Columbia Summer Undergraduate Research Experiences in Mathematical Modeling

May 30-August 4, 2023

The CSUREMM program offers an opportunity for undergraduate students interested in mathematical modeling and scientific computing, regardless of their major, to immerse themselves into an interdisciplinary, experiential, and hands-on experience. Throughout the program, participants will
(1) be exposed to the full range of activities involved in pursuing scientific research including project design, data analysis and interpretation, modeling and simulation, literature review, scientific writing, and scholarly collaboration;
(2) familiarize themselves with advanced methods and techniques used in modern mathematical and statistical modeling and data analysis; and
(3) develop a collaborative interdisciplinary research project under the joint mentorship of Columbia graduate students and faculty.

Guest speakers, hands-on tutorials, and social events are also incorporated into the program. By the end of the experience, students should walk away with a broad understanding of mathematical modeling and scientific computing, knowledge on the scientific research process, experience in presenting academic research, and a network of peer and mentor relationships.

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

• Lectures in mathematical modeling
• Interdisciplinary group project
• Skills and curriculum development

Summary
Lectures in mathematical modeling
As part of the program students will participate in a series of lectures and tutorials given by experts in probability and statistics, and applied and computational mathematics. The lecture series will cover selected topics on dynamical systems, networks, stochastic modeling, operations research, and data analysis. The hands-on tutorials will cover examples of models for real-world problems and case studies that illustrate the key principles and methods introduced in lectures.
**Interdisciplinary group project**

The group project component is designed for participants to get a sense of what is required in the proposal and development of a competent research project. Each participant will be part of a group of three undergraduate students, and teams will propose an interdisciplinary research project on a topic of their choice. Graduate student mentors and faculty will guide the teams throughout their research projects. At the end of the program, each team will prepare and present their findings in the form of a written report and through an oral presentation. Teams are also encouraged to present their work at the Columbia Undergraduate Research Symposium in Fall 2023.

**Skills and curriculum development**

As part of the program students will attend tutorials and training sessions designed to allow the participants to develop and enhance their technical and scientific literacy skills as well as their communication and leadership skills. The participants will also help in creating content and designing a curriculum for training other undergraduate students in mathematical modeling. After the program, the participants will act as Math Modeling Ambassadors and help lead events, teach and inspire the undergraduate students participating in the Columbia Undergraduate Mathematical Modeling Workshop (CUMMW) in Fall 2023.

**Background**

Previous coursework in linear algebra, probability, ordinary differential equations, and some experience with programming are highly recommended, but not mandatory.

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**Eligibility**

The program is open to any continuing Barnard/Columbia undergraduate student, independent of U.S. residency. Women and historically underrepresented minorities are particularly encouraged to apply.

*Students who have already graduated or will have graduated with a bachelor's degree by August 31, 2023 are not eligible to apply.*

**Application**

For your application, you will need:

- One-page CV/resume
- **Project proposal**
- Statement of interest
- Unofficial university transcripts
- Name of one faculty who can act as your reference (a reference letter is not required)

**Application form**

**Application deadline**

**March 10, 2023 at 5:00PM EST**

**Organizers**

- Ivan Corwin & George Dragomir

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**Project proposal**

- Submit a maximum two-page proposal describing a real-world problem that you would like to work on. The write up should include: a brief background, motivation for research, one or two proposed research questions, and at least two peer-reviewed references. Proposals will be evaluated based on the merit of the proposed research question and the feasibility of the proposed project, and not on the chosen area topic.

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