

ERASMUS+ INTERNSHIP REPORT

Internship Powertrain technology research with application of optimal, predictive control and machine learning

Toyota Motor Europe (TME) in Brussels, Belgium

06.09.2021 – 06.03.2022

Work

My internship was located at the Technical Center in Zaventem of Toyota Motor Europe, which has its headquarters in Brussels, Belgium. The internship started in September, and I met my team for the first time at a dinner after they returned from a business trip in Paris – a much appreciated start for me. After that I was introduced



to several software programs that I should work with (mainly Simcenter Studio from Siemens, but also MATLAB; towards the end of my internship I was only working in Python though). My main task was to simulate different vehicles according to their powertrain in order to derive CO2 emissions with which I can predict future market or OEM specific carbon emissions. Simulating single vehicles allowed me to gain valuable knowledge about powertrain components (engine, motor, battery, transmission, vehicle) and different specifications change the vehicle performance. Since optimal, predictive control in Simcenter Studio only allowed us to simulate single vehicles, I switched to machine learning in the second half of the 6-months internship. This approach allowed me to predict the CO2 emissions of all vehicles in each database based on a small number of inputs. Additionally, I could apply my knowledge of courses like machine learning supervised techniques and deep learning and neural nets. There was also an opportunity to apply natural language processing (NLP), but the time constraint of my internship did not allow me to go into details with NLP. I can highly recommend an internship at Toyota in Brussels for anyone who wants to combine automotive with an international experience in Brussels and apply some machine learning in the industry. Finally, I would like to mention that Toyota is one of the largest Japanese automakers and many expats from Japan are here in Europe, so the internship also had a strong cultural experience for me (the cafeteria offered Japanese and European dishes).



Experience

During my time at Toyota I also got to experience Brussels, our European capital. Since the city's language is French, I enrolled a French course to quickly reach a solid level. Living in the European quarter, near the European commission, was an outstanding experience. Every day, you can hear many different languages in your ear and ultimately meet people from all over the world – especially Europe of course. Meeting people from different countries at basically every time you go to work, meet with roommates, go out with work colleagues, is something I definitely will miss once away from Brussels. Belgium has many things to offer such as museums, concerts, and cuisine – fries and waffle as the most known ones. Furthermore, cities like Ghent, Antwerp, Liège, Bruges, or places in the Netherlands, Luxembourg or even Paris, France are not far away and a great pastime activity for the weekends.