

Chris Dare

Ph.D. Student — UCSB



christopherdare.com

Education

Ph.D.* Mathematics — University of California, Santa Barbara | 2020 — current | GPA : 4.0/4.0

M.Sc. Mathematics — Virginia Tech | 2019 | GPA:3.80/4.0 | Thesis: *Turing Decidability and Computational Complexity of Morse Homology*

B.Sc.(Hons.) Computer Science — Virginia Tech | Fall 2019 | GPA:3.71/4.0 | Capstone: Protein Folding

B.Sc.(Hons.) Mathematics — Virginia Tech | 2017 | GPA:3.80/4.0 | Undergraduate Research: *Frequency-Dependent Microphone Matrices*

Skills

Languages: C, Python, Java, Swift
WebDev : HTML, CSS, JS, JQuery, Bootstrap 4.0
Mathematics : LaTeX, MathJax, Mathematica
Software Engineering : Git, *NIX, BASH, REST
Certifications: Splunk Architekt I, Splunk Admin

Extra-Curricular —

President of Math Club @ Virginia Tech (2017-2018)

Hackers@VT

- BoilerMake
- HackGT (Won Apple Dev. prize)
- MHacks
- HackNC
- HackDuke

Work Experience and Internships

- Jun-Aug 19 System Architect Intern NetApp, Raleigh NC
Develop an automated deployment of NetApp software-based storage with ElasticSearch's indexing technology
- May-Aug 18 System Architect Intern NetApp, McLean VA
Developed a Python-based tool which crawled a NetApp storage system's OS (ONTAP) and checked for FedRAMP and SCAP compliance
- May-Aug 17 Professional Services Intern Splunk, McLean VA
Utilized machine and server log data to analyze a system's security. Enrolled in several Splunk certification programs to learn the underlying architecture of Splunk's software and native language (SPL)
- May-Aug 16 Research Fellow NIST, Gaithersburg MD
Studied applied private-key cryptography in the cybersecurity labs at the National Institute of Standards & Technology (NIST) under Lawrence Bassham. Wrote C-based implementations of roughly ten private-key block ciphers, including AES. Data collected was used in NISTIR 8114 *Report on Lightweight Cryptography*

Teaching

- Fall 21 MATH 3B: Calculus with Applications 2
- Summer 21 MATH 4B: Differential Equations
- Spring 21 MATH 117: Methods of Analysis
- Winter 21 MATH 6B: Vector Calculus 2
- Fall 20 MATH 34A: Calculus for Social Sciences

Research and Projects

- (current) Algebraic Geometry Group — UCSB
Working under Professor Xiaolei Zhao on topics in algebraic geometry, with focus towards K3 surfaces and Hyperkahler geometry.
- Aug 19 Riemannian Geometry Applied to General Relativity
An independent / personal project that involved discussing the rigorous mathematics that lead up to the Schwarzschild-De Sitter metric. The series of blog posts is available at <https://christopherdare.com/blogpage>
- May 19 Masters Thesis
Produced *Turing Decidability and Computational Complexity of Morse Homology*, which presents a background on discrete Morse theory and the algorithms used to find its analogue of simplicial homology. Available at <https://christopherdare.com/papers/MastersThesis.pdf>
- May 19 Elliptic Curves in Algebraic Geometry
A review of elliptic curves from the perspective of algebraic geometry in the form of lecture slides. Among the numerous topics covered, a proof that Elliptic curves are the only one dimensional Calabi-Yau projective varieties is provided. Available at https://christopherdare.com/papers/Math6324_FINAL_PRESENTATION.pdf

Notable Courses –

— MATH 6324 (Algebraic Geometry II) | Spring 2019 | Schemes, Hilbert Polynomials, Sheaves, Sheaf Cohomology, Chow Groups | Grade: A

— MATH 5344 (Algebraic Geometry I) | Fall 2018 | Varieties, Projective Nullstellensatz, Blow-ups, Singularities | Grade: A-

— MATH 6324 (Differential Geometry II) | Spring 2018 | Geodesics, Theorema Egregium, Gauss-Bonnet, Characteristic Classes, Pontrjagin Classes | Grade: A

— MATH 5344 (Smooth Manifolds) | Fall 2017 | Submanifolds, Fibre Bundles, Lie Algebras, De Rham Cohomology | Grade: A

— MATH 5236 (Complex Analysis II) | Spring 2019 | Analytic Number Theory (e.g. Zeta function), Riemann Mapping Theorem, Compact Families of Meromorphic Functions | Grade: A-

— MATH 5226 (Real Analysis II) | Spring 2018 | L^p spaces, Riesz Representation Theorem, Hahn-Banach, Weak and Weak-* Topologies | Grade: A

— MATH 5225 (Real Analysis I) | Fall 2017 | Measure Theory, Convergence Theorems, Caratheodory Extension | Grade: A

— CS 4414 (Scientific Computing) | Spring 2019 | GPU Processing, Numerical Methods (e.g. Nedler-Mead, Simulated Annealing), AMBER Molecular Dynamics, Supercomputers | Grade: A

May 19

Protein Folding Capstone

Final report for Virginia Tech's scientific computing senior capstone. Two NVIDIA CUDA cores were used to run simulated annealing on AMBER software in order to find the secondary structure of Trp-cage. Available at https://christopherdare.com/papers/Dare_CS4414_Final_Report.pdf

Nov 16

Frequency-Dependent Microphone Matrices

Semester-long undergraduate research project which taught the basics of Fourier Series and PDEs, as well as their application to sound engineering. In particular, this paper describes how frequency-dependent microphones may be represented as a linear system of equations based off some voltage functions and speaker functions. Available at https://christopherdare.com/papers/Frequency_Dependent_Microphone_Matrices.pdf

Achievements and Honors

Dec 17

Phi Beta Kappa Honors Society

Officially inducted into the oldest and most prestigious collegiate honors society for outstanding academic performance and undergraduate research.

Feb 17

Mathematical Competition in Modelling

Honorable Mention for solution to the MCM 2017 Problem B, which involved using a continuous analogue of the Galton's binomial distribution to model traffic around an toll booth gate.

Jun 16

U.S. House of Representatives Certificate of Congressional Recognition

Received the congressional recognition from Barbara Comstock on account of my research fellowship at the National Institute of Standards in Technology.

May 16

Pi Mu Epsilon Honors Society

Inducted into the mathematical honors society for outstanding performance in undergraduate mathematics courses.

Mar 16

Eta Sigma Phi Honors Society

Inducted into the classics honors society for outstanding performance in undergraduate Latin and Ancient Greek courses.

Feb 16

Mathematical Competition in Modelling

Honorable Mention for solution to the MCM 2016 problem A, which involved using Fourier series to find the heat distribution of water in a tub.

Jan 16

Virginia Tech Honors Presidential Scholarship

Received the VTHP Scholarship for outstanding work within the honors college at Virginia Tech.

Aug 14

Virginia Governor's Latin Academy

Accepted to the Governor's Latin Academy for the duration of Summer 2014 to study vernacular Latin and Ancient Greek. Time outside of classes was spent researching Spondaic meter in Homeric Greek.

May 14

Randolph College Book Award Scholarship

Received the Randolph College Scholarship for outstanding performance in classical studies (i.e. Latin and Ancient Greek).

Electives

Principles of Computer Security, Computational Bioinformatics, Quantum Cryptography