Online Proceedings

POSTER SESSION 2

Commons East, Easel 52

1:00 PM to 2:30 PM

Optimization of Optogenetic Stimulation for Spinal Cord Injury Rehabilitation

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Levinson Emerging Scholar, Mary Gates Scholar
Mentor: Chet Moritz, Physiology & Biophysics
Mentor: Sarah Mondello, Rehabilitation Medicine

Spinal cord injury (SCI) is a debilitating disease with few treatment options available for recovering motor function. Based on past studies using electrical stimulation of the spinal cord, we believe that long-term optogenetic spinal stimulation (OSS) may improve motor function after an SCI. We are investigating this therapeutic potential using a rat model of SCI with an implantable LED to deliver optogenetic stimulation *in vivo*. However, activation of the LED produces heat that could damage the surrounding tissue. I have modified these LED implants by incorporating a thermistor that tracks temperature changes during optical stimulation. Using this device, I determined how the modulation of stimulation parameters affects heat production at the site of the implant and have identified several safe parameter sets. These results will inform the parameter choices used in future studies on OSS. An optimized OSS methodology has the potential to improve the lives of those with an SCI by enhancing their capability for volitional movement.

POSTER SESSION 2

Balcony, Easel 110

1:00 PM to 2:30 PM

Uniformity of Solutions to Diophantine Equations

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Mentor: Amos Turchet, Mathematics
Mentor: Travis Scholl, Mathematics

Diophantine equations are polynomial equations with integer coefficients. In 1970, Matiyasevich proved that an algorithm to decide whether a given Diophantine equation has a solution does not exist. We investigated some such equations including Pell and Thue equations, that have an infinite and finite number of solutions, respectively. Geometrically the solution set of Diophantine equations in 2 variables corresponds to plane curves, e.g. elliptic or hyperelliptic curves, and the number of rational solutions is related to the genus of the corresponding curve. We gathered statistics on the size of the solution sets in an attempt to address an important unsolved problem in arithmetic geometry, known as Uniformity Conjecture of Caporaso, Harris and Mazur. Our project involved an analysis of Python and C code, specifically through the CoCalc development platform, utilizing data from the L-functions and Modular Forms Database (LMFDB). Currently our results agree with the current known data on the sizes of solution sets, and we hope to extend our results to gather data on curves not currently in the LMFDB. This will serve as a testing ground for the Uniformity Conjecture.