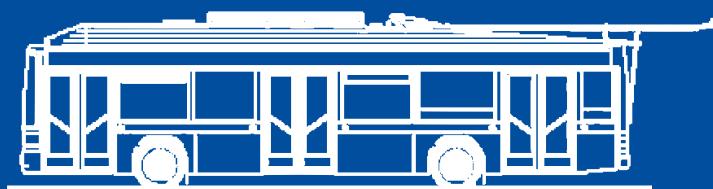




*We wish you a pleasant journey!*



# Lausanne Transportation

EPFL - COM-480 Data Visualization  
Salma Ed-dahabi - Antonin Faure - Lena Vogel



# Lausanne Transportation

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## Initial idea

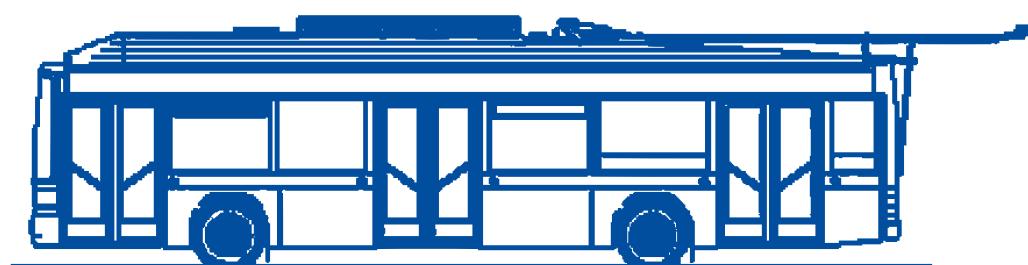
Our Data Visualization project focused on the topic of **public transportation** in Lausanne. We selected this subject because the majority of Lausanne's residents rely on public transport for their daily commute. We recognized that visualizing data related to this topic could be highly beneficial to various groups of people, including potential future residents, analysts, sociologists, geographers, and even professionals from the local transportation authority, TL, who can use the insights for decision-making purposes.

Our primary goal was to create a website that presents visualizations of the public transport network, highlighting its strengths and weaknesses. The visualizations aimed to answer important questions such as:

***What is the traffic like at a specific time on a particular day?  
Where and when do delays occur? Are the suburbs well-served?  
What are the main hubs?***

By providing an accessible platform with these visualizations, we aimed to offer users valuable insights into the performance of public transportation in Lausanne. This would enable them to make informed decisions about their journeys, improving their overall experience and contributing to a more efficient and reliable commuting environment. We strived to present the data in an appealing and user-friendly manner, ensuring that the website offers a comprehensive tour of the available visualizations.

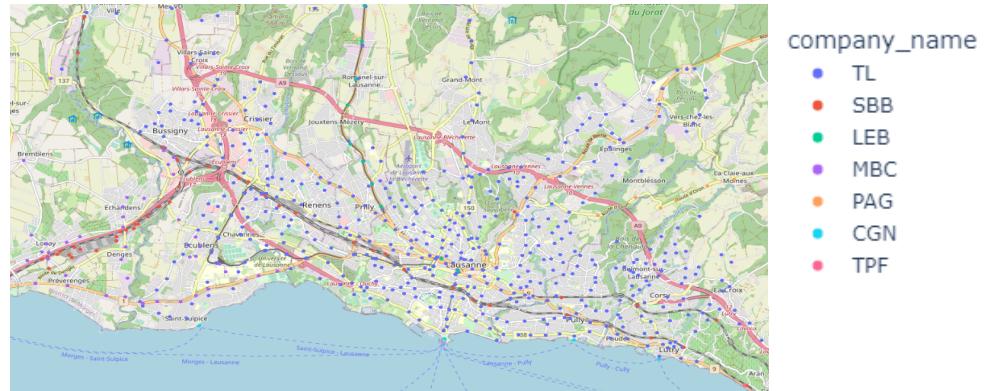
Please watch [this video](#) to have a complete tour of the website, showing the complete overview of the features and functionality.



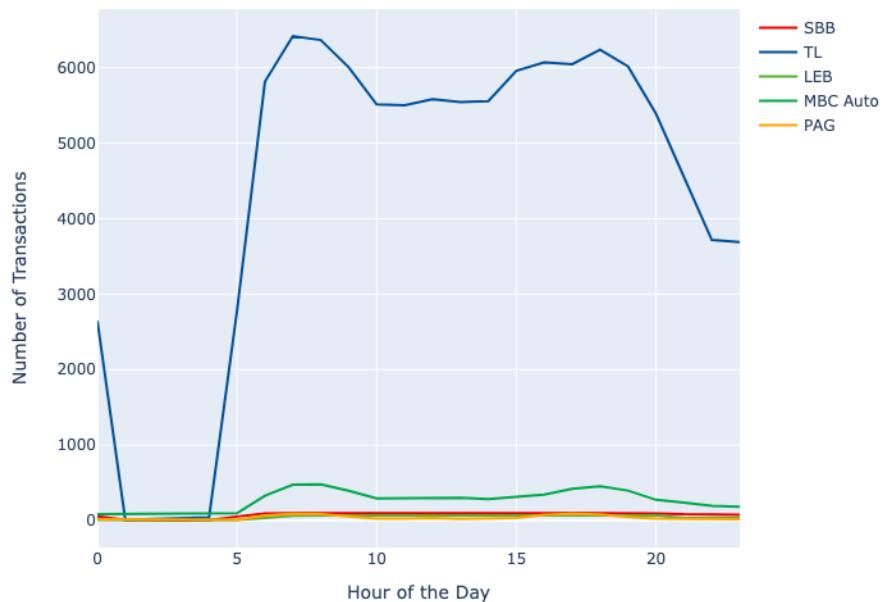
# Exploratory data analysis

For our first visualizations, we took simple statistics such as the number of transactions per day, the locations of the stops and the average delay, part into every active transport company in Lausanne.

## Stops in the region of Lausanne



## Number of transactions per company depending on the hour



Due to the obvious imbalance in the representation of the transport companies, we took the decision to **only focus on the activities of the TL** in order to facilitate the processing of the data as well as the readability of the visualizations for the user.

In total, we have encountered 38 bus lines and 2 subway lines, but unfortunately there is no data on the M2 subway. We can suppose that this lack of data is due to the fact that there are too many transactions per day, which could be challenging to monitor.

From that point, we also decided to imitate the **TL graphic guidelines**: we reused the color palette, the font and created our logo as being the inverse of the official TL logo.

# Technical challenges

## Data processing

Hopefully, in Switzerland all data on public transports can be found on the website "[Open data platform mobility Switzerland](#)".

The primary challenge was the **large size of the dataset** provided by Open Transport Data, which amounted to approximately 10GB per month. To handle this, we narrowed our focus to the Lausanne region and further refined our analysis to utilize data specifically from the TL company.

Another challenge arose from the fact that bus lines in the region could deviate from their **regular paths**. We had to meticulously examine each line's route to have an accurate **list of stops** for all 39 lines. The original (processed) lists contained over 100 errors, which required us to cross-reference the information with the [TL website](#) for validation. **Deviations from the normal trajectory** often led to the emergence of new stops, resulting in higher delays at these additional stops due to the deviation.

Additionally, we faced the unfortunate limitation of not having access to any information regarding delays and transactions specific to the **M2 line**, despite it being the most widely used public transport route in Lausanne. Regrettably, we were unable to incorporate this data into our visualizations.

## Data visualization

More generally, it was very challenging to find efficient ways to represent all of these data, having to deal with the geographical data, the delays, the time, and the date for each bus line. These many parameters were hard to combine in a readable and aesthetic way. This constraint forced us to limit our goals and opt for simplest ones in order to deal with this complicated data.

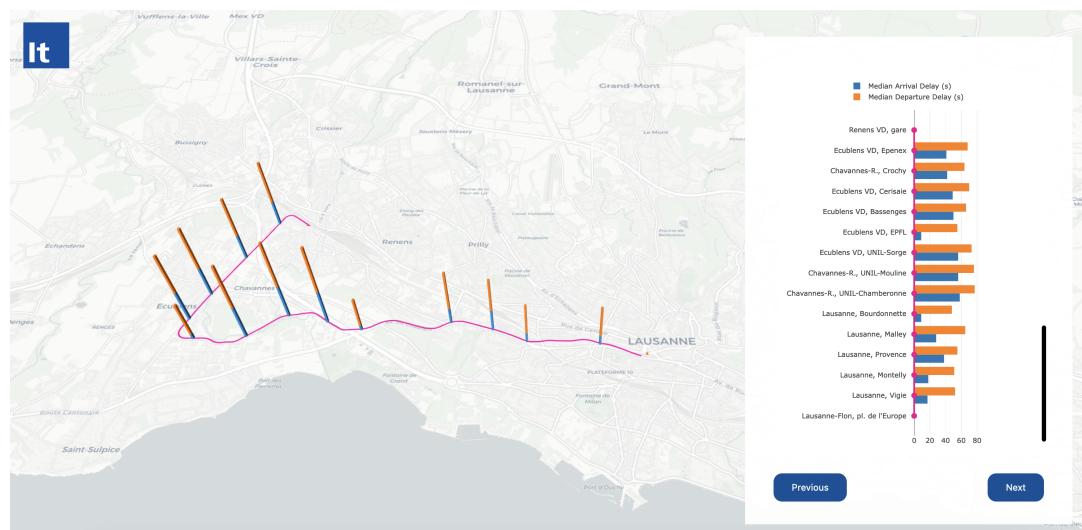
To tackle the visualization aspect, we leveraged libraries like [Maptalks](#) with [Three.js](#), which use the WebGL capability of modern browsers to create visually appealing **3D maps**. For generating basic bar charts, we used [Chart.js](#) and [Plotly](#).

Furthermore, we made a concerted effort to ensure that our website was **responsive** and accessible on mobile devices, catering to users who access the data on smaller screens.

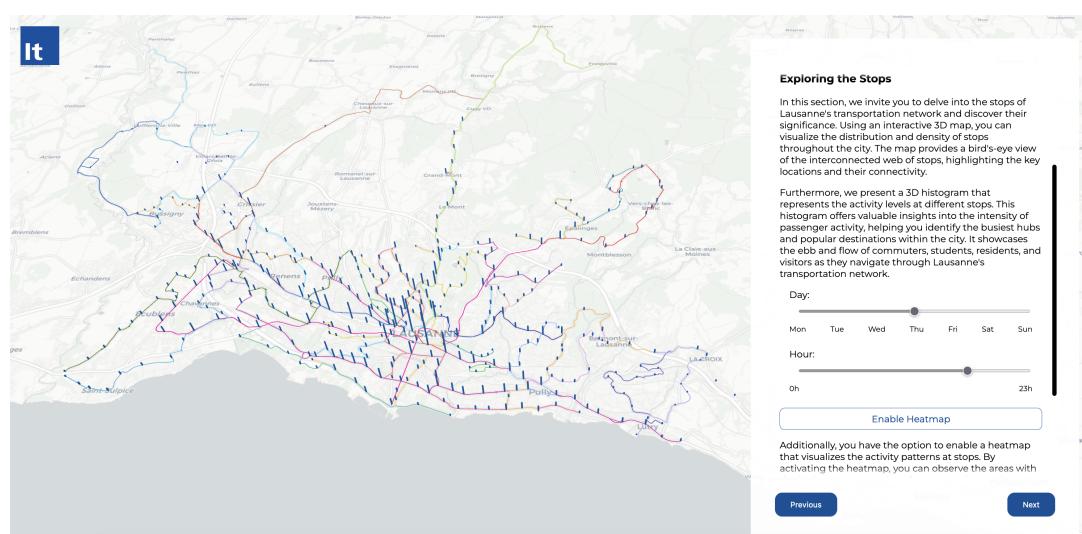
# Current website

From milestone 2, we mainly focused around analyzing the **delays** experienced by each public transportation line. We started by creating a **heatmap** showing an average delay in different zones. This visualization aimed to highlight areas with **high traffic** and **subsequent delays** in public transport services.

Then, we tried to find a funny way to show which bus lines were the most unreliable. We did a **ranking of the bus lines**, depending on their median delays, showing their delay per stop. This resulted in an **3D histogram** directly plotted on the map (see the example below for the M1 subway line). Finally, an **horizontal bar plot** was added on the side, giving the possibility to choose between those two views.

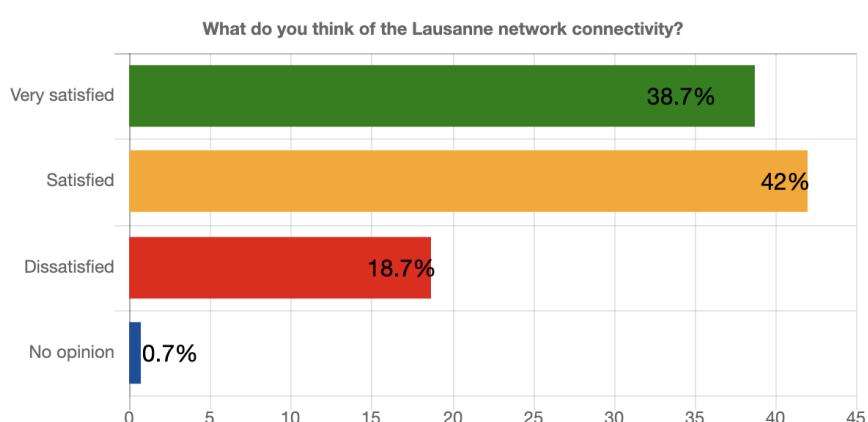
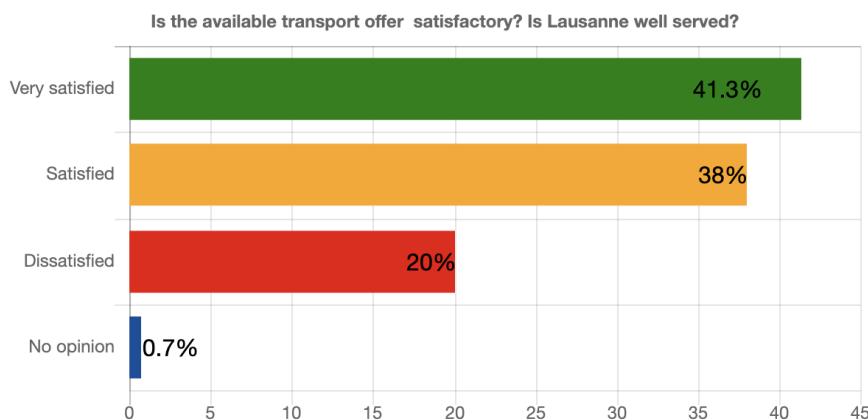
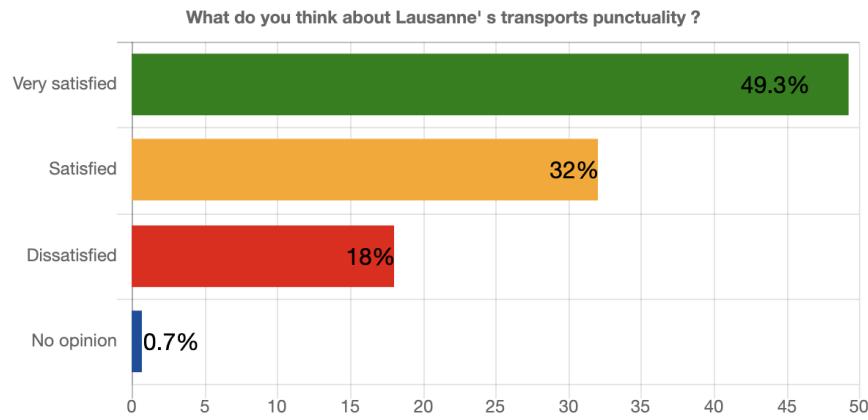


In addition to being able to see the delays per line, per stop and per day, it was important for us to have a more general view of the **activities per stop** or area and per hour of the day. This is why we added a map representing the number of transactions per hour and per stop, with the possibility for the user to enable a **heatmap** as well.



# What about EPFL community?

We did a survey and sent it to EPFL students. We received 150 responses. Here are our findings:



We can see that the majority is satisfied. The punctuality of the TL seems to be more appreciated than its connectivity whereas the availability is associated to the highest dissatisfaction rate. Overall, these three characteristics have the same satisfaction trends among the students.

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## Peer assessment

We managed to form an efficient team. Our different backgrounds and experiences provided the group an intellectual wealth for the genesis of this project. We met every week and had a good organization, each one having some specific tasks to do for the coming meeting. Each one of us has shown respect and flexibility when disagreements occurred. We communicated a lot, discussed a lot and had fun! Despite numerous changes and deviations from our initial ideas, we have ended up with a satisfying result and have learned many useful skills from this project: technical but also human.

Each one of us came up with ideas for the design, the viz, the website and the process book. ***Antonin*** primarily focused on the programming aspects, taking the lead in implementing the website. ***Lena*** and ***Salma*** worked on the process book, responsible for writing the milestones and managing the project's organizational aspects. Additionally, we collectively brainstormed and developed visualizations to ensure a coherent and engaging storytelling approach. ***Lena*** handled tasks such as sketching the website, creating the logo, designing the process book, verifying all TL stops, and producing the screencast. ***Salma*** undertook the task of retrieving colors for all TL lines, conducted a survey among EPFL students, created associated visualizations, managed the cleanliness and structure of the git repository, and collaborated on writing the website's text alongside ***Antonin*** and ***Lena***.

We hope that this work will be useful and informative for all, beyond the scope of this course.

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## Conclusion

Upon analyzing the visualizations we created, it became evident that Lausanne possesses a ***well-designed***, ***interconnected***, and ***highly punctual*** public transportation network, with an average maximum delay of only 1 minute.

With some additional time, we could have included more features such as a ***force graph***, giving the opportunity to play with the connectivity of Lausanne transportation's network. The inclusion of the view of ***future subway line "m3"*** could also be an idea to develop in order to have a better overview of the coming improvements of the network.

In conclusion, we are delighted with the project's progress and the final product we have developed. The challenges we encountered along the way have been valuable learning experiences, leading to the acquisition of various skills in the realm of data visualization. We are proud of the evolution of the project and the outcomes achieved.