

GRACIE CONTE

UNC, Chapel Hill
Department of Mathematics
3250 Phillips Hall # 3
Chapel Hill, NC

Office: Phillips 370
Email: gconte23@unc.edu
Website: www.gconte.net

EDUCATION

University of North Carolina, Chapel Hill • (expected) May 2021

Ph.D. Applied Mathematics

Adviser: Dr. Jeremy Marzuola

California State University, Sacramento • May 2016

M.A. Pure Mathematics

Adviser: Dr. Tracy Hamilton

California State University, Sacramento • May 2014

B.A. Mathematics

B.A. Physics

Certificate: Scientific Computing and Simulation

RESEARCH INTERESTS

- Partial Differential Equations
- Quantum Mechanics
- Fluid Dynamics
- Electricity and Magnetism
- Continuum Mechanics

THESIS

The study of quantum graphs is motivated by modeling physical phenomena and complex quantum systems with graphs. My research specifically pertains to the application of modeling waves propagating through thin branching structures. This can be accomplished by solving Schrödinger type wave equations on metric graphs. Given any graph G and Laplacian operator L , I have numerically define L on G with spectral accuracy. The next step is to implement highly accurate time evolution solvers which are complicated by boundary conditions. Currently, I can evolve linear equations and am constructing the nonlinear portion. Using highly accurate spatial and time dependant solvers, we will then apply the Adjoint Continuation Method to search for time periodic orbits on a variety of Quantum Graphs. All of these components will be adapted into a software package jointly with Roy Goodman.

PUBLICATIONS

Thomas Beck, Isabel Bors, **Grace Conte**, Graham Cox, Jeremy L. Marzuola, *Limiting Eigenfunctions of Sturm-Liouville operators Subject to a Spectral Flow*, (2020)

AWARDS AND SCHOLARSHIPS

J. Burton Linker Award for Excellence in Undergraduate Teaching · UNC-CH	Spring 2019
Initiative for Minority Excellence · UNC-CH	Fall 2016 - Spring 2017
Faculty Endowment Award · CSU, Sacramento	Fall 2015
Royal Vanderburgh Scholarship · CSU, Sacramento	Fall 2014 - Spring 2015
James Clerk Maxwell Award · CSU, Sacramento	Spring 2012 - Fall 2013

CONFERENCES AND TALKS

Discretizing Schrödinger Type Operators on Quantum Graphs with Spectral Accuracy

- Mathematics Graduate Student Association Seminar at NCSU, 13 Mar. 2020
- Graduate Mathematics Association Seminar at UNC, Chapel Hill, 2 Mar. 2020
- Triangle Area Graduate Mathematics Conference at UNC, Chapel Hill, 9 Nov. 2019
- Graduate Mathematics Association Seminar at UNC, Chapel Hill, 25 Mar. 2019

Applying to Graduate School

- Diversity in Data Science and Machine Learning Conference by Samsi at Howard University, 17 Oct 2019

Introduction to Quantum Mechanics

- Girls Talk Math at UNC, Chapel Hill, 12 July 2019
- Girls Talk Math at UNC, Chapel Hill, 10 July 2018
- Girls Talk Math at UNC, Chapel Hill, 14 July 2017

MINI SCHOOLS

Quantum Graphs and Their Spectra · Lake Como School of Advanced Studies	Aug 2019
From Symplectic Geometry to Chaos · MSRI	July 2018

TEACHING AND ACADEMIC EXPERIENCE

Graduate Teaching Assistant

Aug. 2016 - Present

UNC, Chapel Hill

Senior Teaching Fellow:

2019/2020 Academic Year

Coteach Math 920 which prepares incoming math graduate students to be successful course instructors. Check syllabus and other class material of first time instructors as well as observe their teaching during the semester. Assist graduate students with creating class material on request. This position is awarded to a single graduate student each year.

Instructor of Record Class List:

Math 547	Linear Algebra	<i>Summer 2020</i>
Math 383	Differential Equations	<i>Summer 2019</i>
Math 381	Discrete Mathematics	<i>Fall 2020</i>
Math 233	Calculus III (Recitation)	<i>Fall 2016</i>
Math 232	Calculus II (Recitation)	<i>Fall 2018, Fall 2017</i>
Math 231	Calculus I	<i>Summer 2017</i>
Math 130	Precalculus	<i>Spring 2019, Spring 2017</i>
Math 119	Mathematical Modeling	<i>Fall 2018</i>
Math 110	College Algebra	<i>Spring 2018, Fall 2017</i>

Graduate Assistant

Aug. 2014 - July 2016

CSU, Sacramento

Duties: Tutor. Teach review sessions for diagnostic testing. Proctor exams. Grader. Teach classes.

Instructor of Record Class List:

Math 11	Algebra for College Students	<i>Spring 2016</i>
Math 9	Essentials of Algebra and Trigonometry	<i>Fall 2015, Spring 2015</i>

Curriculum Developer and Instructor

July 2015 - June 2016

Brookfield School

Taught math and physics summer camp classes for children ranging from 5th to 8th grade. I developed material that focused on experimentation and applied learning to teach students topics in geometry, number theory, probability and physics. Substitute for any teacher K-8th grade during regular school year.

MENTORING

Undergraduate Research Mentor

Fall 2019 - Spring 2020

- Mentored an undergraduate student for her masters thesis by providing background on her problem and assisting her with the numerical analysis.

PROGRAM CREATION

Graduate Student Seminar Exchange UNC, Chapel Hill and NCSU

January 2020 - Present

- Created exchange program between NCSU and UNC for graduate students to present as a guest speakers at the graduate level seminar

Directed Reading Program UNC, Chapel Hill

August 2018 - Present

- Founded mentoring network where graduate students mentor undergraduate students
- Program exposes undergraduates to advanced level mathematics that is not found in a classroom setting
- Program prepares undergraduates to think an exploratory mindset rather than a regurgitative one

SYNERGISTIC ACTIVITIES

President • Graduate Mathematics Association	Aug. 2019 - Present
President • American Mathematical Society Student Chapter at UNC-CH	Aug. 2019 - Present
Director • Girls Talk Math	Aug. 2018 - Present
Committee Member • Directed Reading Program	Aug. 2018 - Present
Volunteer and Organizer • UNC Science Expo	Apr. 2018 - Present
Treasurer • Society of Industrial and Applied Mathematics	Aug. 2017 - May 2019
Graduate Student Advisory Council • Member	Aug. 2015 - May 2016

PROGRAMMING SKILLS

\LaTeX • MatLab • Mathematica • FreeFem++ • FORTRAN • Labview • C++

RESEARCH EXPERIENCE

Displacement Analysis of Neo-Hookean Elastic Materials • UNC, Chapel Hill

Derived and tested the behaviour of finite element formulations for incompressible plastic materials at finite strains using Cook's Membrane and the Elasto-Plastic Strip using FreeFem++.

Calculating the Stark Effect Energy Shift for the Hydrogen Atom • UNC, Chapel Hill

Found that the numerical eigenvalue methods produced very close estimates to the first-order perturbation theory corrections. However, the second-order estimates were slightly lower than the perturbation theory results. This is likely due to the fact that we truncated the Hamiltonian matrix and so we lost the effect of the higher level states on the eigenvalues.

Heterojunction-Assisted Impact Ionization • University of Oregon REU

Experimentally determined the best method to deposit single crystal epitaxial sphalerite Zinc Sulfide on Silicon wafers. Such thin layers have the potential to increase solar cell photocurrent by promoting impact ionization at the junction between two absorber layers. Through this heterojunction-assisted impact ionization, two free electrons are produced by the absorption of a single high-energy photon.

PROFESSIONAL SOCIETIES

Pi Mu Epsilon (National Math Honor Society)
Pi Sigma Pi (National Physics Honor Society)
Society of Industrial and Applied Mathematics (SIAM)
American Mathematical Society (AMS)