**Doctoral Thesis:**

**Non-invasive neuroimaging of blood-brain-barrier permeability and its relationship with adverse surgical outcomes in older-aged patients**

Dysfunction of the vascular system has been implicated in aging and cognitive diseases. Elderly and cognitive decline individuals are more prone to arteriosclerosis and vascular system dysfunction. The integrity of the blood-brain-barrier in these individuals is usually destroyed, accompanied by inflammatory infiltration, glial cell activation, and Aβ accumulation.

During the perioperative period, anesthesia and surgical operations are also a kind of stress to the body, which may be accompanied by blood-brain barrier damage and brain metabolism dysfunction. Perioperative blood-brain barrier destruction is closely associated with cognitive impairment and may increase the risk of postoperative mortality, which is not conducive to enhanced recovery after surgery.Elderly and cognitive decline individuals may be more vulnerable to adverse outcomes following perioperative anesthesia and surgical intervention, potentially attributable to an already impaired BBB prior to surgery.

**Hypothesis: Increased BBB permeability prior to surgery is related to adverse surgical outcomes such as a prolonged hospital length of stay following surgery in older-aged patients.**

About the study:  
The study is organised by the Department of Anesthesiology at the Klinikum rechts der Isar in collaboration with the Department of Neuroradiology. We will utilise a state-of-the-art MR sequence to address our hypothesis. Data from 25 patients have already been collected. Further data collection will be conducted by a team of two students alongside their studies and the duration of the data collection phase is expected to be up to one year.   
  
Your tasks:  
**1)** **Data collection:** The student will be trained in independent MR and EEG data collection. Patient recruitment will occur 3-4 times a week between around 5-7pm. Data collection will occur either directly following recruitment in the evening prior to the patient’s surgery day or in the following morning 6-8am just prior to the patient's surgery, depending on what timeslots we can acquire at the MR scanner.

**2)** **Data analysis:** The student will be trained in relevant programming languages and MR analytical pipelines. Home office is acceptable where possible. Full support in analysis will be provided by your mentor.

**3)** **Literature research:** The students will become familiar with the relevant literature and be supported in the write-up of their thesis.  
  
What you will gain:  
1) Skills in the collection of cutting-edge neuroimaging tools  
2) Working directly with patients on a topic with real-world impact  
3) Working in an international lab with friendly people  
  
The students will be officially supervised by the Director of the Anesthesiology clinic - Univ.-Prof. Dr. Schneider - but mentored by Dr. Rachel Nuttall, post-doctoral researcher. If you are interested and/or have any questions, please reach out to [rachel.nuttall@tum.de](mailto:rachel.nuttall@tum.de) so we can arrange a zoom meeting to discuss further details.