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Travel Award Winners | Women in STEM

2019

Fall 2019 Travel Award Winner

Gabrielle Majetic

MAJETIC, G.[1,4], MILLER NEILAN, R.[2,4], ADKE, A.[5], CARRASQUILLO, Y.[5] and B. KOLBER[3,4]. A Computational Model of Cell-Type Specific and Pain-Related Neural Activity in the Amygdala During Neuropathic Pain. [1]Department of Engineering, Duquesne University, Pittsburgh, PA [2]Department of Mathematics and Computer Science, Duquesne University, Pittsburgh, PA [3]Department of Biological Sciences, Duquesne University, Pittsburgh, PA [4]Chronic Pain Research Consortium, Duquesne University, Pittsburgh, PA [5]National Center of Complementary and Integrative Health, National Institutes of Health, Bethesda, MD.
Injury changes the excitability of pain-related neurons within the right hemisphere of the central nucleus of the amygdala (CeA). An agent-based computational model was created in NetLogo to simulate neural behavior over time and in response to injury. Each of the 625 agents represents one neuron in the right hemisphere of the CeA and is characterized by its protein-expression type (somatostatin or protein kinase C-delta) and spiking frequency (regular or late). During each time step, neurons' firing rates (Hz) are stochastically updated using probability distributions estimated from data collected in laboratory experiments using a neuropathic pain model. A damage accumulation sub-model tracks the damage accumulated by each neuron during injury as the neurons transition from an unsensitized to a sensitized state. Cumulative firing rates of somatostatin and protein kinase C-delta neurons are used to calculate emergent levels of pain attributed to injury. Results demonstrate the model's ability to predict acute and chronic pain along with neurons' contribution to pain. Agent-based modelling is a useful tool in studying the relationship between neural activity and pain.

Format: TALK
Presenter(s): Gabrielle Majetic