# Alden Wu

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## Education

**University of California, San Diego** — San Diego, CA
*Computer Science B.S. & Pure Mathematics B.S., GPA 3.96* — *September 2022 – June 2026*

## Experience

**Software Engnieer (Intern) – Marvell** | *PHP, HTML/CSS, JavaScript, Subversion (SVN)* — June 2024 – September 2024

- Refactored and simplified large portions of code to improve maintainability, reducing bloat and repetition
- Implemented a new style/structure for web pages, while keeping compatibility with old browsers/tools (e.g. PDF generation)
- Collaborated with other team members to make transition to new style/structure seamless and painless
- Used MySQL to display more detailed and useful information to end users

## Coursework

**CSE** Data Structures, Algorithms Analysis, Object-Oriented Design, Software Tools, Software Engineering, Systems and Architecture, Theory of Computation, Optimization and Machine Learning, Computer Vision, Computer Graphics, 3D User Interaction (VR/AR HCI), Discrete Differential Geometry, Physics Simulation

**Math** Linear Algebra, Vector Calculus, Differential Equations, Probability and Statistics, Abstract Algebra, Graph Theory, Combinatorics, Elementary Logic, Real Analysis, Fourier Analysis, Numerical Analysis, Differential Geometry

## Technical Skills

**Languages** C#, Java, C++, C, Python, Haskell, JavaScript/TypeScript, HTML/CSS, PHP, SQL (PostgreSQL), NoSQL (MongoDB), MATLAB, ARM Assembly, Powershell/Bash, CMake

**Frameworks** Unreal Engine, Unity, React.js, Express.js, Win32 API, WinForms, JUnit, GoogleTest, doctest, NUnit

**Developer Tools** git, ssh, gdb, Amazon Web Services, Oracle Cloud, NVIDIA Nsight, RenderDoc, vcpkg, NuGet, Apache Maven, UNIX/POSIX, Ubuntu Linux, Blender, Houdini, Apache HTTP Server, XAMPP

**Libraries/etc.** .NET, OpenGL, CUDA, NVIDIA OptiX, HIP, Node.js, Passport.js, PyTorch, OpenCV, NumPy, SciPy

## Projects

**Path tracer – "Moth"** | *C++, NVIDIA OptiX, CUDA, CMake* — March 2024 – June 2024

- Programmed a physically based Monte-Carlo ray tracer, GPU accelerated with NVIDIA OptiX
- Implemented the GGX microfacet model for specular reflection and transmission, based on [Walter et al. 2007]
- Improved performance with BSDF importance sampling and next event estimation
- Rendered sharper caustics with photon mapping, based on [Jensen 2001]

**Study website – "rote"** | *TypeScript, HTML/CSS, PostgreSQL, Node.js, React, Oracle Cloud* — August 2023 – September 2023

- Built a full-stack web application for creating, studying, and sharing flashcards
- Implemented a React front-end communicating with a Node.js/Express.js back-end via REST API
- Strengthened authentication security using password hashing, HTTPS (SSL/TLS) encrypted cookies, and CORS
- Designed a scalable database schema in PostgreSQL

**Audio capture tool – "obs-app-audio"** | *C++, Win32 API, CMake/Make, gdb, Audacity* — December 2020 – October 2021

- Wrote a tool for capturing audio from selected processes
- Facilitated low latency (~50µs) IPC by coding a lightweight library for Win32 pipes
- Performed real-time audio processing from concurrent sources using relevant data structures (e.g. ring buffer)
- Created a DLL module injector to hook application APIs and intercept audio data

## Open-Source Contributions

**Rhythm game – "osu!"** | *C#, OpenGL, SDL, NUnit, RenderDoc, .NET* — July 2022 – February 2023
*github.com/ppy/osu, github.com/ppy/osu-framework* — *13 PRs merged, 74 commits*

- Contributed to a large open-source project
- Implemented various real-time graphical effects, e.g. interactive "smoke trails" and more accurate animations
- Collaborated on fixing bugs, e.g. pixel gaps; optimized performance by reducing polygon counts by ~15% for certain objects
- Improved test coverage in several areas, including GUI and gameplay logic