Northeastern
SMART Center

2021 Seminar Series –

2D MATERIALS FOR NEXT-GENERATION INFORMATION TECHNOLOGY: FROM FUNCTIONAL MATERIAL MINIATURIZATION TO ENERGY-EFFICIENT PHASE ENGINEERING

Dr. Jun Xiao

Abstract: The emergence of artificial intelligence and 5G technology is transforming our world with novel applications such as the Internet of Things, smart manufacturing, and AI-empowered medical care. However, this information revolution sets a massive demand for information capacity and energy supply. Such a big challenge urges innovations in device engineering and its material building blocks to boost information capacity and reduce energy consumption. In this talk, I will focus on the exciting progress of the emergent 2D layered materials and their device engineering in this direction. First, I will introduce our discovery of intrinsic 2D out-of-plane ferroelectricity in semiconducting In_2Se_3, which holds great promise for ferroelectric device miniaturization. I will then present our electrostatic doping control innovation as a new energy-efficient mechanism for structural phase engineering in layered materials. I will further show how we utilize such technology to invent the non-volatile Berry curvature memory, a new type of energy-efficient quantum devices. Inspired by these findings and techniques, I will also briefly discuss the exciting future opportunities of leveraging the structure-property relationship and light-matter interactions in layered quantum materials and devices to boost the translation of novel quantum notions into technological advantages for energy-efficient neuromorphic computing, robust quantum processing, and biosensing.

Time: 1:00 - 2:20 pm, January 27th, Wednesday, 2021

Virtual:
Join by Zoom: https://northeastern.zoom.us/j/93417130959

Dr. Jun Xiao is a postdoctoral scholar working with Prof. Aaron Lindenberg in the Department of Materials Science & Engineering and Prof. Tony Heinz in the Department of Applied Physics at Stanford University. He earned his Ph.D. in Applied Science and Technology from UC Berkeley (2018) under Prof. Xiang Zhang's supervision. His research experience and interests focus on leveraging quantum materials and devices for energy-efficient neuromorphic engineering, robust quantum computing, THz sensing, and high-throughput manufacturing.