6	**Time**	**Total**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**	**Vbin**
7			**0**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**
8			**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**
9	0000	9	0	0	0	0	0	0	0	0	0	4	3	0	1	0	0	1	0	0	0	0
10	0015	7	0	0	0	0	0	0	0	0	1	2	4	0	0	0	0	0	0	0	0	0
11	0030	9	0	0	0	0	0	0	0	0	0	1	4	0	3	0	0	0	1	0	0	0
12	0045	5	0	0	0	0	0	0	0	0	0	0	4	0	1	0	0	0	0	0	0	0
13	0100	3	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0
14	0115	3	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0
15	0130	4	0	0	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0
16	0145	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
17	0200	6	0	0	0	0	0	0	0	0	0	3	1	0	2	0	0	0	0	0	0	0
18	0215	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
19	0230	2	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
20	0245	5	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	0
21	0300	2	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
22	0315	6	0	0	0	0	0	0	0	0	1	0	1	3	1	0	0	0	0	0	0	0
23	0330	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
24	0345	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
25	0400	2	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
26	0415	5	0	0	0	0	0	0	0	0	0	1	1	2	1	0	0	0	0	0	0	0
27	0430	3	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0
28	0445	6	0	0	0	0	0	0	0	0	0	1	1	2	1	1	0	0	0	0	0	0
29	0500	5	0	0	0	0	0	0	0	0	0	0	0	1	2	2	0	0	0	0	0	0
30	0515	6	0	0	0	0	0	0	0	0	0	1	0	1	3	1	0	0	0	0	0	0
31	0530	14	0	0	0	0	0	0	0	0	1	5	1	6	0	0	1	0	0	0	0	0

Fig.3 Original 'Galway ATC-Site Moycullen Road 2016 traffic count' file with vehicle count

The X columns consisting of Vbins,Vpp,Vmax , total count have been dropped as they provide information about the sped which is not required for our analysis. The 12 classes of vehicle type have been renamed by its respective vehicle names . The format of timing have been changed according to the standard time format (In Tableau) , also, a new column with dates and routes such as either Eastbound or Westbound has been added by combining both the sheets provided in the workbook.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Time	Total	Cyclist	M/Cycle	Car	Van	Rigid 2 Axle	Rigid 3 Axle	Rigid 4 Axle	3 Axle HGv	4 Axle HGV	5+Axle HGV	Bus	Date	Area
2	0000	9	0	0	5	4	0	0	0	0	0	0	0	18-Nov-16	Eastbound
3	0015	7	0	0	4	3	0	0	0	0	0	0	0	18-Nov-16	Eastbound
4	0030	9	0	0	6	3	0	0	0	0	0	0	0	18-Nov-16	Eastbound
5	0045	5	0	0	0	4	1	0	0	0	0	0	0	18-Nov-16	Eastbound
6	0100	3	0	0	2	1	0	0	0	0	0	0	0	18-Nov-16	Eastbound
7	0115	3	0	0	3	0	0	0	0	0	0	0	0	18-Nov-16	Eastbound
8	0130	4	0	0	0	4	0	0	0	0	0	0	0	18-Nov-16	Eastbound
9	0145	2	0	0	2	0	0	0	0	0	0	0	0	18-Nov-16	Eastbound
10	0200	6	0	1	4	0	1	0	0	0	0	0	0	18-Nov-16	Eastbound
11	0215	1	0	0	0	1	0	0	0	0	0	0	0	18-Nov-16	Eastbound
12	0230	2	0	0	1	1	0	0	0	0	0	0	0	18-Nov-16	Eastbound
13	0245	5	0	0	2	3	0	0	0	0	0	0	0	18-Nov-16	Eastbound
14	0300	2	0	0	2	0	0	0	0	0	0	0	0	18-Nov-16	Eastbound
15	0315	6	0	0	5	1	0	0	0	0	0	0	0	18-Nov-16	Eastbound
16	0330	2	0	0	1	0	1	0	0	0	0	0	0	18-Nov-16	Eastbound
17	0345	1	0	0	1	0	0	0	0	0	0	0	0	18-Nov-16	Eastbound
18	0400	2	0	0	2	0	0	0	0	0	0	0	0	18-Nov-16	Eastbound
19	0415	5	0	0	5	0	0	0	0	0	0	0	0	18-Nov-16	Eastbound
20	0430	3	0	0	2	0	0	0	0	1	0	0	0	18-Nov-16	Eastbound
21	0445	6	0	0	2	2	2	0	0	0	0	0	0	18-Nov-16	Eastbound
22	0500	5	0	0	3	1	1	0	0	0	0	0	0	18-Nov-16	Eastbound
23	0515	6	0	0	3	3	0	0	0	0	0	0	0	18-Nov-16	Eastbound
24	0530	14	0	0	9	5	0	0	0	0	0	0	0	18-Nov-16	Eastbound
25	0545	14	0	0	10	2	1	0	0	0	0	1	0	18-Nov-16	Eastbound
26	0600	17	0	0	12	4	1	0	0	0	0	0	0	18-Nov-16	Eastbound
27	0615	18	0	0	7	9	1	0	0	1	0	0	0	18-Nov-16	Eastbound
28	0630	30	0	0	13	14	1	0	0	1	0	0	1	18-Nov-16	Eastbound

Fig.4 Pre-processed 'Galway ATC-Site Moycullen Road 2016 traffic count' file with vehicle count

3. TASKS

3.1 Task 1: The periods of traffic congestion

Plotting the traffic data of all the vehicles with respect to time and date.

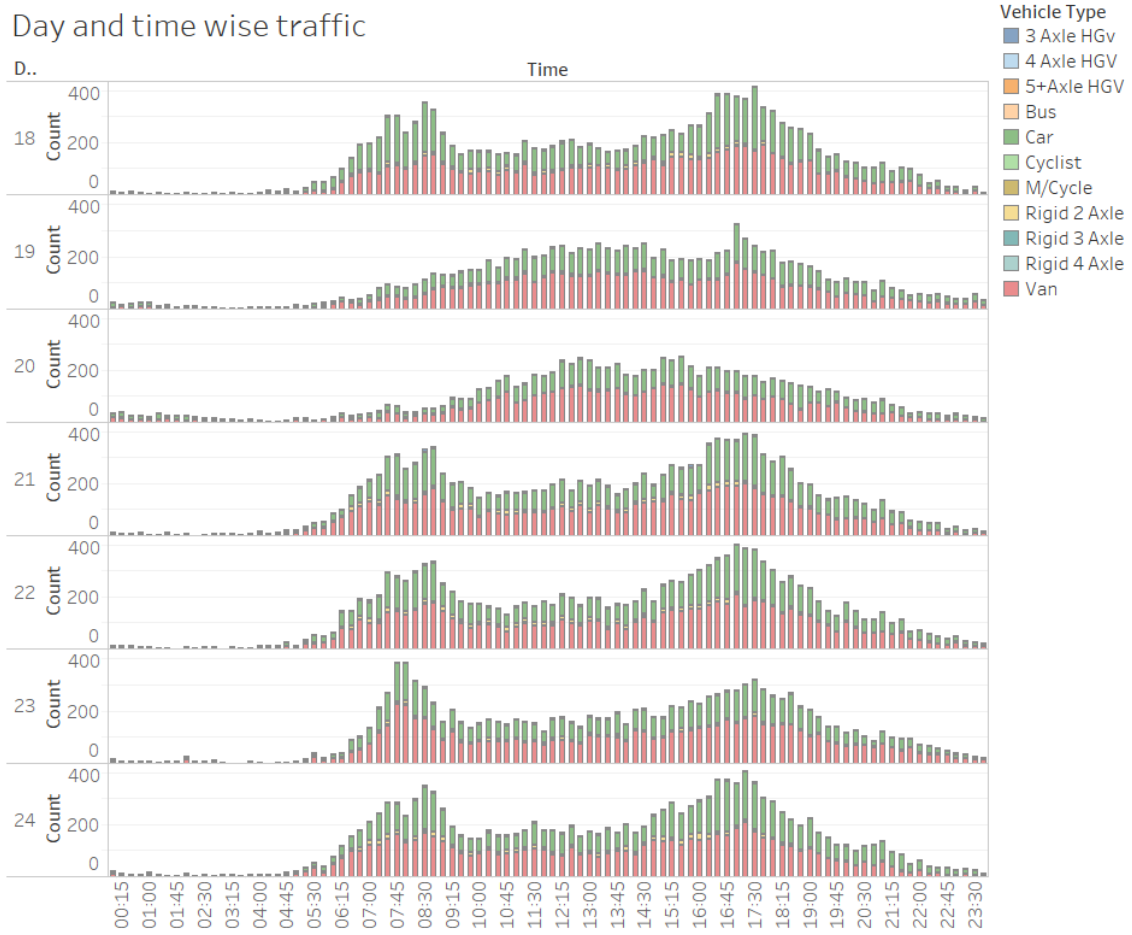


Fig. 5 Traffic data of all the vehicles with respect to time and date

Column (Y- Axis) consists of the traffic count of all the vehicles and time is plotted in the row (X-Axis) with date(day) facetted as rows. This graph helps us narrow down our look up for the period of highest congestion. From the above barchart we can see that on the date 19th and 20th the pattern of graph differs than rest of the days, reason being weekends. Also, from color distribution we can observe that the vehicle type causing major congestion is car and van. So, for our better understanding and classification, two graphs have been plotted separately, one for weekday and weekend to analyse the correct distribution and cause of congestion.

Plotting of weekend traffic data of all vehicles

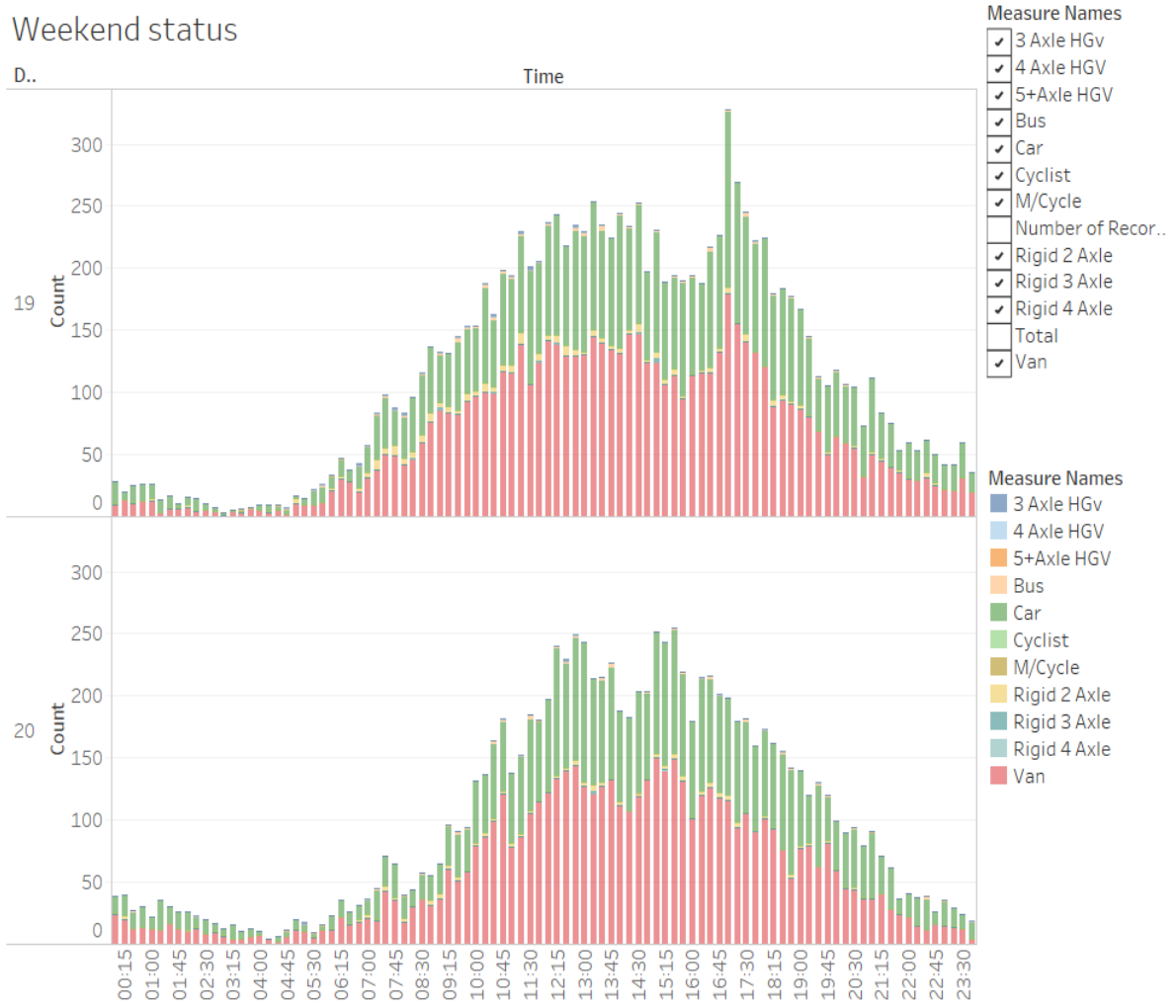


Fig. 6 Weekend traffic data of all the vehicles with respect to time and date

In the above bargraph we have considered only two dates, 19th November and 20th November which are weekends for our study. We can observe that only two vehicles car and van contribute to the major traffic congestion and van being comparatively higher than car. During Weekends, there is two peak times, that is, morning 10:00 to 13:00 and in the evening 15:00 to 17:30 and the total count of both at this time reaches around 250-300 vehicles altogether.

Plotting of weekday traffic data of all vehicles

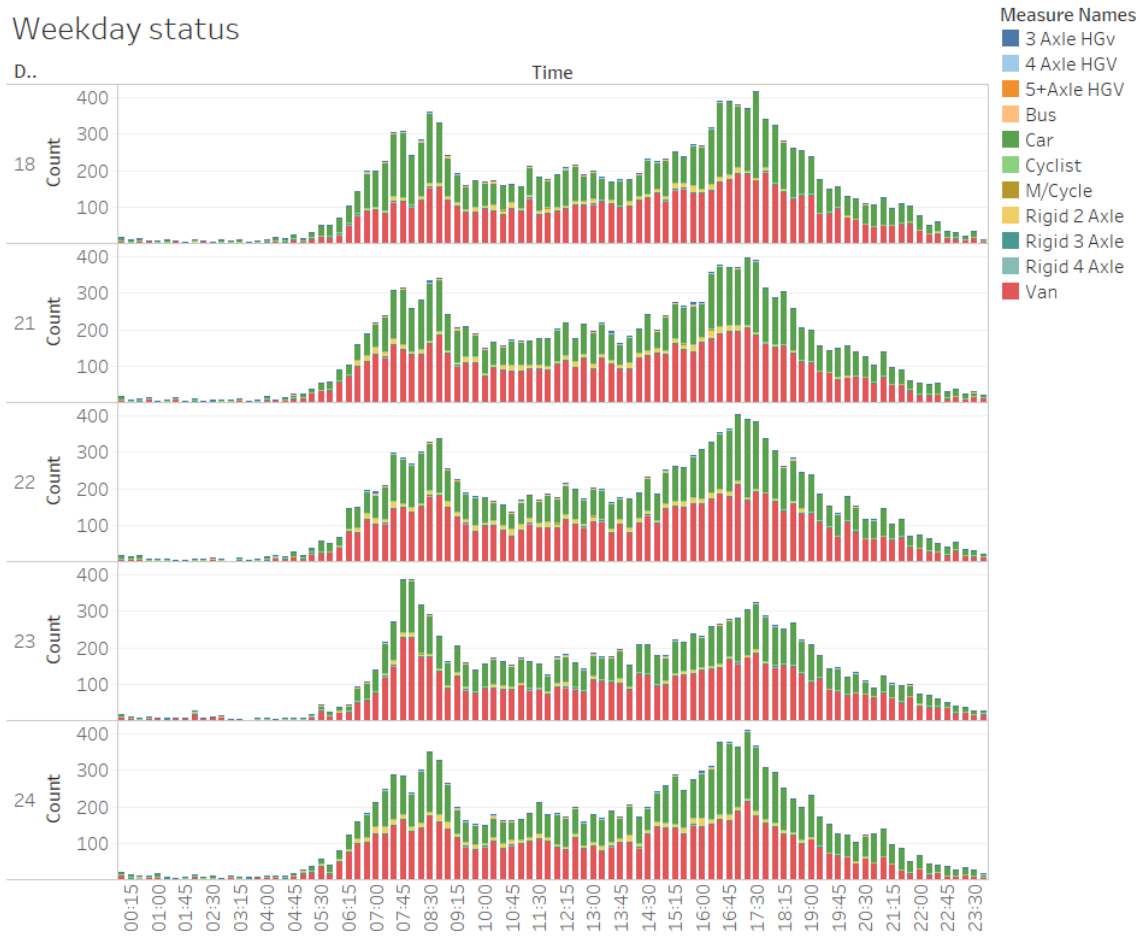


Fig.7 Weekday traffic data of all the vehicles with respect to time and date

In the above bar graph we can observe similar traffic distribution on all the weekdays. Here, we can see that the major contribution for the congenstion is by van and car. There is two peak normal distribution in the above graphs which concludes that major traffic congestion is caused in the morning and in the evening. In the morning, the congestion is moderately starts at 6:00 till 9:00 and is high at 7:45 to 8:30 . In the evening, the congestion increases from 15:10 to 17:30 and is maximum at 16:00 to 16:50. This might be due to the office and school/college goers.

3.2 Task 2: The distributions of vehicle types contributing to daily traffic

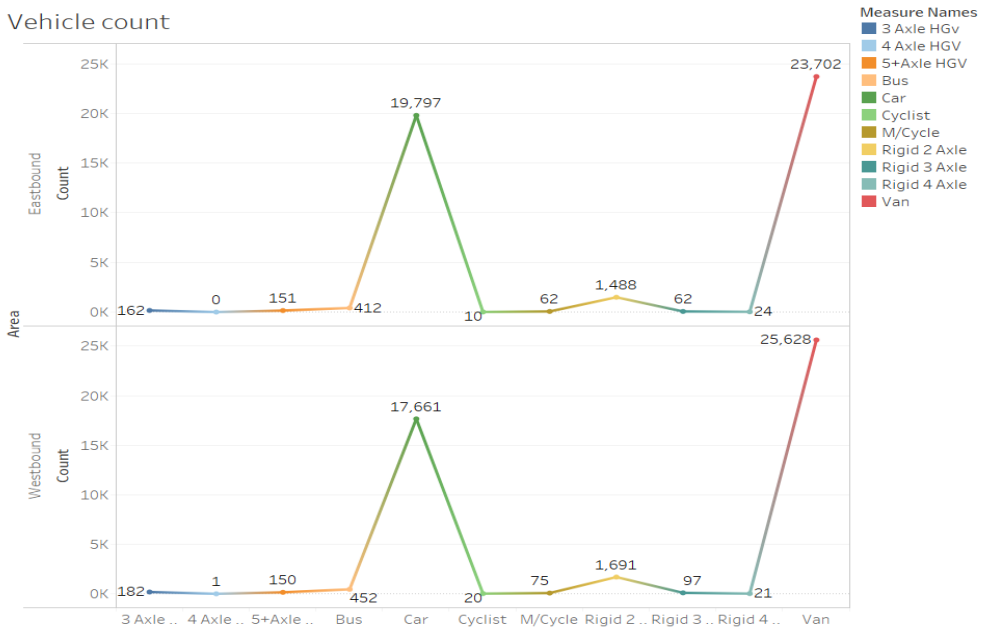


Fig.8 Plot of vehicles with respective area and count

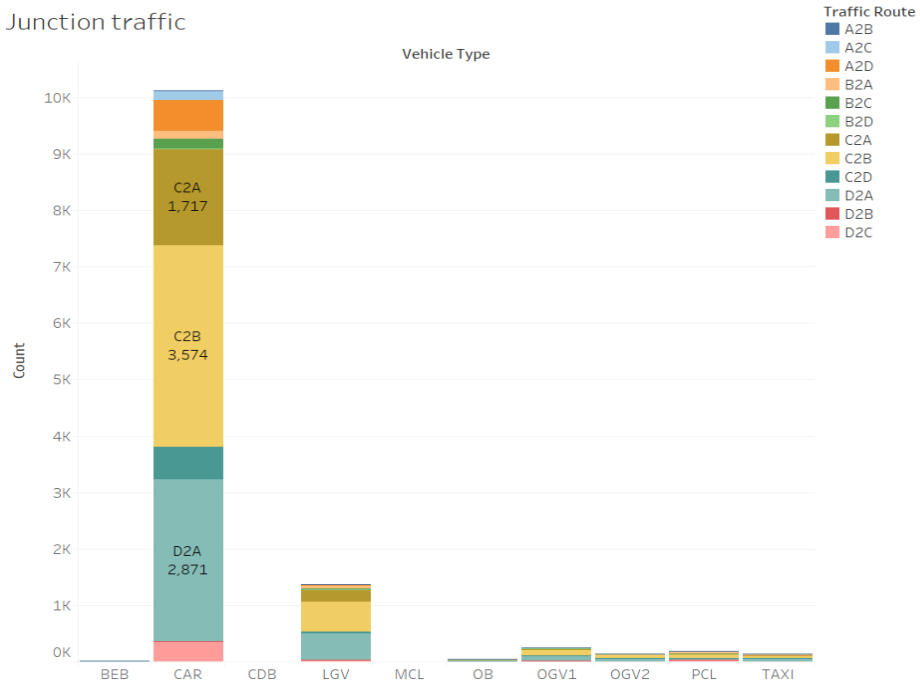


Fig.9 Plot of vehicles with respective traffic route and count

In the above line graph, all the vehicles have been plotted on x axis and their respective counts on Y-axis with the area facetted. We can observe from the distribution of all the vehicle types with their count labelled that usage of van is highest (around 25,000) followed by car (around 19,000) and rigid

2 axle vehicles(around 1,500) both in Eastbound and Westbound. The rest of the vehicle's contribution is comparatively too low with 4 axle HGV count being none or one.

The bar graph shows the vehicle distribution with respect to their count and traffic route. It is observed that the number of cars in the route C to B and D to A is highest followed by light gear vehicles in the same route.

3.3 Task 3: A case for providing a regular bus service from Moycullen to the IDA park and the university. Recommend the times and frequency of this service.

The route from Moycullen to IDA park and the university includes routes, A to C, B to D, C to A, C to B and D to C. Following graphs have been plotted considering these routes and the buses CDB (City Direct Bus), BEB(Bus Eireann Bus) and OB (Other Bus) along with the car count .

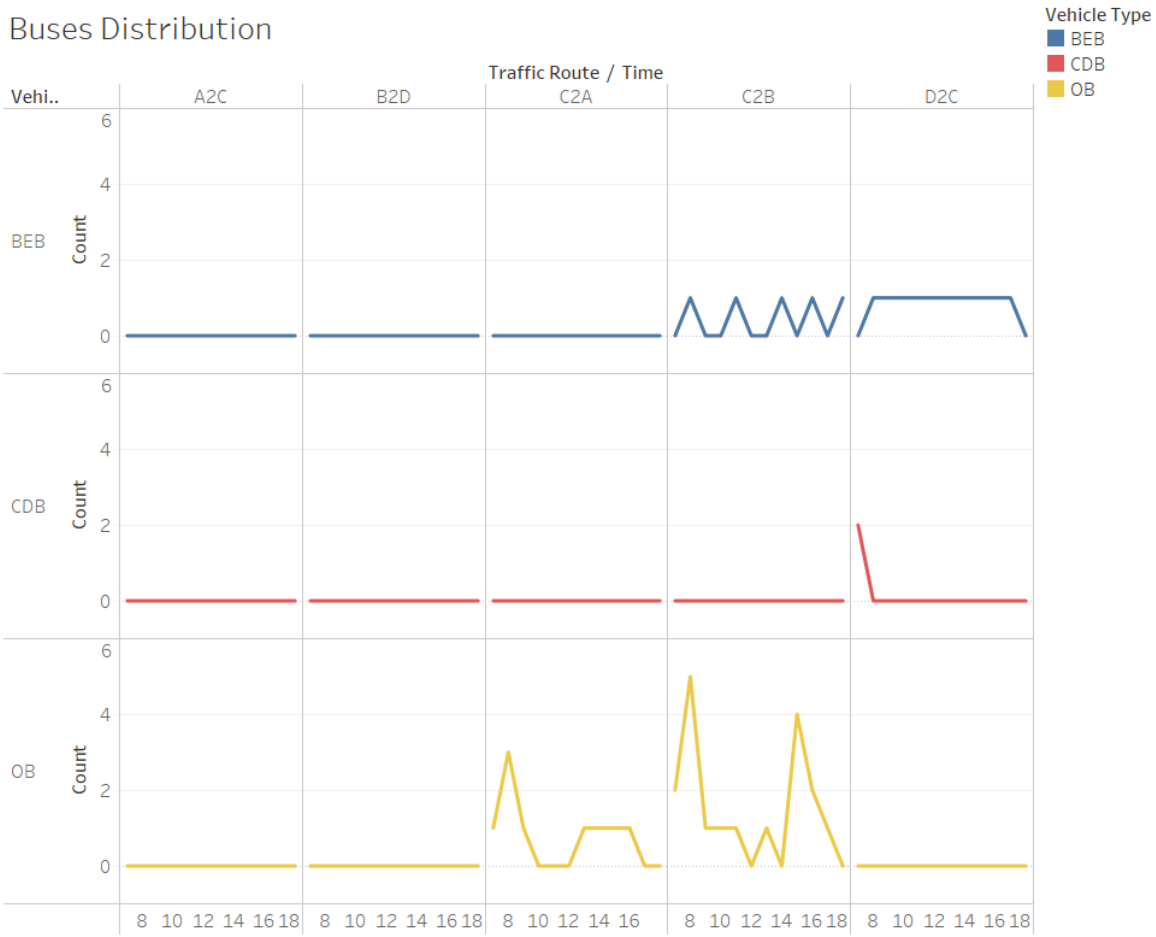


Fig.10 Line plot of buses with respective traffic route and count

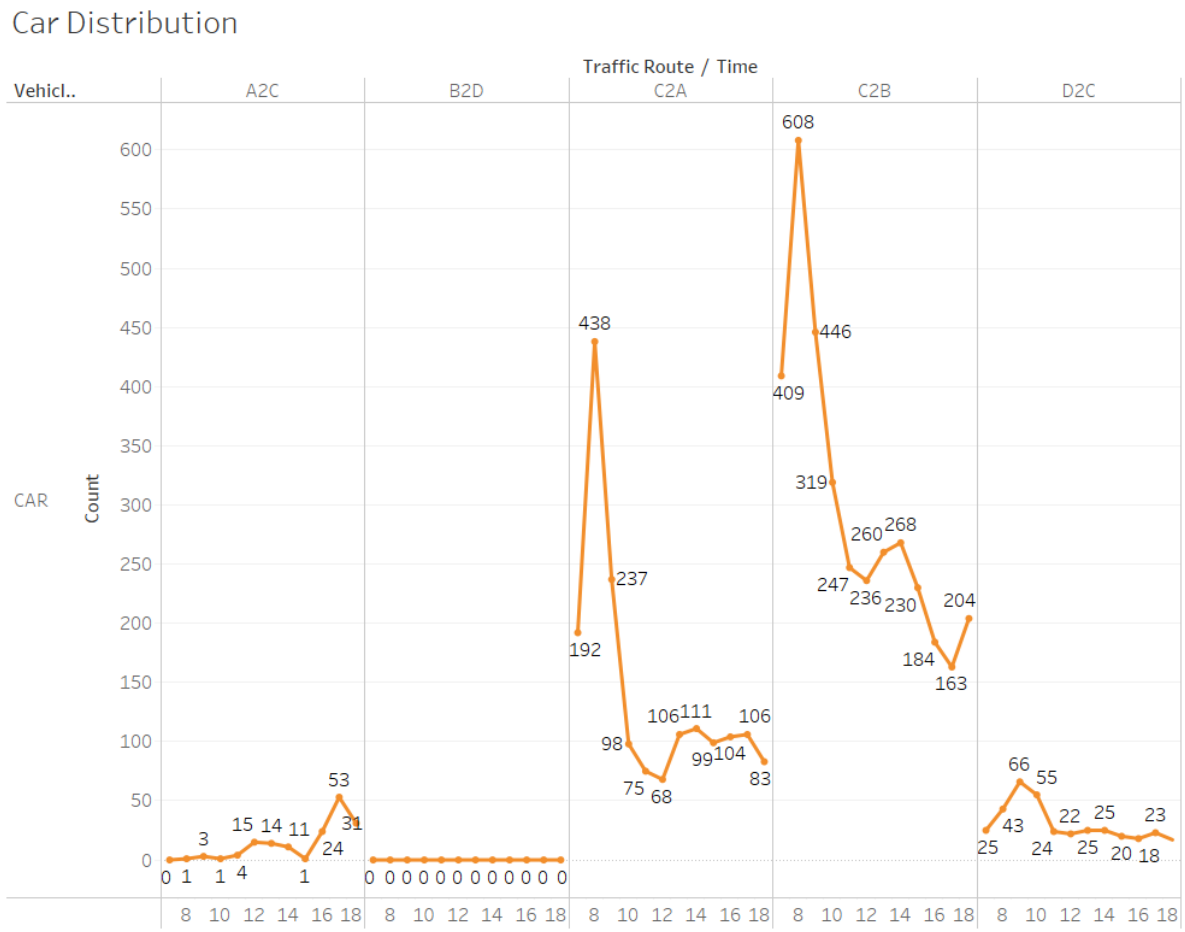


Fig.11 Line plot of cars with respective traffic route and count

In the above line graph of buses we can observe that there is no bus services from A to B and B to D and for C to A only other buses transit. For the route C to B, Bus Eireann shows alternate service every hour and whereas the frequency of other buses is more early in the morning and after in the evening and city buses are none. In the route D to C, there is constant frequency of BEB bus for the entire day after 8 am till 6 pm whereas CDB bus runs only in the morning and none other buses.

On the other hand, we can see the major distribution of cars in the routes C to A and C to B and very few in the route A to C and D to C. There is no bus or car distribution in the path B to D as the path on N59 to and from Moycullen is narrow and makes impossible for any public transport to transit.

We can infer that, the increase in number and frequency of cars has led to major traffic congestion and traffic congestion at these routes can be reduced by increasing the bus services. Passenger Car unit (PCU) is considered as the measure of impact the vehicle has on traffic variables. Generally PCU of car is considered to be 1 and bus is 2. Increase in buses and decrease in cars results in lower PCU value which is good for traffic status. Here, we can see that the count of car is 400 times the count of

buses. By increasing the buses frequency and count at peak time (8:00-9:30 am) and (4:00-5:30pm) we can decrease the car usage and thus, reducing the congestion in the specified route.

3.4 Task 4: Case for providing a greenway cycle path from Moycullen to Galway city via the IDA Business Park and the University.

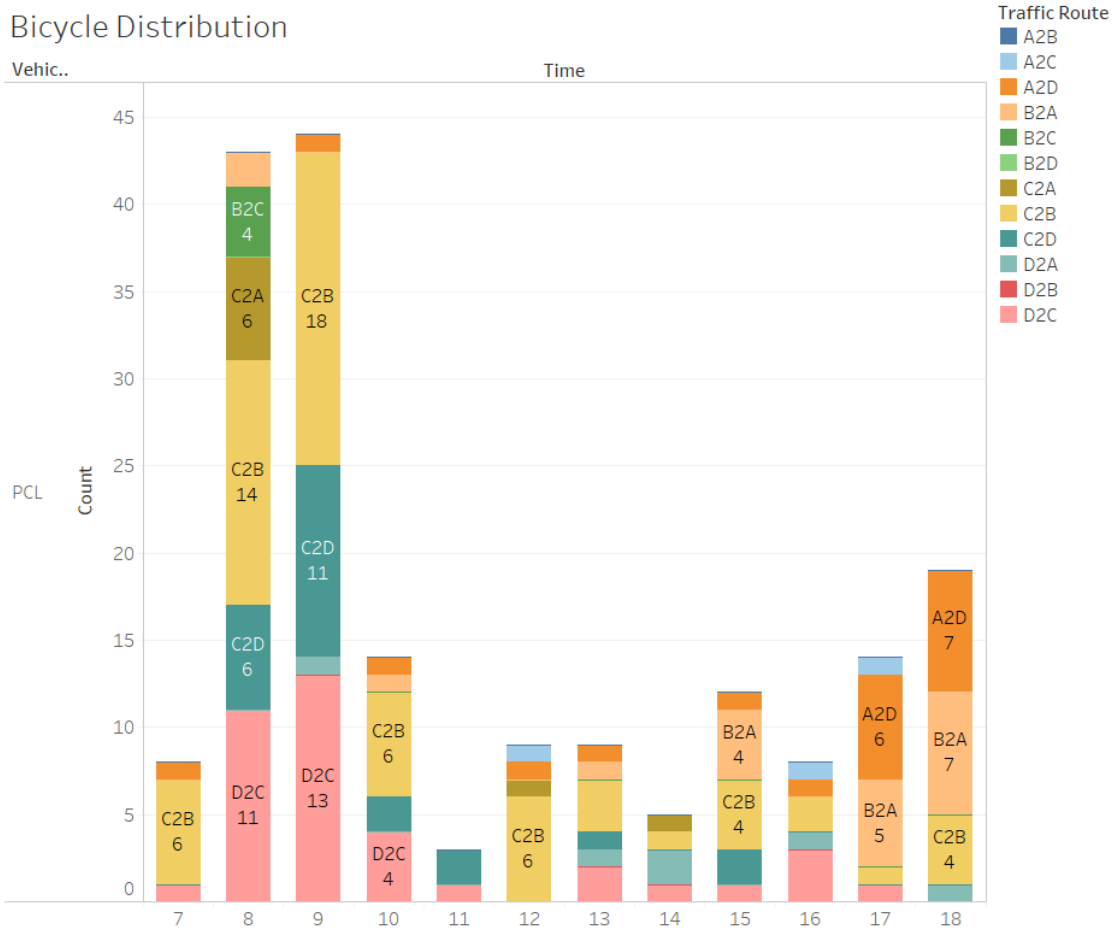


Fig.12 Bar graph of bicycles with respective traffic route and count

The route from Moycullen to Galway city via IDA business park includes, A to C, B to D, C to A, C to B, D to C. Here, we have considered all the paths and time in order to compare the frequency of the bicycles. From our observations from the above graphs, we know that 8:00 to 10:00 and 15:00 to 18:00 is the peak hour and it is observed that the cycle count at this period is high than rest of the time of the day. That is, during morning peak hours C to B and in the evening peak hours, A to D has the highest bicycle count. B to D has the least count as the road is not terribly bicycle friendly and it doesn't have an appropriate path. Thus, there is a need to provide a greenway cycle path along this route.

4. Conclusion

From the above visualization and analysis, we were able to identify the main cause and route for congestion along with the peak time period. It was observed that cars and vans are main cause for congestion at the junction in the peak period of 8:00 to 10:00 and 15:00 to 18:00 hours. The bus and bicycle analysis concludes that with increase in the bus frequency in the route from Moycullen to the IDA park and the university along with building the bicycle tracks will help in drastic decrease in daily congestion at junction especially during peak hours.