

# SCOTT EMMONS

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## EDUCATION

### University of North Carolina at Chapel Hill

Bachelor of Science, *Mathematics and Computer Science*, GPA 4.0/4.0

Expected May 2019

## RESEARCH INTERESTS

Machine learning \* AI safety \* robotics \* motion planning \* network analysis \* complex systems \* community detection \* information theory \* scalable algorithms \* information visualization \* online learning dynamics

## RESEARCH EXPERIENCE

### Intelligent Motion Laboratory, Duke University

Durham, NC

*Undergraduate Researcher*

August 2016 - Present

- Developed method for the efficient, continuous pseudoinversion of a multivariate function, which has implications for robot motion planning and applications such as teleoperation and surgical robotics
- Optimized runtime of pseudoinversion algorithm for average of 25x speed increase, enabling the computation of order-of-magnitude greater problem definitions
- Implemented custom cached database and parallelized, cache-aware algorithms to facilitate analysis at a scale unprecedented for its kind in the existing literature

### Cyberinfrastructure for Network Science Center, Indiana University

Bloomington, IN

*Research Intern*

September 2013 - Present

- Collaborated on international research project to map scientific publication
- Analyzed massively open online course data to empower students, teachers, researchers, and platform developers of massively open online courses
- Designed studies using statistical computing and visual analytics to advance the fields of network science and online learning dynamics
- Wrote up published results of experiments to communicate key findings to the scientific community
- Optimized computational experiments on supercomputer via parallel programming for 100x speed increase
- Led independent research project to map consumer purchasing behavior
- Developed interactive visualizations for users to explore data and make new discoveries
- Reviewed MIT Press books *Visual Insights: A Practical Guide to Making Sense of Data* and *Atlas of Knowledge: Anyone Can Map* to teach sophisticated visual analytics to a general audience
- Created geospatial map to showcase the research center's worldwide impact

### Carolina Center for Applied Mathematics, Mucha Group, UNC

Chapel Hill, NC

*Undergraduate Researcher*

November 2015 - Present

- Developed post-processing methods for community detection in networks to gain insight from large, complex network datasets
- Presented research ideas to foster group collaboration
- Studied graduate-level network science coursework in reading group to build the group's collective, foundational knowledge

### Arnosti Laboratory, Department of Marine Sciences, UNC

Chapel Hill, NC

*Research Assistant*

October 2015 - February 2016

- Developed interactive software for the hierarchical visualization of microbial community composition data used in making oceanography discoveries
- Programmed scripts that automated supercomputing workflows for DNA sequencing to increase the research lab's operational efficiency

**Graph and Map Algorithms Group, University of Arizona**

Tucson, AZ

*Visiting Scholar*

December 2014 - January 2015

- Collaborated directly with Dr. Stephen Kobourov to design study answering previously unresolved questions in the field of network science
- Implemented computational experiments on 4 algorithms and 6 metrics that can be applied to research in disciplines ranging from the social sciences to the biological sciences

**PROFESSIONAL EXPERIENCE****Information Technology Services, University of North Carolina at Chapel Hill**

Chapel Hill, NC

*Residential Computing Consultant*

August 2017 - Present

- Supported on-site information technology needs of 70 university students to ensure a high-quality residential experience
- Solved issues independently and autonomously to provide fast, reliable service to clients

**Robertson Community Coordinators, Robertson Scholars Leadership Program**

Chapel Hill, NC

*Service Committee Member*

August 2015 - May 2017

- Organized volunteer opportunities that drove civic engagement amongst Robertson Scholars
- Oversaw logistics and funding for 4 community service projects that improved living conditions in Durham and Chapel Hill

**Sparq Creative Solutions, LLC**

Bloomington, IN

*Cofounder and Owner*

December 2013 - December 2015

- Created strategic plans, brand identities, logos, and websites to grow local businesses
- Consulted with clients to identify needs and plan projects to meet business objectives
- Formulated contracts and closed sales deals aligning with client goals
- Identified independent contractors with relevant expertise to exceed client expectations
- Executed internal business operations by keeping the books, filing taxes, and coding company website to continue efficiently offering high-quality services

**TEACHING AND MENTORING EXPERIENCE****Shanti Bhavan Children's Project**

Tamil Nadu, India

*Volunteer Teacher*

July 2017 - August 2017

- Taught approximately 80 students from families who make less than \$2 / day in subjects ranging from English literature to physics to provide an educational foundation towards eliminating the cycle of poverty
- Mentored 10 students in quantitative subjects such as mathematics and computer science in preparation for national examinations
- Coached students in preparation for public speaking to an audience of 50 members to develop students' confidence and communication skill
- Instructed 20 students in resume writing for a Goldman Sachs workshop preparing them to seek and attain high-impact careers
- Collaborated with school's founder to draft detailed budget proposal requesting hundreds of thousands of dollars per year in funding for new initiative

**Sunflower County Freedom Project**

Sunflower, MS

*Volunteer Teacher*

May 2016 - July 2016

- Developed standard-aligned 8<sup>th</sup>- and 9<sup>th</sup>-grade math curriculum designed for under-performing middle school students who sought over the summer to enrich their education
- Taught two math classes that saw an average increase in performance of 9% on state standard test
- Developed a three-day coding seminar for middle school students that used active learning with puzzles to introduce the fundamentals of computer science
- Created spreadsheet framework that will form the basis of future data analytics at the Freedom Project to measure courses' academic impact
- Led fitness group in dieting and exercise that resulted in average mile time decrease of over 60 seconds
- Coordinated with videographer to film short documentary used in grant proposals for continued funding

**Life Skills Academy**

Bloomington, IN

*Cofounder*

January 2014 - May 2015

- Negotiated terms with school principal to run program 3 times a week during the school day and help students at risk of failing to pass core, academic classes required to earn a high school diploma
- Oversaw development of “life skills” in 25 mentor-mentee pairs to support classroom achievement

**Information Visualization Massively Open Online Course**

Bloomington IN

*Student Liaison*

Spring 2014, Spring 2015

- Facilitated online discussion of nearly 2,000 enrolled students from over 50 different countries to augment the material taught during lectures
- Reviewed student-facing materials such as examinations to ensure that online coursework maintained the high quality of an in-person university class

**PUBLICATIONS AND PRESENTATIONS***Publications*

- Kris Hauser & **Scott Emmons**: “Global Redundancy Resolution via Continuous Pseudoinversion of the Forward Kinematic Map.” *IEEE Transactions on Automation Science and Engineering*, *Accepted*.
- **Scott Emmons**, Robert Light, & Katy Börner: “MOOC Visual Analytics: Empowering Students, Teachers, Researchers, and Platform Developers of Massively Open Online Courses.” *Journal of the Association for Information Science and Technology (JASIST)*, 2017.
- William H. Weir, **Scott Emmons**, Ryan Gibson, Dane Taylor, & Peter J. Mucha: “Post-Processing Partitions to Identify Domains of Modularity Optimization.” *Algorithms*, 2017.
- **Scott Emmons**, Mike Gallant, Stephen Kobourov, & Katy Börner: “Analysis of Network Clustering Algorithms and Cluster Quality Metrics at Scale.” *PLoS ONE*, 2016.

*Oral Presentations*

- **Scott Emmons**, Robert Light, & Katy Börner: “MOOC Visual Analytics: Empowering Students, Teachers, Researchers, and Platform Developers of Massively Open Online Courses.” Interactive Intelligent Systems Open House. Bloomington, IN, 2015. **Best Presentation Award**
- **Scott Emmons**, Robert Light, & Katy Börner: “MOOC Visual Analytics.” Cyberinfrastructure for Network Science Center Open House. Bloomington, IN, 2014.
- **Scott Emmons**: “Mapping the Consumer Product Space.” Cyberinfrastructure for Network Science Center Open House. Bloomington, IN, 2013.

**AWARDS AND HONORS***Academic*

- Alfred Brauer Award, granted by UNC’s Department of Mathematics “to the undergraduate who... ha[s] demonstrated the greatest ability and shown the greatest promise for achievement in the fields of algebra or number theory,” 2018
- Goldwater Scholar, nationally competitive, research-focused scholarship for undergraduates in the natural sciences, mathematics, and engineering, 2017-2019
- Robertson Scholars Leadership Program, highly selective undergraduate merit scholarship providing unique “dual citizenship” at UNC and Duke University, leadership development workshops, and funding for three summers, 2015-2019, \$250,000
- National Merit Scholar, chosen among top 0.6% of PSAT test takers, 2015, \$2,500
- Honors Carolina, selected as top 10% of incoming UNC class, 2015-2019
- Honorable Mention Paper, M<sup>3</sup> Math Modelling Challenge of the Society for Industrial and Applied Mathematics, among top 6% of submitted papers, 2015

*Competition*

- 4<sup>th</sup> in nation and 2x state champion in case competition, Business Professionals of America, 2013-2014
- 10<sup>th</sup> in nation, computer programming concepts, Business Professionals of America, 2013
- 2x state champion, financial math and analysis, Business Professionals of America, 2013-2014