



# Custom Post Event Report

## Distortion 2018

crowd**connected**

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# Introduction

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- For the 2018 edition of Distortion (30 May - 3 June), the festival's official app (developed by Greencopper) included Crowd Connected's proprietary geo-location technology (Colocator).
- Colocator is widely used by mass attendance events such as festivals to monitor, measure and engage with attendees/visitors. Colocator provides real-time visitor management and cost-effective footfall analytics.
- Festivalgoers who downloaded the Distortion 2018 app (both Android and iOS) were asked to share their location. A positive opt-in activated the Colocator code, and these app users (henceforth 'devices') were subsequently monitored anonymously for the duration of the festival. The individual journeys of people through, into and out of Copenhagen were therefore captured.
- A total of 3509 devices provided location data during Distortion 2018, a healthy sample that is representative of the total festival audience.
- The location data we collected consists of a stream of latitude and longitude coordinates. Colocator recorded how many unique devices visited each location, their dwell times and their repeat visits. This granular location data provides the basis for this report.
- Mobile phones can be switched on/off, they can run out of battery, permissions can be changed and apps can be installed/uninstalled. Consequently, the population of devices that is reporting locations changes over time. Colocator utilises proprietary weighting algorithms to account for this changing population of active devices. This weighting adjustment has been applied to all the relevant data points in this report.

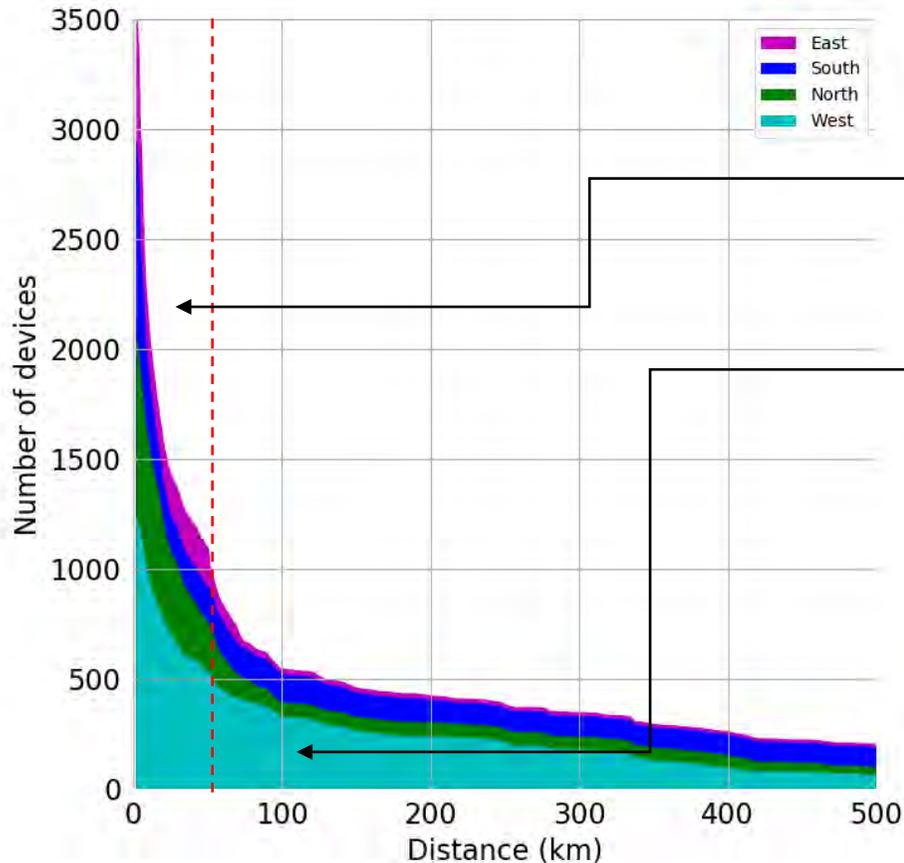
# Background to the analysis

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- This report has been prepared on the basis of discussions with Wonderful Copenhagen.
- First we were asked to analyse what we might be able to discern from available data about where festivalgoers came from. *(See section 1)*
- Second, we performed a cluster analysis on the dataset to identify ‘hot spot’ locations across the duration of Distortion 2018. We sought to identify the most important transport ‘hot spots’ and the most important points of interest, quantifying the relative importance of each. *(See section 2)*
- As a more exploratory element of the analysis, we then sought to quantify the relative importance of these ‘hot spots’ to see if there are any notable findings for different days in terms of crowd behaviour.
- We also mapped the transport ‘hot spots’ to transport modes (making reasonable assumptions, such as devices located at the railway station will have travelled by rail). This enabled us to segment visitors by mode of transport and point of interest. *(See section 3)*
- Finally, we sought to establish if there was any geo-behavioural difference that depended upon transport mode. To achieve this, we used the segments to quantify the average time visitors spent in the vicinity of points of interest and calculate this metric for each transport mode. We then used the average time spent as a proxy for a visitor’s engagement with the point of interest to test hypotheses such as “people travelling in their own vehicle engage with point of interest X for longer than people travelling by rail”.

Section 1:  
Where did visitors to  
Distortion come from?

# Direction of travel: where did visitors come from?



- This chart shows the number of devices as a function of distance from the centre of Copenhagen, broken down by direction.
- Most devices (~70%) were only positioned in the vicinity (<50 km) of Copenhagen (left of red dashed line).
- Most devices came from/went 'west' before/after visiting Copenhagen. (i.e. from Denmark).
- This is consistent with an independent data set from Greencopper (see next page).

# Country Analysis (from Greencopper data)

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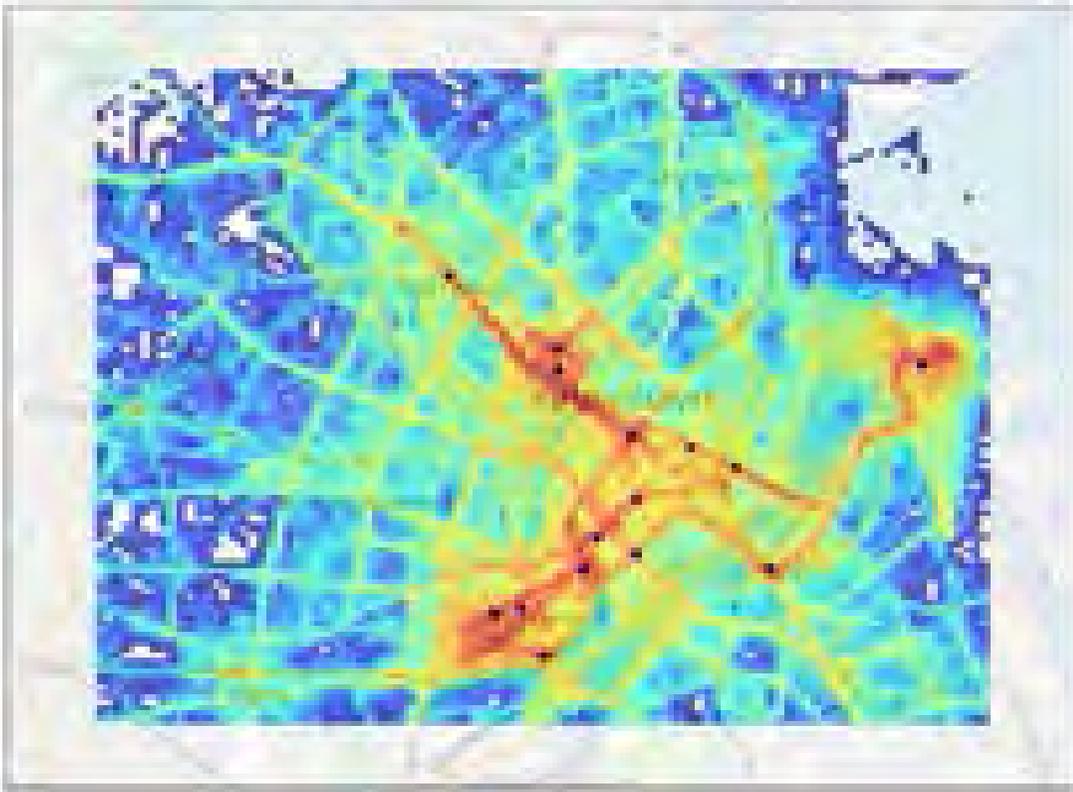
Country	Percentage
Denmark	53.1%
US	13.4%
UK	13.4%
Sweden	3.1%
Germany	3.1%
France	2.9%
Spain	2.0%
Italy	1.5%
Other	7.5%

- App developer Greencopper supplied phone operating system sourced country of origin data for app downloads (independent of the location data).
- This breakdown is set out in the table alongside.

Section 2:  
Cluster analysis  
– ‘hot spots’

# Popularity Map (30<sup>th</sup> May – 3<sup>rd</sup> Jun combined)

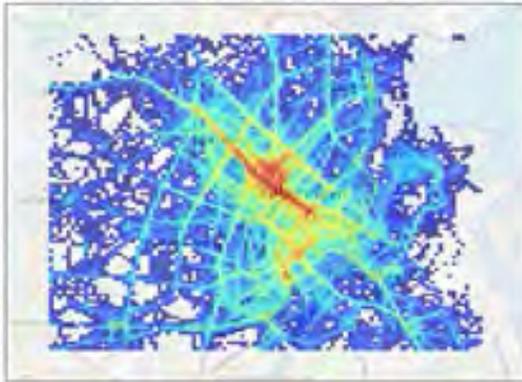
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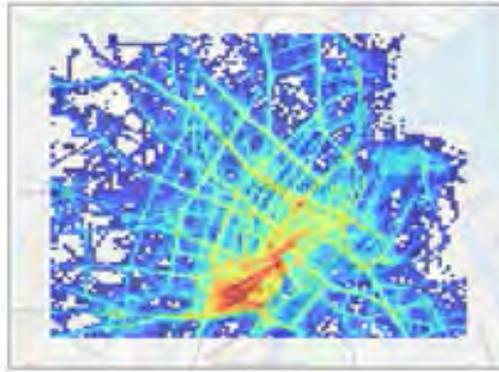
- We mapped density of location updates over the festival period on a grid superimposed on a map of central Copenhagen.
- Red indicates the greatest concentration of location updates. This unsurprisingly corresponds to main arterial roads leading to/from 'hot spots' (marked as black dots; see page 11)
- The heat map on the Colocator web console shows the density of devices at a specific time. This chart shows the number of devices found at each position across the whole duration of the festival.

# Popularity Map by individual day

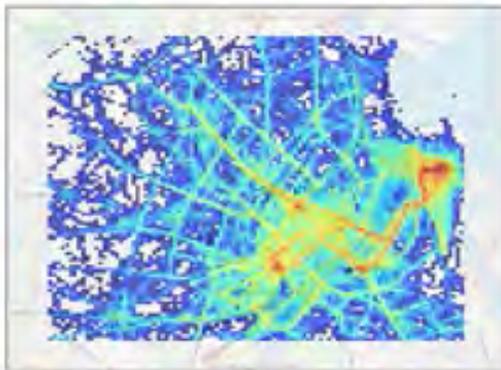
Wed 30<sup>th</sup> May



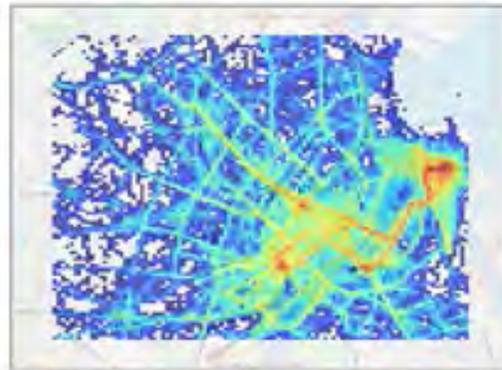
Thurs 31<sup>st</sup> May



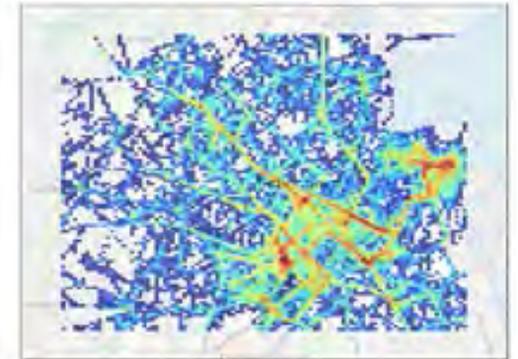
Fri 1<sup>st</sup> Jun



Sat 2<sup>nd</sup> Jun

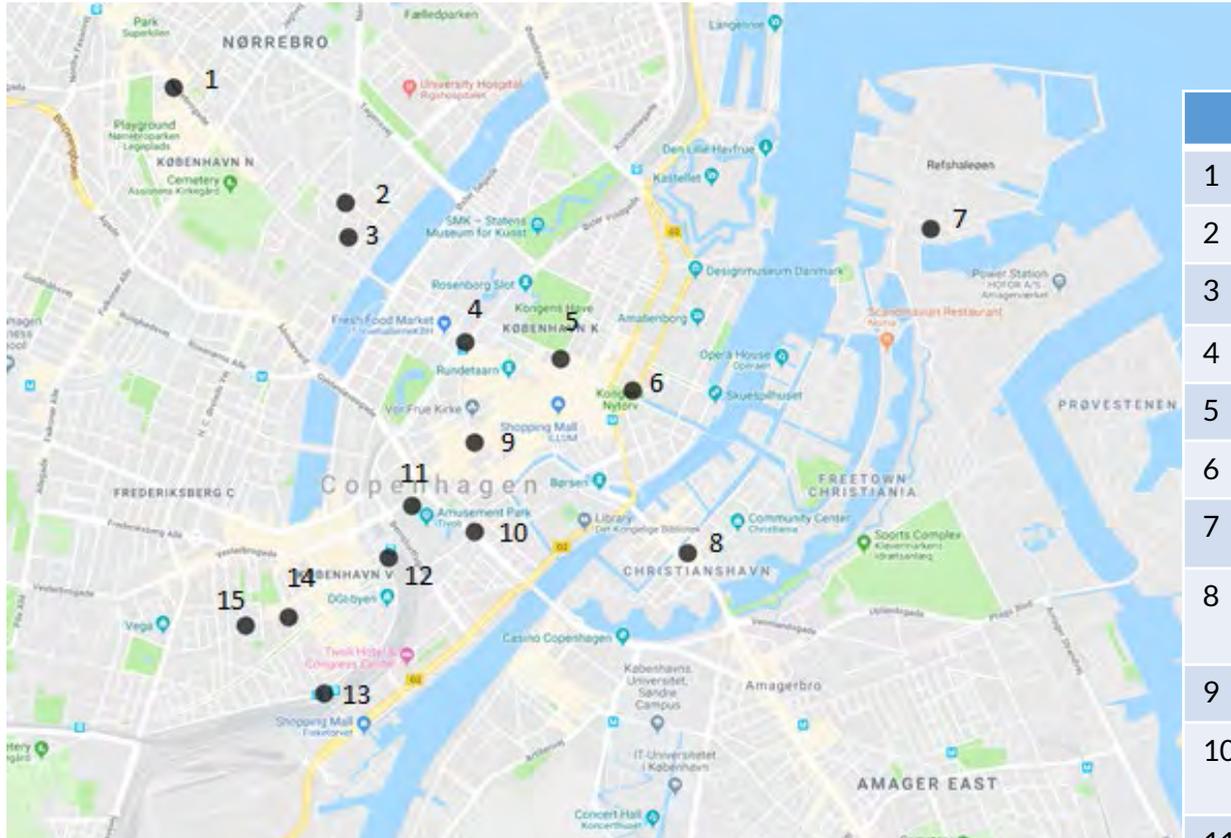


Sun 3<sup>rd</sup> Jun



- Very different patterns of crowd behaviour are observed for Weds, Thurs, Fri/Sat/Sun, driven by the location and timings of advertised festival events.

# Hot spots

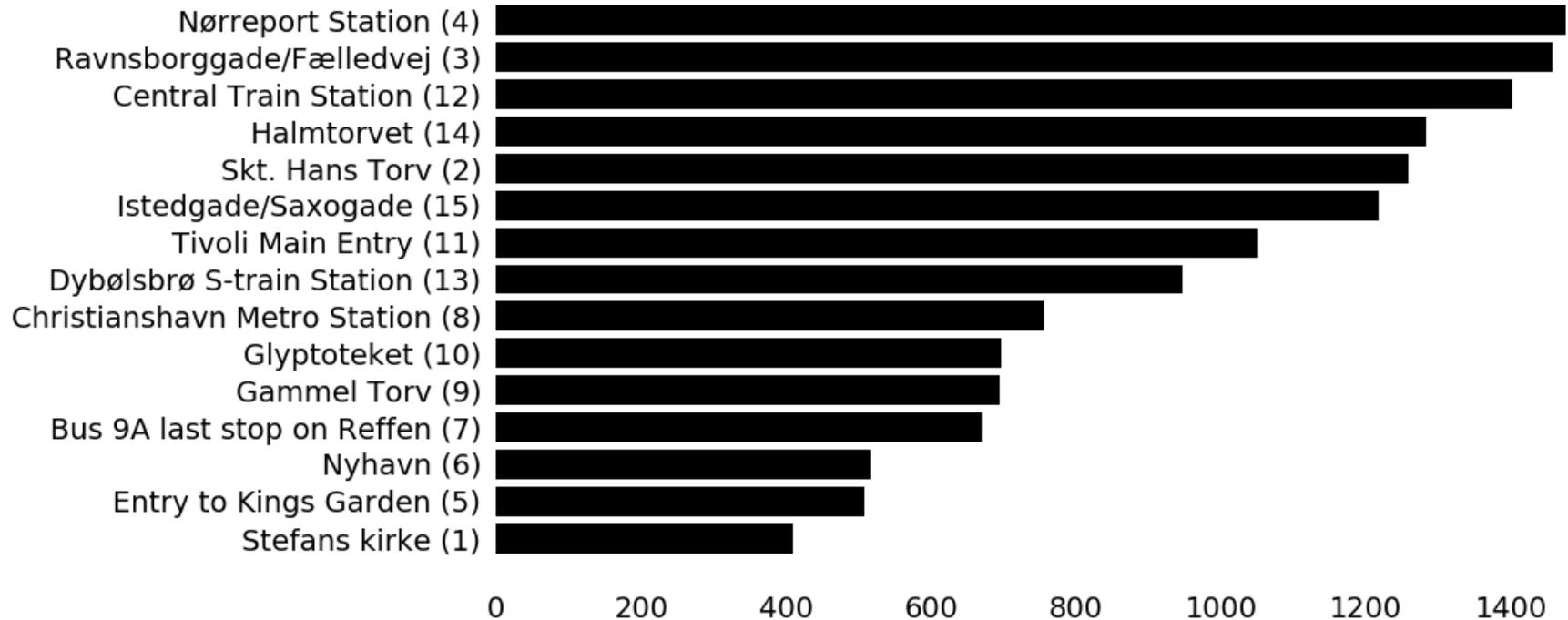


	Name	Type
1	Stefans kirke	T
2	Skt. Hans Torv	P
3	Ravnsborggade/Fælledvej	P
4	Nørreport Station	T
5	Entry to Kings Garden	P
6	Nyhavn	P
7	Bus 9A last stop on Reffen	T/P
8	Christianshavn Metro Station	T
9	Gammel Torv	P
10	Tivoli entry/Glyptoteket/HC Andersens Boulevard	P
11	Tivoli Main Entry	P
12	Central Train Station	T
13	Dybølsbrø S-Train Station	T
14	Halmtorvet	P
15	Istedgade/Saxogade	P

- 15 popular locations ('hot spots') were determined from our analysis of the entire location data set.
- We categorised each as either type transport (T) or point of interest associated with the festival (P).

# Relative importance of hotspots

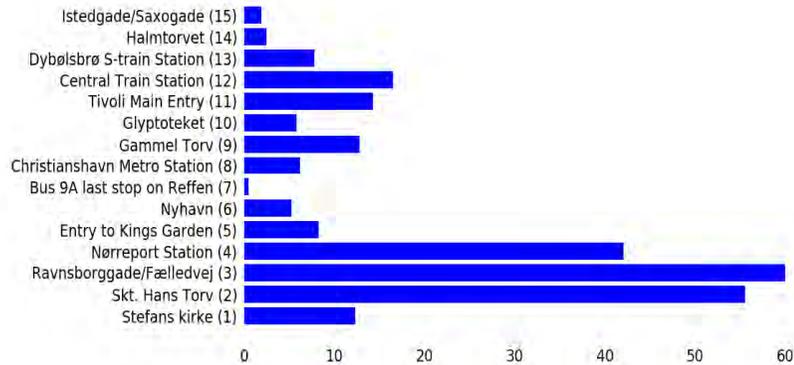
Number of devices seen at each hotspot across all five days.



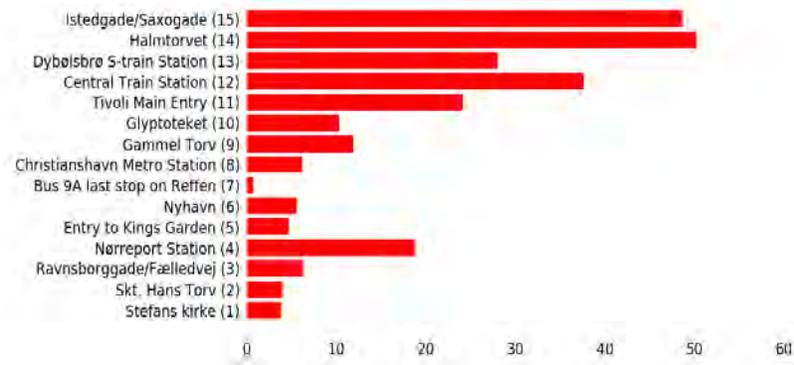
- Unsurprisingly the main transport hubs feature as the most important hotspots. Nørreport Station (4) is ranked as the busiest hotspot and the Central Train Station (12) the third busiest.

# Relative importance of hot spots – by day

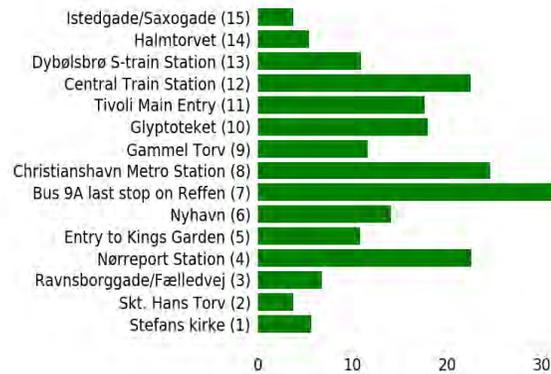
Wed 30<sup>th</sup> May



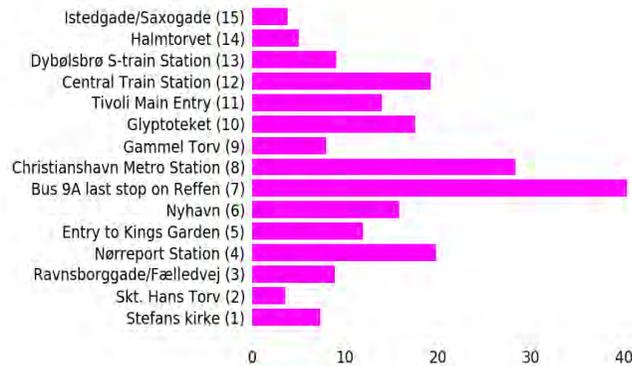
Thurs 31<sup>st</sup> May



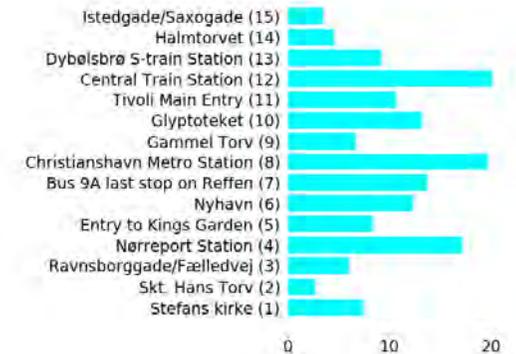
Fri 1<sup>st</sup> Jun



Sat 2<sup>nd</sup> Jun



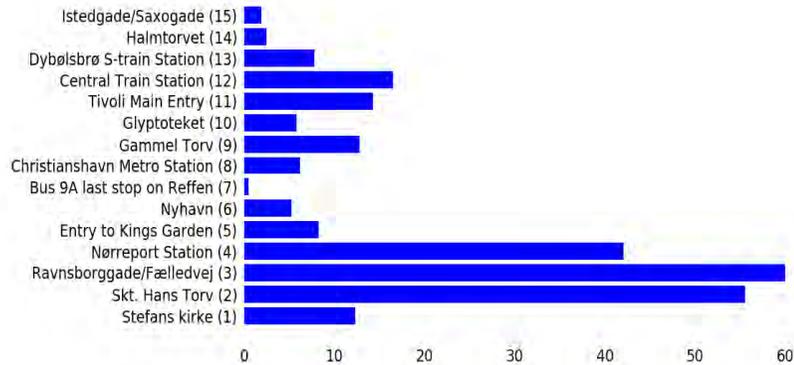
Sun 3<sup>rd</sup> Jun



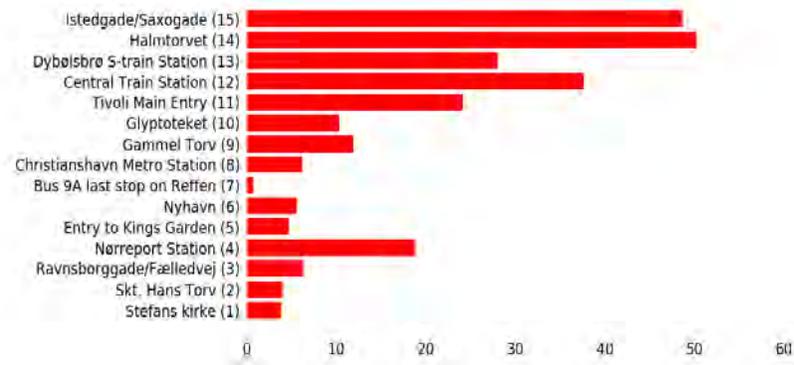
- By plotting the percentage of devices seen at the hot spot relative to all of the devices that reported a location on the day, we can see noticeably different crowd behaviours on different days.

# Relative importance of hot spots – by day (cont.)

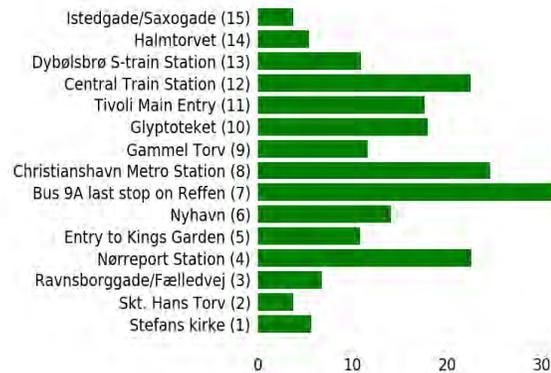
Wed 30<sup>th</sup> May



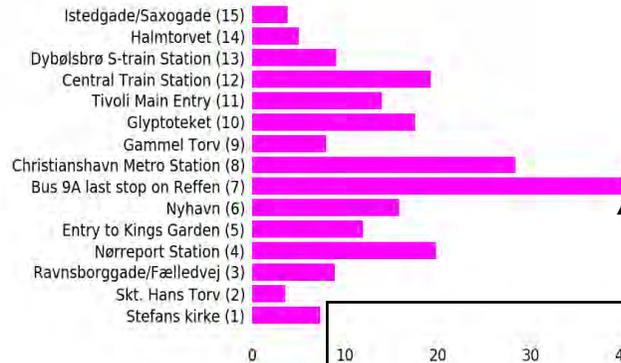
Thurs 31<sup>st</sup> May



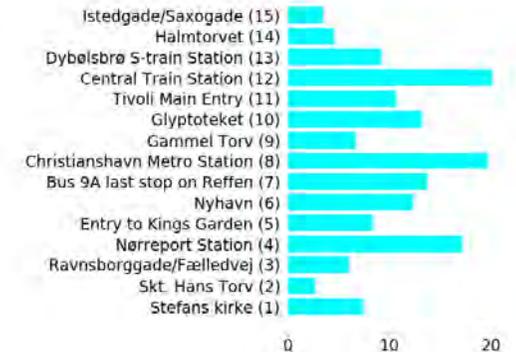
Fri 1<sup>st</sup> Jun



Sat 2<sup>nd</sup> Jun



Sun 3<sup>rd</sup> Jun

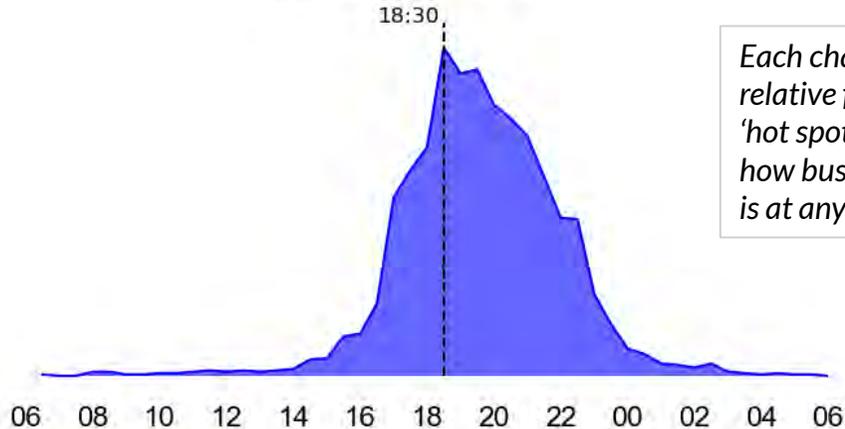


Ravnsborggade/Fælledvej and Skt. Hans Torv are busiest hotspots on Weds whereas Istedgade/Saxogade and Halmtorvet are the busiest on Thurs. This behaviour is driven by the location of the street parties.

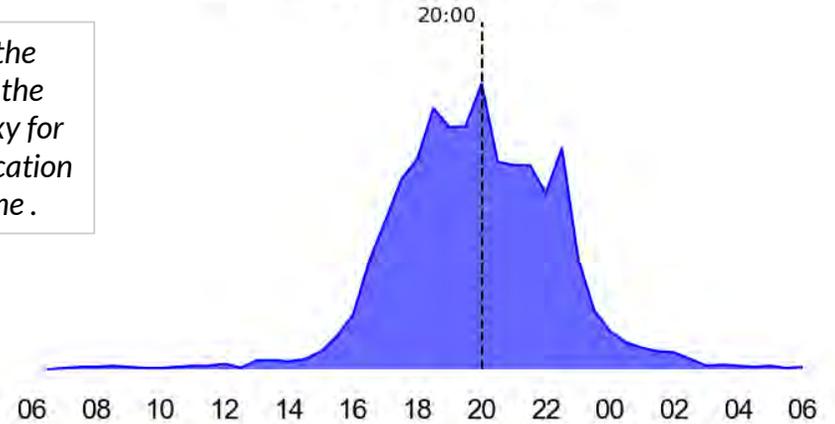
The crowd behaviour on the Fri and 2<sup>nd</sup> June are similar. Hotspot 7 is particularly important as it captures a bus stop on route to the main festivities.

# Top 4 busiest hot spots by time – Wed 30<sup>th</sup> May

Skt. Hans Torv (2)

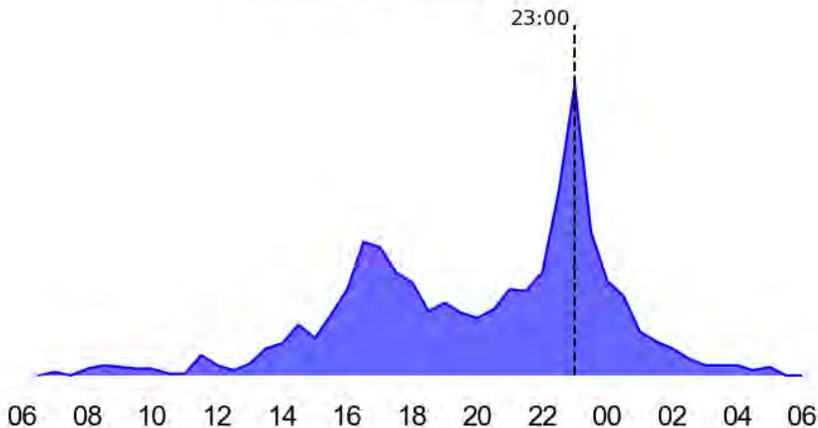


Ravnsborggade/Fælledvej (3)

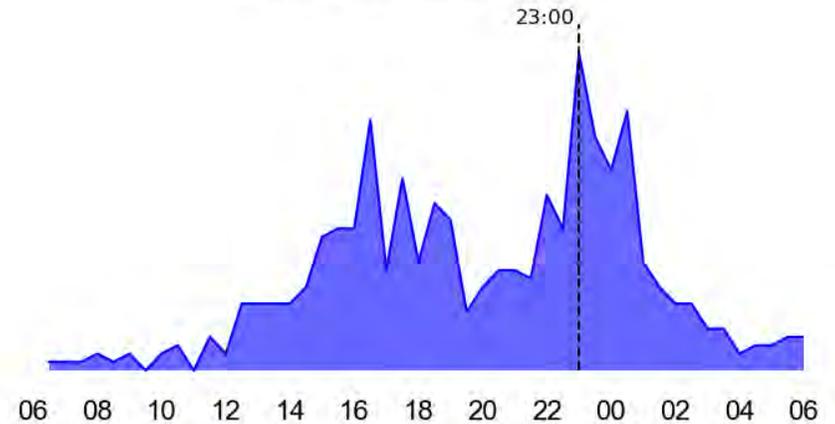


Each chart plots the relative flow into the 'hot spot' – a proxy for how busy that location is at any given time.

Nørreport Station (4)

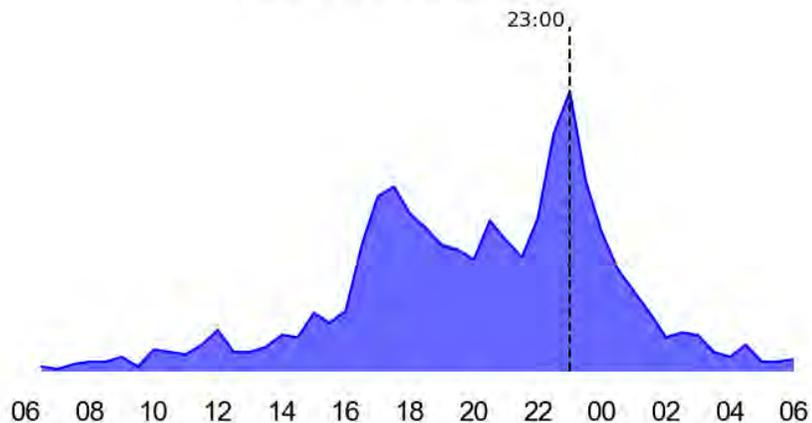


Central Train Station (12)

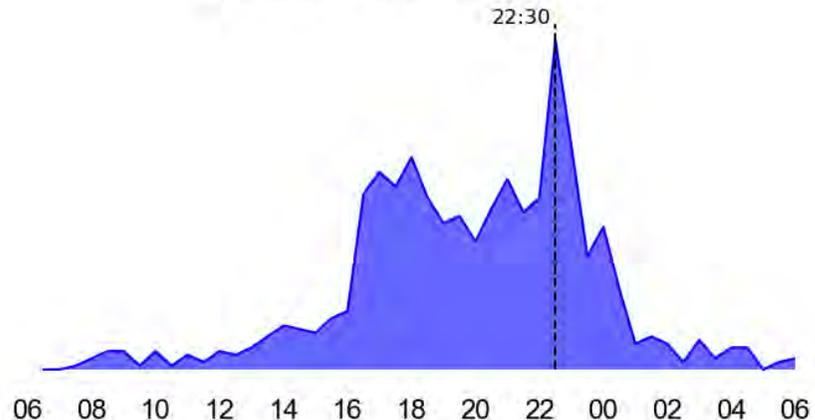


# Top 4 busiest hot spots by time – Thurs 31<sup>st</sup> May

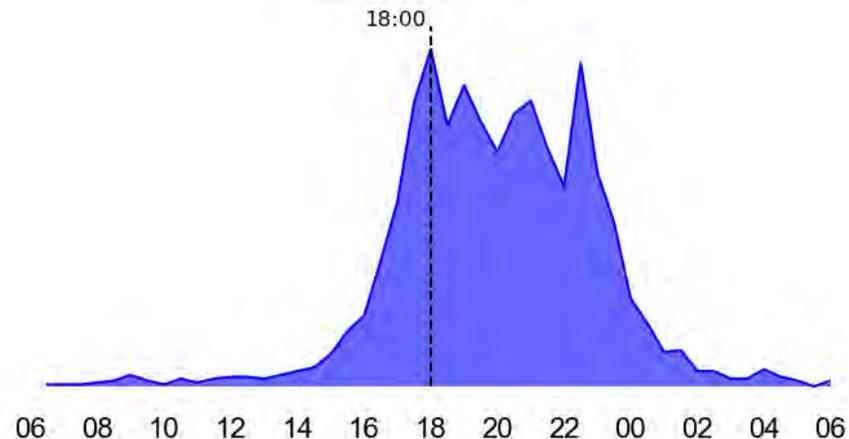
Central Train Station (12)



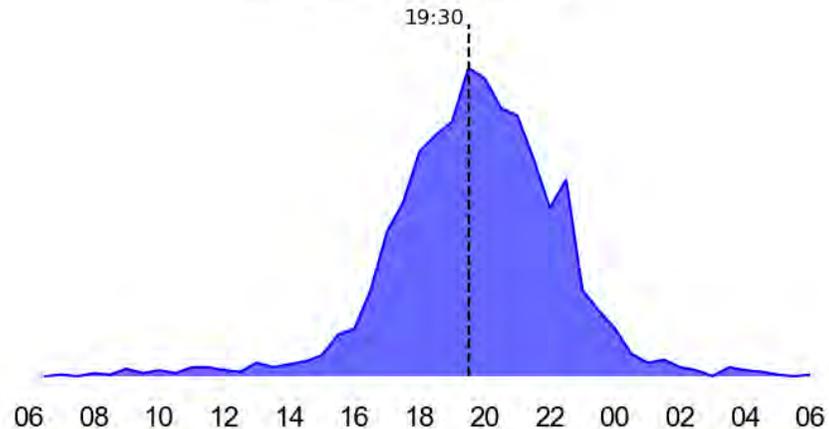
Dybølsbrø S-train Station (13)



Halmtorvet (14)

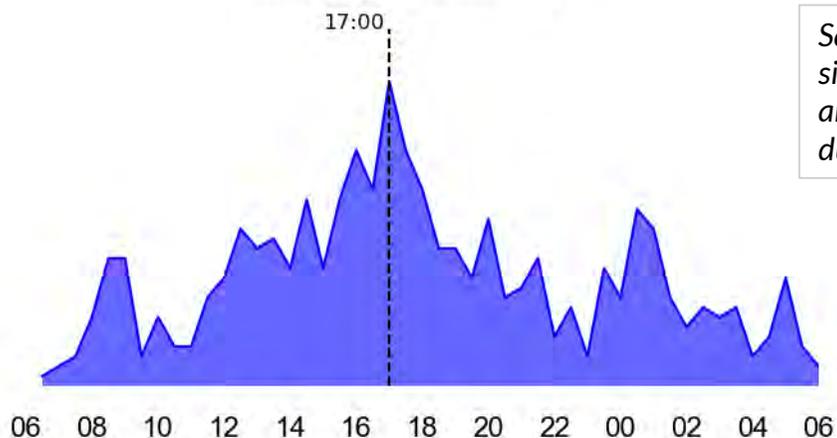


Istedgade/Saxogade (15)



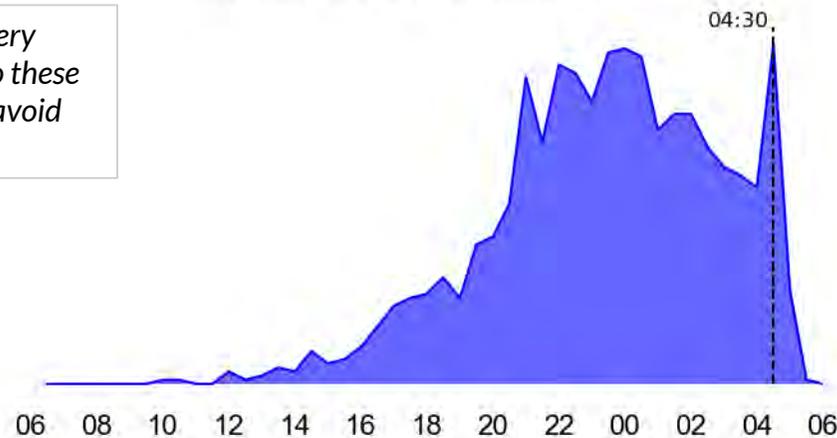
# Top 4 busiest hot spots by time – Fri 1<sup>st</sup> June

Nørreport Station (4)

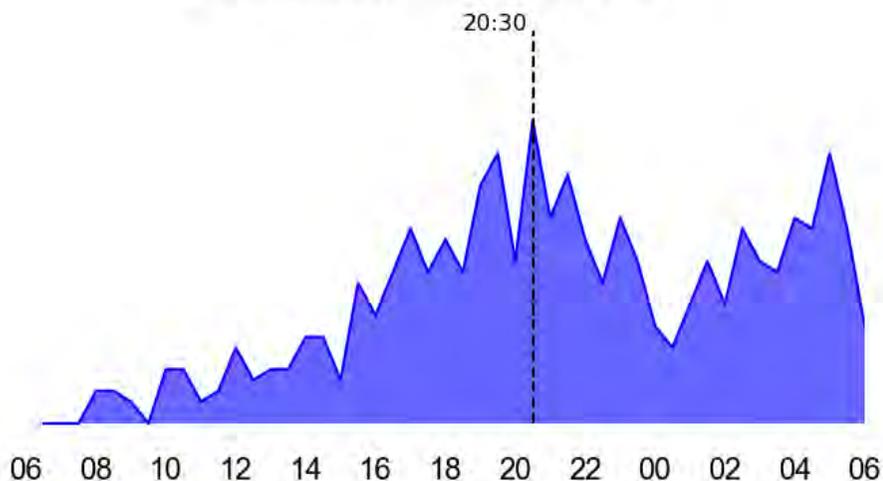


*Sat & Sun are very similar to Fri, so these are omitted to avoid duplication.*

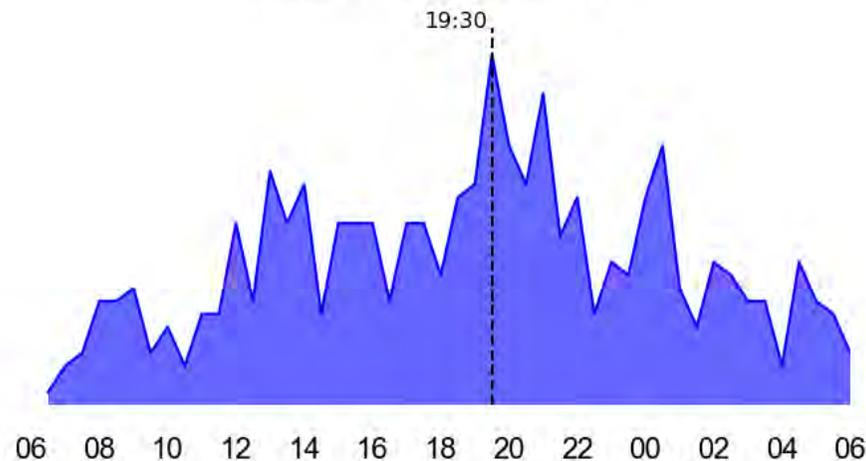
Bus 9A last stop on Reffen (7)



Christianshavn Metro Station (8)



Central Train Station (12)

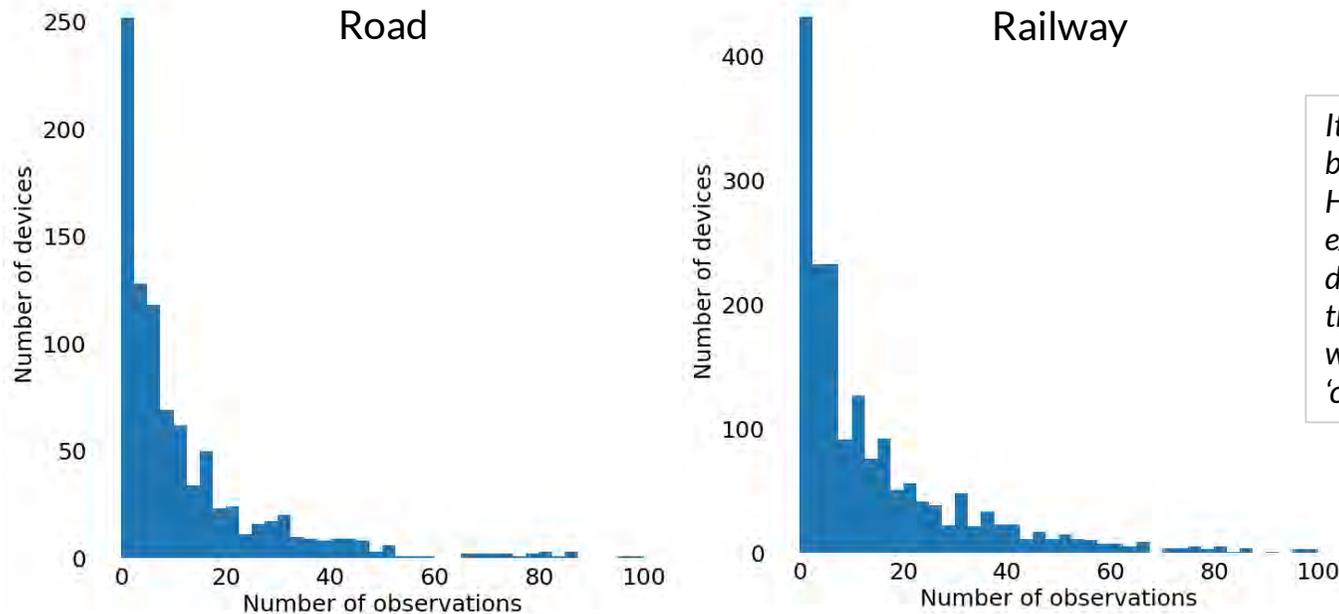


Section 3:  
Transport mode analysis



# Creating road / rail groups

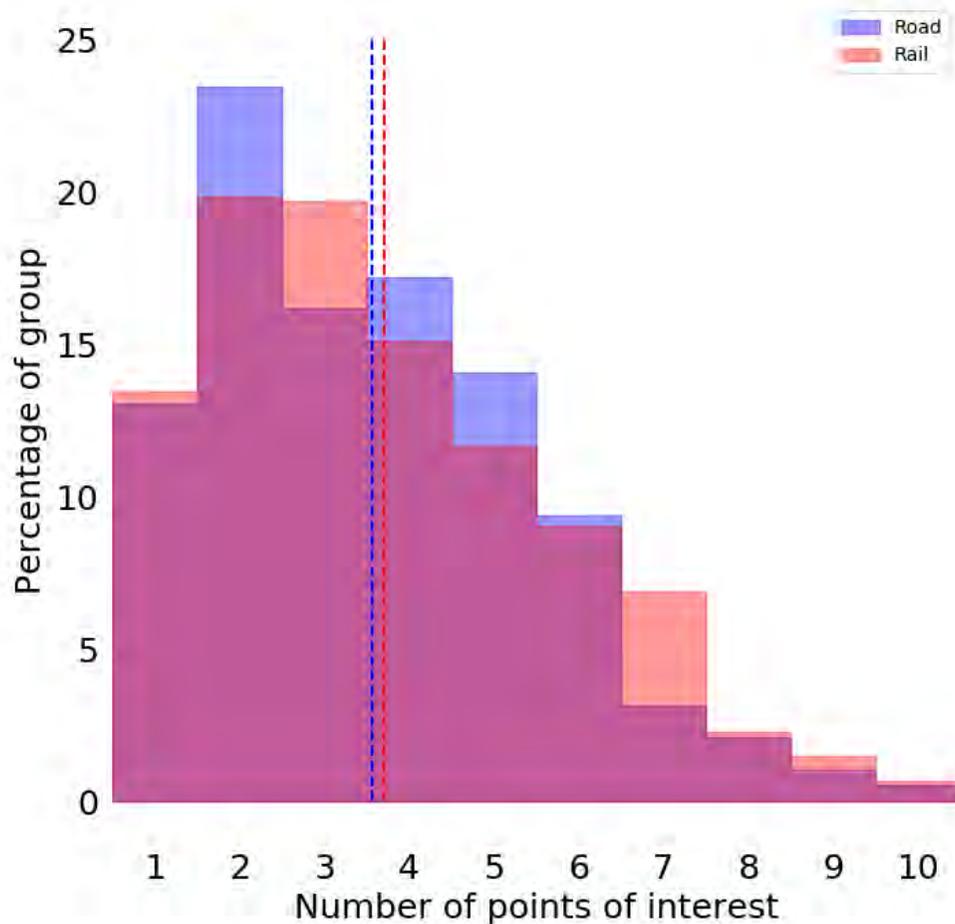
Frequency of the number of observations recorded on the road (left) and railway (right) networks.



*It is entirely possible for a visitor be both a road and railway user. However, to examine if visitors exhibit different behaviours depending upon their mode of transportation further filters were applied to obtain relatively 'clean' rail and road groups.*

- The rail group contains only those devices that recorded at least 10 observations on the rail network and none on the road network.
- The road group contains only those devices that recorded at least 10 observations on the road network and none on the rail network.
- After applying these filters the rail group contains 673 devices and the road group contains 217 devices. This suggests that the rail travel was roughly 3 times more popular than road travel.

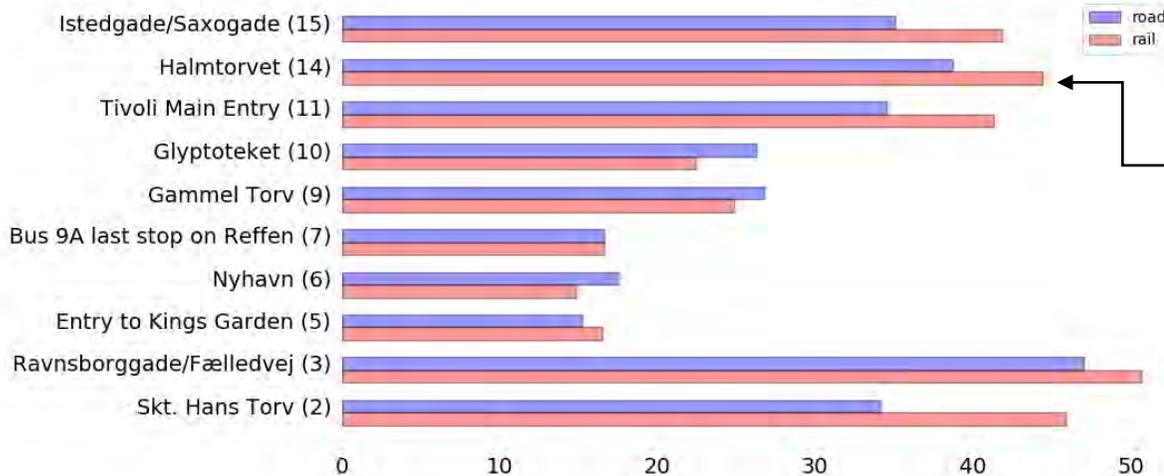
# Number of hot spots for rail/road groups



- Only a slight difference could be discerned between the average number of hot spots visited by the road and rail groups.
- The road group visited 3.5 hot spots and the rail group visited 3.7 hot spots on average. The distributions are very similar.

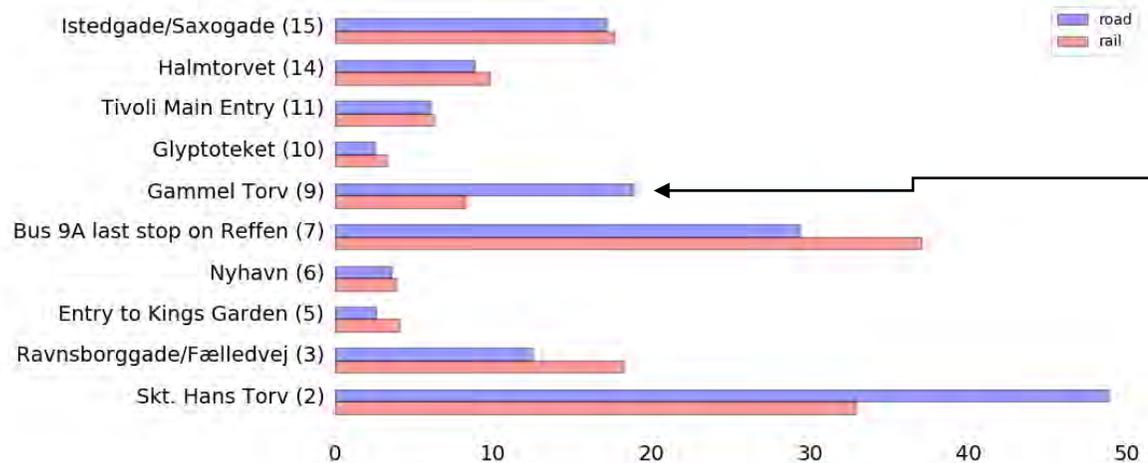
# Number of hot spots for rail/road groups

The relative importance (percentage of the group)



- The relative importance (percentage of the group) of the hot spots is similar for the road and rail groups.
- However a slightly larger fraction of the rail group are seen at Istedgade/Saxogade (15), Halmtorvet (14) and Tivoli Main Entry (11). This is probably due to their close proximity to the Central Train Station (12).

The average time spent (minutes)



- The average time spent (minutes) at each of the hot spots is also similar for the road and rail groups with a couple of exceptions.
- The visitors that travelled by road spent more than double the amount of time at Gammel Torv (9) compared with the visitors in the rail group. This may be because there are a number of car parks in the close vicinity of this location.

# colocator

Built from the ground  
up for live events.

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