

Emma Liu

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Education

Carnegie Mellon University

M.S. in Computer Science May 2022

B.S. in Computer Science May 2021

QPA: 3.3, Minor in Computer Graphics

Coursework

* Fall 2021, ** Spring 2022

Graphics

15-462 Computer Graphics

15-869 Visual Computing Systems*

15-668 Physics-Based Rendering**

15-464 Technical Animation

15-463 Computational Photography*

15-466 Computer Game Programming*

15-458 Discrete Differential Geometry

Architecture, Algorithms, & Software

15-418 Parallel Computer Architecture

15-740 Grad Computer Architecture

15-410 Operating Systems

15-451 Algorithm Design and Analysis

10-315: Machine Learning

17-637: Web Application Development*

Skills

Languages: C/C++, Python, JavaScript, Objective-C, HTML/CSS

Tools & Libraries: three.js, CUDA, Git, LaTeX

Developing Skills: OpenGL, Metal, Blender

Interest Areas: Graphics Architecture, Rendering, 3D Animation & Simulations

Projects

JelloSim April – May 2021

- Designed a physically accurate simulation of Jell-O with a mass-spring model using three.js, handling collisions with scene primitives/more Jell-O

Scotty3D & DrawSVG (15-462) Sept – Dec 2020

- Implemented a 3D graphics software package supporting mesh editing on half-edge meshes, path tracing with global illumination, and animation
- Extended a software rasterizer supporting point, line, and triangle primitives, as well as texture mapping

Industry Experience

NVIDIA, Software Engineering Intern May – Aug 2021

Graphics Application Performance Team (Software Tools Infra)

- Created tools to validate and flag hardware performance metric invariants in graphics application performance reports
- Investigated reducing frame-by-frame variation in metric invariants by optimizing the scheduling configuration of perf counter collection
- Contributed to an internal OpenGL API capture tool supporting a temporal performance profiler used in chip development

Apple, Software Engineering Intern

GPU Pre-Silicon User-mode Driver Team June – Aug 2020

- Provided runtime support to a low-level GPU trace explorer tool used on pre-silicon GPU models
- Prototyped features to support functional debugging (kernel dispatch display, GPU register reads/writes tracing, runtime shader instruction tracing, and register accumulation display)

GPU Pre-Silicon User-mode Driver Team May – Aug 2019

- Key contributor of tooling infrastructure for architectural performance studies on next-generation GPU models
- Created automation to classify and simplify GPU workloads based on performance attributes of interest

Academic Experience

CMU Graphics Lab, Research Assistant Jan 2021 – ongoing

- Investigating cache-friendly reordering of mesh data structures to optimize geometry processing
- Working under Keenan Crane in the Geometry Collective

CMU School of Computer Science, Teaching Assistant

15-462: Computer Graphics Jan – May 2021

- Facilitated instruction and student completion of assignments on graphics concepts (vector rasterization, geometry processing and mesh editing, raytracing, and kinematics-based animation)

15-418: Parallel Computer Architecture Jan – May 2020

- Maintained and held office hours to support course assignments (in CUDA, OpenMP, OpenMPI) on concepts including message passing, synchronization and locking

15-213 Introduction to Computer Systems Jan – Dec 2019

- Held recitations and office hours on systems concepts and labs (building memory allocator, shell, cache, proxy server)
- Led exam question development

OSnap (15-410) Feb – May 2020

- Wrote a kernel in a mixture of C and x86-IA32 assembly supporting virtual paging, multiprocessing, high frequency preemption, and shell console, as well as implementing and integrating a thread library

Accelerating WebP Encoding Oct – Dec 2019

- Transformed stages of the WebP image encoding pipeline into CUDA to optimize for parallelism

Lunar Gala 2019 ANOMIE Website Jan – Mar 2018

- Wireframed and styled show website with show theme