SEMINAR - סמינר

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום א' 26.11.17
(ח' בכסלו, תשע"ח), בבניין דן קאהן, קומה 2 בחדר 217, 14:30.

ירצה:

Dr. Firas Mawase
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Johns Hopkins School of Medicine, USA

על הנושא:

Leveraging Human Motor Control Principles for Translational Applications

להלן תקציר ההרצאה:

Biological motor control presents a great challenge for scientists and engineers. "Simple" tasks such as keyboard typing are much more difficult for artificial machines than many "intelligent" tasks such as playing a game of Chess. The human brain, perhaps the greatest and most complicated learning system, exercises control over almost every aspect of our sensorimotor behavior. The fascinating ability of the motor system is specifically engaged when humans learn new skills and adapt to novel environments. Unfortunately, the ability of the motor system to facilitate learning is largely disrupted after brain damage. In my talk, I will present results from recent studies that provide insight form theory in motor control and basic neuroscience into processes that impact post-stroke learning and their relationship to neurorehabilitation.
In the first part of my talk I will describe the adaptability of the motor system using locomotor adaptation model. In locomotor adaptation, human subjects adapt to speed perturbation using split-belt treadmill that imposes different walking speeds to each leg. This short-term adaptation leads to formation of long-term motor memory. I'll discuss the modularity in this long-term motor memory using resting-state fMRI and will present a mathematical model of learning that account for the short and long-term memory.
In my second part, I will describe the interaction between different learning principles underlying motor learning, with a focus on use-dependent plasticity and reinforcement learning. Moreover, I will show the benefits of using non-invasive brain stimulation techniques such as Transcranial Magnetic Stimulation (TMS) in probing the degree of brain plasticity. Our results suggest that reinforcement is not only important for learning new behaviors, but can shape our subsequent behavior via its interaction with plasticity induced by movement repetition.
I will conclude my talk by describing the critical relevance of motor learning principles (i.e. practice, reinforcement and plasticity) to neural engineering and to neurorehabilitation for stroke patients.

In particular, I will present findings from a recent study that aims to quantify and correct abnormal hand synergies in human patients with chronic stroke. Abnormal hand flexion synergy is one of the most common symptoms that arises after stroke. It results in difficulty isolating joint movements and reduced finger individuation, ultimately preventing affected people from performing basic daily functions. Our study reveals that a personalized, challenging and intensive training protocol helps restore the ability of a person with chronic stroke to actively individuate each finger and improves finger dexterity.
I hope that the tools and insights provided in this talk will assist engineers in exploiting the virtue of adaptability and learning in artificial systems, and physiologists in modeling the biological motor control system.

המארח: פרופ' יורם הלוי

בברכה,

פרופ"מ מתי סאס
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