

# THOMAS STECKMANN

(919)-964-1644 | [tmsteckm@ncsu.edu](mailto:tmsteckm@ncsu.edu) | [Portfolio: ThomasSteckmann.com](https://portfolio.thomassteckmann.com)

## EDUCATION

**North Carolina State University:** 4.0 GPA - Physics B.S. | Mathematics B.S.

University Honors Program; Physics Honors; Math Honors; Phi Beta Kappa; Park Scholar

Raleigh, NC

Aug. 2018 – May 2022

## RESEARCH EXPERIENCE

### Quantum Information Science Intern

Summer 2020, Summer 2021 - Present

Oak Ridge National Labs and North Carolina State

Oak Ridge, TN

- Investigated the application of Lie Group decomposition to produce an efficient circuit for matrix exponentials, which has benefits in long-time simulation of quantum systems on quantum computers
- Work lead directly to an in-review publication: [Fixed Depth Hamiltonian Simulation via Cartan Decomposition](#)
- Developed and published a python package to simplify the implementation of the decomposition algorithm and to encourage exploration into applications beyond the expertise of the authors: [Cartan Quantum Synthesizer](#)
- Investigating applications of Cartan Decomposition to studying the dynamics of the Hubbard model for electrons using current quantum computing hardware. Using a variety of optimization tools centered around Cartan Decomposition, our non-Trotter based approach succeeds where previous simulations on superconducting hardware failed

### Organic Electronics Research

June 2018 – June 2020

North Carolina State University - Organic and Carbon Electronics Lab

Raleigh, NC

- Investigated the relationship between the morphological characteristics and the electronic characteristics of organic transistors.
- We demonstrate that an efficient fabrication method using floated polymer films can be used to preserve high quality charge transport in films down to only two molecular layers. This is significant improvement compared to the existing understanding of N2200, the semiconducting polymer used, and opens up possibilities for highly material efficient, transparent, and flexible electronics.
- Experience managing a project in an experimental laboratory setting, including designing experimental procedures and working in a collaborative research setting.
- Presented research at the Material Research Society Fall 2020 Meeting, and currently preparing the final paper for publication.

## PUBLICATIONS AND PRESENTATIONS

### Publications:

Efehan Kökcü, Thomas Steckmann, JK Freericks, Eugene F Dumitrescu, and Alexander F Kemper, "Fixed depth hamiltonian simulation via cartan decomposition," (2021) [arXiv preprint arXiv:2104.00728](#)

### Presentations:

- 2nd place, "Efficient Quantum Simulation on a Quantum Computer," McCormick virtual Symposium | 2021
- "Constant Depth Exact Time Evolution of Spin Systems Based on Cartan Decomposition," National Council For Undergraduate Research | 2021
- ["Scalable Fabrication of High Mobility Monolayer OFETs Using Floating Film Transfer"](#) Virtual poster, Material Research Society | 2020
- Honorable Mention, "High Efficiency Semiconducting Polymer Self-Assembly in Organic Transistors" Poster, McCormick virtual symposium | 2020
- 3rd place, "Aggregation Mechanisms in Low Temperature Ultrathin Water-Floated Films Future" Future of Materials IV Workshop | 2020

## TECHNICAL SKILLS AND RELEVANT COURSEWORK

**Programming Languages:** Python, Java, Mathematica, HTML, CSS

**Libraries/Packages:** Qiskit, NumPy, Scipy, Matplotlib

**Featured Course Work:** **Graduate Level:** [Mathematical Foundations of Quantum Computation](#) | Linear Algebra | Complex Analysis | Computational Physics | **Undergraduate Level:** Modern Algebra | Quantum Mechanics | [Cryptography](#) | Java Software Development

## QUANTUM COMPUTING

---

### **Undergraduate School on Experimental Quantum Information Processing** Summer 2021

- Virtual summer program featuring lectures on the theory and implementation of quantum algorithms, qubit architectures, and quantum communication protocols

### **Quantum Ideas Summer School** | *Hosted by Duke University STAQ collaboration* Summer 2019

- Introduction to quantum computing hardware approaches including superconducting and trapped ion systems
- Exploration of advanced variational algorithms and error correcting codes

### **Quantum Computing Hackathons with Qiskit** 2020

- [Qiskit Hackathon Global](#) With a team of five students, developed an easy to use function to evaluate the Quantum Volume of IBM hardware during this 24 hour invite only event
- [NC IBM Q Summer Jam](#) Implemented an algorithm for quantum PageRank using Quantum Random Walk

## COMMUNITY ENGAGEMENT AND LEADERSHIP DEVELOPMENT

---

### **Quantum Information Club at NC State** | *Co-founder, Current President* March 2020 – Present

- Developing approachable programming in quantum computing for undergraduate students with a range of math, science, and engineering backgrounds by working closely with community partners such as the NC State Q Hub and IBM Qiskit, and university groups at UNC Chapel-Hill, Duke, Georgetown, and Georgia Tech
- Primary organizer for the [2020 North Carolina IBM Summer Jam Hackathon](#) with over 60 participants, and a workshop co-organized with IBM Qiskit with over 40 participants

### **Park Scholarships** 2018 -2022

- Four year, merit based scholarship awarded for excellence in Leadership, Service, Character, and Scholarship
- Development courses focusing on leadership development, civic engagement, and diversity

### **CrowdSolv Developer** 2019-2020

- Volunteer front end development (HTML, CSS, Bootstrap, Javascript) for CrowdSolv, a non-profit building a collaborative platform for crowd-sourced problem solving

### **Habitat for Humanity** | Works Project Officer 2019-Present

- Regular volunteer with Habitat Wake and the NCSU chapter to promote affordable housing access and work in home construction
- As a club officer, I assist with fundraising efforts, facilitate student involvement, and work with construction leaders to work with new construction volunteers