

# Volitional Control of Hippocampus in Rodents

Summer student project for May-August 2020, supervised by Dr. Milos Popovic and mentored by Kramay Patel

## Target Student Population(s)

Undergraduate student in Engineering Science, Neuroscience, Life Science in years 1-4. Preference will be given to students with prior experience with handling rodents (rats and mice).

## Brief Project Description

In our lab, we have demonstrated that humans can be trained to upregulate activity of individual neurons in medial temporal lobe structures such as the hippocampus. This type of training can be used to help individuals self regulate brain activity in regions that are commonly involved in memory function, and also in seizure generation. We now wish to investigate the underlying neural mechanisms that facilitate this type of learning. We will do this by implanting rodents with microelectrode arrays in multiple brain regions and investigate how various brain structures work together to facilitate this type of *neuroprosthetic skill learning*. This project will involve significant interaction with rodents, designing and running behavioural experiments, helping perform electrode implant surgeries as well as exposure to data analysis through Matlab/Python.

## Expected Learning Outcomes

Through this project, we expect you to learn the following -

1. Become comfortable with handling and interacting with rats, delivering injections, etc.
2. Get some experience performing stereotactic electrode implant surgeries in rats.
3. Learn the basics of experimental design for rodent behavioural tasks.
4. Learn the basics of neural data analysis.
5. Framing a research question.
6. Effectively reading scientific literature to identify the current state of the art.
7. Writing scientific reports to report your developments and your findings.
8. Presenting your work to audiences from a diverse set of backgrounds.

## Expected Research Outcomes

Through this project, you will be contributing to an active research project in our laboratory and will be performing experiments, collecting and analyzing data that will be essential for future data collection for this project. Successful completion of the project will result in the student receiving an authorship in a journal publication and possibly in other conference publications as well.

## Required technical Skills

- Prior experience working with animals, preferably laboratory animals.
- Programming experience in Matlab would be an asset.
- Experience with reading and critiquing scientific literature (optional)

## Funding

Funding for this project may be obtained through competitive scholarship: [NSERC USRA](#). It is the student's responsibility to apply in a timely manner, with the approval and assistance of their supervisor. Students may also apply to departmental awards for funding this research opportunity.

## Application Details

To apply for this project, you must first complete the [IBBME USRP application](#) (Note: only need to do this once). Once you've don't that, please email your updated CV and a statement of intent to Dr. Milos R. Popovic ([Milos.Popovic@uhn.ca](mailto:Milos.Popovic@uhn.ca)), and to Kramay Patel ([kramay.patel@mail.utoronto.ca](mailto:kramay.patel@mail.utoronto.ca)). Explain briefly why you are interested by the project and its outcomes, and why you would be a good fit for this project. Please also provide your latest transcript (can be unofficial) to help us assess your chances to obtain funding. The subject of your email should be "*Summer Student Application: Hippocampal Neurofeedback*".