Statement of Purpose

Sanket Chirame

I am applying to the Ph.D. program of the Department of Physics at Purdue University. I aspire to make a significant contribution to the field of condensed matter theory (CMT) while gathering skills for a successful academic career in theoretical physics. I believe that Purdue University, with its vibrant research environment, will be a perfect place for laying down the foundation of a successful career in academic research.

I intend to become a theoretical physicist carrying out independent research in the field of condensed matter physics. I seek for a graduate program offering an opportunity to discover various facets of the field with focused research along with guidance from experienced faculty. I am interested in working with Prof. Rudro Rana Biswas, whose research in mathematical aspects of disordered systems is very interesting. His recent preprint on gauge-invariant variable representation of fractional quantum hall effect has caught my interest. I am also interested in Prof. Erica Carlson's work on examining spatial patterns of electron clusters in strongly correlated systems. I also found work of Prof. Yuli-Lyanda Geller on spin-based effects in condensed matter systems very interesting. I believe that the Ph.D. at Purdue will offer me a great opportunity to work in multiple research areas of my interest.

In order to pursue research in these topics, I have developed my profile through various projects and advanced courses. I am examining phase transition from extended to localized states in the driven Aubry-Andre model under the guidance of Prof. Soumya Bera. My interest in quantum mechanical applications was developed during my summer internship at the University of Konstanz, Germany under the guidance of Prof. Wolfgang Belzig where I worked on entangling two qubits via their interaction with squeezed light. I employed perturbation theory to obtain the effective Hamiltonian and analysed implications of disregarding rotating wave approximation. I have also worked with Prof. Mandar Inamdar to analyze effects of tensile and motile forces on the closure of a wound in a cellular monolayer using CHASTE C++ simulation framework. These projects have made me familiar with the systematic way of theoretical investigation into a problem and the importance of computational techniques for validation of a theory. I have also acquired extensive experience in scientific computation using C++ and Python.

Apart from academic work, I have been part of IITB student satellite project where I headed the Attitude Determination and Controls subsystem of the second satellite, *Advitiy*. I also worked on developing a quality assured computational platform for closed-loop simulation of attitude dynamics. Working on such a complex project consisting of five interdependent subsystems made me aware of complexities associated with the application of theory in real systems. I learnt to devise structured agendas for individual and subsystem level tasks to achieve short-term goals while keeping long-term system level goals in mind. I also acquired the ability to interact with the interdisciplinary group of more than 50 members which, I believe, would be a key strength for Ph.D. research.

In summary, the theoretical background developed through various advanced courses along with the computational skills that I have honed through projects will prove to be assets while pursuing my Ph.D. research. I believe that with hard work and persistence, I will be able to match expectations of the program.

Personal Website: `https://sites.google.com/view/sanketchirame`