

Anthony Pizzimenti

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Education

The University of Iowa B.S. – Computer Science

May 2020 (Expected)

The University of Iowa B.A. – Mathematics

May 2020 (Expected)

The University of Iowa Large Data Analysis Certificate

May 2020 (Expected)

Research Interests

Graph theory, combinatorics, group theory, linear algebra, algorithms, and large data analysis.

Languages, Tools, and Frameworks

Considerable Experience Python • Java • Bash • JavaScript • TypeScript • Git • Subversion • LaTeX • QGIS

Moderate Experience C++ • C • C# • R • MATLAB • Prolog

Employment

Research Partner *Metric Geometry and Gerrymandering Group – Tufts University, MIT, Harvard University* July 2018 – Present

Since the conclusion of the Voting Rights Data Institute, I have continued my involvement with the Metric Geometry and Gerrymandering Group as a research partner. At the University of Iowa, my research group and I have undertaken research on seeding MCMC methods through the application of clustering algorithms to graphs, in parallel to the MGGG's work on MCMC random walk methods. I have also continued software development work on Districtr and Gerrychain, district drawing and MCMC random walk software packages.

Undergraduate Tutor *The University of Iowa Departments of Computer Science, Mathematics* February 2017 – Present

I tutor undergraduate students in mathematics, informatics, and computer science.

Undergraduate Researcher *The University of Iowa Department of Computer Science* January 2017 – Present

I am a member of the Numerical, Parallel, and Optimization Algorithms Group. My research focuses on graph theory, combinatorics, algorithms, and data analysis; our most recent work on is on graph algorithms, cluster analysis, the application of classic cluster analysis methods, and optimal algorithm parallelization.

Data Science and Research Contractor *FairVote* August 2019

In August 2019, the city of Lowell, Massachusetts was set to vote on whether to change their city council's districting system. In light of this possible change, FairVote, alongside the More Equitable Democracy organization, decided to make the case for a ranked-choice voting system. I was contracted by FairVote to create ensembles of maps to demonstrate the demographic effects of a ranked-choice system, as well as complementary data analysis of those ensembles.

Data Science and Research Intern *FairVote* June – August 2019

During summer 2019, I relocated to Washington, D.C. to work at FairVote, an electoral reform non-profit which focuses on promoting ranked-choice voting. One of four research interns, I focused on GIS mapping, data collection and analysis, developing novel mathematical tools to analyze voting data, and writing extensive reports and documentation for the former.

Student Application Developer *The University of Iowa Information Technology Services* September 2015 – May 2019

A full-stack software developer at the University of Iowa ITS. As a member of the C# .NET Development team, I worked on institution-scale web applications and software. My responsibilities included project architecture, programming, documentation, and maintenance for both enterprise and individual software.

Tisch Summer Fellow *Voting Rights Data Institute – Tufts University, MIT, Harvard University* June – July 2018

In the summer of 2018, I completed a six-week computer science- and mathematics-intensive program at Tufts, MIT, and Harvard. I was one of 52 team members working toward the detection and prevention of partisan, racial, and incumbent gerrymandering through statistical analysis, graph theory, MCMC methods, legal review, and mathematical modeling.

Teaching Assistant *The University of Iowa Big Data Summer School*

May – July 2017

As part of my involvement with the University's Large Data Analysis Certificate and Big Data Summer School, I helped prepare lessons, advise participants, co-teach modules, and interact with prospective University students.

Relevant Coursework

CS:2210 Discrete Structures
CS:3330 Algorithms
MATH:1860/2850 Calculus II/III
MATH:3770 Real Analysis
MATH:4050 Combinatorics

CS:2230 Data Structures
CS:4350 Mathematical Logic
MATH:2700 Linear Algebra
MATH:3800 Numerical Analysis
STAT:3200 Linear Regressions

CS:2820 Object Oriented Programming
CS:4720 Optimization Techniques
MATH:3720 Abstract Algebra
MATH:4040 Matrix Theory
MATH:5400 Topology

Major Projects

Redistricting in Houston *Python, R [github.com/apizzimenti/houston]*

July – August 2019

- Demonstrated the effects of a theoretical redistricting of Houston after the 2020 census.
- Collected and prepared geospatial and demographic data.
- Used `GerryChain` to describe the space of possible districting maps.
- Developed a novel method to help guide MCMC walks.
- Wrote an extensive blog post series on the mathematics, intentions, and consequences of redistricting in Houston.

Districtr *Python, JavaScript [mggg.org/Districtr]*

October 2018 – Present

- Currently working on the MGGG's online district-drawing tool.
- Programming responsibilities include building out the back-end API as well as the front-end API interface.

GerryChain *Python, Bash [gerrychain.readthedocs.io]*

June 2018 – Present

- Actively developing and maintaining MGGG's Monte Carlo Markov Chain random walk implementation.
- Consumes a shapefile (.shp), finds a dual graph, and performs a random MCMC walk on the graph.
- Responsibilities include developing fast graph connectivity-checking algorithms, managing memory overflow, discretizing continuous compactness measures (e.g. Polsby-Popper, convex hull), and ensuring adherence to PEP-8 documentation standards.

Bongo *Python, JavaScript, PHP [bongo.org]*

April 2016 – May 2019

- One of three University of Iowa ITS team members managing the Bongo ecosystem.
- Provides real-time GPS data on all buses for the Iowa City, Coralville, and Cambus transit agencies.
- Web and mobile Bongo sessions total more than 24.4 million per year.
- Responsibilities include data management and API development.

AutoGraphs *Python, Make [pypi.org/project/autographs]*

July – October 2018

- Created a software package for specific, high-level graph operations required by the MGGG.
- Currently, the package contains code to find and display the faces of a planar graph using a traversal on the total ordering of each vertex's outgoing edges.

cli-weather *JavaScript*

December 2015 – January 2018

- Wrote software to retrieve and display local weather through the command line interface.
- 30,000+ downloads from NPM.

Mississippi *Python [github.com/apizzimenti/Mississippi]*

July – August 2018

- Designed and programmed a tool to find and custom-color the faces of Mississippi's Congressional districts using the `AutoGraphs` package.
- Part of an informational art project showcasing the MGGG's analysis of Mississippi's electoral results.

Do Your Bidding *TypeScript, Google Firebase*

January – March 2018

- A real-time auction app built with TypeScript and using Google's Firebase Realtime Database technology stack.
- Responsibilities included developing a Realtime Database API, programming user interfaces, and database management.

Blox *JavaScript, C#*

April 2016 – October 2017

- Developed adaptive learning software that provides highly customizable course creation, management, and distribution tools for professors across multiple disciplines at the University of Iowa.
- Responsibilities included database management, API development, and adaptive learning algorithm design.

Professional Organizations

The American Mathematical Society (AMS)

September 2018 – Present

Mathematical Association of America (MAA)

September 2018 – Present

Society for Industrial and Applied Mathematics (SIAM) *The University of Iowa*

August 2018 – Present

ActivitiesWebmaster, SIAM Student Chapter *The University of Iowa [ui-siam.org]*

August 2018 – Present

Member, Undergraduate Mathematics Club *The University of Iowa*

January 2017 – May 2019

Men's Hockey Team *The University of Iowa*

September 2017 – March 2018

AwardsUndergraduate Research Assistantship *The University of Iowa Department of Computer Science*

January 2017 – Present

Dean's List

Spring 2019

Tisch Summer Fellowship *Tufts University Jonathan M. Tisch College of Civic Life*

June – July 2018

Arthur Collins Scholarship *The University of Iowa Department of Computer Science*

2017

AP Scholar with Honor *Iowa City West High School*

2016