Jacky Song

Undergraduate student at **Rensselaer Polytechnic Institute** majoring in Applied Physics

Research · Computational Physics · UI/UX Design · Web & Software Development · Composer · Student leader

Current Research

2024 ***Ultra-long-distance power transmission and space-based energy capture***

Space-based power swarms are a technology that may one day become a source of near-limitless energy. With my team, I work on modelling electromagnetic power transmission for this technology by conducting finite-element simulations. The aim is to not only advance research into long-distance power transmission, but to also incorporate it as part of a detailed study of a space-based power swarm system that could one day be built.

2025 ***Machine learning-assisted material prediction and simulation for laser active media***

Laser power transmission over long distances has been a topic of research over decades. In particular, space-based power transmission using masers (microwave lasers) has multiple advantages compared to other approaches. However, the difficulty of finding suitable gain media for masers is an obstacle to further development, and manual identification is slow. My research seeks to using machine learning to be able to predict materials optimally-suited for laser gain media for building high-performance lasers.

Past Research Experience

2022 ***On the machine-learning assisted optimization of Alcubierre-like spacetime metrics***

I conducted theoretical analysis on the characteristics of the Alcubierre metric in General Relativity, which is of interest in advanced theoretical physics, and examined its properties via computational methods. I then investigated the issues with high energy densities associated with the standard metric, and demonstrated a machine-learning based strategy to find the optimal parameters for the metric to mitigate these issues.

Past and Current Work

Current **Head of Project Elara student organization**

I supervise Project Elara, a student-driven organization whose mission is to work on research projects dedicated to improving the world. I am involved both with the research of Project Elara and leading and coordinating its team.

Past and Current Work continued

Current **Undergraduate researcher**

I work as an undergraduate researcher for the Materials Intelligence group at Rensselaer, which specializes in using machine learning to accelerate materials discovery and advance materials science research. For this work, I build and train machine-learning models for a variety of different prediction tasks.

Current **Community administrator and designer to the Natron project**

I am a community contributor and designer for Natron, an open-source compositing software for digital artists. As part of my work, I have been participating in a 3-year development effort for the upcoming launch of the completely redesigned Natron website. In association with my co-designer, I am also working towards a visual interface redesign for the software.

Past **Designer and contributor to Mewa**

I was previously a contributor to Mewa, a motion graphics and animation software, for which I worked on the design of its visual components, set up an infrastructure for UI/UX design improvements, and redesigned the interface of its online plugin store.

Software Development Portfolio

Elara GFX

A general-purpose library for GPU programming and GPU-accelerated rendering using OpenGL

Elara Math

A math library for automatic differentiation, N-dimensional arrays, and neural networks, written in Rust

Light of Hope

An open-source JavaScript-based web player for my musical compositions, released as open-source

Skillset

Python I am fluent in Python programming, including Python for scripting, server-side web applications, scientific computing, data visualization, and general-purpose programming.

Web development I have designed and developed websites and web applications, and can write client-side JavaScript, work with static site generators, style elements with CSS or Sass, and prepare modern, responsive, accessible websites.

Research I am proficient in scientific computing, scientific machine learning, and conducting numerical simulations, and I can work as part of a research team as well as conduct research independently.

Skillset (continued)

Digital design	I use Figma frequently and am proficient in working on UI/UX design in Figma. I can also do icon designs, poster designs, and vector art in Figma or Inkscape, as well as cinematic renderings and short animations using Blender.
Composing	I am a classically-trained pianist as well as a composer of solo piano pieces, short film scores, and pieces for ensemble/orchestra. In addition, I am also skilled at digital music composition and notation, and have had many years of experience with MuseScore and Waveform.