# David Hua

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## Education

**University of Waterloo** September 2020 – Present
*Bachelor of Software Engineering*
95% GPA (3.98/4.00)
4×Term Dean's Honor List (Top ~10%)

**ETH Zürich** September 2023 – February 2024
*Academic exchange semester*
Courses: Parallel and High-Performance Computing, Advanced Encryption Schemes, Control Systems I

## Research Experience

**Undergraduate Research Assistant** January 2023 – Present
*University of Waterloo* *Waterloo, Canada*

- Improved the object initialization safety checker in the **Dotty Scala compiler** by fixing bugs and implementing optimizations.
- Contributed to a research paper and prepared a code artifact for the initialization checker which was published in OOPSLA 2023 and won a **distinguished paper award**.
- Supervised by Professor Ondřej Lhoták.

**Research Intern** May 2024 – August 2024
*EPFL* *Lausanne, Switzerland*

- Researched use cases and programmed proof of concepts for a symbolic execution based approach for determining the memory usage of **C** programs, with work presented as a poster at OSDI 2024.
- Implemented a unit testing and mocking framework into the **KLEE** dynamic symbolic execution engine to easily mock out portions of code for faster execution and verification.
- Supervised by Professor George Candea.

**Undergraduate Research Fellow** May 2023 – August 2023
*University of Waterloo* *Waterloo, Canada*

- Wrote proposals to amend the WebAssembly specification to support two new extensions for algebraic effects: lexical scoping and bidirectionality.
- Implemented the proposals into the WebAssembly **OCaml** reference interpreter and created test cases, providing a proof of concept for the two extensions.
- Supervised by Professor Yizhou Zhang.

## Publications

2023 Fengyun Liu, Ondřej Lhoták, **David Hua**, and Enze Xing. 2023. Initializing Global Objects: Time and Order. Proc. ACM Program. Lang. 7, OOPSLA2, Article 268 (October 2023), 28 pages. https://doi.org/10.1145/3622844

## Posters

2024 Yonghao Zou, **David Hua**, and George Candea. 2024. Memory Usage Interfaces for Serverless Functions. Poster presented at OSDI '24. https://davidhua.ca/files/osdi24.pdf

## Work Experience

**Software Engineer Intern** January 2024 – April 2024
*Jane Street Capital* *New York, United States*

- Used **OCaml** and various internal tooling.

**Computer Graphics Developer Intern** September 2022 – December 2022
*SideFX Software* *Toronto, Canada*

- Optimized the Houdini plugin for Unreal Engine 5 using **C++** by serializing and compressing data, improving transfer rate across pipelines.
- Designed performance improvements in the plugin's model renderer, increasing the number of polygons it can render for a single mesh by **over 100%**.
- Expanded the functionality of an **automation server** built into the Houdini software using **C++** interfacing with **Python** via **PyBind11**, adding features to streamline creation of dependency graphs.

**Full Stack Developer Intern** January 2022 – April 2022
*Immigrate.ai* *Toronto, Canada*

- Engineered and tested a wide variety of full stack applications using **React** and **Node.js** for various clients seeking external aid on their startups.

**Big Data Engineer Intern** May 2021 – August 2021
*Huawei Technologies* *Toronto, Canada*

- Created optimizations for a distributed SQL query engine based on **PrestoSQL** in **Java** and **C++**, reducing query execution time by **over 30%** through **LLVM** code generation.
- Developed a comprehensive **C++** and **Java** test suite using **Google Test** with **100%** function coverage.

**Backend Software Developer (Freelance)** June 2018 – March 2019
*Podcrash Ltd.* *Toronto, Canada*

- Produced tools using the **LWJGL Java** library to enhance the performance of video games on lower end hardware, resulting in frame rate improvements of up to **100%**.
- Developed a support ticketing backend with **Java** and **MySQL**, streamlining communication between customers and developers, resolving technical problems for **hundreds of users**.

## Projects

**VeggieTales 2 (First Person Shooter Game)** | *Java, OpenGL (LWJGL Library)*

- Built a 3D first person video game using **Java** and **OpenGL** API.
- Created a physics engine for handling 3D movement and collision detection.

**Alpha Beaver** | *React, MongoDB, Express.js*

- Led team of 4 to create a **MERN** stack web app facilitating interactions between educators and students.
- Implemented sessionless user authentication and access control using **JSON Web Tokens**.

**Daily Journey** | *Python (Django), JavaScript (React), HTML/CSS, PostgreSQL*

- Managed a team of 4 to build a single page web app that uses the Overpass API to generate nearby jogging paths, complete with **Django** session authentication and stored usage history for users.
- Utilized **Google Maps API** to graphically plot paths on an interactive map embed.

**More projects can be viewed on my website.**

## Skills

**Programming Languages**: C, C++, Java, Python, TypeScript/JavaScript, OCaml, Scala, Kotlin
**Web**: HTML/CSS, Node.js, React, Django, Express.js, AWS
**Databases**: MySQL, PostgreSQL, SQLite, MongoDB
**Other**: LLVM, JavaFX, Latex, Git