

# Beining Zhou

## Curriculum Vitae

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🌐 <https://kawasemii.github.io/beiningz.github.io/>

### Education

- 2022.09– **Computer Science**, BSE (degree expected), University of Michigan
- 2020.09– **Electrical and Computer Engineering**, BSE (degree expected), UM-SJTU Joint Institute, Shanghai Jiao Tong University

### Skills

- **Programming Languages**  
C, C++, C#, Python, HTML, Javascript, L<sup>A</sup>T<sub>E</sub>X
- **Operating Systems**  
Windows, Linux
- **Tools**  
Unity, MS Visual Studio, MATLAB, SOLIDWORKS, Arduino

### Working Experiences

- 2022.05– Physics laboratory teaching assistant, UM-SJTU Joint Institute
- 2022.08

### Projects

- **The Legend of Zelda (1986) Unity Remake**  
Tools: Unity, C#  
Link to web build: <https://kawasemii.github.io/eecs494-zelda-remaster/>  
Accurately recreate the dungeon part of The Legend of Zelda (1986) with unity. Also, a custom level is designed and added to the game. In the custom level, players can control two characters, where one moves in the opposite direction of the other, to solve various puzzles.
- **Iroha - original 2D platform game**  
Tools: Unity, C#, Blender  
Link to web build: <https://kawasemii.github.io/eecs494-iroha/>  
A novel 2D platform action game where players can change the color of the protagonist. Only game objects with the same color as the protagonist are visible and accessible. Players need to make use of this mechanic to bypass traps in the game.
- **Insta485**  
Tools: Python, React, REST API, Javascript, Jinja2, HTML, CSS  
Create an Instagram clone implemented with both client-side and server-side dynamic pages. Insta485 allows users to create/modify account, log in/out, make posts, like/unlike a post, comment a post, follow/unfollow a user.

- **Among Us**

Tools: C++

Implement Prim's algorithm to calculate a minimum spanning tree for a given weighted graph with certain restrictions. Research and implement several efficient heuristics to approximate a solution to the Travelling Salesperson Problem. Finally, find the optimal solution to the TSP problem using a branch and bound algorithm based on the approximation provided by the heuristics.

- **SillyQL**

Tools: C++

Emulate a basic relational database with an interface based on a subset of a standard query language (SQL). The database supports commands that create and remove tables, and table commands to insert, delete data from tables, as well as to join tables and print selected data.

- **The Walking Deadline**

Tools: C++

Simulate a game of defending the school against invading zombies. Zombies are generated each round, with either user-specified or random name, distance to the player, moving speed, and health. And the player refills their quiver and shoot the zombies according to a certain priority. Print the conditions of zombies and at the end of each round, and print statistics such as median lifetime of zombies, most/least active zombies, first/last shot zombies according to the user's request. In addition, the priority queue data structure used in this program is re-implemented in different ways with arrays, binary heaps and pairing heaps.

- **Cryptographic Attacks**

Tools: Python

Conduct a length extension attack to vulnerable hash function constructions on SHA-256. Generate hash collisions of MD5 to create malicious payload. Perform padding oracle attack to encryption in CBC cipher mode. Use Bleichenbacher's attack to forge RSA signature.

- **Web Attacks**

Tools: Python, Javascript, HTML

Perform SQL injection, cross-site scripting, cross-site request forgery attacks and exploit the weakness of the websites' defenses.

- **Space Parking Lot Simulation**

Tools: C++

Design an interstellar parking lot using C++ classes and inheritance. Draw the vehicles and the parking lot with user-specified number of parking slots using the OpenGL library, and animate cars moving and parking. Vehicles have different shapes and different moving styles such as teleporting, spinning, etc. The program generates vehicles randomly and calculates the price of parking for each vehicle depending on its type and time spent in the parking lot.

- **Rescue the Countess**

Tools: C++

Search a user-specified map containing obstacles and warp pipes traveling to different rooms, and output a path from the starting position to the goal by implementing some basic path finding algorithms. The program accepts two versions of input, either a map with symbols or a list with coordinates and tile information. The output also supports both versions, and includes the direction of each move to the next position.

- **Diplomatic Mars Rover**

Tools: Arduino, SOLIDWORKS

The prototype of the Mars rover is mostly made of A4 printing paper, having a weight of 459g and the ability to move freely while bearing a load of 10 kg so as to save the cost of launching. It integrates line tracking and diplomatic functions such as laser detection, music playing, raising and lowering flags, which are all controlled by Arduino mega 2560. In addition, a space capsule is designed and produced to provide shelter for the rover in case it encounters unexpected attack.

- **Crossroad Simulation**

Tools: MATLAB

Produce an animation of cars passing a crossroad with two lanes in opposite directions. The crossroad and cars are drawn based on the road width provided by user input. The user also sets the total number of cars, the color cycle of the traffic lights, and the probability that a car does not stop at the red light. The program simulates the traffic stream at the crossroad and displays the animation until a car crash happens or all cars have safely passed the crossroad.

- **Simple World**

Tools: C++

The simple world program simulates a number of creatures running around on a two-dimensional grid. Each creature belongs to a particular species. A creature can move forward, turn 90 degrees, infect another creature, and its behavior pattern is controlled by a program associated with the species. The controlling programs are specified by users in pseudocode. The simple world program simulates the behaviors of all creatures for a user-specified number of rounds.

- **Blackjack**

Tools: C++

The program implements a simplified version of the blackjack card game. The game statistics are stored and managed by different ADTs such as card decks, hands, the player and the dealer. A driver program takes in arguments that specify the amount of player's bankroll, the maximum number of hands and the player's gaming strategy.

- **LC2K Assembler and Simulator**

Tools: C

Use a C program to translate LC2K assembly-language program into hexadecimal machine code. Opcodes, register names, offset values and labels are resolved into binary numbers and combined into a 32-bit number. After the machine code is generated, the program simulates the behavior of legal LC2K machine-code programs. Memory states and register contents are displayed before the execution of every instruction and after the LC2K program terminates. The total number of instructions executed is also tracked and printed.

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## Related Courses

- EECS281: Data Structures and Algorithms
- EECS494: Introduction to Game Development
- EECS370: Introduction to Computer Organization
- EECS376: Foundations of Computer Science
- EECS485: Web Systems
- EECS388: Introduction to Computer Security
- VG100, VG101: Introduction to Engineering, Computers and Programming
- VE203: Discrete Mathematics
- VE270: Introduction to Logic Design
- VE280: Programming and Elementary Data Structures
- VE215/216/311: Electronic Circuits and Signals
- VV156/255/256, VV214: Honors Calculus and Linear Algebra
- VP150/250/390, VP141/241: Physics, Modern Physics, and Physics Lab
- VC210, VC211: Chemistry and Chemistry Lab
- VE401: Probabilistic Methods in Engineering

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## Honors & Awards

- Shanghai High School outstanding graduate
- UM-SJTU 2021 Summer Design EXPO Best Presentation Award
- Shanghai Jiao Tong University Undergraduate Scholarship