Applied Mathematics Summer Research with Professor Barranca

Potential Projects May Involve Applications in: *nonlinear network dynamics, mathematical modeling of computations in the brain, signal processing, information encoding, reconstructing neuronal network connectivity, dynamical systems*

Skills Involved and Developed:

- Mathematical Programming
- Mathematical Modeling
- Model Simulation, Data Analysis, and Visualization
- Mathematical Analysis using Dynamical Systems, Probability, and Approximation Theory
- Best Practices for Professional Presentations, Writing, and Peer Collaboration in Scientific Research Settings



Core Prerequisites:

Differential Equations (Math 43/44 or equivalent) and Programming Ability (CS 21 or equivalent)

Helpful, But Not Required, Additional Coursework:

Modeling (Math 56), Probability (Stat 51), or Stochastic and Numerical Methods (Math 66)

No neuroscience experience needed: only interest in applications of math to biology is required

If Interested:

- Contact Prof. Barranca over email at vbarran1@swarthmore.edu for more information. Please send along a short message explaining your interest in the research and relevant background. Feel free to reach out with any questions!

My Expectations for Summer Students

- Students should read through the information on the webpage here to understand the application process and important deadlines.

- Students are expected to commit 10 weeks of their summer and to work ~40 hours per week (standard for Swarthmore summer research). There will not be a strict expectation of 9am-5pm workdays, but you should treat this as a full-time job and regularly be available on campus to collaborate with the research group.

- Throughout the summer, we will have regular meetings to discuss progress and next steps.

- Each summer there will be typically be a single project that all of my students will work on collaboratively, but each student will ultimately focus on different facets of the project and gain autonomy as the summer progresses.

- At the end of the summer, students will write a summary of their findings, organize code/figures they have developed, and present research on campus (Math/Stat Dept. Summer Research Session, Sigma Xi Poster Session).

My Commitment to Your Success

- In original scientific research, we don’t “know the answer" ahead of time, so perseverance, creativity, and critical thinking are important skills. I will strive to point you in a productive direction and provide all resources necessary for you to succeed in this position.
- Students will generally work both independently and collaboratively with their research group. I will do my best to ensure these collaborations are enjoyable and fruitful.
- Depending on the stage of the research, it may be possible for summer projects to lead to conference participation, publications, or further research opportunities for course credit.
- I will create a respectful environment in which all students can thrive and feel valued.
- I will mentor students on ways in which their research can contribute to success in their future endeavors. This may include: providing detailed feedback to aid in developing scientific communication skills, identifying opportunities for students to present work at scientific communities, and writing recommendation letters reflecting on summer work.