

Chez Pierre

Presents ...

Friday, December 1st, 2023

12:00 pm -1:00 pm

Duboc Room – 4-331



Special Chez Pierre Seminar

Mohit Randeria, The Ohio State University

“Are there Upper Bounds on the Superconducting T_c ?”

I will first describe exact upper bounds on the BKT T_c in 2D superconductors that are independent of pairing mechanism or strength. These general results are obtained by optical spectral weight bounds on the superfluid stiffness for arbitrary multi-band superconductors, with the only assumption that the vector potential couples to the kinetic energy and not the interactions. I will show that these bounds are particularly useful for strongly correlated and low-density superconductors where mean field theory fails and discuss applications to a range of problems including the BCS-BEC crossover in 2D Fermi gases, Li:ZrNCl, and monolayer FeSe/STO. Motivated by magic angle twisted bilayer graphene, I will describe how one needs to generalize these exact results to topological flat-band models. I will present bounds on the low-energy optical spectral weight related to the quantum geometry of flat band wavefunctions. I will also describe recent experimental progress in estimating the superfluid stiffness of twisted bilayer graphene. Finally, I will discuss the challenges in obtaining general bounds on T_c in 3D, which remains an open question.