

## **LAB ROTATION #1 – LAB DIRECTOR: VAIBHAV DIWADKAR, PHD**

**Topic:** Processing and modeling of fMRI signals

**Trainee's Duty:** To learn methods of the pre-processing of fMRI signals collected in task-active states in both health and disease. We have access to large datasets collected in a spectrum of childhood and adult onset disorders in tasks of basic and complex sensori-motor function. The overall goal, will be to used modeling to investigate mechanisms of normal and abnormal functional integration of signals across brain networks.

**About the lab:** Dr. Diwadkar is Associate Professor of Psychiatry & Behavioral Neurosciences, and Co-Director of the Department's Division of Brain Research and Imaging Neuroscience. He received his PhD in Cognitive Neuroscience from Vanderbilt University, and joined Wayne State University following post-doctoral and faculty positions at Carnegie Mellon University and the University of Pittsburgh. He has published extensively in the field of MRI research in both normal and psychiatric populations.

## **LAB ROTATION #2 – LAB DIRECTOR: ZHIFENG KOU, PHD**

**Topic:** Traumatic vascular injury of the brain

**Trainee's Duty:** The trainee will involve in the clinical study and image analysis of traumatic brain injury (TBI). Particularly, we will focus on the vascular injury by using advanced imaging techniques. The trainee will also assist with our lab members for subject recruitment, study coordination, imaging analysis, and preparation of publication.

**About the lab:** Dr. Kou's primary interest is neural imaging of traumatic brain injury. His work covers basic animal models and clinical study of human subjects. The primary goal of his lab is to used advanced MRI to understand the pathophysiology of brain trauma and future improve the diagnosis, prognosis and clinical treatment.

## **LAB ROTATION #3 – LAB DIRECTOR: JALADHAR NEELAVALLI, PHD**

**Topic:** Current state of the art in clinically evaluating and differentiating early vs. late IUGR babies

**Trainee's Duty:** In this work, I expect the student to do a thorough literature search on clinical examinations used for investigating IUGR. At the end of the study, if possible, the student's work may conclude by coming up with a possible hypothesis as to what additional biological/physiological metrics might be changing in late and early IUGR babies compared to normal physiological growth

**About the lab:** My work is focused on developing quantitative imaging methods for evaluation of the physiological status of a human fetus, both the brain and peripheral organs. Specifically, I am interested in finding MR based quantitative biomarkers which can better identify both early and late intra-uterine growth restricted (IUGR) babies. Furthermore we are interested in studying the mechanisms/etiology behind in-utero hypoxic-ischemic injury in the fetuses using quantitative MR imaging methods to look at placental perfusion, blood oxygenation in the fetal and placental circulation.

## **LAB ROTATION #4 – LAB DIRECTOR: JEFFREY STANLEY, PHD**

**Topic:** Understanding the post-processing and quantification procedures of in vivo  $^{31}\text{P}$  and  $^1\text{H}$  MRS data collected.

**Trainee's Duty:** The trainee will be introduced to the different procedural steps in the post-processing and quantification of in vivo  $^{31}\text{P}$  and  $^1\text{H}$  MRS data. As well, the trainee will be given the opportunity to apply these procedures including tissue segmentation of MRI for partial volume estimations to existing MRS data of different projects. The goal is for the trainee to gain the knowledge and experience in the quantification of MRS data.

**About the lab:** [Jeffrey Stanley, Ph.D.](#) – Associate Professor, co-director of the Brain Research and Imaging Neuroscience ([BRAIN](#)) Division and Director of the Translational Neuroscience graduate program [add link - <http://www.tnp.wayne.edu>], Department of Psychiatry and Behavioral Neurosciences, Wayne State University School of Medicine, Detroit, MI.

Dr. Stanley is a trained MRI physicist with over 20 years of research experience in the application of different neuroimaging methodologies in furthering the understanding of different pediatric disorders and how it relates to neurodevelopment dysmaturations from the perspective of brain chemistry, function, macrostructure and morphology. He is currently being funded by the National Institute of Mental Health (NIMH) [add link - [http://www.brain.med.wayne.edu/clinical\\_research.php](http://www.brain.med.wayne.edu/clinical_research.php)] to investigate age-related changes in the biochemistry, function and morphology of children with ADHD. A focus in identifying when and where in the brain developmental alterations occur relative to healthy individuals from these different perspectives will enhance our ability to better track illness progression, predict illness outcome, and as a consequence enhance the efficacy of early intervention.

#### **LAB ROTATION #5 – LAB DIRECTOR: KING YANG, PHD**

**Topic:** Development of vehicle occupant models for vulnerable populations

**Trainee's Duty:** Advanced Human Modeling Laboratory at Bioengineering Center offers an student internship in June to work on an ongoing project to develop a 3D patient-specific finite element model from CT and MRI scans of a 75-year-old female. The selected student will be trained with image processing softwares to do segmentation, 3D surface rendering, and related analysis.

**About the lab:** The Bioengineering Center of Wayne State University is a leading laboratory doing research work in the area of impact biomechanics. Current projects in the Advanced Human Modeling Laboratory include, model development of animal/human brain during traumatic loadings, numerical simulation of brain and lower extremity injuries due to blast loadings, development of vehicle occupant models for vulnerable populations, and experimental characterization of a variety of biological tissues.

#### **LAB ROTATION #6 – LAB DIRECTOR: YONGQUAN YE, PHD**

**Topic:** Whole brain functional connectivity analysis using fMRI

**Trainee's Duty:** Develop and evaluate novel data evaluation methodologies for whole brain functional connectivity analysis using fMRI. The project will include: 1) using Matlab and SPM to analyze resting state fMRI data; 2) implementing, testing and evaluating processing algorithms; 3) comparing and evaluating connectivity results under different imaging and physiological conditions. The trainee is thus expected to know some basis with Matlab programming, and have an interest in neuroimaging with fMRI.

**About the lab:** Dr. Ye is focused on developing novel imaging acquisition concepts, signal component models

and applications related to functional brain imaging using fMRI. His specific projects of interest include: MR angiography enhancement, high resolution high speed fMRI, BOLD signal component analysis and functional connectivity. He is highly experienced in the design on pulse sequences, experimental paradigms and signal modeling and image processing.

### **LAB ROTATION #7 – LAB DIRECTOR: JINSHENG ZHANG, PHD**

**Topic:** Brain network plasticity following noise- or blast-induced tinnitus and its related mild traumatic brain injury (mTBI)

**Trainee's Duty:** The Laboratory of Tinnitus & Auditory Neuroscience Research is dedicated to investigate the mechanisms of noise- or blast-induced tinnitus and auditory neuro-prostheses using multidisciplinary techniques, such as cochlear and auditory brainstem and auditory cortex implantation, biocompatibility of implantable devices, neuromodulation, behavior assays, in vivo electrophysiology, neuropharmacology, immunocytochemistry, and MRI and MEMRI imaging.

**About the lab:** The Laboratory of Tinnitus & Auditory Neuroscience Research is dedicated to investigate the mechanisms of noise- or blast-induced tinnitus and auditory neuro-prostheses using multidisciplinary techniques, such as cochlear and auditory brainstem and auditory cortex implantation, biocompatibility of implantable devices, neuromodulation, behavior assays, in vivo electrophysiology, neuropharmacology, immunocytochemistry, and MRI and MEMRI imaging. It is located in the Lande Medical Research Building at the Wayne State University School of Medicine. The lab is equipped for acute and chronic neural implantation, acute and chronic multi-channel electrophysiology, sophisticated multichannel electrical stimulation, noise exposure, behavior testing for tinnitus and hearing loss, neuropharmacology, microscopy, histological processing for immunocytochemistry. The lab also contains three IAC sound attenuation booths (8'x8'). Lab members have access to confocal microscopy, MRI imaging facilities for MEMRI and fMRI, resources in Smart Sensors and Integrated Microsystem (SSIM) for microfabrication of implantable electrodes at Wayne State University, and research facilities at Henry Ford Health System.