# Max **Slater**

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## Education

### Carnegie Mellon University — *Pittsburgh, PA*

B.S. in Computer Science, Concentration in Computer Graphics, Concentration in Computer Systems, 3.96/4.0 — *Aug. 2018 - Dec. 2021*

- Computer Graphics (TA), Discrete Differential Geometry, Technical Animation, Physics-Based Rendering, Intro to 3D Animation
- OS Design & Implementation, Compiler Design, Parallel Computer Architecture & Programming, Visual Computing Systems

### University of Nevada, Reno — *Reno, NV*

Dual Enrollment, 4.0/4.0 — *Jun. 2015 - May 2018*

### Davidson Academy — *Reno, NV*

High School Diploma, emphasis in Computer Science and Mathematics, 4.0/4.0 — *Aug. 2013 - May 2018*

## Experience

### Jane Street — *New York City, NY*

SWE Intern — *May 2021 - Aug. 2021*

- Incoming SWE intern for summer 2021.

### Carnegie Mellon University — *Pittsburgh, PA*

Undergraduate Researcher — *Jan. 2021 - PRESENT*

- Investigating high performance closest point query algorithms on modern GPU hardware.
- Working with Rohan Sawhney and Keenan Crane of the Geometry Collective.

### Apple — *Reno, NV*

GPU Software Intern — *May 2020 - Aug. 2020*

- Developed a novel automated tool for comparing frame traces across platforms, increasing velocity of competitive performance analysis work.
- Selected to present project to SVP of software Craig Federighi and his team.

### NVIDIA — *Santa Clara, CA*

3D Graphics Software Intern — *May 2019 - Aug. 2019*

- Constructed automated regression testing service measuring OpenGL/Vulkan graphics performance on embedded Linux devices.
- Profiled and diagnosed OpenGL benchmark performance bugs.

### University of Nevada, Reno — *Reno, NV*

High School Researcher — *May 2015 - May 2016*

- Assisted in wireless networking research under Shamik Sengupta supported by NSF Grant #IIA-1301726.
- Authored and published a white paper on the subject.

## Teaching

### Carnegie Mellon University — *Pittsburgh, PA*

Computer Graphics Teaching Assistant (S20,F20,S21) — *Jan. 2020 - May 2021*

- Re-wrote the course codebase, improving structure, performance, interface, and student directions/documentation. Deployed fall 2020.
- Held solo office hours, answered online questions, and assisted with project/exam grading. Designed short assignments and notes.
- Course received 4.7/5.0 student rating (highest since 2015) during the fall 2020 virtual semester.

### Davidson Academy — *Reno, NV*

Instructor — *Aug. 2015 - May 2017*

- Taught 3 years of high school computer science electives.
- Created curriculum on C++, data structures, and 2D graphics/games. Published website that maintains ∼2k monthly views.

## Skills

**Programming** C++20, C, Rust, OCaml, SML, Python, x86

**Tools** OpenGL, Vulkan, Win32, Linux, Git, Debuggers/Profilers

## Projects

### Scotty3D

*GitHub*

Primary Author and Maintainer — *Jan. 2020 - PRESENT*

- Scotty3D is an educational graphics software package including interactive 3D mesh editing, realistic path tracing, dynamic animation, and physically based simulation. It includes code structure and guidelines for student projects used by CMU 15-462/662, CMU 15-464/664, and Stanford CS248.
- Implemented all subsystems, a modern OpenGL renderer, graphical user interface, C++17 abstractions, and many fixes/optimizations.
- Designed new simulation tasks: particle systems, mass-spring cloth, and position based fluids. Designed new rendering tasks: more camera models, reasoning about continuous probability, and multiple-importance sampling.
- Oversaw additional development work from student contributors.

### FCPW

*GitHub*

Contributor — *Jan. 2021 - May 2021*

- FCPW is a C++ library for fast closest point and ray intersection queries. It is about 3x faster than Embree for closest point queries and only slightly slower for ray intersection queries.
- Wrote new bench-marking and visualization system for testing performance gains and analyzing thread + SIMD-width scaling.
- Designed and implemented GPU accelerated closest point queries using Vulkan and hardware RT.

### Exile Game Engine

*GitHub*

Author — *Jul. 2017 - PRESENT*

- *Handmade* from-scratch voxel game engine including a modern OpenGL deferred renderer, parallel voxel world generation, multiple OS layers, a custom C++ standard library with automatic type introspection, debugging/profiling features, and more.
- Currently working on a re-write with a new C++20 standard library and real-time ray tracing in Vulkan. Coming soon!

### Pebbles Kernel

Co-Author — *Mar. 2020 - May 2020*

- x86 Kernel supporting device drivers, preemptive multitasking, virtual memory protection, threading, and virtual consoles.
- Worked with partner to design & implement all features from scratch in C and x86 assembly.

### Navi Compiler

Co-Author — *Aug. 2020 - Dec. 2020*

- Compiler for a safe variant of C targeting x86 assembly and supporting SSA conversion with SCCP, graph coloring register allocation, various assembly optimizations, and language-level async primitives.
- Worked with partner to design & implement all features from scratch in Rust.

## Writing

### Blog

*https://thenumbat.github.io/*

Author — *Jul. 2018 - PRESENT*

- Various technical write-ups and thoughts on education.

### Lists

*GitHub*

Author — *Aug. 2017 - PRESENT*

- Curated list of articles focusing on many areas of computer science and technology.

## Activities

### CMU Esports

*Pittsburgh, PA*

Overwatch Manager and Player — *2018 - 2020*

- Managed and competed with the CMU Overwatch team in the Tespa collegiate league.

## Honors & Awards

2018-2021 **Dean's List, High Honors,** Carnegie Mellon University — *Pittsburgh, PA*

2018 **National Merit Scholarship,** NMSC — *Reno, NV*