

Modal split on the Zernike Campus: Summary

Introduction

The word *mobility* is often used interchangeably with the word *transportation*. However, there is a significant difference between these two terms. Transportation is the act of moving something or someone. Mobility is the **ability** to move freely by having **access** to transportation options we can count on to get us where we need to go. Improving people's mobility is at the heart of any transportation project.

Mobility is an important subject for Campus Groningen. The Zernike Campus is currently home to around 40.000 students and 8.000 employees, and under similar circumstances, these figures are predicted to grow linearly in the upcoming years, approaching 60.000 Campus users by 2030 (Figure 1), nearly 22% increase. The area of the Campus is, however, geographically limited, and the increasingly scarce space needs to be managed and used optimally.

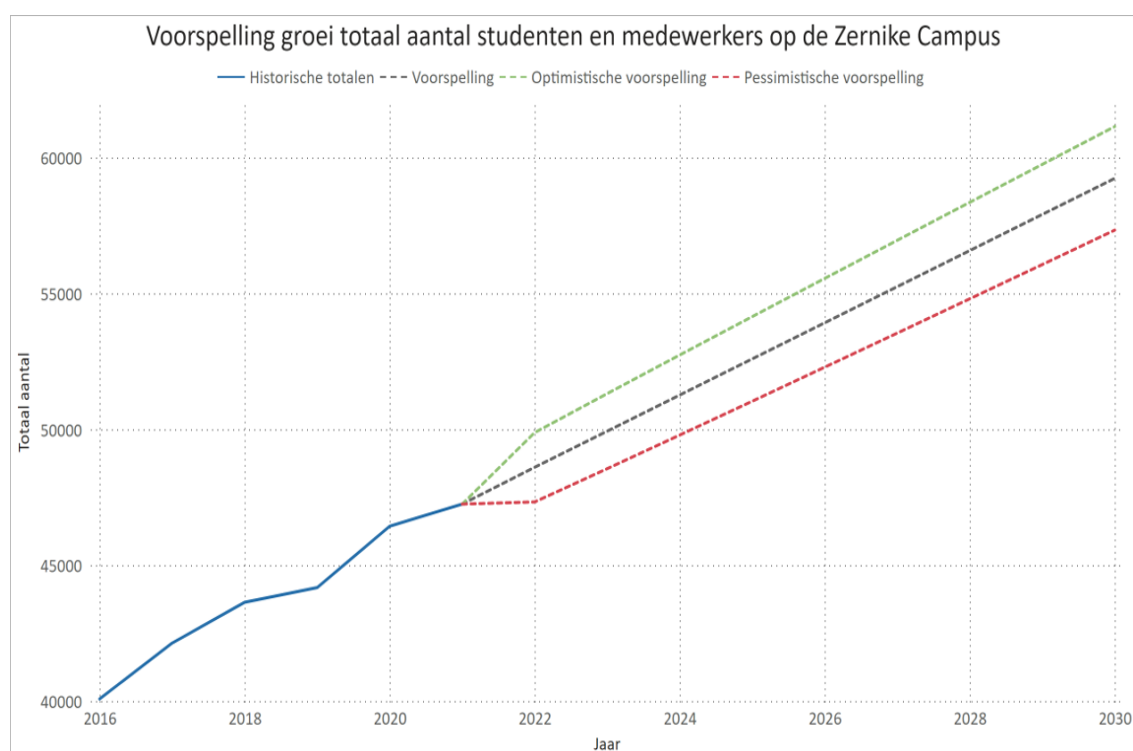


Figure 1. Predicted growth of Zernike Campus visitors (employees and students) based on linear trend forecasting. Source: Campus Groningen.

As the number of students and employees increases, the demand for mobility will also increase. This is likely to have a tremendous impact on physical space, and as a result on individual experiences. The Zernike Campus may face challenges such as severe traffic congestion and related safety issues, decline in air quality, increasingly crowded public transport, decrease in quantity and quality of bicycle and pedestrian infrastructures etc. To address and tackle these challenges the [Actieagenda Smart Mobility Campus 2022-2030](#) was introduced earlier this year. It aims for a *hospitable, accessible, and lively* Campus and includes ambitious goals such as the reduction of cars on the Zernike Campus, the promotion of change in travel behaviors of employees and students and the promotion of shared mobility by 2030. Certain concrete measures have been proposed to achieve these goals, such as the significant reduction of the available parking spaces.

To be able to formulate these goals more clearly, we need to first understand and assess the current situation. A vital component to evaluating transportation behavior and developing sustainable mobility in a particular area is the **modal split**, also known as modal share or modal choice. Modal split shows the distribution of traffic volumes among the various modes of transport. It can give us insight into our current transportation preferences and behavior. By understanding our current modal split, we can set modal split goals for the future. Doing so we may hope to achieve a **modal shift**, a change in the share of modes, ideally in favor of more sustainable options.

In this article we will provide an overview of the modal split on the Zernike Campus. We will look at current traffic volumes and discuss how they are distributed among the different modes. We will also describe the different modes of transport in a little more detail.

The results are based on data collected by AI-based intelligent traffic sensors called [FlowCubes](#) which are placed at six separate locations on the Zernike Campus and count incoming and outgoing traffic volumes, including bicycles and pedestrians. The data is anonymized and has around 95% accuracy. Anonymized data on public transport use has been acquired from the [OV-bureau Groningen Drenthe](#).

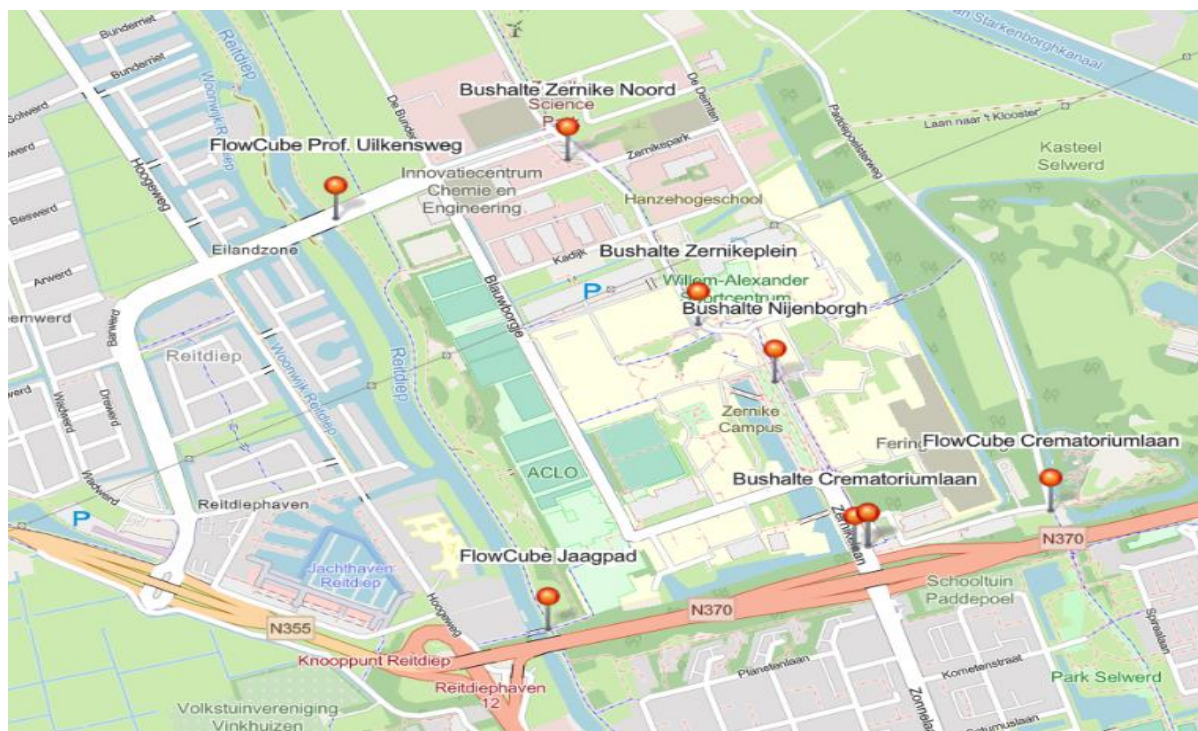


Figure 2. Locations of the FlowCubes and bus stops on the Zernike Campus.

Exploring this data can help us better understand the current traffic dynamics on the Zernike Campus and shape our assumptions about traffic volumes and behavior in the upcoming years. We can also look at external factors, such as weather conditions, Campus activities, public holidays etc. to see how they influence the current traffic volumes and how that information can be used in a smart way to optimize the mobility and use of space on the Zernike Campus.

Modal split analysis Zernike Campus

The summaries below depict data measured between 01-01-2022 and 20-09-2022. For this article we have focused on incoming traffic volumes (counts), however some summaries may also include outgoing traffic volumes (counts). Weekends and public holidays have been excluded from the data and have not been used in the calculations. On the other hand, vacation periods and certain exceptions (e.g., a day with an extreme weather, a day before or after a public holiday) have been included; even though they influence the average values, they are part of the natural data flow and are not considered outliers. To correct the effect of extreme

values on average values, we have also included the median values in our summaries – the median is the middle value in a dataset and as a positional value is not affected by extreme data points. All average values are working day averages.

Please take into consideration that we are still in the stage of data collection, and we regularly update and correct the data based on new information. Therefore, you may encounter some variability in the figures presented in this report and figures we may have published elsewhere. However, the rule of thumb is that the figures should approximately correspond and that there shouldn't be any extreme deviations or differences. There may also be some irregularities due to rounding.

Modal Split

Figure 2 depicts modal split on the Zernike Campus. We can see that bicycles make up just under half of all the incoming traffic into the campus, at a whopping 48,53%. Cars and public transport users have similar proportions at 21,05% and 17,13% respectively. It is noteworthy to mention that even though these two modes of transport come second and third in ranking, their total combined value is still lower than the total number of bicycles. The remaining traffic share, around 13%, is distributed among pedestrians, scooters, buses, and other modes of transport (e.g., trucks, motorcycles). On average, there are **15.740** people visiting the Zernike Campus on a working day.

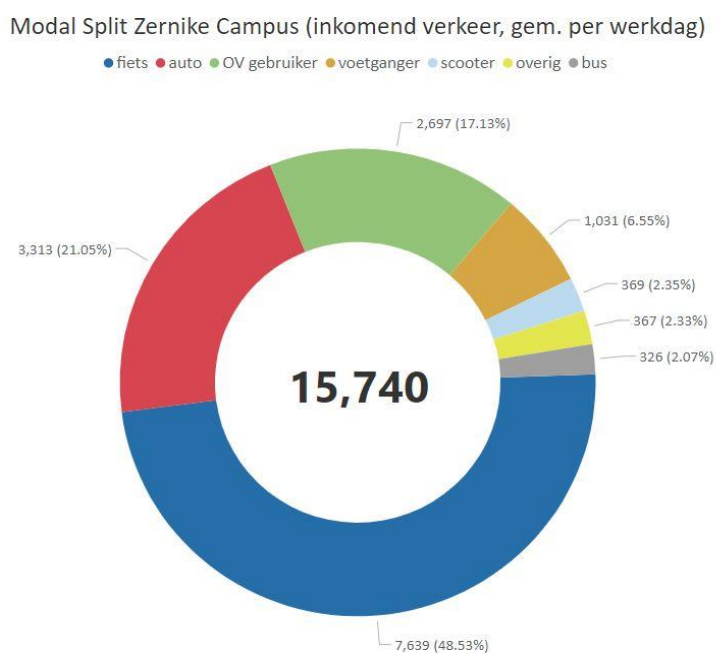


Figure 3. Modal split of all incoming modes of transport on the Zernike Campus. Source: FlowCubes, OV-bureau Groningen Drenthe.

Figures 4 and 5 highlight monthly trends. Figure 4 depicts monthly averages. These averages are dependent on the number of working days in a month; for example, we know that April has fewer working days than March due to three public holidays. We can also see the September peak after the summer holidays. However, since only the first three weeks of September have been measured so far, we can expect an even higher value at the end of the month.



Figure 4. Monthly averages of incoming traffic. Source: FlowCubes, OV-bureau Groningen Drenthe.

Figure 5 highlights the working day averages in more detail and allows us to explore the trends more closely. For example, we can see that as days get warmer, the use of bicycles becomes more prevalent. Dips in the data on specific days can also provide us with interesting insights.

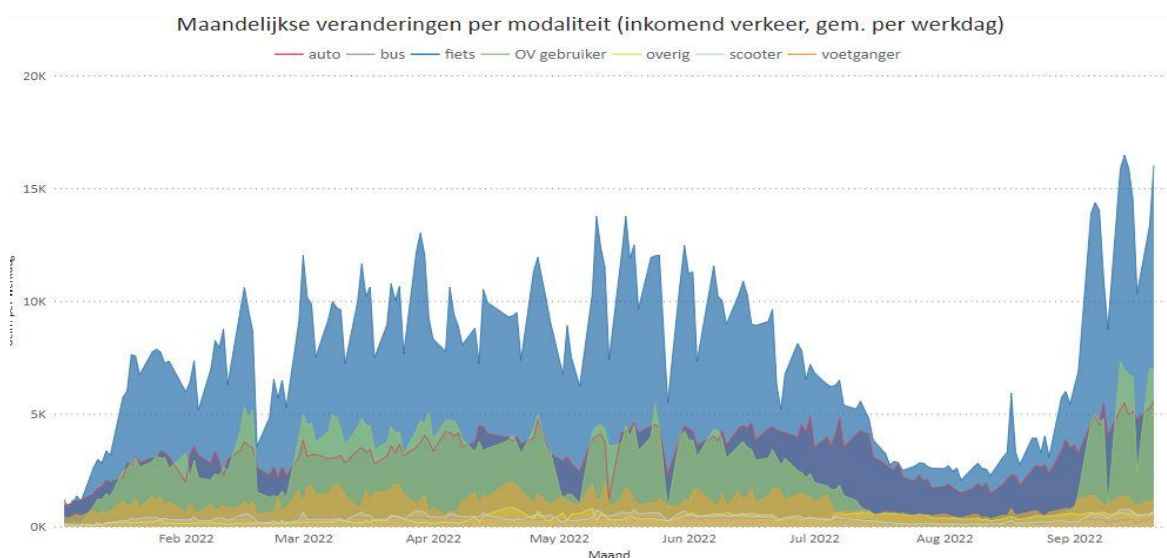


Figure 5. Working day averages of incoming traffic per month. Source: FlowCubes, OV-bureau Groningen Drenthe.

Let us zoom in on one such day, such as 18 February. A quick google search will tell us that this was a particularly stormy day with Code Red warnings from the KNMI – therefore we see a decline in traffic volumes in general. We can also see that the number of bicycles has almost halved compared to an average Friday (Figure 6), while the number of cars and public transport users has increased. There are also slightly fewer pedestrians.

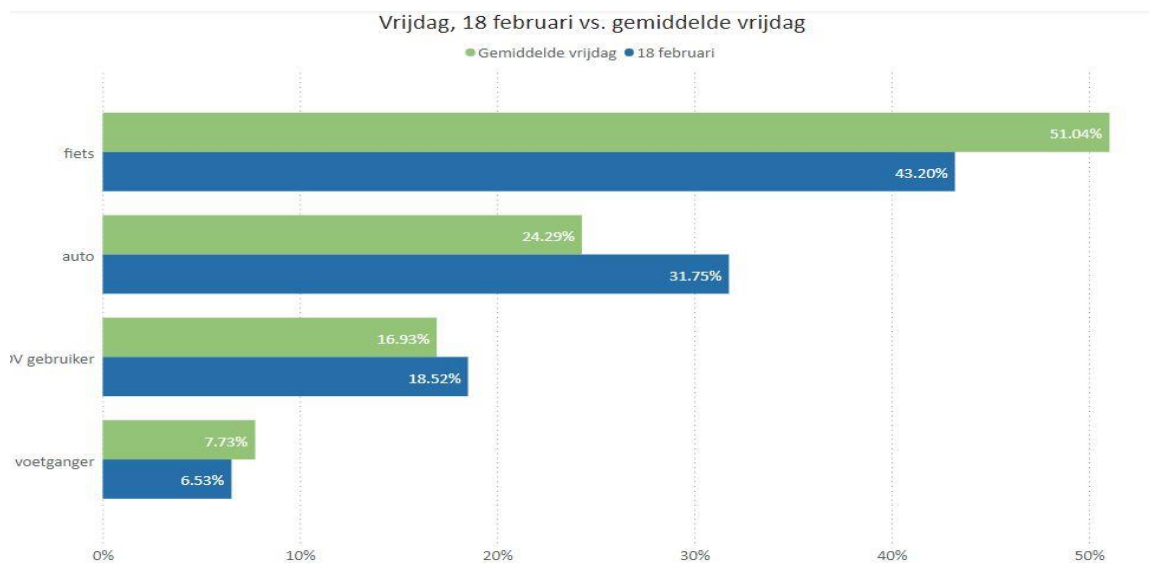


Figure 6. Comparison between Friday, February 18, and an average Friday. Source: FlowCubes, OV-bureau Groningen Drenthe.

Overview of the Modes of Transport

There are on average **15.740** people visiting the Zernike Campus on a working day. The median value of the daily visitors is **16.204**. Figure 13 depicts an overview of the hourly traffic into the Campus. The morning peak is at 08.00 and the afternoon peak is at 15.10 and 16.10.

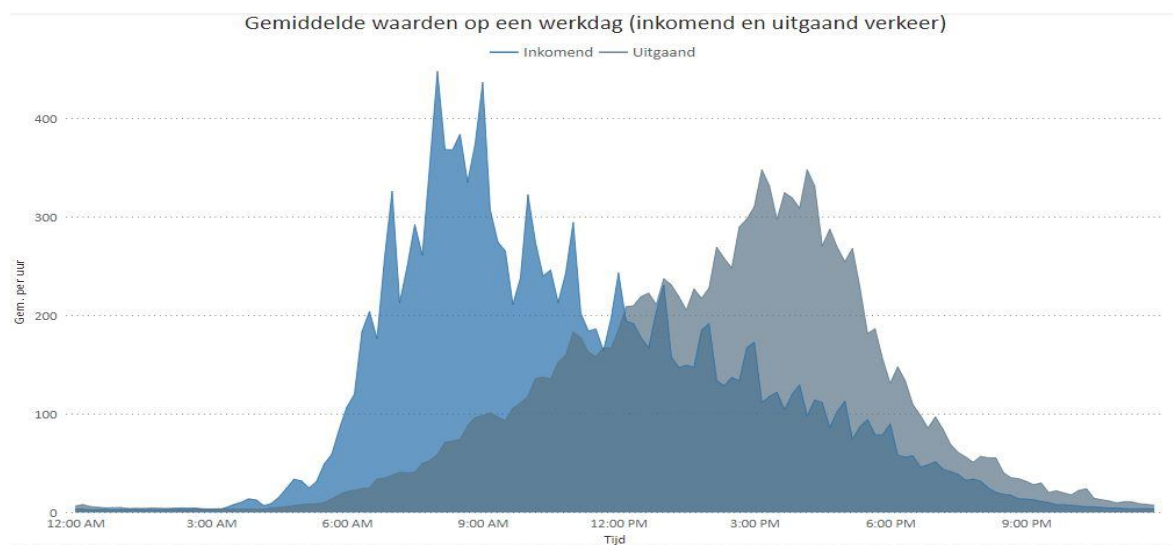


Figure 7. Average number of incoming and outgoing modes of transport per hour on a workday. The data is measured every ten minutes. Source: FlowCubes, OV-bureau Groningen Drenthe.

Walking and taking the car are the preferred means of transport in the early morning and late evening. In the morning and early afternoon, cars, bicycles, and public transport are the most preferred means of transport (Figure 8).

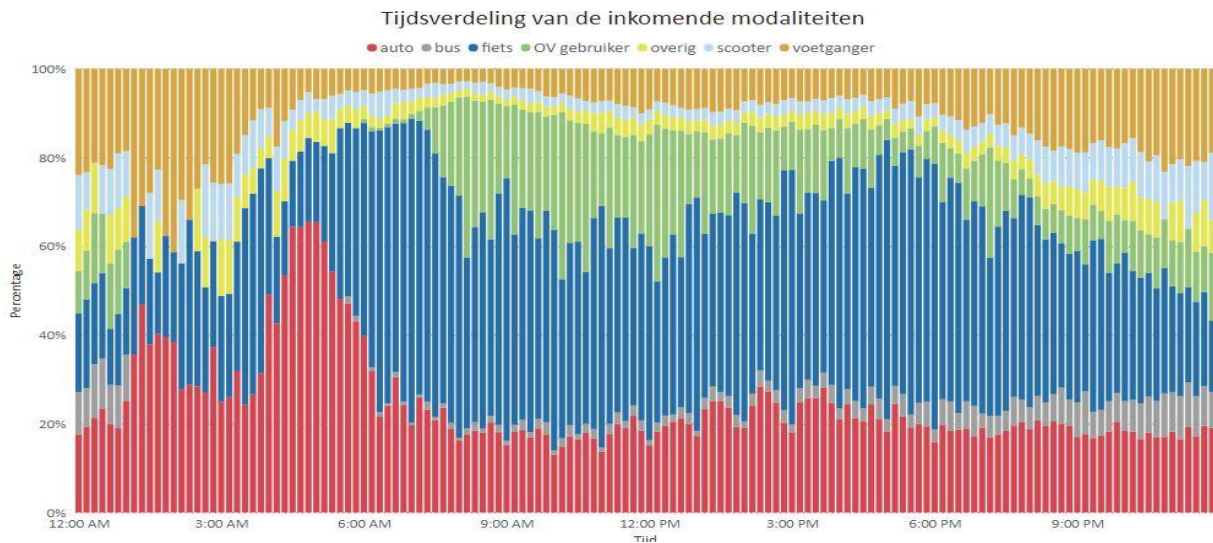


Figure 8. The time distribution of average number of incoming and outgoing modes of transport on a workday. The data is measured every ten minutes. Source: FlowCubes, OV-bureau Groningen Drenthe.

Tuesday is the busiest day on the Campus, followed by Wednesday and Thursday, while Friday is the quietest day (Figure 9).

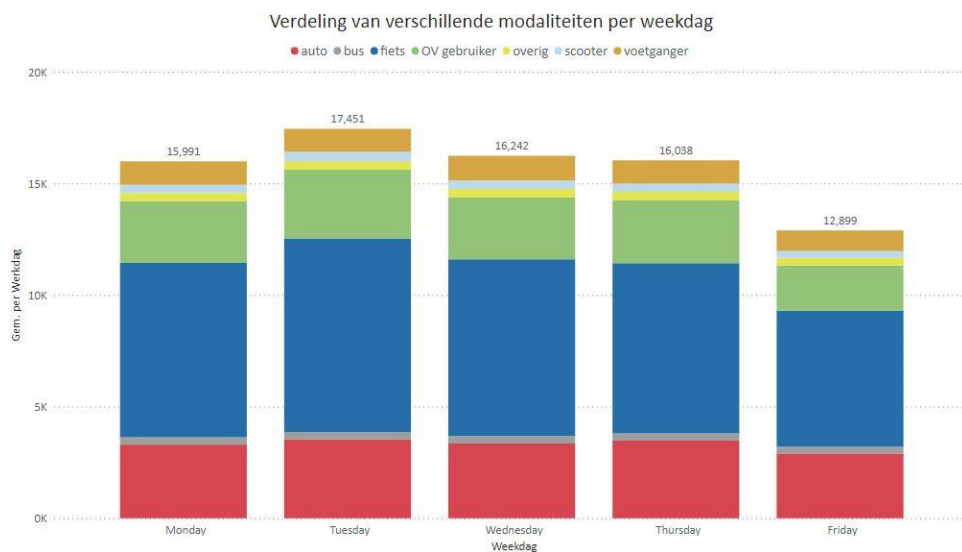


Figure 9. Average number of incoming modes of transport per weekday. The data is measured every ten minutes. Source: FlowCubes, OV-bureau Groningen Drenthe.

Cars

On average **3.313** cars come to the Campus on a working day. The median number of cars is **3.375**. Cars make up around 21% of all the daily traffic to the Zernike Campus. The morning peak hour for cars is 08.00 and the afternoon peak is at 15.50.

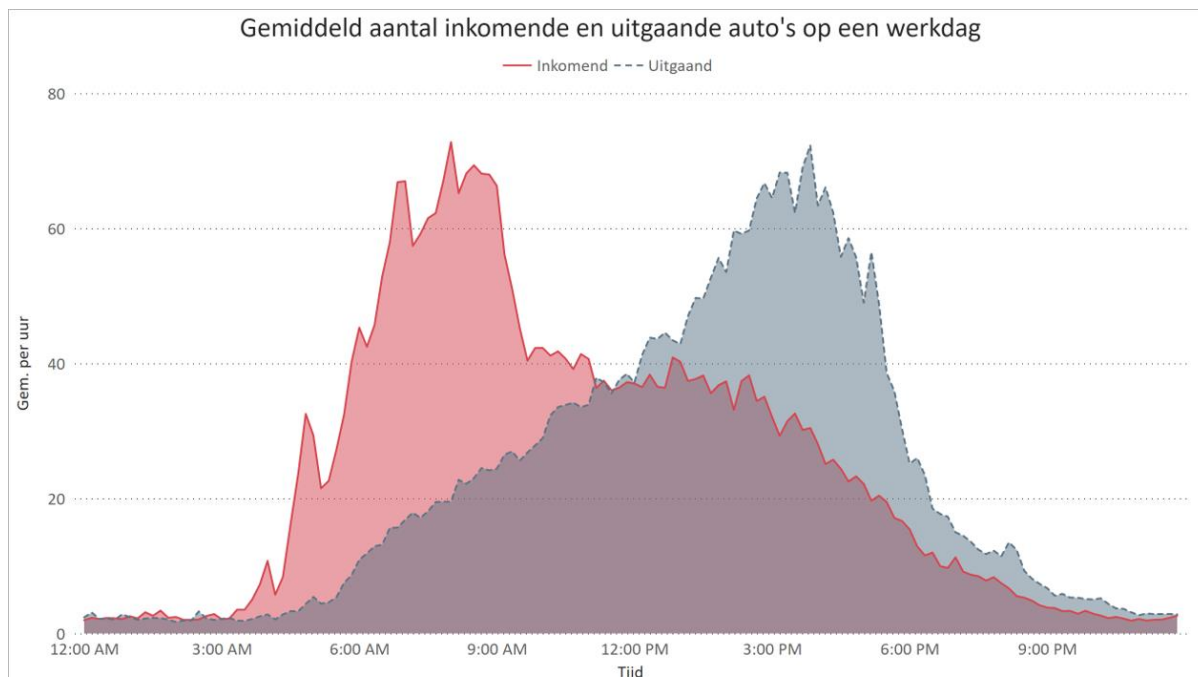


Figure 10. Average number of incoming and outgoing cars per hour. The data is measured every ten minutes. Source: FlowCubes.

Bicycles

On average **7.639** people cycle to the Campus on a working day. The median number of bicycles is **7.597**. Cyclists make up 50% of all the daily traffic into the Zernike Campus. The morning peak hour for bicycles is 09.00 and the afternoon peak is at 16.10. It can be seen from Figure 8 that there are multiple peaks for incoming cyclists during the day. It is likely that these peaks have to do with lecture times: the peaks for outgoing traffic are less sharp which further reinforces this possibility; students are more flexible to leave at their convenience after lectures. However more data is needed to clarify this.

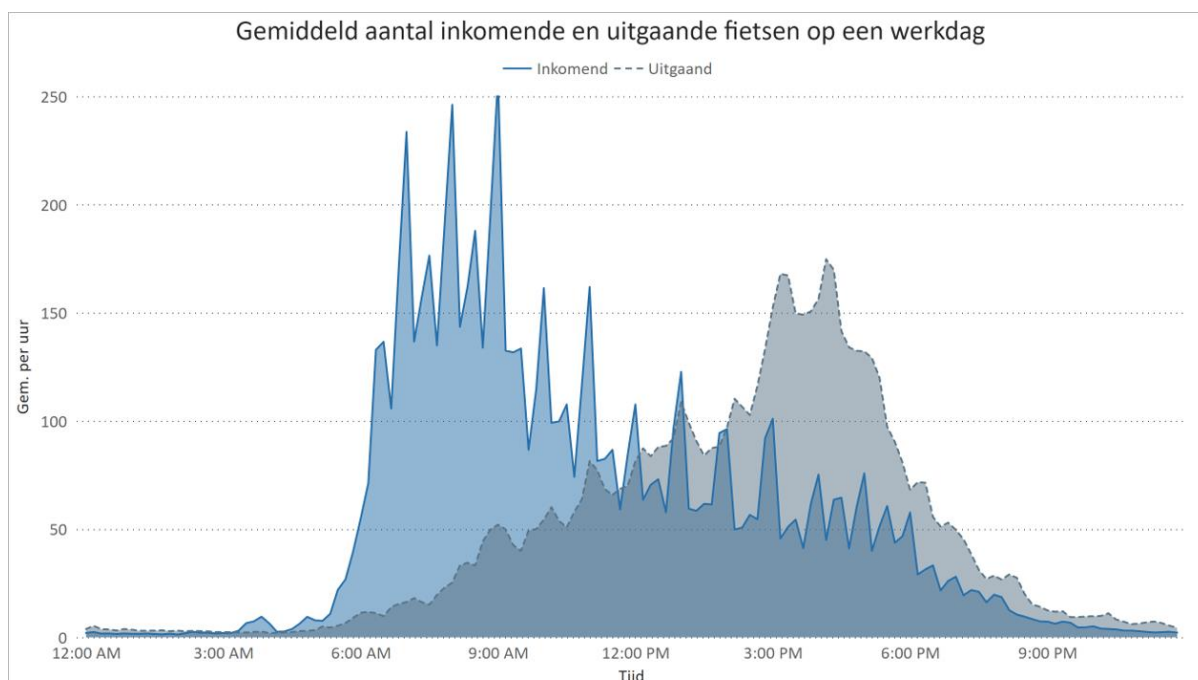


Figure 11. Average number of incoming and outgoing bicycles per hour. The data is measured every ten minutes. Source: FlowCubes.

Public Transport

On average **2.697** people come to the Campus on a working day using public transport. The median number of public transport users is **3.028**. Public transport users make up around 17% of all the daily traffic to the Zernike Campus. The morning peak hour for public transport users is 08.10 and the afternoon peak is at 16.40.

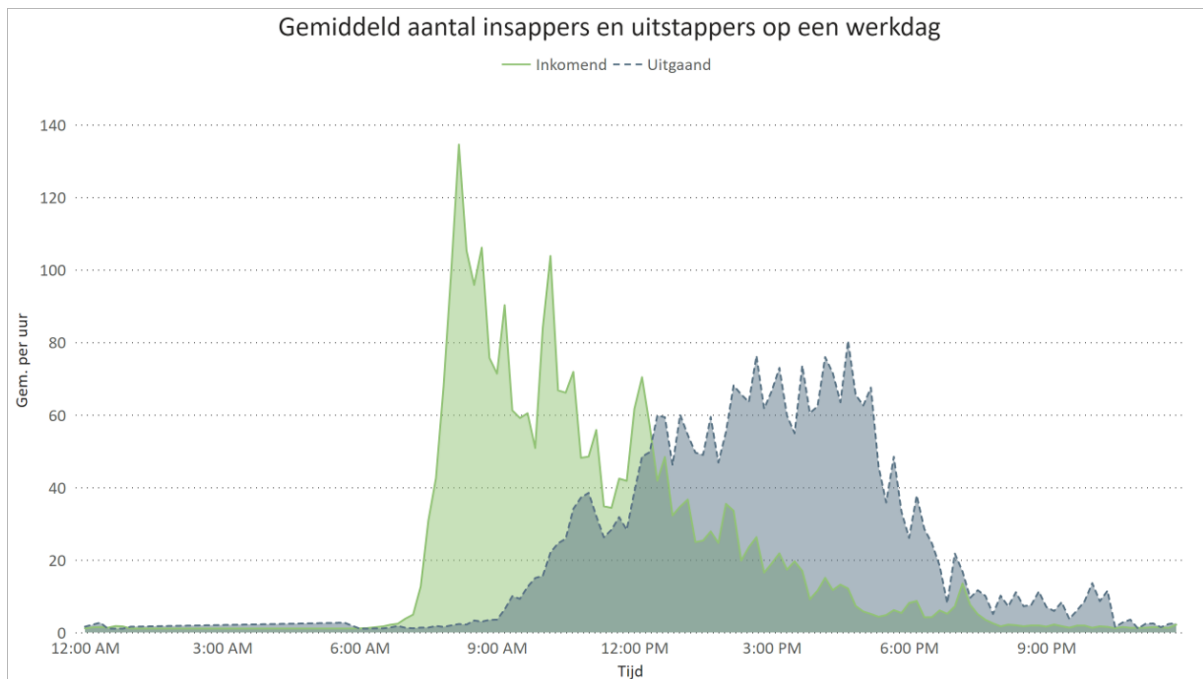


Figure 12. Average number of public transport users per hour. The data is measured every hour. Source: OV-bureau Groningen Drenthe.

On average **326** buses operate on the Campus on a working day. The median number of buses is **351**. This makes up only around 2% of all the traffic into the Zernike Campus. It is a little difficult to pinpoint the peak hours for buses since they operate on regular schedules. We can however see that there are more incoming buses in the morning, from 08.20 to 10.20, and slightly more outgoing buses in the afternoon, starting from 15.50.

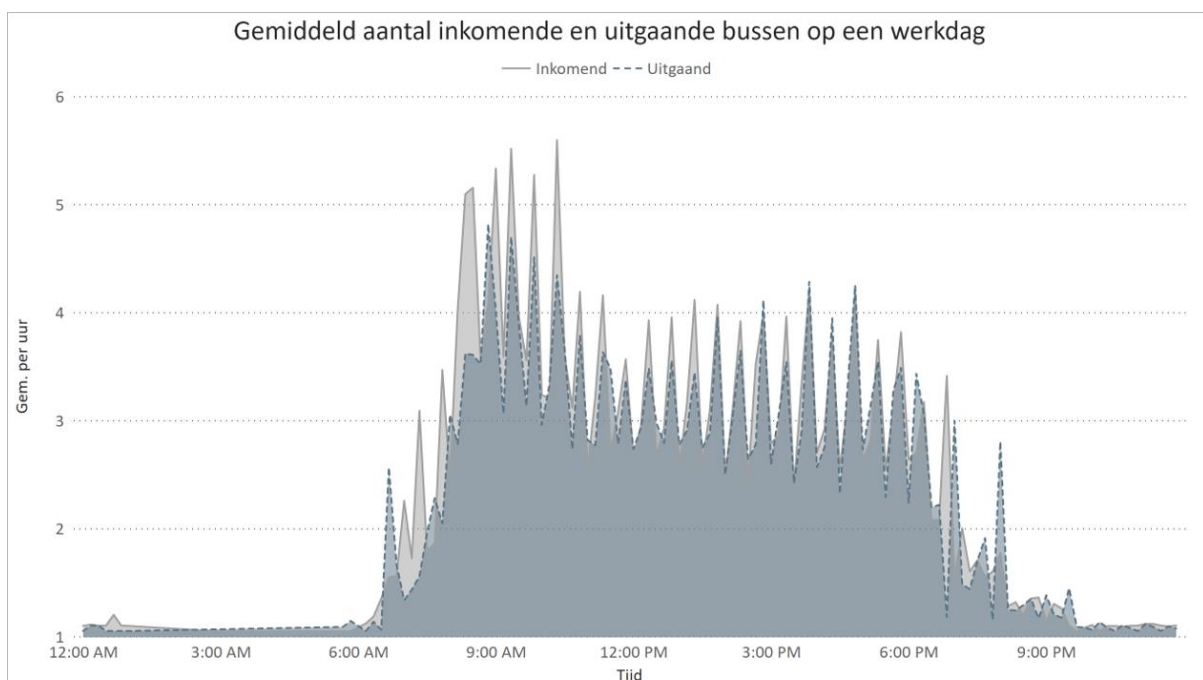


Figure 13. Average number of incoming and outgoing buses per hour. The data is measured every ten minutes. Source: FlowCubes, OV-bureau Groningen Drenthe.

Scooters

On average **369** scooters come to the Campus on a working day. The median number of scooters is **362**. Scooters make up a little over 2% of all the traffic into the Zernike Campus. The morning peak hour for scooters is 06.20 and the afternoon peak at 15.10. We notice similar sharp peaks for incoming scooterists, which may again have to do with lecture times.

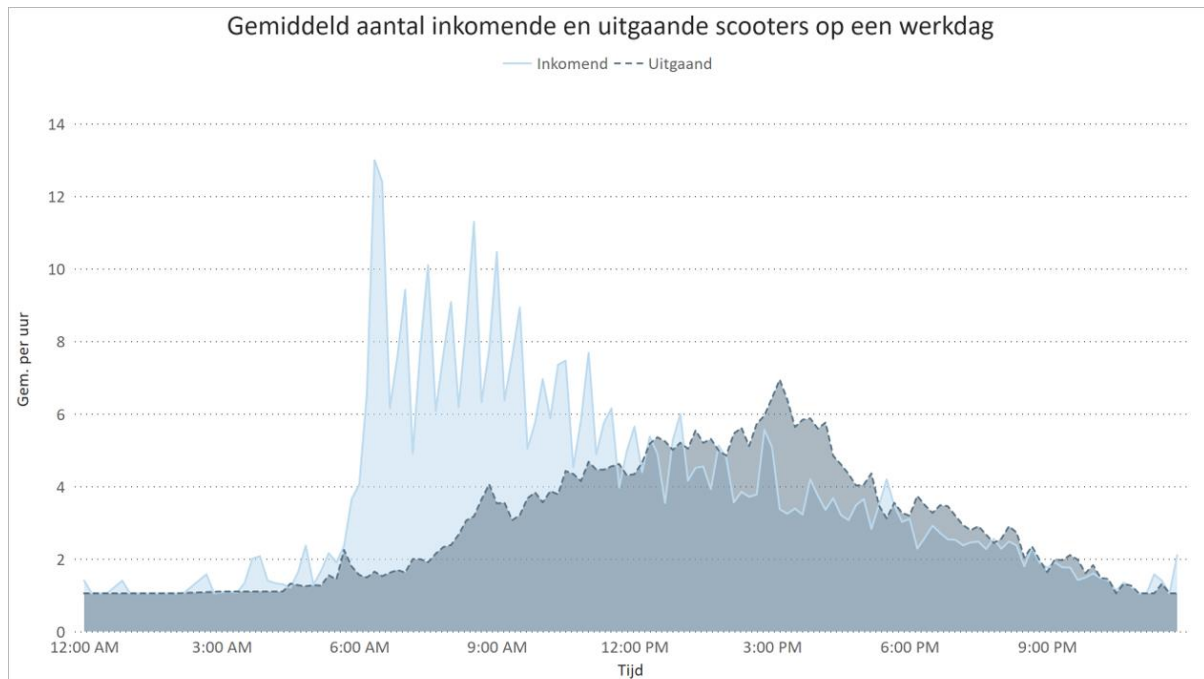


Figure 14. Average number of incoming and outgoing scooters per hour. The data is measured every ten minutes. Source: FlowCubes, OV-bureau Groningen Drenthe.

Pedestrians

On average **1.031** pedestrians come to the Campus on a working day. The median value for pedestrians is **1.003**. Pedestrians make up around 7% of all the traffic to the Zernike Campus. It should be noted that public transport users are not counted as pedestrians. Pedestrians may belong to two categories: students or employees who live close by and walk to the Campus, or visitors who come to the Campus for a walk. The morning peak hour for pedestrians is between 08.50 and 11.50 and the afternoon peak is at 15.10. Sharp consistent peaks exist in the data as well, which may indicate that these are more likely to be students attending lectures than random visitors.

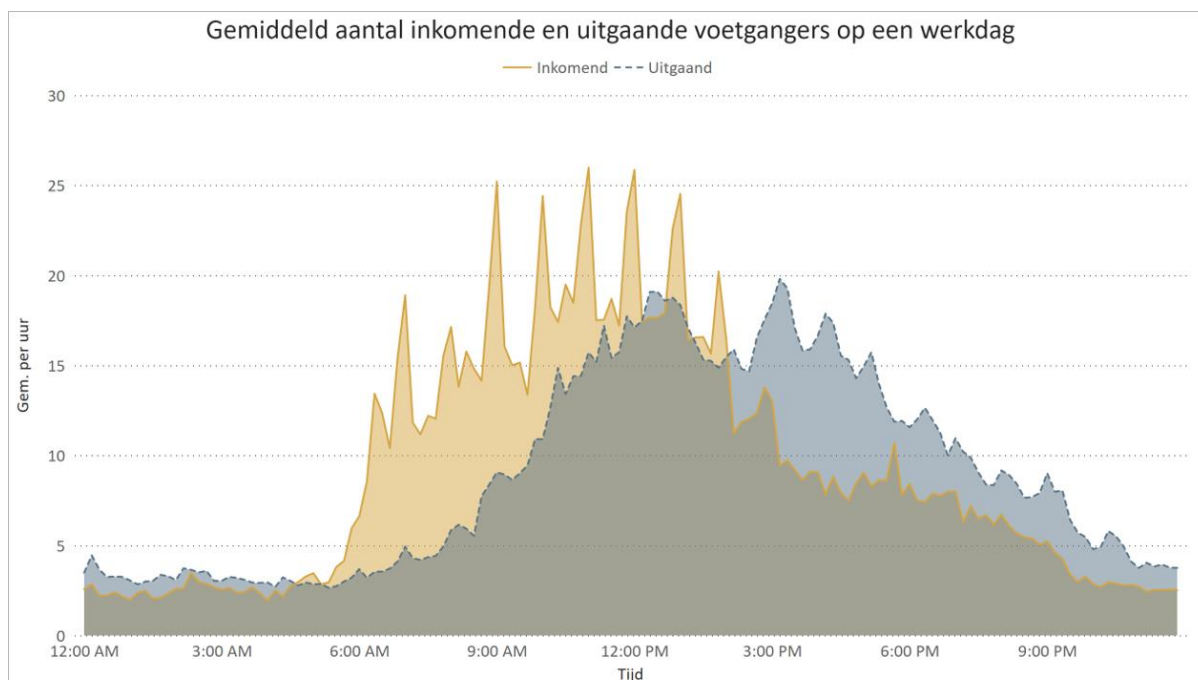


Figure 15. Average number of incoming and outgoing pedestrians per hour. The data is measured every ten minutes. Source: FlowCubes, OV-bureau Groningen Drenthe.

Median vs. Average

To see how well the average values represent reality, we can compare them to the median values, which are less sensitive to extreme data points. In Figure 16 we can see that the median and average values for all modes of transport are quite close to each other, with the only exception being the public transport users. This can mean that we have many extremely low values in the data, which have affected the average. In this case the median value is more representative of the reality than the average value.

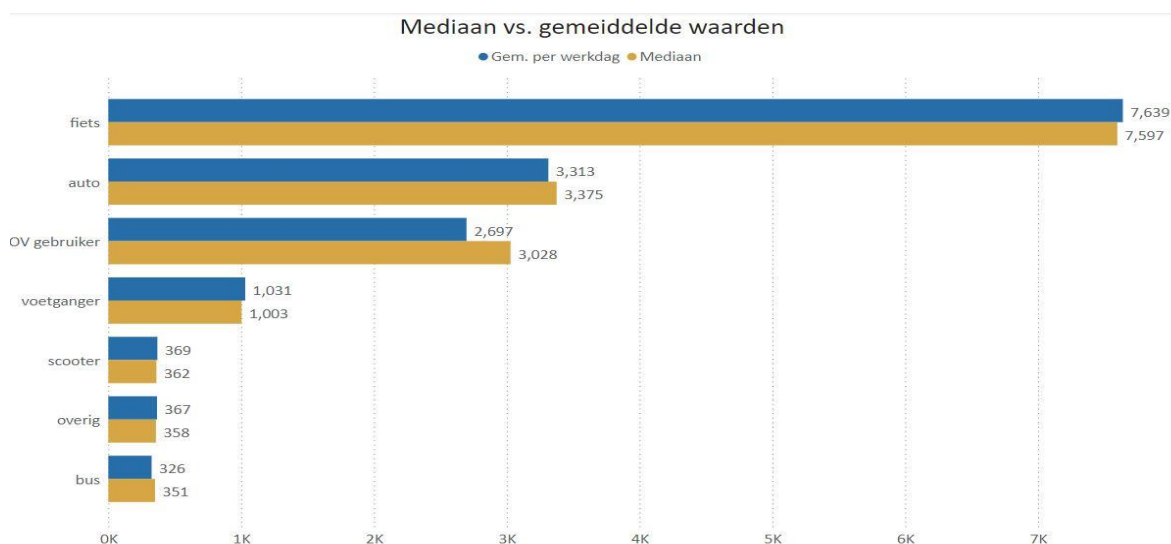


Figure 16. Median vs. average values per working day for all modes of transport. Source: FlowCubes, OV-bureau Groningen Drenthe.

Conclusion

In this article we discussed the modal split on the Zernike Campus and dived a little deeper into how different modes of transport are represented on the Campus. While more research needs to be done to clarify the trends we see, a lot can already be explained with the current data. Exploring it in more detail has already proven immensely useful. We have a better overview of the traffic volumes and behaviors on the Campus and can make simple models that allow us to see the effects of external factors on the different modes of transport. As we obtain more data over time and further collaborate with the different parties involved in regulating the complex mobility network of the Campus, we can perform more advanced analysis to set clearer goals for the future to achieve a more sustainable mobility.