

PHYSICS  
ARTS & SCIENCES

SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE students

APPLICATION DEADLINE: 03/01/2023

PROJECT TITLE: Theoretical Condensed Matter Physics

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### Project Description

My research is on theoretical condensed matter physics and in particular a branch of that called strongly correlated electronic systems. I study quantum behavior of many electron systems when they strongly interact with each other. This has applications in building future quantum computers as well as room temperature superconductivity. You can find more about my research from my website in <https://homepages.uc.edu/~komijayr/pi.html>.

A topic related to quantum computer is spin fractionalization in Kondo lattices. This is a topic that I worked on together with my previous undergraduate assistant and led to a published paper in a peer reviewed journal. We found that when superconductors are brought to the vicinity of strongly correlated electrons, paired electrons fractionalize into free particles. A possible direction would be to continue this research. For this project, a good knowledge of quantum mechanics and good math background is needed.

On a separate note, I am looking for motivated students to write simulation codes for simple mechanics and other physics problems. This is for an outreach activity that involves high school students. For this project, I need students who know basic physics as well as some knowledge of Python.

In both cases, motivation and the desire to learn is more important than the knowledge. Please inquire for any question.