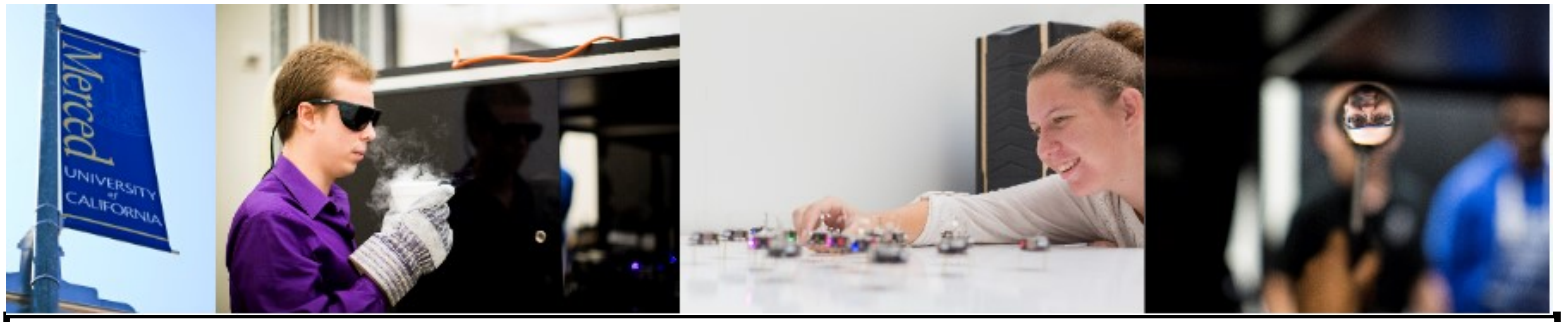

PHYSICS COLLOQUIUM:

Computational Physics: Computers as Virtual Laboratories to Study Quantum Systems

Date: **9/6/19** Time: **10:30 AM** Location: **COB2 140**	**Ettore Vitali** Assistant Professor, Physics California State University, Fresno	For more information, contact : **David Strubbe** **dstrubbe@ucmerced.edu**

Abstract

Since the earliest days of Quantum Mechanics, we witnessed great achievements in the exploration of how Nature works at the atomic scale. Nevertheless, unravelling the complexity of highly correlated systems is still a huge challenge. Several unexpected fascinating new features appear when the interactions become strong and new approaches are needed to shed light into the physical mechanisms underlying the puzzling emergent phenomena.

In the petaflops era, unprecedented computational resources put us in a unique position to pave the way for a deeper insight. The computer becomes a virtual laboratory where we can visualize quantum systems at work.
Starting from the idea of Feynman paths, I will show how is it possible to use a computer to get accurate answers for strongly correlated systems. I will present cutting-edge results for superfluids and cold atomic systems, for which we are now able to predict dynamical quantities that can be directly compared with experiments, and for high-temperature superconductors, where we are finding novel fascinating orders. The methodologies themselves can also have important applications beyond the realm of strongly correlated quantum physics, with impact on several branches of science, from systems of biological interest to modeling of complex systems.