

Physics Seminar: Clifford Cheung
Wednesday, April 16 · 2:00 – 3:00pm

Location: 313

Title: Hidden Structures in Scattering

Abstract: Scattering amplitudes are a powerful diagnostic for uncovering hidden structures in the laws of physics. With modern developments it is possible to bootstrap the dynamics of real-world particles---gravitons, gluons, and pions---without invoking a Lagrangian or Hamiltonian. These methods yield strikingly simple expressions that reveal deep connections amongst these familiar particles. In particular, I will describe how gravity serves as the "mother of all theories," whose amplitudes secretly unify, among others, all gluon and pion amplitudes, and how this theory space is "diatomic" in what is known as the double copy construction. I will then present a first-principles derivation of a broad class of double copies within quantum field theory, allowing for generalizations to curved spacetimes and strong-field configurations. Finally, I will show how these structures can be harnessed to compute state-of-the-art observables for black hole binary systems, as relevant to gravitational wave observatories.