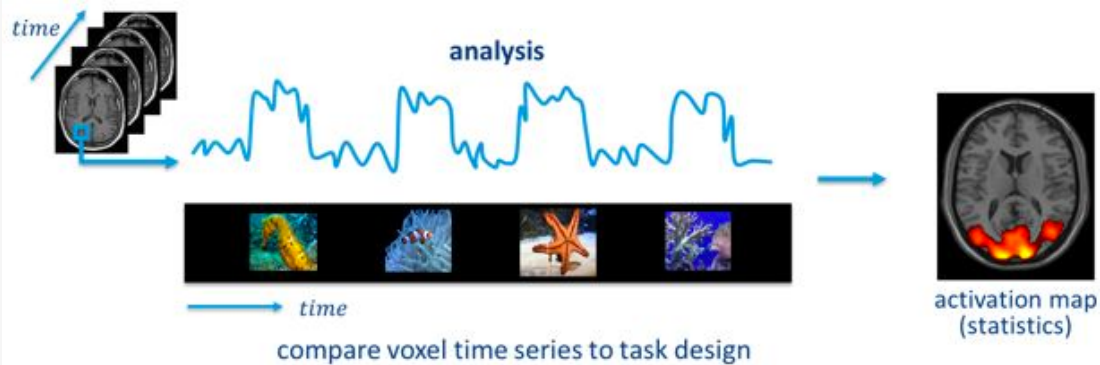


Functional MRI to diagnose and treat cognitive problems in epilepsy

Supervisor: prof. Marcel Breeuwer

Functional MRI (fMRI) provides a non-invasive window on **brain activity**. It works by means of the BOLD contrast (blood oxygenation level dependent), which means the image gray values go up and down in accordance with brain-activity induced changes in blood perfusion. The best known application is task fMRI, which can be used to construct so-called **activation maps**.

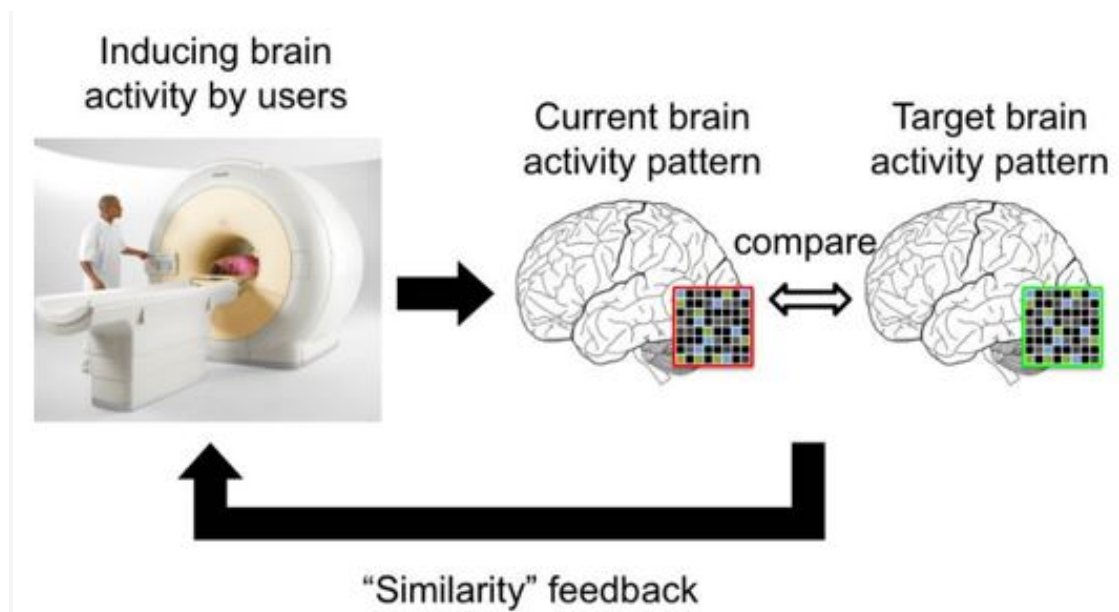


Task fMRI: identifies voxels which time series correspond to a specific task.

Instead of single activity blobs, activation maps may show **multiple regions** of simultaneous activity, especially in higher (cognitive) brain functions. These sets of regions are called **functional networks**.

Epilepsy is characterized by epileptic seizures, but about half the patients also experience **cognitive problems**. Within our research team, we study (cognitive) functional networks to find specific **network abnormalities** in epilepsy.

Having found these abnormalities, we aim to treat these using **real-time fMRI neurofeedback**. This means the fMRI data is being analyzed while the test subject is still in the scanner, and a metric of (abnormal) network organization is provided as feedback. The idea is that by providing a subject insight into his/her abnormal brain activity, he/she can be trained to **normalize these functional networks**, and the symptoms may improve.



Within this research program, we continuously have challenging student projects available. These may be about functional network identification, finding specific abnormalities, designing a feedback measure, implementing the real-time analysis, and assessing clinical improvement of the study. Most image processing and data analyses are done in **Matlab**. Knowledge of signal processing/system identification and/or (functional) MRI is a (strong) advantage, but not a must.

This project is in cooperation with epilepsy center **Kempenhaeghe** and **Philips Research**.

Both **bachelor and graduation projects** are an option; the exact content of the assignment depends on the current status of the research line and the background of the student. The student will be based **at TU/e**. If the project involves actual MRI-scanning, this will take place at Kempenhaeghe in Heeze. For more information, please contact dr. ir. René Besseling, r.m.h.besseling@tue.nl, (040)(247)3186, and/or dr. Rolf Lamerichs (rolf.lamerichs@philips.com).