

Mark Gillespie

Curriculum Vitae

Education

2014–2018 **B.S. Computer Science, Mathematics**, *California Institute of Technology*, Pasadena, GPA: 4.0.

The computer science degree involves courses in systems, algorithms, functional programming, and complexity theory. I supplemented these courses with electives in computer graphics and advanced algorithms. The math degree involves courses in abstract algebra, differential geometry, and analysis. I supplemented these courses with electives in algebraic topology.

Work and Research Experience

Fall 2017 **Teaching Assistant for CS 171, Introduction to Computer Graphics**, *Caltech*.

Under Professor Alan Barr, graded problem sets, held weekly office hours, delivered recitation lectures

Summer 2017 **Arthur R. Adams Undergraduate Researcher**, *Caltech*.

Under Professor Peter Schröder, implemented an energy-preserving integrator for 2D MHD on grids and proved its conservation properties

- Analyzed conservation behavior of the algorithm using discrete differential geometry
- Implemented algorithm in Houdini

Summer 2016 **Arthur R. Adams Undergraduate Researcher**, *Caltech*.

Under Professor Mathieu Desbrun, developed a new algorithm for computing polymer conformation using dimensionality reduction techniques.

- Implemented algorithm in C++
- Experimented with applying the algorithm to point cloud denoising

Jan. 2016 – **Undergraduate Researcher**, *Caltech*.

2017 Under Professor Alan Barr, explored applications of interval analysis to root-finding and solving differential equations

- Implemented interval analysis library in Haskell
- Implemented graphical viewer for interval root-finding and minimization algorithms

Spring 2017, **Teaching Assistant for CS 38, Introduction to Algorithms**, *Caltech*.

Spring 2016 Under Professor Leonard Schulman, graded problem sets and held weekly office hours

Summer 2015 **Software Engineering Intern**, *Google*.

Prototyped new credit card entry interface for Android library. Developed in Java

Programming Languages

C/C++, Python, Java, Mathematica, Matlab, Haskell, Ocaml, \LaTeX

Talks Given

- Oct. 2017 **2D Plasma Simulation via Discrete Exterior Calculus**, *Caltech Summer Research Seminar Day*.
15 minute presentation on the results of my summer research
- Sept. 2017 **Combinatorics and the Probabilistic Method**, *Westfield High School Seminar in College Mathematics*.
30 minute presentation to a high school math class. Gave an introduction to elementary combinatorics and presented some simple applications of the probabilistic method
- Mar. 2017 **Continuous and Discrete Mechanics for Variational Integrators**, *Caltech CS 177b*.
1.5 hour final presentation for a computer graphics class. Gave an overview of Hamiltonian/Lagrangian mechanics and how to discretize them to produce variational time integrators
- Dec. 2016 **Measurement in Quantum Mechanics**, *Westfield High School Seminar in College Mathematics*.
30 minute presentation to a high school math class. Gave an introduction to projective measurements in Quantum Mechanics, working through the example of the Stern-Gerlach device
- Oct. 2016 **Computing Chromosome Embedding from Contact Frequencies**, *Caltech Summer Research Seminar Day*.
15 minute presentation on the results of my summer research

Selected Classes Taken

- CS 177ab **Discrete Differential Geometry** *discrete study of: differential forms, deRham cohomology, Poisson problems, variational mechanics*
- CS 176 **Introduction to Computer Graphics Research** *geometry processing, data visualization, vector fields and flows*
- CS 171 **Introduction to Computer Graphics Laboratory** *shaders, geometry processing, physical simulation, ray tracing*
- Ma 109bc **Introduction to Geometry and Topology** *manifolds, vector fields, Gauss-Bonnet theorem, geodesics, differential forms*
- Ma 151a **Algebraic Topology** *fundamental groups, covering spaces, homology*
- CS 150 **Probability and Algorithms** *analysis of probabilistic algorithms, the probabilistic method*
- CS 139 **Analysis and Design of Algorithms** *streaming algorithms, experts algorithm, SDPs, spectral graph theory*
- CS 151 **Complexity Theory** *nondeterminism, nonuniform circuits, randomized algorithms, polynomial hierarchy, interactive proofs, approximation*
- Ma 120a **Abstract Algebra** *graduate course in commutative algebra*

Awards/Fellowships

- Summers 2016, 2017 **Arthur R Adams SURF Fellow** *Fellowship to fund my summer research*
- Summer 2017 **SIGGRAPH ACM Turing Award Celebration Grant** *I was one of 10 students sponsored by SIGGRAPH to attend the ACM Turing Award Celebration*