附件 2

Session 2: New Materials

Session Abstract

Materials are the building blocks for societal advances, from computing miniaturization to smart, energy-efficient homes. Underlying these technological advancements is the development of new materials, inspired by natural systems, motivated by synthetic and manufacturing innovations, and driven by sustainability concerns. One example is the illumination strategy of the beetle, which has inspired the design of light scattering pigments from sustainable materials. Another avenue of new materials development is the development of inorganic-organic hybrids and multifunctional systems that enable sensing, signaling, and processing in interconnected environments.

Session 3: Neuroengineering

Session Abstract

Neuroengineering is an inter-disciplinary, high-impact research area that spans multiscale neuroscience (from neurons to behaviors) and engineering (from electrodes to integrated artificial systems) in order to address scientific questions relating to the complexity and function of the nervous system, as well as clinical challenges in diagnosis, treatment, and rehabilitation for individuals with neurological or psychiatric disorders or other sensory or motor deficits.

Current frontiers in neuroengineering have transformed neural interfacing technology for recording and stimulating neurons, enhancing computational capacity in neural decoding and encoding, and translating neurotechnology to clinical applications. For example, advances in new materials and electronics enable the fabrication of a ultra-large channel-count microelectrode arrays to record large-volume, high-fidelity neural signals simultaneously. Excitation of neurons in the brain can be achieved beyond electrical stimulation nowadays; other afferent modalities for neural modulation, such as optogenetic stimulation and ultrasound stimulation, have become feasible. Neuroscientists and engineers harness big data, machine learning, and cloud computing into neural signal analysis and decoding to gain deeper understanding of neural networks and their functions. The clinical translational efforts are built upon the improvement of reliability and safety of novel neural technologies that can potentially benefit millions of individuals with brain disorders or functional deficits.

Given the breadth of the field, this session focuses on system-level research in neuroengineering that aims to restore human motor or sensory function. The goal of the session is (1) to present the state-of-the-art research in brain-machine interfaces for mobility restoration, communication and neurostimulation for sensory rehabilitation or augmentation, (2) to discuss the knowledge gaps and challenges in neuroscience, engineering, and clinical translation, and (3) to foster new collaborative ideas among the audience.

Session 4: 5G Wireless Communications Technology

Session Abstract