Yitong (Tony) Zhao

tony.zhao@prismsus.org | Personal website | GitHub: @ttzytt | Stack Overflow: @ttzytt

Check the newest version *here*, the top 20 activities and honors *here*.

Education

Princeton International School of Math and Science (PRISMS)

Sept 2021 — current | PRISMS, NJ

- GPA (Freshmen - Junior, unweighted): **3.99/4.00**
- SAT : **1570/800 (Math 800/800, English 770/800)**

CS/CE-related courses:

- **Freshmen:** Precalculus (A); Principles of Computer Science (A); Applied Engineering 1 (A)
- **Sophomore:** AP Calculus BC (A); AP Computer Science Plus (A); Applied Engineering 2 (A)
- **Junior:** Differential Equation (A-); Multivariable Calculus (A); Linear Algebra (A); Artificial intelligence (A); CS/AI Research (A)
- **Senior:** Advanced Robotics; Interactive Media & Game Design; CS/AI Research; AP Statistics

MIT 6.S081

June 2022 — July 2022

- An operating system open course.
- Completed all labs and lectures independently; wrote detailed notes about my approaches in each lab. Examples include *Lab3* and *Lab11*.
- Solutions to the labs are available in this *GitHub repository*.
- listed as *reference material on csdiy.wiki*.

Ray Tracing in One Weekend / The Next Week

Aug 2022 — Oct 2022

- Built a ray tracer that includes functionalities in the first two volumes of the book. Source code available in this *GitHub repository*.
- Implemented additional features like multi-threading not included in the book.

Stanford CS144

Dec 2022 — Jan 2023

- A course on computer networks and TCP protocol.
- Completed the first four labs, finishing an implementation of TCP.
- Posted detailed notes about my approaches on my personal website: *CS144 Notes*.

GAMES101

June 2023 — July 2023

- Course on modern computer graphics; completed all lectures
- Participated in a lab for the more advanced course *GAMES202* on real-time rendering.

Digital Logic Design Summer Course

July 2023 | Cooper Union, NY

- Developed a Flappy Bird game using logic gate chips.
- Used the knowledge to led CS club project on building *full adders with logic gate chips.*

NYT Photojournalism as Art

Jun 2024 | School of New York Times, NY

- Learned history, techniques, and ethics of photojournalism.
- Created a *photo essay* on Life in New York City.
- Created a *zine* with other students.

ICP Analog Photography

Aug 2024 | International Center of Photography, NY

- *Black-and-White Film photography*: learned film development and darkroom printing.
- *Film Scanning*: learned film digitalization with DSLR and film scanner.

CS/CE Projects

Personal website

Aug 2021 — current

- Started the website to share detailed solutions for competitive programming problems.
- Extended to include notes from open courses, articles on topics like the low-level implementation of function calls, and contributions to OI wiki.
- Published articles like one about *treaps* for OI wiki and another about *function calls* accepted by Luogu Daily.
- Multiple articles listed as top search results in Google, such as *implementation of function calls.*

IBCP (Innovative Bot Coding Playground) [*frontend*, *backend*]

Apr 2023 — Aug 2024

- An educational tank game where users write scripts for human/bot-bot matches.
- Modular design for easy customization (gameplay tweaks, control modes like keyboard/controller), adaptable to different skill levels.
- Running bots on difference threads/processes to prevent blocking, ensuring smooth gameplay.
- Debugging tools for beginners, with advanced strategies for experienced users (like async APIs and multithreading).
- Built a collision engine from scratch, supporting boolean operations on shapes through computational geometry.
- Use websocket for real-time communication between frontend/bot and backend, ensuring easy multilanguage support.
- Won *Second Place in CS* and an *Association for Computing Machinery (ACM) Award* at the North Jersey STEM fair.

PyAutoGrade

Sept 2023 — current | PRISMS, NJ

- Python project that evaluate student code submissions.
- Handles memory leaks, infinite loops, security issues including file access, and more.
- Support simulated I/O for testing, students can directly use `input()` and `print()` in their code.

Rust Parser in OCaml

Jul 2024 — Aug 2024 | Stony Brook University, NY

- Partially support parsing Rust source code into an AST using OCaml.

- Use Menhir as the parser generator, and OCamllex for lexical analysis.
- Solved various syntax conflict in LR(1) parsing, including using a Python pre-processor.
- Developed automatic AST visualization tool using *ppxlib* metaprogramming tool and *Mermaid.js*.

Neural networks

Oct 2022

- Built a fully-connected neural network from scratch to recognize hand-written digits in the MNIST dataset.

Chess

Dec 2022 — Jan 2023 PRISMS, NJ

- Developed chess software; In charge of GUI using *swing*.
- Implemented various algorithms for chess bot, including alpha-beta pruning, transposition tables, principle variation search, etc.

Magnetic field in solenoids illustration video using Manim

Aug 2023 PRISMS, NJ

- Created an illustration video using Manim to explain the uniform magnetic field in solenoids.

Experiences and Positions

Computer Science Club

Sept 2021 – current; 4hr/wk; 36wk/yr PRISMS, NJ

- Club leader starting from junior year.
- Established the *club website*.
- Led projects such as house event webstie, building full adders with logic gate chips, and creating math illustration videos with Manim.
- Organized a trip to *PyCon*, including a special session with CMU's admission officers.
- Invited professionals to give talks on topics like open-source software.

Teaching assistant for Principles of Computer Science

Sept 2023 – current; 3hr/wk; 30wk/yr PRISMS, NJ

- Developed PyAutoGrade to automate grading.
- Providing review sessions and office hours for students.
- Provided suggestion on curriculum design.

Student intern at StonySystems

Jul-Aug 2024; 65hr/wk; 7wk/yr Stony Brook University, NY

- Worked in *Prof. Shuai Mu*'s StonySystems lab on improving C++ memory safety and interoperability with Rust.
- Refactored a *codebase* on Rust-like smart pointers in C++.
- Partially implemented a *Rust compiler frontend* using OCaml.
- Presented progress weekly and wrote reports on C++/Rust interop.

Honors and Achievements

USA Computing Olympiad (USACO)

Mar 2023

- Entered the gold division.

High School Mathematical Contest in Modeling (HIMCM)

Nov 2023

- Meritorious, ranked in the top 202 among 967 teams. Best result of my school in past 4 years.

Carnegie Mellon Informatics and Mathematics Competition in Programming (CMIMC Programming)

Apr 2023

- 4th place (Optimization Round, with two problems out of three ranked 1st and 3rd), 6th (New Language Round), and 14th place overall out of 115 teams.

North Jersey STEM fair

Mar 2024 Kean University, NJ

- *Second Place in CS*
- *Association for Computing Machinery (ACM) Award*

Pennsylvania Classic (PClassic)

Apr 2023 University of Pennsylvania, PA

- 5th place in the Advanced Division.

Battlecode

Jan 2023

- Ranked 124th out of 434 participants.

Honors and Achievements (Non-CS/CE)

International Photography Award (IPA)

- 1 *Honorable Mention* in People/Lifestyle
- 10 Official Selections [*1*, *2*, *3*, *4*, *5*, *6*, *7*, *8*, *9*, *10*]

Scholastic Art and Writing Awards

- Photography
  - 1 National Silver Medal
  - 3 Regional Gold Keys
  - 2 Regional Silver Keys
  - 5 Regional Honorable Mentions
- Critical Essay
  - 2 Regional Silver Keys
  - 1 Regional Honorable Mention

Software/Programming Language Skills

- Adobe Lightroom ●●●●○
- C++ ●●●●○
- Python/Kotlin/Java ●●●○○
- OCaml ●●○○○
- Typst/Latex/Hexo ●●○○○
- Linux/Git/AutoCAD/OnShape/Logisim ●●○○○
- Adobe Photoshop/Premiere Pro ●●○○○

Hobby

Outside CS/CE, I'm interested in photography. The following image is one of my favorites. See my *portfolio* for more.