



Columbia Summer Undergraduate Research Experiences in Mathematical Modeling

May 28-August 2, 2024

The CSUREMM program presents a valuable opportunity for undergraduate students passionate about mathematical modeling and scientific computing, regardless of their major. It delivers an immersive, interdisciplinary, and hands-on experience, guiding participants through various dimensions of scientific research. Throughout the program, students will actively participate in project design, data analysis and interpretation, modeling and simulation, literature review, scientific writing, and collaborative scholarly endeavors.

Moreover, participants will become acquainted with state-of-the-art methods and techniques used in contemporary mathematical and statistical modeling, fostering a comprehensive understanding of these disciplines. The program's culmination involves the development of a collaborative interdisciplinary research project, supported by the joint mentorship of Columbia graduate students and faculty.

To enhance the learning experience, guest speakers, hands-on tutorials, and social events are integrated into the program. By the program's conclusion, students will have gained a broad understanding of mathematical modeling and scientific computing, acquired knowledge of the scientific research process, honed skills in presenting academic research, and established a valuable network of peer and mentor relationships.

Framework

There are three main activities that students will participate in during the program.

Interdisciplinary group project

The group project segment is designed to familiarize participants with the demands involved in formulating and developing a proficient research project proposal. Each participant will join a group consisting of three undergraduate students, and together, these teams will propose an interdisciplinary research project centered on a topic of their choosing. Throughout their research endeavors, graduate student mentors and faculty will provide guidance to the teams.

Upon program completion, each team will compile and present their findings in both a written report and an oral presentation. Teams are further encouraged to showcase their work at the Columbia Undergraduate Research Symposium in Fall 2024. This collaborative approach ensures that participants gain practical experience in the complete lifecycle of a research project, from proposal to presentation.

Lectures in mathematical modeling

The program will involve students in a sequence of lectures and tutorials led by specialists in probability and statistics, as well as applied and computational mathematics. The lecture series will explore selected topics in dynamical systems, networks, stochastic modeling, operations research, and data analysis. The objective of these sessions is to offer participants an introduction to these subjects.

In addition to the lectures, hands-on tutorials will showcase concrete examples of models applied to real-world problems. Case studies will be used to demonstrate the core principles and methods introduced in lectures, enabling students to apply their theoretical understanding to practical situations.

Skills and curriculum development

Within the program, students will partake in tutorials and training sessions designed to foster the development and refinement of their technical and scientific literacy skills, alongside enhancing their communication and leadership abilities. Additionally, participants will actively contribute to content creation and curriculum design aimed at training fellow undergraduate students in mathematical modeling.

Post-program, participants will take on the role of Math Modeling Ambassadors, assuming responsibilities such as leading events and inspiring their peers. They will actively contribute to teaching and guiding participants in the Columbia Undergraduate Mathematical Modeling Workshop (CUMMW) during the Fall of 2024. This multi-faceted approach ensures that participants not only benefit from the program but also play a pivotal role in cascading their knowledge and skills to future cohorts.

Background

While not compulsory, prior coursework in linear algebra, probability, ordinary differential equations, and some exposure to programming is recommended.

Eligibility

The program invites applications from ongoing undergraduate students at Barnard and Columbia University, irrespective of U.S. residency. We actively encourage applicants from diverse backgrounds and historically underrepresented minorities.

The program is not open to graduating seniors and graduate students. Students who have already earned or will have earned a bachelor's degree by August 31, 2024, are ineligible to apply. Additionally, students not currently enrolled full-time at Barnard/Columbia are not eligible to participate.

Application

For your application, you will need::

- A one-page CV/resume
- Project proposal*
- Statement of interest
- Up-to-date unofficial university transcripts
- Name of one faculty member who can act as a reference (a reference letter is not required)



[Application form](#)

Application deadline

March 1st, 2024 at 5:00PM EST

* Project proposal

Submit a proposal of up to two pages detailing a real-world problem you wish to address. Include a brief background, your motivation for research, one or two proposed research questions, and cite at least two peer-reviewed references. Evaluation will be based on the merit of the research question and the feasibility of the proposed project, and not the chosen topic area.

Organizers

- [Ivan Corwin](#) & [George Dragomir](#)

The 2024 CSUREMM program is made possible with support from the [Herbert and Florence Irving Institute for Cancer Dynamics](#), [Department of Mathematics](#), [Department of Statistics](#), [Barnard SRI Program](#) and the [NSF](#) through [DMS:1937254](#) - [Research Training in Applied Mathematics at Columbia University](#).