Caroline Nagib

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[Website](#) | [LinkedIn](#)

EDUCATION

Georgia Institute of Technology   Aug 2022 - Expected: July 2027

Ph.D. Candidate in Physics (GPA: 3.78/4.00)

Research focus: Computational Astrophysics

Minor: Computational Data Science and Intelligence

Dissertation Topic: *Seeing the Invisible: Using High-Performance Computing to Develop the First Comprehensive Simulation of Direct-Collapse Black Hole Formation*

University of California, Los Angeles (UCLA)   Sep 2016 - Dec 2020

Bachelor of Science in Astrophysics

Minor: Arabic and Islamic Studies

RESEARCH AND PROFESSIONAL EXPERIENCE

Georgia Institute of Technology   Aug 2022 - Present

Physics Ph.D. Researcher

- Conduct computational astrophysics research on direct-collapse black hole (DCBH) formation and evolution using high-resolution numerical simulations.
- Design, run, and optimize adaptive mesh refinement (AMR) hydrodynamic simulations on HPC systems to investigate DCBH formation pathways.
- Build analysis pipelines to process large-scale simulation outputs, converting high-dimensional datasets into interpretable, publication-ready figures and results.
- Develop reproducible workflows for simulation, data reduction, and visualization to support rigorous, high-throughput research.
- Apply advanced quantitative modeling, numerical methods, and large-data handling to accelerate compute-intensive modeling, debugging, and performance-focused research workflows.

NASA   April 2024

Review Executive Secretary

- Supported the chair and panelists acting as a scribe for all Astrophysics Research and Analysis (APRA) proposal discussions to reach final verdict.
- Assisted in organizing review panel meetings, including managing conflicts of interest, scheduling, coordinating meeting agendas, and ensuring that information required for deliberations is distributed to the panelists on a timely basis.
- Received highly positive feedback from panelists, who noted that my detailed notes significantly improved their ability to evaluate the proposals effectively.

ICEYE   Oct 2021 - Jul 2022

Satellite Mission Operator

- Performed daily monitoring and commanding functions for synthetic aperture radar (SAR) satellites, supported telemetry and tracking, and controlled ground network operations.
- Supported daily payload operations, responded to satellite and network alarms, executed commands and procedures (nominal and anomalous), supported with pass scheduling/payload scheduling activities, and coordinated troubleshooting activities.
- Assisted Spacecraft Engineers in spacecraft anomaly analysis and gathered data to create anomaly reports.
- Presented and explained ICEYE's monitoring technology and software capabilities to officials from the Space Force Executive Advisory Group, NRO, NGA, NOAA, and company board members.
- Helped in the hiring process of operators; developed training materials and trained new operators.

California Institute of Technology and   Jun 2020 - Aug 2020
NASA Jet Propulsion Laboratory
Caltech Research Fellow

- Debugged code and added upgrades to the Europa Clipper Python planetary modeling software SatStressGUI that automate data processing, make it more user-friendly, and calculate maximum stresses on icy moons.

- Documented several bugs in the source SatStressGUI code and worked with advisors to fix them.

- Wrote and submitted a proposal, an abstract, two reports, and a final paper that were approved by JPL.

- Co-authored a conference paper that was presented at The Geological Society of America annual meeting.

- Attended and participated in Europa Clipper planning meetings and weekly research discussions with the Europa Clipper scientists to review important research papers.

NASA Marshall Space Flight Center and   Jun 2019 - Aug 2019
the University of Alabama in Huntsville
REU Intern

- Conducted NSF-funded heliophysics research on the evolution and explosiveness of the magnetic field from bipolar ephemeral active regions (BEARs) in solar coronal holes.

- Used Python and IDL to obtain significant results regarding flux cancellation and its role in being a trigger mechanism for eruptions in BEARs. Results disprove misconceptions presented in a major paper on the subject (Moore *et al.* 2010).

- Identified major bugs in the Python-based solar physics software package SunPy, and collaborated with developers at Lockheed Martin to debug code to correctly account for solar differential rotation.

Search for Extraterrestrial Intelligence: Mar 2018 - Jun 2018
Theory and Applications at UCLA
Student Researcher

- Used Python to process and analyze data from the Green Bank Telescope to conduct a search for technosignatures from a Sun-like star that could host habitable planets.

- Used Python to compute Fourier transforms of the samples received from the star and to further process the data.

- Analyzed the signals to classify them as radio frequency interference, of anthropogenic nature, or unclassified signals that could potentially be technosignatures.

- Presented a machine learning algorithm that filters irrelevant interfering signals.

- Results are published in *The Astronomical Journal*.

Bruin Spacecraft Group at UCLA   Sep 2016 - Jan 2020
Student Researcher

- Collaborated with team members to conduct research and write a proposal for a competition by Lens Research & Development, a company specializing in sun sensor design and development.

- Proposal suggesting an inexpensive, low-power application for an analog sun sensor that can operate a constellation of small satellites to communicate and navigate relative to each other won at the Small Satellite Conference.

- Helped engineer a plausible application for the analog sun sensor for satellite navigation and communication in proximity operations.

- Lens R&D will be implementing this application on future satellites.

PUBLICATION

Margot *et al.* 2021, "A Search for Technosignatures around 31 Sun-like Stars with the Green Bank Telescope at 1.15–1.73 GHz," *AJ* **161** 55 (https://doi.org/10.3847/1538-3881/abcc77).

CONFERENCE PRESENTATION WITH PUBLISHED ABSTRACT

Patthoff, D. A., Leonard, E., **Nagib, C.**, Quick, L. C., and Wyrick, D. "Searching for Europan Plumes: Past, Present, and in the Future," *The Geological Society of America 2020 Connects Online*, October 2020 (https://doi.org/10.1130/abs/2020AM-356959).

TALKS AND PRESENTATIONS

Poster Presentations

Nagib, C., and Wise, J. "Seeing the Invisible: Developing the First Comprehensive Simulation of Direct-Collapse Black Hole Formation," *The 54th Saas-Fee Advanced Course: Galaxies and Black Holes in the First Billion Years as seen with the JWST*, Saas-Fee, Switzerland, January 2025

Nagib, C., Panesar, N., Moore, R., and Sterling, A. "Cradle-to-Grave Evolution and Explosiveness of the Magnetic Field from Bipolar Ephemeral Active Regions (BEARs) in Solar Coronal Holes,"

- *APS Conference for Undergraduate Women in Physics*, Irvine, CA, January 2020
- *American Geophysical Union Annual Conference*, San Francisco, CA, December 2019
- *The University of Alabama in Huntsville Poster Day*, Huntsville, AL, August 2019

Oral Presentations

Nagib, C., "Seeing the Invisible: Developing the First Comprehensive Simulation of Direct-Collapse Black Hole Formation," *Massive Black Holes Across Cosmic Time at the University of Cambridge*, Cambridge, UK, September 2025

Nagib, C., "Seeing the Invisible: Developing the First Comprehensive Simulation of Direct-Collapse Black Hole Formation," *JSI Workshop on The Formation and Early Evolution of Supermassive Black Holes*, Baltimore, MD, November 2024

Nagib, C., "Direct Collapse Black Holes (DCBHs)," *Cosmic Coffee*, Atlanta, GA, November 2023

Nagib, C., Pappalardo, R., and Patthoff, D. A. "Calculating Stresses on Europa and Other Solar System Moons: Improving SatStressGUI," *JPL SURF Research*, Pasadena, CA, August 2020

Nagib, C., Panesar, N., Moore, R., and Sterling, A. "Cradle-to-Grave Evolution and Explosiveness of the Magnetic Field from Bipolar Ephemeral Active Regions (BEARs) in Solar Coronal Holes,"

- *APS Conference for Undergraduate Women in Physics*, Irvine, CA, January 2020
- *The University of Alabama in Huntsville REU Final Presentations*, Huntsville, AL, August 2019

AWARDS AND HONORS

Saas-Fee 2025 Advanced Course full travel grant – Swiss National Science Foundation
Summer Undergraduate Research Fellowship – California Institute of Technology
UCLA Dean's Honors List for 3.75 GPA or higher
Lens R&D Sun Sensor Challenge Winner – Small Satellite Conference
1st Place Award in Project ECHO Business Competition – UCLA

TEACHING EXPERIENCE

Georgia Institute of Technology   Aug 2022 - Dec 2023
Teaching Assistant

UCLA Center for Learning in the Sciences   Sep 2018 - Dec 2018
Calculus Learning Assistant

OUTREACH AND EDUCATION

Georgia Institute of Technology   Sep 2023 - Present
Physics Allies for Wellness Lead Mentor

- Provide online and in-person sessions for students to discuss their problems and guide them to find effective solutions, improving the climate in the physics department.
- Attend journal clubs to discuss current research that cover topics such as physics education, science communication, research ethics, and philosophy.
- Completed trainings focusing on safe spaces, addressing implicit biases, and other relevant topics to better equip me to support students facing challenges.

Georgia Institute of Technology   Jun 2023 - Present
Physics Graduate Mentor

- As an active member of the Graduate Association of Physicists, provide mentorship and academic guidance to first-year graduate students in the Physics Ph.D. program, offering support and insight into common challenges and how to overcome them.
- Assist mentees in course selection, research project development, and overall academic planning.
- Mediate conflicts and provide a safe space for mentees to discuss academic or research-related challenges, offering constructive solutions and resources.

Georgia Institute of Technology   Aug 2023 - Jan 2024
CUWiP Panel Speaker and Volunteer

- Helped plan the APS Conference for Undergraduate Women in Physics (CUWiP) held at Georgia Tech by contacting physics departments at various educational institutions to promote the conference, and recruited students, professors and panel speakers.
- Assisted in the coordination and logistics of the conference, including scheduling and contacting vendors, and helped coordinate workshops.
- Served as a poster judge and on a panel motivating women in physics to consider potential career paths.

SKILLS

- Advanced in Python, C++, and IDL
- Experienced in running and analyzing hydrodynamic astrophysical simulations
- Highly experienced in Mathematica, MATLAB, Jupyter, and LaTeX
- Experienced with Grafana, STK, and proximity operations
- Experienced with Atlassian tools such as Jira and Confluence
- Operating Systems: Macintosh, Windows, and Unix/Linux
- Fluent in English and Arabic