

## NENS Exchange Report

**Project title of the training stay:** The functional connectome of the human vestibular system

**Home institute:** Neurologisches Forschungshaus, University Hospital, Ludwig-Maximilians-University Munich, Graduate School for Systemic Neurosciences (GSN)

**Host institute:** Complex Traits Genetics, Center for Neurogenomics and Cognitive Research (CNCR), Vrije Universiteit Amsterdam (VU)

**Duration of stay:** 16.03.2019 – 18.03.2019

I stayed in the lab of Martijn van den Heuvel at Vrije Universiteit (VU) Amsterdam for 2 months. The aim was to learn more about network analysis to evaluate differences between human functional connectomes. Specifically, I arrived with preprocessed functional magnetic resonance (fMRI) data of participants who underwent different stimulation paradigms in the scanner. During my stay I wanted to determine an analysis strategy and start implementing this analysis.

Over the course of eight weeks, I performed several crucial steps of my investigation. Firstly, I evaluated the success of my preprocessing strategy and optimised some parameters according to the suggestions of Dr. van den Heuvel. Subsequently, we agreed to start with an initial exploration of the data using the network-based statistic (NBS) toolbox. Although I have used this toolbox briefly before, I did not use it to systematically determine differences in functional connectomes. Furthermore, I also learned more about the statistical concepts helping the interpretation of the results. Thirdly, I explored properties of individual subnetworks using graph theory. For this, I used the brain connectivity toolbox (BCT). Finally, in the last days of my internship, I constructed a plan on how to continue with the analysis at my home institution in Munich. The stay in the lab is important for the success of my project because I understood what is and what is not possible in terms of analysing my data.

I gained a lot insight and profited from the regular meetings with both Dr. van den Heuvel as well as his lab members. Under the supervision of Dr. van den Heuvel I understood that a key principle in analysing connectomes is to keep the biology in mind and to use simple and interpretable measures to characterise the brain connectome. The skills and the analysis plan I set up will be extremely valuable for my future research. Furthermore, I will share my knowledge both with my colleagues working on connectomics projects, as well include it in lectures when teaching at my home university in Munich.

Beside learning new analysis methods, I participated in weekly seminars and special lectures of the Complex Traits Genetics Lab at VU. These consisted of Wednesday lab seminars where students of the department, staff from other VU departments, as well as external speakers from other Dutch universities presented their research. Up to this point, I did not know a lot about the combination of genetic data sets with imaging data. However, during the two months I learned about commonly used methods such as genome wide association studies (GWAS). I also learned about the dimension reduction algorithm tSNE (t-Distributed Stochastic Neighbor Embedding) in a lecture by Prof. Boudewijn Lelieveldt from TU Delft and Leiden Universiteit. This

algorithm, similarly to PCA, maps high-dimensional space to low dimensional space, while preserving neighbourhood relations. tSNE algorithm may be useful in my future steps of data analysis.

Overall, I enjoyed the experience in the lab of Dr. Martijn van den Heuvel a lot. I felt a strong passion for science by all lab members which led to fruitful scientific and even philosophical discussions. These happened not only during lab meetings, but also during our “Tuesday Cake Day” and Friday social get-togethers.

Thank you to everyone from the Complex Trait and Genetics (CTG) Lab group and particularly Dr. Martijn van den Heuvel for hosting me. I also want to additionally thank my room mates Simone, Grace, Rory, Lotte & Yongbin who made me feel very welcome and well-integrated in the group. I am sure we will meet each other soon on various conferences!

Thank you also to NENS for providing me with this unique opportunity and financially supporting this exchange. Without this programme I would have probably not had the idea to visit another lab during my PhD, and not have the financial means of doing so. I would highly recommend applying for the NENS exchange grant, because it provides the opportunity to gain new methodological skills and to connect with fellow scientist.

