

# Undergraduate Research in Mathematics and Statistics

Drs. Peter Muller and Alexander Diaz-Lopez

9/6/2019



VILLANOVA  
UNIVERSITY

# What is student research?

- Opportunity to 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
  - Computational
  - Statistical
- Different opportunities:
  - Internal/external to Villanova
  - Paid/unpaid
  - Internships
  - REUs (Research Experiences for Undergraduates)

# Why do research as an Undergrad?

- Educational Benefits
- Professional Benefits
- Personal Benefits

# Educational Benefits

- Experience **first-hand** what research is
- Enhance understanding and knowledge of your academic field
- Apply what you learn in class to other problems
- Learn new things that aren't covered in classes
- Possibly earn academic credit
- Prepare for graduate-level 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 valuable professional experience
- Gain academic credentials to build up your resume
- Find a mentor
- Develop strong faculty relationships (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
- Increase your ability to learn new ideas and concepts on your own
- 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?
  - During a semester
  - During the summer
- 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:
  - Community of Mathematicians and Statisticians Exploring Research
    - Co-MaStER
  - Center for Research and Fellowships (CRF) is a great resource
    - Villanova Match Research Program for First Year Students
    - Villanova Undergraduate Research Fellows (VURF) Summer Program
  - Paid or Unpaid options
  - Semester-long or Summer
  - Ask your professors
  - Go to departmental colloquia 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.)
  - NSF-sponsored REUs

# 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
  - Ask a professor for advice
- Pick a variety of programs including what might look to be ones that aren't as “exciting”
- Talk with your 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
- Villanova's Career Center is a great resource for preparing application materials and to connect to internships

# Community of **M**athematicians and **S**tatisticians **E**xploring **R**esearch (Co-MaStER)

- <https://sites.google.com/site/diazlopezalexander/co-master>
- Six professors ready for Fall 2019 projects
  - Extremal Graph Theory; led by Dr. Michael Tait
  - Extremal Combinatorics using Automated Conjecturing; led by Dr. Vikram Kamat
  - The volatility of portfolios; led by Dr. Klaus Volpert
  - Mathematical Modeling Projects; led by Dr. Peter Muller
  - Combinatorics related to permutations; led by Dr. Alexander Diaz-Lopez
  - Led by Dr. Al Marrero:
    - Distributional and probabilistic properties of prime numbers and related primality questions
    - Analysis of publicly available data
    - Any topic that students want to research

# Community of **M**athematicians and **S**tatisticians **E**xploring **R**esearch (Co-MaStER)

- <https://sites.google.com/site/diazlopezalexander/co-master>
- Students participating in a Co-MaStER research project this fall are expected to meet together monthly to share what everyone has been working on
- Students will also be expected to commit a few hours (5-10) per week to research
- If you have not already filled out the Google Form, please do so.
- Fill out the Form before Sept. 13 to definitely get started in the Fall.



# Hear from student researchers

Jesse McKean

Zbynek Gold

# Questions?

