



Columbia Summer Undergraduate Research Experiences in Mathematical Modeling

June 21-August 13, 2021

Mathematical modeling and scientific computing are essential tools in the applied sciences and engineering and across disciplines. The purpose of the summer program is two-fold: to introduce the participants to some of the advanced topics in mathematical modeling and simulation encountered in modern interdisciplinary research; and to allow the participants to propose and develop collaborative interdisciplinary research projects under the joint mentorship of Columbia graduate students and faculty. Throughout the program the students will 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 interactive collaboration.

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**

There will also be several remote social activities with students from other summer undergraduate research programs offered by the mathematics department.

Summary

Lectures in mathematical modeling

As part of the program students will participate in a series of lectures and mini-courses given by experts in probability and statistics, and applied and computational mathematics. Organized around five thematic series, the lectures and mini-courses will cover selected topics on dynamical systems, networks, stochastic modeling, operations research, and data analysis. The instruction will be combined with hands-on modeling of real-world problems and case studies that illustrate the key principles and methods introduced in each thematic series. The exact topics and schedule will be made available to the participants before the start of the program.

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. It also serves as an opportunity for students to apply the mathematical and computational skills acquired during the program to investigate real world problems in scientific areas they are most interested in. Each participant will be part of a group of three undergraduate students, and each group will work throughout the program under the direct supervision of a graduate student. At the beginning of the program, teams will propose an interdisciplinary research project on a topic of their choice. Groups will complete their projects under the joint guidance of their graduate student mentor and the faculty members contributing to the program. Teams will prepare and present their findings in the form of a written report and through an oral presentation delivered via Zoom on the last day of the program. Teams are also encouraged to present their work at the [Columbia Undergraduate Research Symposium](#) in Fall 2021.

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 are encouraged to act as Mathematical Modeling Ambassadors and help lead events, teach and inspire the undergraduate students participating in the Columbia Undergraduate Mathematical Modeling Workshop in Fall 2021.

Background

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

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.

Application

Interested students are invited to apply at: <https://forms.gle/WFVHhL9bCVBZHcWJ9>

Application deadline:

April 15, 2021, before 5:00 PM (EST)

Contact

For further inquiries please contact the program organizers:

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