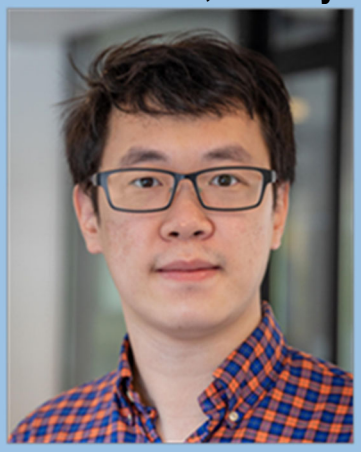
Tiancheng Song

Monday, May 8: Seminar at 11:00AM, Faraday Room (67-124 ENGR IV)



"Discovering and Engineering Quantum Materials in 2D Flatland"

Abstract:
Understanding and manipulating macroscopic quantum phenomena such as superconductivity and magnetism are crucial for future quantum science and technology. Two-dimensional (2D) materials and their van der Waals (vdW) heterostructures offer a promising platform to achieve this goal due to their exceptionally broad tunability. In this talk, I will highlight the potential of such a platform through two outstanding examples: 2D magnetism and 2D superconductivity. In the first part, I will talk about a series of emergent phenomena enabled by the vdW nature of 2D magnets, including (1) giant tunneling magnetoresistance enhanced by spin-filtering effects; (2) control of interlayer magnetism by tuning layer stacking; (3) novel moiré magnetism by twisting two layers of 2D magnets. In the second part, I will talk about the gate-tunable superconductivity in a 2D topological insulator, monolayer tungsten ditelluride (WTe 2). By employing a new probe to detect superconducting fluctuations down to millikelvin temperatures, I will discuss unconventional superconducting behaviors which are revealed by surprisingly unusual vortex Nernst signals. Finally, I will conclude by highlighting unique opportunities to discover and engineer new quantum materials and quantum devices in two dimensions.

Bio:
Tiancheng Song is a Dicke Fellow at Princeton University working with Prof. Sanfeng Wu., before which he obtained his Ph.D. from the University of Washington in 2021, under the supervision of Prof. Xiaodong Xu. During his Ph.D., he studied magnetic 2D materials using various optical and electrical measurement techniques, and discovered several emergent phenomena in magnetic van der Waals heterostructures, including giant tunneling magnetoresistance effect, stacking-dependent interlayer magnetism, and magnetic moiré superlattices. During his postdoc, he works on new 2D quantum materials and extends his expertise in quantum transport and thermoelectric measurement to study superconducting and topological 2D materials.

****Pizza lunch for students directly following seminar****

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