

Matthias Broske

[Portfolio](#) | [GitHub](#) | tias@broske.com

EDUCATION

College of Science and Engineering, University of Minnesota-Twin Cities | Minneapolis, MN

Degree: Bachelor of Science in Computer Science, 2023 | GPA 3.9

Minors: Mathematics, Astrophysics, and Asian and Middle Eastern Studies (Chinese)

Honors: University of Minnesota Honors Program, Dean's List, Chinese Flagship Certification with Distinction

Coursework: Computer Graphics, Graphics and Games, Animation and Planning, Applied Linear Algebra, Computational Methods, Parallel Programming, Machine Learning, Advanced Programming Principles, Algorithms and Data Structures, Internet Programming, Program Design & Development, Machine Architecture, Operating Systems

Study Abroad: CET Beijing: Language Immersion in China

Chinese Flagship Capstone Year in Taipei

Summer 2019

Sept 2022 - Jun 2023

SKILLS

Programming Languages: C#, HLSL, C++, C, Java, Python

Tools and Software: Unity (5+ years), Git, Blender, RenderDoc, FMOD, Audacity, Android Studio

Specialties: Games programming, XR/VR/AR, visualization, graphics, shaders, linear algebra, OOP

Foreign Languages: Fluent in Mandarin Chinese (ACTFL/ILR 3+ in Oral, Listening and Reading)

WORK EXPERIENCE

Computer Graphics & Virtual Reality Researcher

Mar 2021 - Present

University of Minnesota Interactive Visualization Lab (IV/Lab) | Minneapolis, MN

- Develop a novel networked VR application (Mayo Proton App) using Unity under the guidance of radiation oncologists at Mayo Clinic to greatly improve their ability to analyze and select ideal Proton Beam Therapy plans for the treatment of cancer patients
- Built a Unity package from scratch that provides brushing, linking, and filtering functionality between 2D plots and 3D visualizations to enable the exploration of high dimensional datasets
- Contributed to the development of the Artifact Based Rendering engine, implementing a rendering solution for volumetric datasets
- Collaborated on multi-disciplinary teams involving artists, engineers, and physicians, giving regular demos and incorporating feedback into project development

Game Development Intern

Sept 2022 - Dec 2022

Gamania | Taipei, Taiwan

- Programmed a mobile game from scratch inspired by Vampire Survivors using Unity
- Communicated exclusively in Mandarin Chinese with supervisors to discuss gameplay requirements and development progress, as well as receive and incorporate feedback

Global Leaders Intern

Sept 2019 - Dec 2019

University of Minnesota Learning Abroad Center | Minneapolis, MN

- Synthesized and articulated individual experience abroad to better connect with both those who have, and haven't, studied abroad
- Communicated with students through public speeches to promote studying abroad
- Further developed cross-cultural skills acquired while abroad

PROJECTS

Mayo Proton App

Mar 2021 - Present

University of Minnesota Interactive Visualization Lab (IV/Lab) | Minneapolis, MN

- Develop and combine a custom 2D plotting package with a custom “structure-aware” signed distance field (SDF)-based volume rendering solution in the Unity game engine to create a networked VR environment in which Proton Beam Therapy plans can be collaboratively analyzed and compared in order to select the ideal treatment plan for a cancer patient
- Extract principal curvature information from SDFs to procedurally generate geometry which conveys the shape of surfaces in a perceptually intuitive way using HLSL and compute shaders
- Utilize iterative design to implement a robust, widget-based VR interaction model with a “go-go gadget” style extendable cursor that intelligently snaps to interactable objects
- Create a specialized data-processing pipeline to convert DVH plots, proton radiation doses, structure contours, and CT scans in the DICOM standard file format to a custom JSON + binary data format suitable for a networked VR application