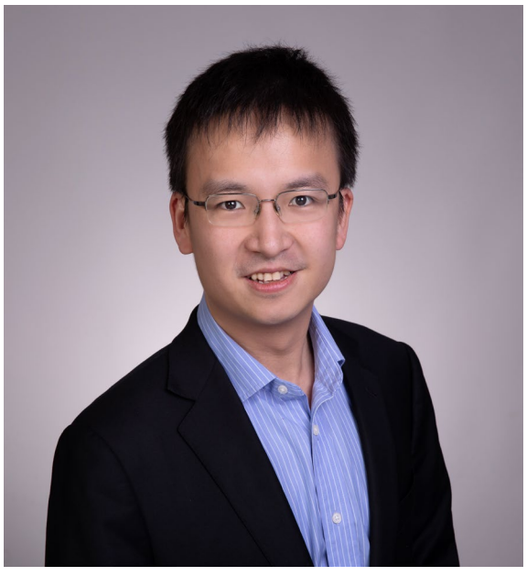
NJIT New Jersey Institute of Technology

BME

Department of Biomedical Engineering
Graduate Seminar

Date	Location	Time
Wednesday, February 26th	Fenster Hall 698	11:30 AM



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Subject-Targeted Neural Interfacing with Non-Genetic, Minimally Invasive Nanotechnology

Abstract: Recent developments in optogenetic and viral technologies have demonstrated that modulating the targeted neurons and projections in the brain is capable of rescuing behavioral deficits associated with depression, autism, anxiety, and epilepsy. However, optogenetics faces two major challenges to clinical translation: First, due to limited tissue penetration of visible light, invasive craniotomy and intracranial implantation of optical fibers are generally required. Second, this approach requires genetic modification of neurons via viral transduction, which poses significant safety challenges. In this presentation, I will discuss nanoparticle-based approaches to address these two challenges. First, I describe the application of mechanoluminescent nanoparticles for minimally invasive optogenetic neural stimulation, triggered by a brain-penetrant focused ultrasound. The nanoparticles are injected into the circulating blood, thus, neither craniotomy nor intracranial implantation is required for this targeted neuromodulation approach. Second, I describe the application of functionalized gold nanorods in the nervous system, including that they are rapidly internalized by neuronal axon terminals, transported through axons, and reliably modulate neural activity and animal behavior under near-infrared light both *in vitro* and *in vivo*. This method is a first-time demonstration of projection-specific neural modulation via a non-genetic method. Finally, I will briefly discuss how nanoparticle and electronic approaches will further advance the development of targeted neural interfacing technology via a minimally invasive manner.

Light refreshments will be served.