Riccardo Bonfanti

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Summary

Master's student in Computer Science focused on **Computer Graphics** and GPU programming. Research Assistant at UIC's Electronic Visualization Laboratory, building a real-time **3D Gaussian Splatting** renderer for **tiled stereoscopic displays**.

Education

University of Illinois at Chicago, Master of Science in Computer Science. Jan 2025 – Dec 2026 (Expected)
- Current GPA: 3.86/4.0
- **Coursework:** Advanced Topics in Software Engineering, Secure Web Application Development, Computer Security, Computer Graphics, User Interface Design, High Performance Processors and Systems, Artificial Intelligence.

Politecnico di Milano, Master of Science in Engineering of Computing Systems. Sept 2024 – Apr 2027 (Expected)
- Current GPA: 3.9/4.0
- **Coursework:** Software Engineering II, Computer Graphics, Distributed Systems, GPUs & Heterogeneous Systems, Advanced Algorithms and Parallel Programming.

Politecnico di Milano, Bachelor in Engineering of Computing Systems. Sept 2021 – Sept 2024
- Final GPA: 3.68/4.0 (Degree final mark: 108/110)

Experience

Research Assistant | Master's Thesis, University of Illinois – Chicago, IL Jan 2026 – Dec 2026
- At the **Electronic Visualization Laboratory**, I built a real-time **3D Gaussian Splatting renderer for head-tracked, tiled stereoscopic displays** in Unity 6, with one rendering process per display on a GPU cluster.
- Designed a **head-centered pipeline**: sort order and spherical-harmonic color are computed once per display from the tracked head and shared by both eyes, and a **radial sort key** keeps displays consistent without synchronization.
- Benchmarked the pipeline on a **22-display CAVE** with scenes containing up to **106M Gaussians**, achieving speeds **1.3–2.8× faster** than the reference 3DGS Unity plugin.
- Tools Used: Unity 6 (URP, Render Graph), C#, HLSL compute shaders, UniCAVE.

Projects

Monte Carlo Path Tracer – CPU (C++) and GPU (Vulkan)
- Developed a **physically based path tracer** expanding on the *Ray Tracing in One Weekend* series with BVH, mixture-PDF importance sampling, volumes, and textured OBJ/glTF meshes. Implemented **multithreading** to drop render times from 24 hours to 1 hour.
- Built a headless **Vulkan compute** port (GLSL to SPIR-V) featuring progressive, multi-dispatch sample accumulation.
- Tools Used: C++, Vulkan, GLSL, CMake.

Embarrassingly Sequential, Finite State Automata Computations on RISC-V SoftGPU
- Designed a lightweight custom OpenCL kernel for automata processing on the **Vortex soft-GPU**, reaching up to **1.7 IPC**.
- Tools Used: C++, OpenCL, Vivado.

Campus ARt – Interactive Augmented Reality Web Experience
- Built an **AR web application** for collaborative virtual art hotspots found via real-time geolocation, with a **secure backend**.
- Tools Used: Next.js, TypeScript, MindAR, Drizzle ORM, Geolocation API.

Codex Naturalis - Software Engineering project
- Engineered a **real-time, multiplayer** board game with a client-server architecture, synchronizing up to **100 sessions**.
- Tools Used: Java, JavaFX.

Technologies

Graphics & GPU: Unity (URP, Render Graph), 3D Gaussian Splatting, GLSL, HLSL, OpenCL, WebGL, Path tracing, Vulkan.
Languages: C, C#, Java, C++, JavaScript / TypeScript, SQL, Python.
Tools: Git, CMake, VS Code, IntelliJ, PyCharm, Docker, Vivado.

Volunteering & Awards

Associazione Amici di Lollo - amicidilollo.it Sept 2016 – present
- Contributing as a **member & associate** of a nonprofit supporting pediatric oncology research and awareness.

Best Freshmen Award, Politecnico di Milano 2021–2022
- Recognized among top-performing first-year students for academic excellence.