Marco Cheng

(310) 880-3626 | marcoc7@uci.edu | linkedin.com/in/marcocheng485

Objective/Research Interests

Applied physics major with research experience in infrared cosmology, computational modeling, and space mission design. Interested in developing instrumentation and observational techniques to study the cosmic microwave background and gravitational lensing

Education

University of California, Irvine Irvine, CA

Bachelor's of Science in Applied Physics (Engineering Concentration) *Sept. 2022 – June 2026*

- GPA: 3.93/4.00 - Dean's Honor List

Research and Relevant Experience

Space Telescope Design Proposal – Jet Propulsion Laboratory June 2025 – Aug. 2025

Supervisors: Jennifer Rocca, Stephen Unwin *Pasadena, CA*

- Contributed to the development of a NASA Concept Study Report (CSR) for the PRIMA far-infrared space telescope mission.
- Developed and refined a preliminary Exposure Time Calculator (ETC), enabling science performance evaluation across multiple instrument configurations.
- Compiled over 100 potential Guest Observer science cases from the astrophysics science community and conducted supporting data analysis to assess alignment with instrument capabilities; incorporated into the Concept Study Report, with potential authorship on a forthcoming mission publication.

Observational Cosmology – UC Irvine Oct. 2023 – Present

Cooray Group | Advisor: Professor Asantha Cooray *Irvine, CA*

- Simulated and generated simulated strongly-lensed arcs produced by galaxy clusters SPHEREx images via legacy survey data and simulated noise parameters for machine learning based arc detection.
- Constructed SPHEREx mosaic maps of the North Ecliptic Pole by integrating multi-survey legacy catalogs (e.g., unWISE, HEROES, H2O, DESI), and photometric fitting for data analysis.
- Developed the sky-pointing strategy and sensitivity calculator for a proposed all-sky mid-infrared space telescope, enabling trade studies between survey depth, cadence, and sky coverage.
- Applied MCMC-based lens model fitting to Euclid cutouts, extracting Einstein radii and source parameters to support machine learning classification of strong gravitational lenses.
- Interviewed and onboarded 12 undergraduate researchers; authored onboarding and introductory materials and provided mentorship in catalog querying, observational astronomy fundamentals, astrodynamics, and scientific computing workflows.

Aerospace Structure Simulations - UC Irvine Sept. 2023 – June 2025

Computational Solid Mechanics Lab | Advisor: Professor Julián Rimoli *Irvine, CA*

- Developed and implemented a reduced-order simulation model for the dynamic and post-buckling behavior of tensegrity structures in Python.
- Conducted finite element analysis (FEA) using Abaqus to evaluate stress, deformation, and load distributions across various structural configurations.
- Contributed to the design and prototyping of novel tensegrity topologies and built a hardware testbed with Arduino-based electronic controls for structural validation.

Projects

UCI CubeSat Design Project - Systems Lead | *Ansys STK, MATLAB, Python* April 2023 – June 2025

- Led the Systems team in defining high-level satellite requirements and ensuring seamless integration across subsystems, including communications, ADCS, power, and payload.
- Synthesized the Concept of Operations (CONOPS) and Systems Requirements Document by consolidating technical objectives, risk analysis, subsystem interfaces, design/mission specifications and science objectives.

- Modeled and optimized orbital parameters using Ansys STK and MATLAB; authored a preliminary launch proposal for NASA's CubeSat Launch Initiative (CSLI), outlining scientific goals, system architecture, and deployment strategy.

Graphing Calculator Developer | *TI-BASIC, eZ80 Assembly, Python* Sept. 2018 – Aug. 2022

- Developed and coded about 40 software programs for Texas Instrument graphing calculators in Python, TI-BASIC, MATLAB, and eZ80 assembly language, such as derivatives and indefinite integral solvers as well as games.
- Commissioned by high school math department and academic competition clubs to design, program, and teach custom programs, placing 3rd in Science Olympiad California State and 1st in Academic Decathlon LA County.

Technical Skills

Programming Languages: Python, MATLAB, C++, SQL, TI-BASIC, Visual BASIC, eZ80 Assembly

Astronomy & Data Analysis Tools: AstroPy, PyAutoLens, SExtractor, SAO DS9/JS9, IRAF, MCMC (Nautilus), Scikit-learn

Engineering & Simulation Software: SolidWorks (CAD & FEA), Abaqus, Ansys STK, Zemax, Fusion360, AutoDesk Inventor

Hardware & Fabrication: Arduino, Embedded Electronics, 3D Printing (FDM & Resin), Prototyping, Assembly, Technical Documentation

Scientific Computing Tools: Linux (SSH, SCP), Bash, Jupyter Notebook, Git/GitHub, LaTeX, Conda, HPC (SLURM), VS Code

Awards and Honors

UROP Research Experience Fellowship Fall 2024
Undergraduate Research Opportunities Program, UC Irvine, $415

Honorable Mention for Outstanding Service Spring 2025
Department of Physics and Astronomy, UC Irvine

Undergraduate Research Assistantship – Academic Year 2024–2025
Prof. Asantha Cooray, UC Irvine, $7,800

Undergraduate Research Assistantship – Summer Term Summer 2024
Prof. Asantha Cooray, UC Irvine, $2,600

Dean's Honor List 2022 – Present
School of Physical Sciences, UC Irvine, All academic quarters

Presentations

Poster: *"Machine Learning on Largely Lensed Arcs by Galaxy Clusters in SPHEREx"* May 2025
UC Irvine UROP Poster Session *Irvine, CA*

Poster: *"Tensegrity Rover Project"* May 2025
UC Irvine UROP Poster Session *Irvine, CA*

Talk: *"Machine Learning on Largely Lensed Arcs by Galaxy Clusters in SPHEREx"* April 2024
SPS Undergraduate Research Talks *Irvine, CA*

Poster: *Image Simulation and Modeling Pipeline for SPHEREx* Jan. 2025
AAS 245 Meeting *National Harbor, MD*

Poster: *"Development and Applications of Deployable Tensegrity Structures"* May 2024
UC Irvine UROP Poster Session *Irvine, CA*

Poster: *"Design and Development of AntSat 01's 2U CubeSat Flight Subsystems"* March 2024
UC Irvine Winter Design Review *Irvine, CA*

Outreach, Leadership, & Service

Society of Physics Students (SPS) May 2023 – Present

UC Irvine Chapter | President, Secretary *Irvine, CA*

- Led and revitalized the SPS chapter, growing active membership from 10 to over 110 active members—making it one of the largest SPS chapters nationally.
- Created and developed almost all core organizational infrastructure, including financial planning spreadsheets, weekly event templates and checklists, onboarding/offboarding materials, and an automated merchandise ordering system using Google Apps Script.
- Co-created and launched a graduate–undergraduate mentorship program ("Big Dipper, Little Dipper") in partnership with Physics and Astronomy Community Excellence (PACE), NOVA, and other student groups; initiated discussions with UCI Physical Sciences to establish a technical workshop series on programming, CAD, and 3D printing.
- Assisted in the development of the SPS STEM outreach program, helping define its goals and organizing visits to high schools and community colleges to promote physics engagement and early research exposure.

Academic Success Committee Nov. 2024 – Present

UC Irvine Department of Physics and Astronomy | Committee Member *Irvine, CA*

- Worked with students and faculty to identify challenges and propose improvements to support student success; promoted department initiatives, supported student-led organizations, and encouraged broader participation in academic programming.

Undergraduate Physics Committee June 2024 – Present

UC Irvine Department of Physics and Astronomy | Committee Member *Irvine, CA*

- Represented undergraduate student interests in departmental discussions and initiatives related to curriculum planning and academic resources.
- Created four-year sample course plans for physics majors pursuing concentrations in Mechanical, Aerospace, Materials Science, Biomedical, and Electrical Engineering, tailored to varying levels of preparation including transfer status and math background.
- Advised students on course selection and research opportunities based on their interests in physics and applied engineering pathways.

Resonance Mentorship Program Fall 2023 – Present

UC Irvine Department of Physics and Astronomy | Mentor *Irvine, CA*

- Mentored a cohort of 5–7 incoming physics majors (freshmen and transfer students), providing guidance on academic success strategies, research opportunities, and essential skills for thriving in the major.
- Collaborated with faculty and fellow mentors to support student adjustment and foster a strong academic community within the department.

Science Olympiad (Alumni/Supervisor) June 2023 – Present

UC Irvine and Southern California Chapter | Vice President, Volunteer Coordinator, Test Manager *Irvine, CA*

- Co-founded the UCI Science Olympiad Alumni Chapter and helped organize the Orange County Regional Tournament, where over 30 middle and high school teams compete across 23 STEM events yearly.
- Serving as Southern California Test Coordinator, overseeing exam development for physics and astronomy events at the regional, state, and national levels; manage test review, volunteer assignments, and lab logistics for over 10 tournaments.
- Wrote and supervised over 30 technical tests on optics, astronomy, cryptography, structural engineering, and general physics across competition tiers; ensured scientific rigor, clarity, and fairness.

American Society of Mechanical Engineers (ASME) April 2023 – Present

UC Irvine Chapter | Communications Officer *Irvine, CA*

- Managed internal and external communications for an over 1,000-member chapter group, promoting technical events, workshops, and networking opportunities.
- Assisted with planning, logistics, and promotion of industry talks, research seminars, and student-faculty networking events.
- Collaborated with executive board members to streamline event outreach strategies and increase member engagement through digital platforms.

Relevant Coursework

Physics: Observational Astrophysics, Stellar Astrophysics, Mathematical Physics, Physical & Geometrical Optics, Electronics, Classical Mechanics, Quantum Mechanics, Statistical Mechanics, Electrodynamics, Special Relativity

Engineering: Astrodynamics, Lightweight Structures, MATLAB, SolidWorks, Statics and Dynamics, Fluid Mechanics, General Chemistry

Mathematics: Linear Algebra, Multivariable Calculus, Mathematica, Complex Analysis

Future Planned Coursework: Cosmology, Astrophysics of Galaxies, Research Communication, Control Systems, General Relativity

Teaching Experience

Lab Assistant – Classical Physics Lab (Physics 7LC) Winter 2025

UC Irvine Department of Physics and Astronomy *Irvine, CA*

- Guided undergraduate students through experiments and data analysis on classical mechanics topics including energy, force, momentum, and rotation.

References

Available upon request.