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# Qiyuan Cui

## Software Engineer

Willing to Relocate  
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### EDUCATION

**B.S. in Computer Science and B.A. in Mathematics** | University of Michigan, Ann Arbor May 2023 (expected)

Course Highlights: Cryptography, Randomized Algorithms, Information Theory, Conversational Artificial Intelligence, User Interface Development, Algebraic Combinatorics, Abstract Algebra

### TECHNICAL SKILLS

**Programming Languages** C/C++, HTML5, CSS, JavaScript, Node.js, WebAssembly, Lisp, OCaml, Rust, Python, Java

**Natural Languages** Chinese (native), English (fluent), Russian (intermediate)

**Other Skills** Linux, Git, Markdown, LaTeX, Heroku, GIMP, GPG, Figma, Office software

### EXPERIENCE

**Research Lead | Randomness and Statistical Properties of Quadratic Congruential Generators** Jan 2022 — Present

- Led a team of 4 researchers to devise an improved algorithm for congruential random number generators
- Eliminated many weaknesses of the original generator at a relatively low performance cost
- The algorithm showed significant improvement in both Dieharder and TestU01 randomness test suites
- Increased difficulty of reverse engineering the internal state and parameters of the recurrence function

**IT & Translator | Shanghai Liangchen Culture Media Co., Ltd.** May 2019 — Jun 2019

- Developed a multilingual (Chinese, Russian, English) name tag printing program for participants at the China-Russia Expo
- Translated PPT slides from Russian to Chinese
- Translated a WeChat App for attending guests from Chinese to Russian
- Responsible for other critical IT services in preparation of the Expo

### PROJECTS

**Co-developer | TDOM Cryptosystem | C++** Jul 2022 — Present

- An experimental symmetric cipher using multiple passwords
- Implemented algorithms for dynamic generation of substitution and permutation boxes
- Achieves quantum-resistance by merging several well-studied ciphers

**Co-developer | Schematica | HTML5/CSS/JS/Lisp** Dec 2019 — Present

- A WebApp for drawing diagrams using a dialect of Lisp without boilerplate code
- Responsible for the syntax checker, parser, interpreter and optimization of the program overall
- Added functionality of URL-saving and exporting to .png, .svg and LaTeX TikZ formats

**Developer | 3D Projection Library | JS** Mar 2020 — Dec 2020

- An extremely lightweight JavaScript 3D perspective and orthogonal projection library
- Performs fast 3D projection using only linear algebra; no trigonometry required
- Uses mobile-friendly technology as it does not rely on WebGL

**Developer | Substitution Box Analyzer | HTML5/JS** Jul 2020 — Aug 2020

- A graphical statistical analyzer for linear and differential probability biases in substitution boxes of block ciphers
- Analyzes a Nyberg S-Box - affine transforms on a Galois Field inversion
- Useful for quickly generating dynamic, maximal nonlinear S-Boxes

**Developer | Chomp | C/C++/HTML5/JS** Mar 2021 — Present

- An optimal AI for the poset game, Chomp, using memoization
- Provides a new perspective to finding patterns of critical positions in Chomp
- Invented a space-efficient data structure for storing critical positions

**UMich EECS 280: Programming & Intro Data Struct** A Python Web Server and C++ Backend for managing office hour queue.

**UMich EECS 281: Data Struct & Algorithm** A TSP algorithm using heuristic, MST and Branch and Bound written in C++.

**UMich EECS 370: Intro to Comp Org** A compiler/linker/simulator for running a LC2K program

### AWARDS & HONORS

- CEESA High School Math Competition Senior Team First Place | 2019
- CEESA High School Knowledge Bowl Team First Place | 2018