Zoe Carver
(206) 859-1242 / zoec@zoecarver.com / GitHub: @zoecarver

Experience

Apple - Current
I am currently working on Apple's core complier team where I was directly responsible for C++ interoperability with Swift which was highlighted as the second headlining feature during WWDC's State of the Union presentation. I have designed and implemented several language features for C++ interoperability and coordinated both internal and open source development and adoption. Beyond my development work, I help plan work, assign tasks, and communicate progress by showing demos and answering questions at the Director, VP, and Senior VP levels.

Apple - Intern - Summer 2021
As an intern at Apple, and a code owner for libc++ I worked on maintaining and improving libc++ (Apple's C++ Standard Library). I was the primary implementor of C++20 Ranges, which is the headlining C++20 library feature.

Pro.com - Intern - Summer 2019, Summer 2020
As an intern at Pro.com, I worked as a full-stack engineer across several projects. I was one of the primary developers of their homepage website. I applied modern edge technology and web development techniques to create an exceptionally fast, dynamic, and reactive webpage. I helped build internal iOS and Mac apps, which reactively connected clients in real time. Finally, I helped develop and implement machine learning solutions to real world problems by creating, optimizing, and deploying machine learning models on custom hardware.

Healthy School Buildings - iOS & Full Stack Developer - Summer 2018
I was an engineer on a team of three that built iOS and React Native apps for school district clients. I learned how to program collaboratively and leverage native APIs to implement a clean and responsive design.

Foundry 10 - Intern - Summer 2017
As an intern at Foundry10, I helped build a multiplayer game where players interacted with each other in real time. I was responsible for architecting and implementing the connection between the server and clients, which required extremely low latency, high performance synchronization.

Robotics - Programming Lead - 2017, 2018
I was the programming lead on Seattle Academy's varsity robotics team for two years, competing in the FIRST Tech Challenge for one year and the FIRST Robotics Competition for the other. I built a custom neural network to quickly detect position and size of game objects on low power hardware. We qualified and competed at the World Championship in Houston, where we won the "Think" award for process and documentation.

Open Source Contributions

Swift (2019 - Current)
I spearheaded Swift's open-source implementation of C++ and Swift interoperability, organized working groups to collaborate across Adobe, Meta, Google, and Apple, implemented some of Swift's memory ownership features, helped design and implement a new parser, and improved and implemented various optimizations. I have landed 368 changes to Swift's codebase which accounted for 23,000 lines of code.

libc++ (2019 - Current)
I am one of the four code-owners for libc++, Apple's Standard Library. As a code owner I am responsible for reviewing other contributors code. I have implemented dozens of C++ library features and bug fixes. I have landed 114 changes to libc++'s codebase which accounted for 35,186 lines of code.

Clang (2019 - Current)
I have also contributed features and fixes to Apple's C++ compiler, clang, where I have improved various LLVM optimizations and implemented built-in functions.

JavaScript Compilers and Runtimes (2017 - 2018)
I have contributed to Fly.io and Babel, where I helped build an edge application runtime for JavaScript. The runtime I worked on used a JIT compiler built on v8 to dynamically serialize JavaScript objects extremely efficiently.

Talks

WWDC: Mix Swift and C++

At WWDC last year I presented our team's work on C++ and Swift interoperability. Preparing this talk taught me how to communicate technical details in a succinct and understandable way as well as Apple's high standard for quality and attention to detail.

Swift Performance

At Apple I presented on writing high performance Swift code and how to optimize Swift at every level: structural optimizations, macro optimizations, and micro optimizations. I discussed various patterns that I've seen while adopting Swift across dozens of teams and their impact on performance.

C++ and Swift Interoperability

At Apple I presented my work on C++ and Swift interoperability and communicated technical details to our organization, discussing the feature, why it is important, how it is implemented, and a path for adoption.

C++20 Ranges

At Apple I gave my final intern presentation on the C++20 Ranges library to our organization and Senior Director. I discussed how the ranges library can help improve security and provide a better user interface.

Bridging Generic APIs

At Apple I presented my designs for bridging generic APIs between Swift and C++ to our organization. During the talk, I discussed generic APIs in various programming languages, their pros and cons, and how we can make various models work together seamlessly.

CppCon 2019

I received a student scholarship to the 2019 CppCon where I introduced the keynote speaker and gave a lightning talk about compile time evaluation of programs.

Technical Writing

Vision Document

I wrote Swift's third vision document, a 27 page technical document outlining in detail the goals and design approaches that Swift and C++ interoperability will take. This document was reviewed by the Swift community for almost a year before being accepted by the language steering group. The document can be found here.

C++ ISO Standards Committee

I participated in the C++ Standards Committee and have attended various work group meetings for the past two years. I have reviewed documents and discussed features of the language which were eventually compiled into an 1800 page technical document.

Swift Forums and Clang Mailing List

On these forums I have posted technical documents describing the design of several language features including foreign reference types, class hierarchy bridging, bridging generic APIs, and comprehensive smart pointer lifetime optimizations.

Education

Seattle Academy, Graduated 2021, GPA: 3.9

Machine Learning

In high school I completed a couple of independent studies. One of these independent studies was centered around machine learning. During this independent study I learned about a novel machine learning object detection network: YOLO. I then built the model from scratch using python, applying tweaks an optimizations.

Climate Model

In another independent study, I worked with two other students to develop a climate model that simulated our atmosphere. It was able to accurately predict the planet's temperature based on the amount of CO2 in the atmosphere.

Genetic Modification of Plants

In my final independent study in high school, I used a bacteria called Agrobacterium to infect Tobacco plant cells with Jellyfish DNA. The Jellyfish DNA made the plant cells glow under LED light.