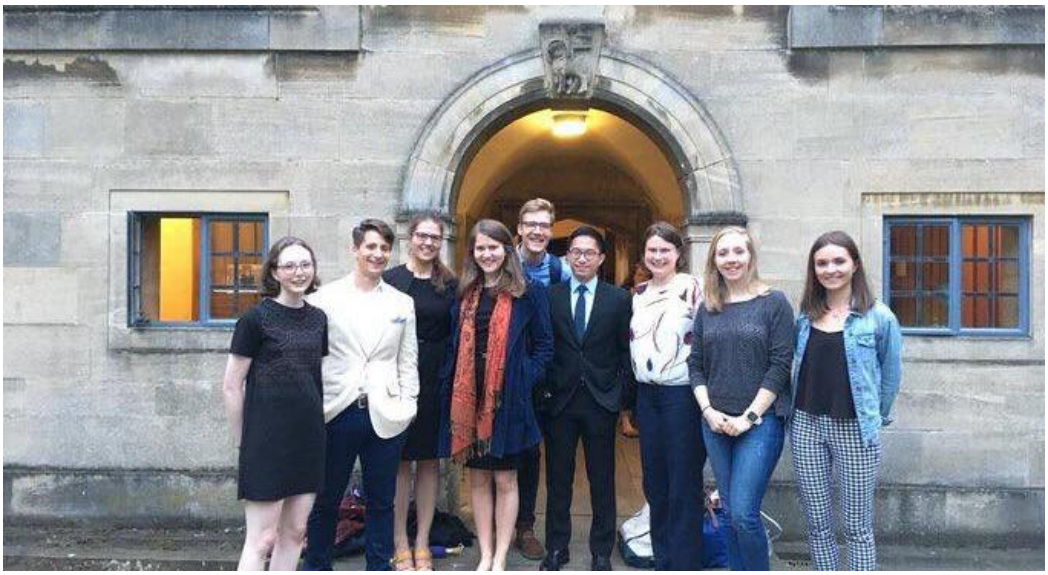
**Chui's Student Excellence Scheme – Ho King Chun Leadership Fund: Learning Report**

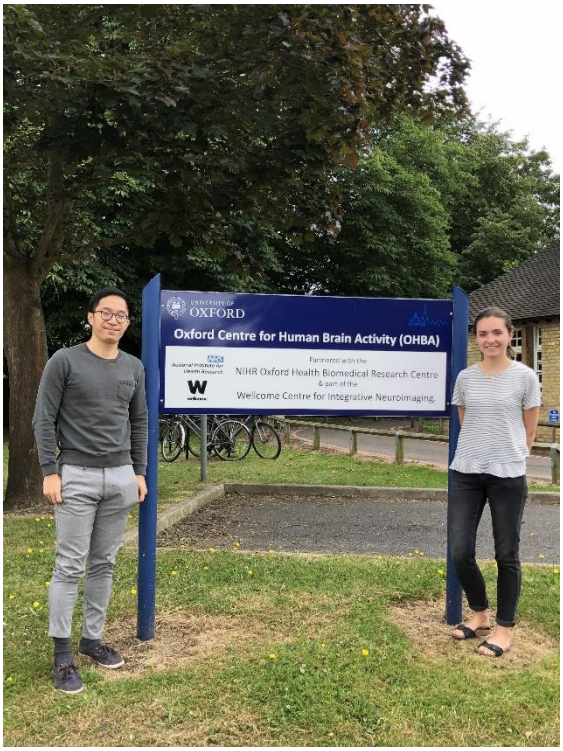
Man Kwun Andrew Li (MBBS Year 5)



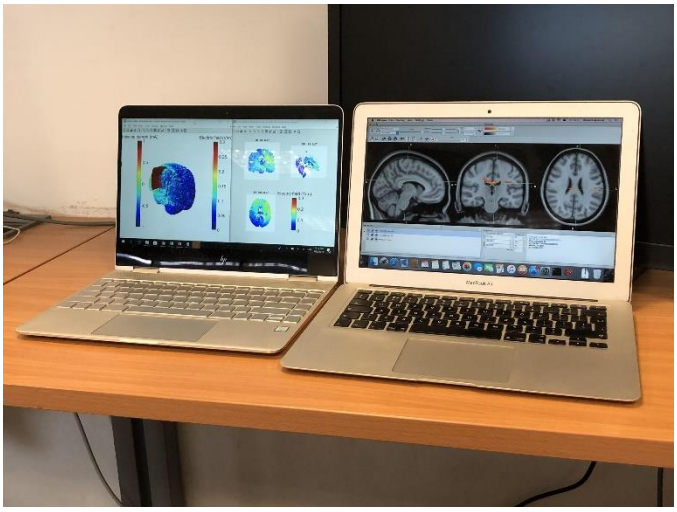
For 6 weeks from May 14 to June 22, 2017, I conducted clinical neuroscience research at the Physiological Neuroimaging Group in the Wellcome Centre for Integrative Neuroimaging at University of Oxford. Possessing a strong desire to specialize in neurology or neurosurgery in the future, I was keen to learn and participate in the advancement of neuro-technologies with significant potential for clinical application. Since the commencement of my medical studies, I have undertaken multiple research attachments abroad and locally to expand my knowledge, gaining experience in invasive procedures such as deep brain stimulation. However, my time conducting research on and improving these technologies made me realize that non-invasive techniques may prove to be the long-term gold standards in the future. Interning at the Physiological Neuroimaging Group at Oxford provided me with the ideal setting to delve into this field, as their focus is on understanding how various neuroimaging and noninvasive brain stimulation techniques can facilitate motor rehabilitation in stroke patients.

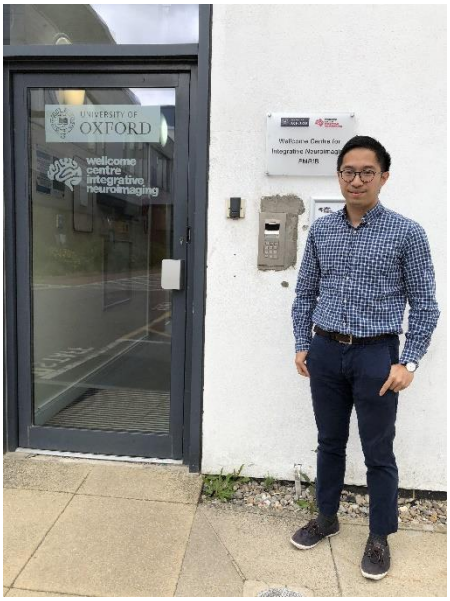
Under the supervision of principal investigator, Professor Charlotte Stagg, and DPhil candidate, Ainslie Johnstone (pictured above - right), I utilized computational techniques to model electrical current flow distribution in subjects who underwent an increasingly utilized noninvasive brain stimulation technique for stroke rehabilitation - transcranial direct current stimulation (tDCS). tDCS, which involves placing electrodes on the scalp of patients to pass an electric current through the brain to stimulate target regions, has been shown to hasten the recovery of limb movements after stroke in patient cohorts, due to the ability of the electric current to stimulate neurons to release neurotransmitters that facilitate learning and adaptation. However, the efficacy of this technique is highly variable, and researchers have hypothesized that this may be due to the differences in the head anatomy of individuals. The thickness of the

skull, the amount of cerebrospinal fluid within the skull and even the distance of the electrode from the brain surface may influence the amount of electric current that is directed at the brain region of interest, and hence lead to varying results. By studying the variability of electrical current patterns across subjects and correlating them with detectable neurochemical changes and brain structural changes, we can corroborate the proposed hypothesis, which would inform the development of patient-specific protocols for the application of tDCS in stroke patients.




During my time with the group, I learned extensively about the most cutting-edge techniques for neuroimaging and neurostimulation analysis, identifying structural changes, neurochemical changes as well as fluctuations in current flow. My initial learning stemmed from self-studying lectures and practicals offered by the graduate-level courses at Oxford, followed by applying what I have learned to the data that the group had collected. I was pleasantly surprised and impressed by the willingness of my fellow researchers to facilitate my learning, especially on the relevant computational tools. It was a pleasant coincidence that the computational tools for brain imaging analysis now used all over the world originated from the very centre in Oxford I was based in (FMRIB, Wellcome Centre for Integrative Neuroimaging), and I was fortunate to have the opportunity to learn the pertinent software and tools from the developers themselves. I also had weekly chances to sit in and assist researchers in conducting various brain scans of individuals and patients (Magnetic Resonance Imaging, Diffusion Tensor Imaging, and Magnetic Resonance Spectroscopy), and as a result, became particularly adept in the operation of tDCS. My 6 weeks working on this research project helped me significantly expand my repertoire of research skills in the clinical neurosciences, but more importantly, equipped me skills that I can apply clinically, especially in terms of imaging. My increased understanding of the mechanism and operational technicalities of various neuroimaging techniques will certainly facilitate my future clinical practice in neurology or neurosurgery.






My time at Oxford also gave me the chance to attend seminars and talks given by fellow clinical neuroscientists pursuing research on other topics. I had the chance to attend research workshops ranging from computational modeling work on Parkinson's Disease to spinal cord neuroimaging in hyperesthesia patients. The breadth of research I was exposed to at Oxford opened my eyes to the multitude of clinical topics that still requires deeper exploration and understanding. It has solidified my conviction to remain involved in clinical research as I practice as a physician. Having established a close connection with Professor Stagg and her group during my 6 weeks at Oxford, I plan to continue the research project at hand to completion, hopefully culminating in a poster presentation or publication. Eventually, I do hope to have the opportunity to return to Oxford to further hone my clinically-pertinent research skills. I would like to thank the Chui's Student Excellence Scheme Ho King Chun Leadership Fund for making my research internship possible.