Undergraduate Research in Mathematics and Statistics

Presented by
Dr. Thanh Nguyen
Rowan 10/29/2019

What is student research?

- Collaborate with a mentor (professor or supervisor) on a research project to solve a mathematical/statistical problem of interest to the academic community or motivated by industry.
- Devote a certain number of hours/week to work on the project and meet regularly with their mentor.
- Different types of problems: theoretical, applied (industry), computational (programming)
- Different opportunities: internal/external to Rowan, paid/unpaid, internships, REUs.

Why do research as an Undergrad?

- Educational Benefits
- Professional Benefits
- Personal Benefits

Educational Benefits

- Experience firsthand what research is
- Enhance understanding and knowledge of your academic field.
- Apply what you learn in class to real-world projects.
- Learn new things that aren't covered in classes
- Earn academic credit
- Prepare for graduate study
- Improve/Acquire Skills:
  - communication (written and oral)
  - critical thinking
  - problem-solving
  - teamwork
  - time management

Professional Benefits

- Explore your interests and clarify your career goals
- Gain academic credentials to build up your resume
- Find a mentor
- Develop strong relationships with faculty (think recommendation letters!!!).
- Network with experts in your field (Future employers).
- Check out potential graduate school programs/Build liaisons (Off Campus)

Personal Benefits

- Build confidence in your skills.
- Sharpen your critical and analytical thinking skills
- Meet new people with common goals and interests
- Travel to a new place (Off Campus research or Conference presentation)
- Earn scholarships, stipends, and/or awards for having conducted research.
- Confront a fear/learn something new
- Life changing experience

Before getting involved consider

- What do you hope to gain from research experience?
- What are your interests?
- What do you know about research in your field?
- How much time can you realistically commit to working on a research project?
  - Consider summer programs
- Are there particular skills you need to aid you in your research project?
- Are there courses you should take before doing a particular research project?
- What type of learning environment do you prefer?

Selecting a Mentor

- What do you expect from a research mentor?
- What are your scholarly interests and career goals?
- Which faculty shares your interests?
- Who do you enjoy working with?
- What is your preferred research environment?
- What type of training do you want?
- What skills do you want to develop?

Where do I find one?

- On Campus:
  - Paid or Unpaid options
  - Semester long or Summer (5 or 10 weeks available)
  - Talk to your professors
  - Go to departmental colloquium to get an idea

- Off campus
  - Usually over summer
  - Search internet (Key words: Summer undergrad research/internships)
  - Check out Local Businesses (Large companies: Banks, Pharmaceuticals, etc.)
  - National Science Foundation REU program: https://www.nsf.gov/crssprgm/reu/

How do you get one?

- Plan in advance (Off campus deadlines from early Dec – April)
- Take courses that will help you be a strong candidate (consider Math 01.390 – Mathematical Research)
- Pick a variety of programs including what might look to be ones that aren't as "exciting"
- Talk with your faculty advisor about the application
- Don't underestimate yourself
- Apply on time with a complete application
- Apply! Apply! Apply!

Applications

- List of relevant coursework or transcripts
- Letter(s) of Recommendation
  - Don't wait until the last minute
  - Try to give all at once with link to program, addresses and deadlines
- Personal Statement (important)
- Resume (write a good one – get help)
- Ask for a second opinion from advisor

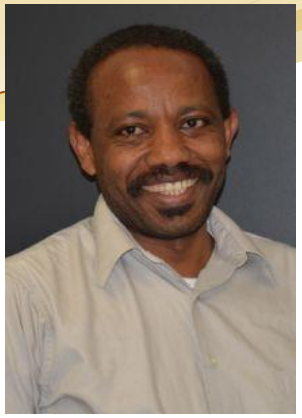
Start Now!

- Sign up sheet to talk to a Math professor for opportunities

Dr. Nasrine Bendjilali

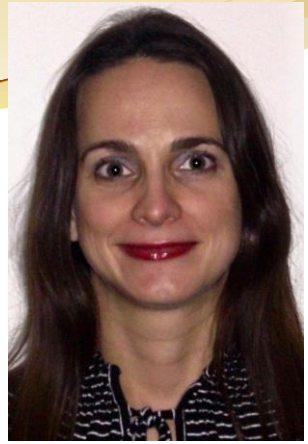
- Research Interests:
  - Statistical genetics/methodologies.
  - Genetic risk factors contributing to development of complex human diseases.
- Potential Projects:
  - Genetic risk factors contributing to development of cardiovascular diseases.
- Time frame: No immediate plans
- Student Skills required:
  - Some experience using programming languages such as R and C++.
  - Knowledge of statistics .
- Contact Info:
  - bendjilali@rowan.edu, Robinson 228D.

Dr. Abdul Hassen



- Research Interests:
  - Analytic Number Theory
  - Partition Functions
  - Bernoulli and Euler Polynomials and Numbers
- Potential Projects:
  - Number theory related problem (TBD)
- Looking for two committed students
- Initially unfunded, with funding Fall 2020
- Time frame: Late Spring 2020 and beyond!
- Student Skills required:
  - Discrete math, Calculus III
- Contact Info:
  - hassen@rowan.edu, Robinson 229E

Dr. Marlena Herman



- Research Interests:
  - The Golden Ratio and Other Ratios that Share its Characteristics
- Potential Projects:
  - mathematical investigation with the use of dynamic geometry software and computer algebra systems
- Looking for 1-2 students
- Funding: maybe (CGCE or college)
- Time frame: available now. Student's first task will be to read a book on Golden Ratios
- Student Skills required:
  - familiarity with dynamic geometry software and computer algebra systems;
  - strong knowledge of algebra, geometry, precalculus, trigonometry, and calculus
- Contact Info:
  - herman@rowan.edu, James Hall 3074

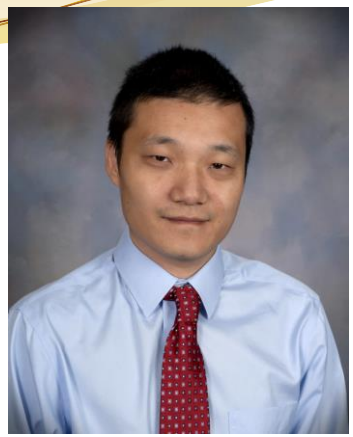
Dr. Hieu Nguyen

- Research Interests:
  - Coding Theory, Frame Theory
- Potential Projects:
  - Error-correcting codes for interactive communication
  - New constructions and partitions of equiangular tight frames for communication
- Looking for up to 2 students
- Funding available
- Time frame: Academic year 2019-2020
- Student Skills required:
  - Discrete math (coding theory), linear algebra (frames)
  - Computer programming experience
- Contact Info:
  - nguyen@rowan.edu, Robinson 228N

Dr. Thanh Nguyen

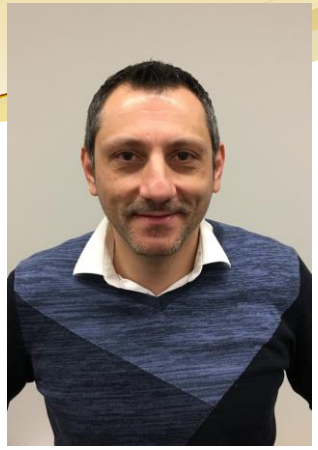
- Research Interests:
  - Ordinary and partial differential equations;
  - Optimization;
  - Applications in engineering and industry
- Potential Projects:
  - Inverse problems in heat transfer and in wave propagation and scattering
  - Fractional differential equations
- Looking for up to 4 students, in particular from underrepresented groups
- Funding: potentially available in summer 2020 and fall 2020.
- Time frame: from late fall 2019
- Student Skills required:
  - Linear Algebra and Ordinary differential equations.
  - Programming experience (Matlab/Python/C++)
- Contact Info:
  - nguyent@rowan.edu, Robinson 230C

Dr. Juming Pan



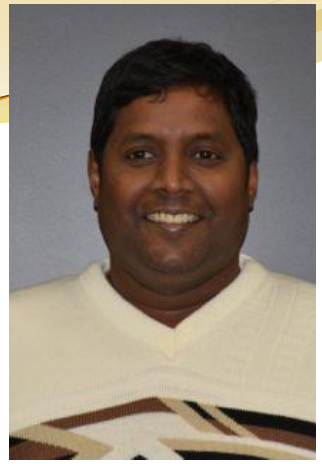
- Research Interests:
  - Statistical Learning
  - Longitudinal Data Analysis
- Potential Projects:
  - Cutting-edge Methods for High-Dimensional Data Analysis
  - Sample Size Estimation for Longitudinal Studies
- Funding available
- Time frame: 2019-2021.
- Student Skills required:
  - Diligent and enthusiastic about research
  - Easy to communicate with
  - Basic statistics knowledge
  - Some experience in programming
- Contact Info:
  - pan@rowan.edu, Robinson 228 I

Dr. Babis Papachristou



- Research Interests:
  - Statistical Genetcis, Biostatistics (Analysis of Biological Data), Epidemiology, Statistical Computing (Writing Software Packages in R or C/C++)
- Potential Projects:
  - Data analysis
  - Statistical programming
- Looking for up to 2 students
- Funding may be available
- Time frame: Now or End of July-August (4 weeks)
- Student Skills required:
  - At least an Intro Stat course (Required)
  - Experience in statistical programming (R, C/C++ desired)
- Contact Info:
  - papachristou@rowan.edu, Robinson 230D
  - Available Tuesday and Thursday 9:30-10:30am

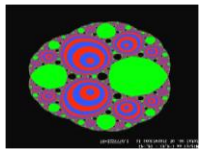
Dr. Uma Thayasivam

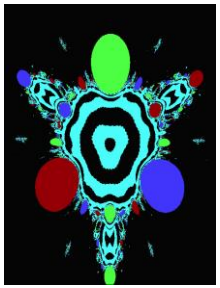


- Research Interests:
  - Statistical Learning, Predictive Modeling in Big Data, Robust Estimation
- Potential Projects:
  - Student predictive modeling
  - Telemedicine and Telehealth Statistical learning
  - Advance statistical computing for modeling big data
  - Robust methods for high dimensional data
  - Open to student driven projects on statistical/data mining
- Looking for interesting students who are willing to gain experience
- Initially unfunded with potential for future funding support
- Time frame: Fall 2019 and beyond!
- Student Skills required:
  - Basic Statistics course
  - Some experience in computing programming
  - Desire to learn and willing to commit some quality time
- Contact Info:
  - thayasivam@rowan.edu, Robinson 228F

Dr. Marcus Wright

- Research Interests (more details available upon request):
  - Geometry of Julia Sets Associated to Root-Finding Methods (Newton, Halley, Secant, ???) (see images below)
  - Constructive Algorithms for Elementary Number Theory (Fermat Two Squares, Factorization, Chirality of Triples/Quadruples)
  - I am willing to collaborate with other professors and their students
- Potential Projects:
  - Using Mathematica to Image/Analyze Julia Sets
  - Understand the Zagier Algorithms for Solutions of the Two Squares Problem
  - Using a constructive algorithm for Zagier's Fermat Two-square proof to factor
  - Generalizing Chirality of Triples to n-tuples
  - Open to student driven projects!
- Looking for up to 2 students
- Unfunded for now
- Time frame: Spring 2020 and beyond!
- Student Skills required:
  - Your brain should be open.
  - Basic programming/Mathematica could be useful for some projects
- Contact Info:
  - wright@rowan.edu, Robinson 229D





Questions?