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*
2016	**William Lowell Putnam Mathematics Competition**	*31 points (rank: 365/3214)*