Information Session: REUs

By: UC Merced SIAM Student Chapter

Outline

- What is an REU?
- Why should you care about them?
- UCM Specific vs. National vs Industry
- How to apply
- Guest Speakers!

What we would like for you to understand after today:

- How to look for an REU

- Application process.

- REU expectation from current graduate students experiences.

What is an REU?

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- 8-10 weeks to immerse yourself into a real-world research problem!

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<u>Why should I care?</u>

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Why should I care?

- Be a competitive candidate when applying for jobs.
- Further develop your critical thinking and communication skills.
- It shows you can *use* the knowledge obtained from your classes.

National Research Opportunities

- The first place to check is the National Science Foundation (NSF) website.
- Post research opportunities from universities across the nation.
- Unfortunately, some of the webpages are outdated- up to you to *find* the REU.
- Required experience varies per program.

Some examples of REU's found...
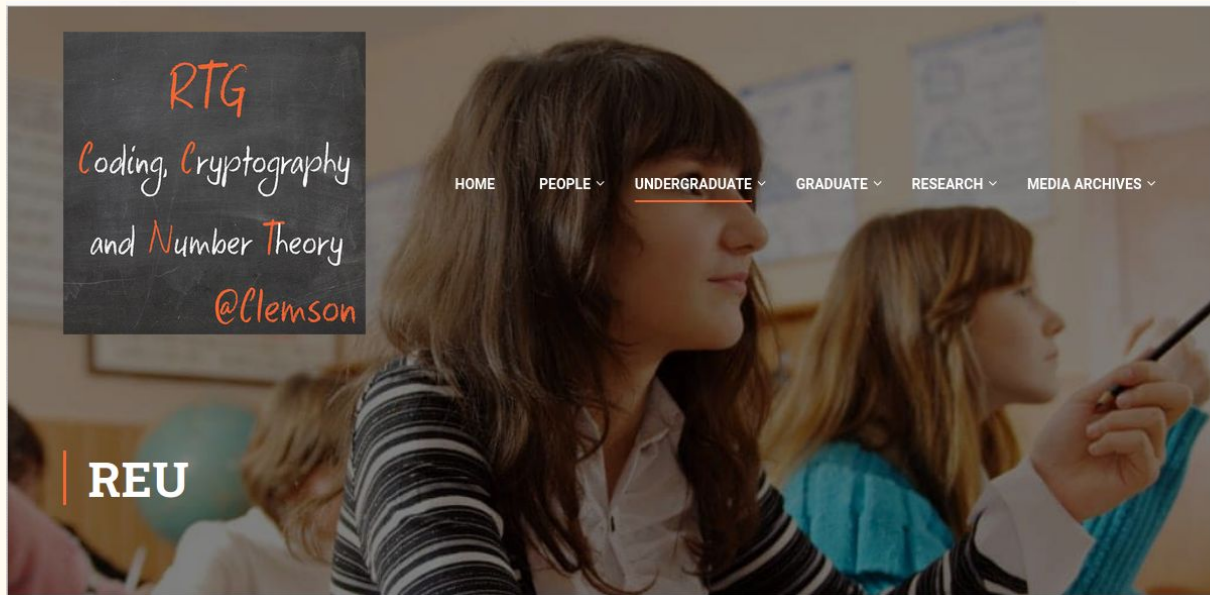
Webpage of a computer science REU at Clementon University. Directed from the NSF page.

Some examples of REUs found...

Summer 2020 undergraduate research programs - SPUR and REU

Home » Research » Summer 2020 undergraduate research programs - SPUR and REU

*Information on Summer 2021 programs will be updated in December 2020.

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Summer 2020 Department of Mathematics
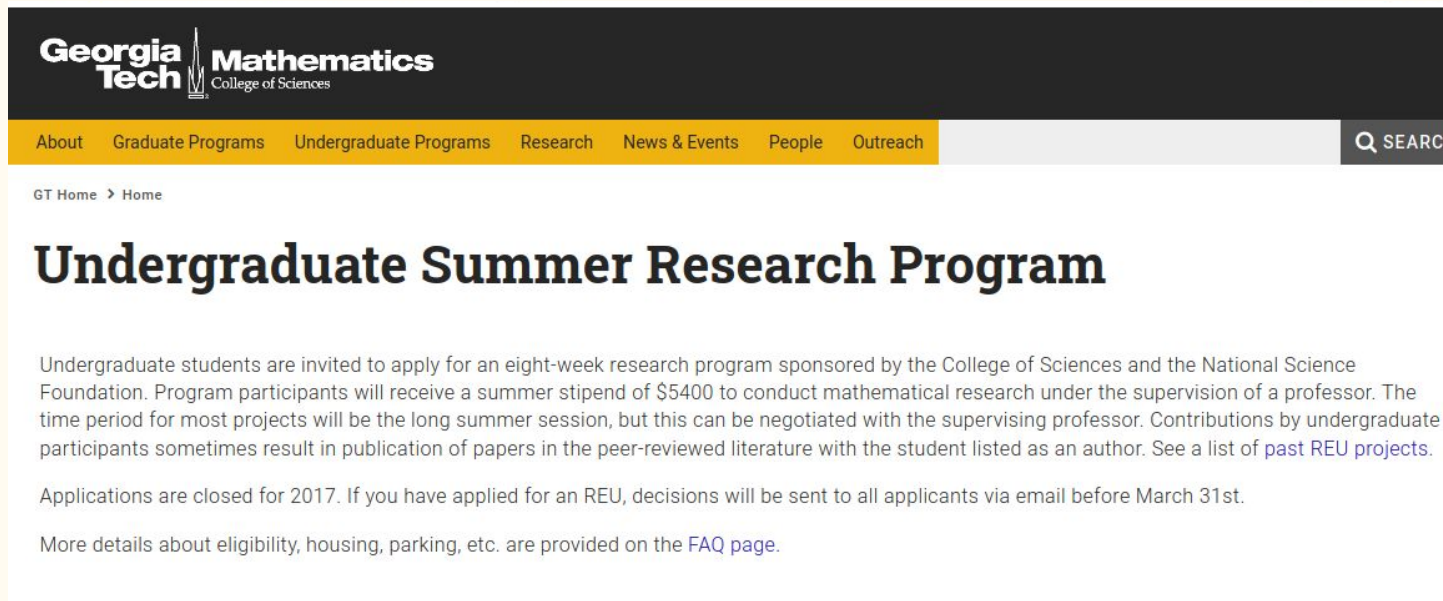Undergraduate Research Programs

SPUR PROGRAM - Summer Program for Undergraduate Research
REU PROGRAM - Research Experience for Undergraduates

SPUR Program Projects 1 & 2

From searching on the NSF website: continuing REU at Cornell University in pure and applied math.

Some of the pages are outdated :(

Georgia Tech | Mathematics College of Sciences

About   Graduate Programs   Undergraduate Programs   Research   News & Events   People   Outreach

GT Home > Home

Undergraduate Summer Research Program

Undergraduate students are invited to apply for an eight-week research program sponsored by the College of Sciences and the National Science Foundation. Program participants will receive a summer stipend of $5400 to conduct mathematical research under the supervision of a professor. The time period for most projects will be the long summer session, but this can be negotiated with the supervising professor. Contributions by undergraduate participants sometimes result in publication of papers in the peer-reviewed literature with the student listed as an author. See a list of past REU projects.
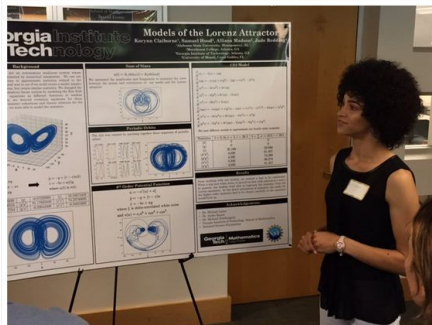
Applications are closed for 2017. If you have applied for an REU, decisions will be sent to all applicants via email before March 31st.

More details about eligibility, housing, parking, etc. are provided on the FAQ page.

Application closed for 2017? But I'm looking for summer 2021!

For outdated pages, you need to do more work...

Undergraduate Research

The School of Mathematics at Georgia Tech has a rich tradition for undergraduate research. The projects have been mentored by many different faculty, on topics ranging from fad formation, to random walks, tropical geometry, one bit sensing, extremal graph theory, and convex polyhedra. Our students have published many papers, have won a number of awards, and have been very successful in their graduate school applications. For a sample of the past projects please see below.

In Summer 2020 there will be several research opportunities available for undergraduates, which tentatively includes projects on the following topics:

- Jonathan Beardsley, Operads and Singular Knots

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https://math.gatech.edu/undergraduate-research

- Jonathan Beardsley, Operads and Singular Knots
- Wade Bloomquist, Quantum Topology/Algebra
- Federico Bonetto, The Lyapunov spectrum of coupled Arnold cat maps
- Daniel Cruz, Cellular automata inspired by experiment design
- Rachel Kuske, Dynamics and noise in energy harvesting and Dynamics and noise in optimization algorithms
- Miriam Kuzbary, Pure Braids and Link Concordance
- Doron Lubinsky, Generalizations of orthogonal polynomials
- Cheng Mao, Statistical Ranking
- Henry Matzinger, Statistical study of Covid-19 epidemy
- Jung Park, Knot Concordance
- Lutz Warnke, Random Graphs/Networks

To complement the research projects, the School of Mathematics will also hold professional development sessions on relevant topics, such as:

- How to create and present a poster
- What is graduate school like?
- Applying to graduate school

Undergraduate researchers will also have access to poster sessions and other activities sponsored by the College of Sciences.

The typical research project lasts approximately 8 weeks, in June and July, although the exact timing is negotiable and can be worked out between students and their mentors. There will be a summer stipend, and there is affordable housing available on campus. More details can be found at the FAQ page.

Found the REU website and a project/mentor list!

University of California Opportunities

- There are unique UC system wide research programs that meant to serve as an stepping stone into research.
- Opportunities for both Humanities and STEM majors.

STEM Related Opportunities (UC-wide)

- Both:
  - Stepping-stone to research.
  - Workshops and resources to prepare and encourage graduate school.
  - Project depends on the faculty member i.e the program does not guarantee a project.
  - UC-wide research symposiums!
- Difference:
  - UC LEADS:
    - 2-year program
    - Undocumented Students Eligible
  - CAMP:
    - 1-year
    - Funded through NSF, only citizens are eligible

Industry REUs

Industry research experiences may be more competitive.

Here are two examples:
1. NCAR: National Center for Atmospheric Research has projects dedicated to undergrads.
2. JPL has a summer and year round research internship

SIPARCS 2021 PROJECTS

Technical Projects for Summer 2021
If you are interested in the non-technical CISL Outreach, Diversity, and Education (CODE) Intern position please visit this page

For Summer 2021, we are currently planning for an in-person internship program though everything is bound by the local safety and health regulations due to COVID-19. In 2020, our entire program continued as a completely remote internship program. Read more about how we transitioned to a virtual internship program for 2020.

Please see How to Apply and Eligibility for clarification on academic standings.

Print-friendly PDF of the 2021 SIParCS Projects

Undergraduate Projects
Project 1. Expanding the GeoCAT-Examples Visualization Gallery
Project 2. Machine Learning Data Commons Web Portal**
Project 3. Machine Learning to Improve Weather Forecasts through Improved Data Assimilation**
Project 4. Python integration of NCL Fortran Code for GeoCAT
Project 5. Understanding HPC Application Power Efficiency, System Power Controls, and Impacts
Project 6. GPU-Accelerated Insitu Analysis of Weather and Climate Model Data
Project 7. Software Engineering and Application Development for GDEX-Obs: Enabling Scientific Data Discovery and Use

General Application Process

- (Almost) All REUs will require
  - <u>Letter of Intent:</u> why are you interested in this research opportunity? What do you hope to gain? Why are you interested in *this* topic?
  - <u>Letter of Recommendation:</u> usually a faculty member, a professor you had that can speak well about you! Not just "this person got an A in my class".
  - <u>CV or Resume</u>
  - <u>Transcripts</u>
- The letter of intent and letter of recommendation are the most important!
- Spend time reflecting about why you are interested in research or why you would like to gain research experience.

Guest Speakers!

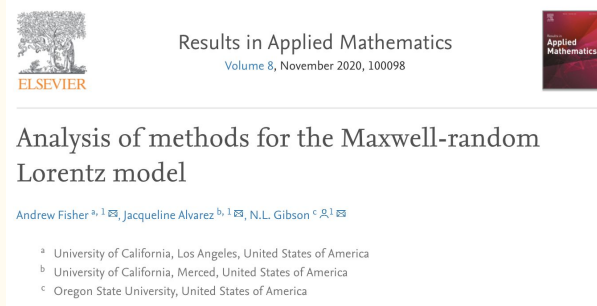Tanya Tafolla

Jocelyn Ornelas-Munoz
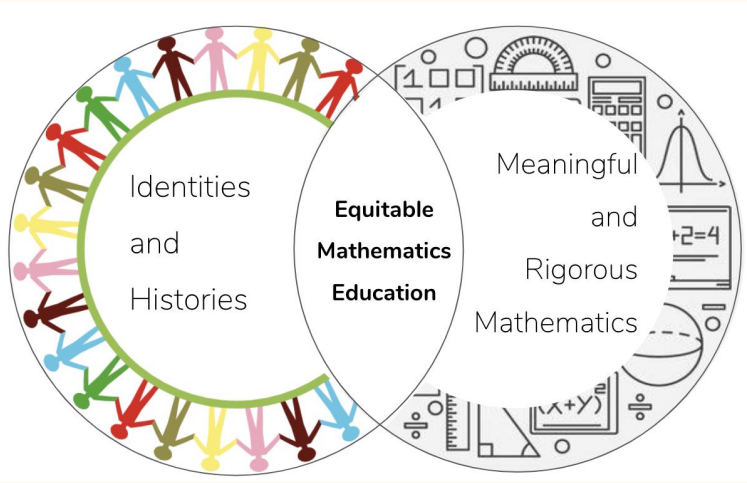
Jacky Alvarez

Tucker Hartland

Oregon State University

- Located in Corvallis, Oregon (~2 hours south of Portland)
- Worked with Dr. Nathan L. Gibson
- Studied numerical schemes to solve the inverse problem of Lorentz polarization model
- Work was published in academic journal earlier this year!
- First time living away from home and in a different state!
- Lots of fun activities: Trips to Portland and Seattle, and got to stay in town for the Solar Eclipse!

ELSEVIER

Results in Applied Mathematics
Volume 8, November 2020, 100098

Analysis of methods for the Maxwell-random Lorentz model

Andrew Fisher [a], [1] ✉, Jacqueline Alvarez [b], [1] ✉, N.L. Gibson [c] [2],[1] ✉

[a] University of California, Los Angeles, United States of America
[b] University of California, Merced, United States of America
[c] Oregon State University, United States of America

UC Irvine SURF (8 weeks)

- Worked with Dr. Elizabeth van Es to develop my own research project to understand how teachers are creating equitable mathematics classrooms

- Research Symposium Presentation

- Graduate School Preparation

- Nuclear reactor tour!

- Continued working with Dr. van Es through UCSD research scholarship for full academic year (TRELS)

https://grad.uci.edu/about-us/diversity/grad-prep-programs/surf.php
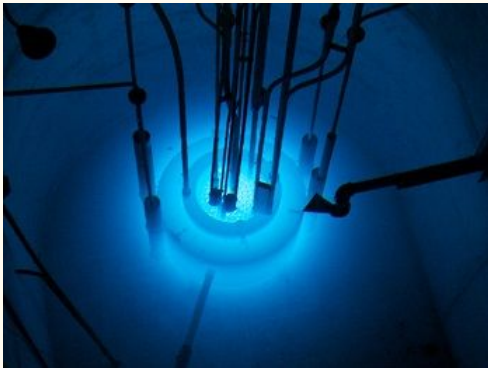
California State University, Chico 2014 REU

1. Conducted numerical studies of the influence of seabed topography on the dynamics of shallow water waves (e.g., tsunami waves).
2. This experience led to my first publication, conference and poster presentations.
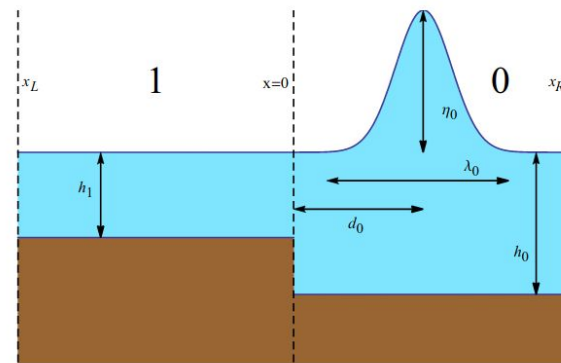

Figure 2: Schematic of a solitary wave, with characteristic height η_0 and wavelength λ_0, passing over a shelf (from right to left).

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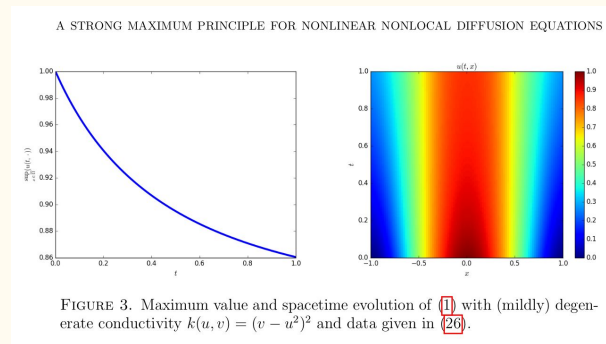Linear long wave propagation over discontinuous submerged shallow water topography

Ravi Shankar [a], Yan Sheng [b], Megan Golbek [c], Tucker Hartland [a], Peter Gerrodette [a], Sergei Fomin [a], Vladimir Chugunov [d]

University of Nebraska, Lincoln 2015 REU

Worked in Dr. Petronela Radu's nonlocal modeling group to gain better theoretical understanding for nonlocal equations, that for example describe fracturing materials.

Stayed in a dorm in Niehardt hall (see image on right).

Saw fireflies for the first time!

A STRONG MAXIMUM PRINCIPLE FOR NONLINEAR NONLOCAL DIFFUSION EQUATIONS

FIGURE 3. Maximum value and spacetime evolution of (1) with (mildly) degenerate conductivity $k(u,v) = (v - u^2)^2$ and data given in (26).

University of California, Merced   2016 REU

- First research opportunity through UC LEADS, was a 3rd year student.
- Worked with Dr. Francois Blanchette on modeling penguin huddles.
- Led to my first national conference at SACNAS!
- Honorable mention poster presentation at UC Leads Conference.

Princeton University

2017 REU

- First out of state experience!
- Found this opportunity by networking at the SACNAS conference.
- Develop numerical models for classifying bacteria transporter proteins.
- Presented at SACNAS again and won a poster presentation award!
- I was the featured student on their REU postcard.