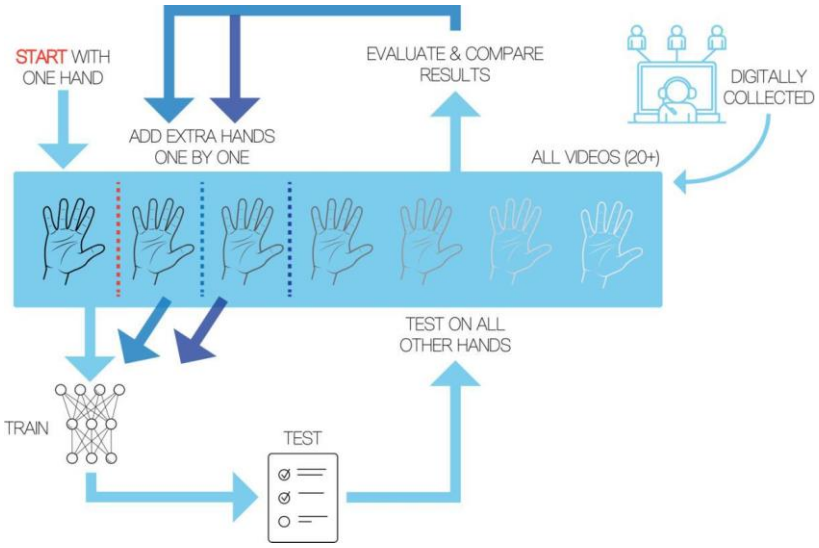
Title: Automatic definition of white matter fiber bundles for neurosurgical planning
Background: To help neurosurgeons avoid damaging axons that are underlying important brain-functions such a speech or motor behavior when resecting tumors or epileptic sources, our research group developed a digital toolbox for automatically defining white matter tracts. This is done by modelling axons based on diffusion MRI-images and selecting the simulated axons (streamlines) based on a-priori defined criteria. The output of this procedure consists of 3D volumetric representations of different fiber bundles such as the corticospinal tract and arcuate fasciculus, that can be easily visualized and used by neurosurgeons.
The project: Defining different fiber bundles consists of composing sets of instructions that can subsequently be applied to multiple patients. In this project the student will create several sets of instructions for automatically defining a number of novel fiber bundles, and will validate the results with those obtained with a manual procedure. Composed fibers will be validated in healthy subjects and patients with brain tumors.
Supervisor: Mathijs Raemaekers (m.raemaekers-2@umcutrecht.nl)

Title: Improving the procedure for predicting damage to the brain's connectivity structure following stroke
Background: To be able to better predict the neurocognitive impairments following stroke and the effects of rehabilitation therapy, our research group developed a procedure for predicting white-matter fiber damage based on the volume and location of a lesion. The rationale behind this approach is the notion that damage to the connectivity structure of the brain is a better predictor for functional deficits than a predictor that is based solely on the volume and location of a stroke.
The project: The quality of the prediction of damaged white matter fibers depends strongly on the choice for the settings of several parameters that are used when constructing the database that is underlying the procedure. This includes e.g. the way that brains are put in a standard space, and the algorithms used for creating white matter fibers based on diffusion MRI data. The student will explore part of the parameter-space for creating the database and assess the reliability of the results, thereby improving the predictions produced by the procedure.
Supervisor: Mathijs Raemaekers (m.raemaekers-2@umcutrecht.nl)

Title: Inventory of complications related to intracranial recordings
Background: In 2012, we conducted an investigation on risk factors for complications related to intracranial electrocorticography (ECoG) recordings in epilepsy patients. Based on the data available then, there was no relationship between the number of subdural electrodes implanted and the complication rate. However, at that time, we only investigated the serious complications (those that required surgery to be resolved). We are currently interested in also the less serious complications and their relationship with the different possible electrode configurations, including stereo-EEG electrodes.
The project: In this internship, you will investigate complications in patients who have been implanted with intracranial (ECoG and stereo-EEG) electrodes and study the relationship between the occurrence of complications and the type and number of implanted electrodes. Familiarity with medical (neurosurgical) terminology is essential, as well as proficiency with software for statistical analysis.
Supervisors: Dr. Mariska van Steensel (M.J.vanSteensel@umcutrecht.nl), Dr Mariana Branco (M.PedrosoBranco@umcutrecht.nl)

Title: Generalized DeepLabCut Hand Gesture Model
Background: Our group is investigating a procedure for automatically recognizing hand gestures, called DeepLabCut (DLC).



The project: The project is aimed at generalizing a DLC based hand model by stepwise increasing the number of hands included in the training of the model. You will start this assignment by recording short videos of 20 or more different hands. Since we are all in social isolation due to the Covid19 crisis, it is strongly recommended to collect those via digital instructions and communication tools such as (Skype, Zoom, Hangouts, Facetime….). These videos of different hands performing similar movements will be used to create input for the DLC hand model. We would like to get an answer to the question: With how many hands do we need to train a DLC model for it to accurately recognize new hands?

- Student should be available for at least 6 weeks
- Coding experience is not required, although student should be interested in the possibilities of Deep Learning and should not be afraid to open their terminal
- Student should have access to a computer (preferably with a GPU, if not discuss with Jinne on how to organize and schedule the training)
- Student should have good communicational skill and be able to reach a diverse population to (virtually) volunteer in their research

Supervisor: Jinne Geelen (j.e.geelen@umcutrecht.nl)