

Project Proposed By:	Intelligent Sensory Microsystems Laboratory, Electrical and Computer Engineering, University of Toronto
Supervisor:	Professor Roman Genov
Project Title:	Estimating Rodent Pose using Computer Vision and Neural Signal Recordings
Project Description:	<p>Our research group has been exploring ways to improve the correlation between peripheral nerve stimulation and the pose obtained by the animal as a result of that stimulation. This has an important application in bioelectronic medicine, neural prosthetics, and sensory restoration. One example of the most challenging and impactful applications for this is spinal cord injury.</p> <p>In this project we are looking to use Computer Vision, along with neural signal recordings from the animal to train a Machine Learning model for pose classification. This can facilitate the development of novel applications in bioelectronic medicine and neural prosthetics.</p> <div data-bbox="451 535 1388 892" data-label="Figure"> <p>The figure consists of two panels. The left panel shows a grayscale image of a rodent's paw with colored dots (blue, green, yellow, orange) and lines representing joint positions and movement trajectories. The right panel is a heatmap titled 'Spatiotemporal signature of a single naturally-evoked compound action potential'. The y-axis is labeled 'Contact number' and ranges from 0 to 60. The x-axis is labeled 'Time (ms)' and ranges from 0 to 3.33. The heatmap shows a series of vertical bands of high intensity (yellow/orange) against a blue background, indicating neural activity over time and across different contacts.</p> </div> <p>Figure: Left: Example from DeepLabCut [1] for animal pose estimation. Right: Spatiotemporal signature of recorded neural signals</p> <p>We are seeking highly motivated students with strong expertise or interest in Machine Learning and Computer Vision to join our team. Students from background in ECE, CompEng, or EngSci, with knowledge of the following tools and/or techniques are encouraged to apply.</p> <ul style="list-style-type: none"> • Familiarity with Computer Vision - DeepLabCut[1] toolbox. • Expertise with training & testing CNN and DNN algorithms in Software, with some knowledge of deploying algorithms on Hardware (on FPGA). • Proficiency with Python, and knowledge of basic signal processing concepts • Experience with Verilog and PCB designing is preferred • The Candidate(s) must have a self-driven attitude, ability to debug and solve problems, and ability to work independently.
Contact Person:	Kindly reach out to Mustafa Kanchwala (mustafaa.kanchwala@mail.utoronto.ca) and copy to Prof. Roman Genov (roman@eecg.utoronto.ca). Please include your cover letter, resume and transcript (unofficial is ok)

[1] <https://www.mackenziemathislab.org/deeplabcut> - software package for animal pose estimation