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 **Summer 2019**
Chinese Flagship Capstone Year in Taipei **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 rendering solution in the Unity game engine to create a networked VR visualization system for radiation treatment planning that supports the rendering of multiple proton radiation volumes side-by-side
- Extract principal curvature information from SDFs to procedurally generate geometry which conveys the shape of surfaces in a perceptually optimal 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 dose, structure contours, and CT scans in the DICOM standard file format to a custom JSON + binary data format suitable for a networked VR application