Gabriel Isaac Alonso Serrato

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Education

Bachelor of Science in Computer Science, Concentration in Data Analytics — August 2021 - December 2025
The University of Texas at El Paso (UTEP) — GPA: 3.93 / 4.00

Experience

Undergraduate Research Assistant — October 2024 – December 2025
NSF Funded CIELO-G Lab at The University of Texas at El Paso (UTEP)

- Initiated and led the development of the CIELO-G Learning Framework under mentorship of Dr. Aaron Velasco, Dr. Katalina Salas, and PhD candidate Marc Garcia, a novel modular gamification platform addressing critical gaps in domain-specific educational technology for Earth-science pedagogy.
- Architected modular educational game framework with 1,500+ lines of GDScript across 40+ scripts, scenes, and shaders, implementing state machine architecture and singleton patterns for centralized game flow orchestration and reusable component design
- Developed 3 extensible game systems (Clickable, Drag-and-Drop, Mix-and-Match) with 14+ prefab components and scene inheritance patterns, enabling rapid prototyping of educational minigames with configurable validation logic and visual feedback
- Applied software engineering best practices including comprehensive documentation (README, API guides), version control (Git), and MIT open-source licensing to facilitate worldwide educational adoption and collaborative development
- Published framework to Github with 151 tracked files and 300+ active user sessions, demonstrating real-world educational impact and community engagement with open-source contributions

Summer Geometry Initiative Research Fellow — August 2 - 15, 2025
Massachusetts Institute of Technology (MIT) and University of Nevada, Reno

- Performed research under Dr.Ankita Shukla (University of Nevada, Reno) on the topological and geometric structures of AI-generated images, applying algebraic topology (persistent homology) and differential geometry to study latent-space organization in generative models (GANs, diffusion models).
- Analyzed 100,000 CIFAR-10 images using LID (Local Intrinsic Dimensionality) with ResNet-18 feature embeddings to distinguish AI-generated from real samples, producing per-class distributions and significance tests.
- Applied PCA to estimate the minimal discriminative subspace and developed an LID-based threshold classifier, jointly tuning neighbor count k and cutoff Threshold.
- Achieved up to 0.65 accuracy and F1 $\approx$ 0.60 with baseline ML classifiers (SVM, Logistic Regression).
- Built a visualization toolkit displaying real vs fake LID histograms, threshold-vs-accuracy curves, per-class LID bar plots with standard deviations and p-values, and confusion matrices for analysis and reproducibility.

Summer Geometry Initiative Research Fellow — July 19 - August 1, 2025
Massachusetts Institute of Technology (MIT) and Adobe Research

- Researched with Dr.Yi Zhou (Adobe Research) on Differentiable Mesh Reconstruction with DMesh++, exploring continuous probabilistic mesh representations for high-resolution reconstruction.
- Replaced slow virtual machine workflows with an optimized Windows Subsystem for Linux (WSL) setup, configuring CUDA and PyTorch for direct GPU access and achieving x2 faster DMesh++ training and visualization performance.
- Implemented a silhouette-aware tessellation function that improved mesh connectivity and continuity through multi-angle silhouette consistency, reducing reconstruction speed by an estimated 30% under identical 15-minute training budgets and settings.
- Proposed a 1:1 pixel-to-voxel optimization strategy, reformulating the mesh optimization process into voxel-position refinement for pixel-level reconstruction fidelity and gradient stability.

- Developed advanced visualization and comparative analysis tools integrating the Minimum-Ball and Weighted Delaunay Triangulation (WDT) algorithms, incorporating sigmoid-based probability modulation to dynamically assess connectivity accuracy, tessellation continuity, and optimization stability as outlined in Section 3.1 -3.2 of the *DMesh++: An Efficient Differentiable Mesh for Complex Shapes* paper.

Summer Geometry Initiative Research Fellow July 12 - 18, 2025

Massachusetts Institute of Technology (MIT) and University of Toronto

- Conducted research on Adaptive Fluid–Particle Splitting with Dr. Eitan Grinspun and Ph.D. Jonathan Panuelo (University of Toronto), focusing on resolving under-sampled regions in Voronoi-based compressible fluid simulations at hypersonic speeds.
- Investigated Lagrangian Voronoi discretizations for compressible Euler flow, adapting the leak proof topology-preserving coupling framework to mitigate wake under-resolution and boundary separation.
- Implemented 4 Python prototypes using Taichi (GPU-accelerated kernels) and Houdini VEX scripts for particle-based Voronoi refinement, validating mass, momentum, and energy conservation across 2000+ frame sequences.
- Evaluated adaptive refinement methods to maintain sufficient and necessary leakproofness of the fluid domain, referencing Algorithm 1 and Section 4.2 (Clipped Voronoi Stitching) of the paper *Topology-Preserving Coupling of Compressible Fluids and Thin Deformables.*

Undergraduate Research Assistant June 2023 - August 2023

Center of Nanoscience and Nanotechnology (CNyN) at the National Autonomous University of Mexico (UNAM)

- Conducted research under the supervision of Dr. Jonathan Guerrero on the molecular geometry of molybdenum disulfide (MoS_2), exploring over 2,000 candidate atomic configurations through computational modeling and polygon-based lattice generation, with the top three models submitted for supercomputer analysis.
- Implemented Python algorithms to dynamically generate triangular and hexagonal atomic lattices, computing centroids, interatomic distances, and nearest-neighbor alignments between molybdenum (Mo) and sulfur (S) atoms.
- Utilized Matplotlib and NumPy to visualize spatial distributions across thousands of simulated lattices, identifying patterns in symmetry, defect alignment, and molecular layer formation representative of MoS_2 structures.
- Developed a pipeline for analyzing, storing and exporting polygon-based molecular datasets for extended study of bonding geometry, stability, and material properties.

Google Tech Exchange Fellowship January 2023 – May 2023

Google and The University of Texas at El Paso (UTEP)

- Selected as one of 150 students nationwide for the Google Tech Exchange Program, a semester-long academic initiative between Google and Hispanic Serving Institutes, focused on advancing representation in computer science and software engineering.
- Completed 7 credit hours of advanced coursework in Software Engineering and Applied Data Structures, designing scalable distributed systems using industry standards and best practices.
- Engineered a full-stack web application with Flask, hosted on Google Cloud Run and Cloud Storage Buckets. Designed and tested 600+ lines of code through unit tests and CI/CD pipelines, leveraging GitLab for version control and deployments.

Publications - Conference Abstracts

- Alonso Serrato, G., Salas, K., Garcia, M., & Velasco, A. A. (2025, December 16). *Gaming to Better the Earth: A Community-Centered Framework for Earth Science Education Through Game Design.* Poster presented at the AGU Fall Meeting 2025, Session ED23B – *Advances and Progress in Fostering a Supportive Scientific Community for All II*, New Orleans, LA, USA. American Geophysical Union.

Conference Presentations

American Geophysical Union (AGU) Conference – New Orleans, LA December 2025

Research Poster Presentation — *"Gaming to Better the Earth: A Community-Centered Framework for Earth Science Education"*

High Impact and Innovative Teaching (HIIT) Conference – El Paso, TX November 2025

Talk Presentation — *"A Gamification Framework for Democratizing Earth Science Education"*

SACNAS National Diversity in STEM Conference – Columbus, OH October 2025
Research Poster Presentation — *"Gaming to Better the Earth: A Community-Centered Framework for Earth Science Education"*

Projects & Deliverables

CIELO-G Learning App [App Link] October 2025
Developed and launched the official NSF-funded CIELO-G Web-app, which hosts and showcases playable, classroom-ready Earth-science courses built with my CIELO-G Learning Framework, a modular gamification platform.

From Triangles to Gradients: Exploring DMesh++ [Article Link] September 2025
Authored a research article during the MIT Summer Geometry Initiative (SGI) on the DMesh++ differentiable meshing framework, under the mentorship of Dr. Yi Zhou.

CIELO-G Learning Framework [Source Code Link] August 2025
Created an open-source educational game framework in Godot 4 with three modular game systems, automatic progress tracking, and certificate generation. Designed for rapid deployment by educators worldwide with plug-and-play architecture and comprehensive documentation.

Behavioral Deplasticization Animation [Video Link] July 2025
Produced a 3D animation illustrating behavioral deplasticization concepts using Spline 3D and Adobe Premiere. Focused on clear visual storytelling to promote environmental awareness and behavior change.

LEGO UTEP Animation [Video Link] March 2025
Created a LEGO-style animation in Blender for the UTEP Geology Department's TCM Day, featuring a playful dinosaur theme.

3D Educational Game Concept for Kids [Demo Link] November 2024
Developed a 3D educational game with modular mini-games to enhance interactive learning, featuring Firebase for authentication, tracking, and analytics.

Spaceship Navigation Controller [Demo Link] October 2024
Built a 3D spaceship controller in Godot 4 with physics-based motion, thrust, and camera control. Optimized for gamepad gameplay.

Infinite Runner (GMTK Game Jam) [Demo Link] August 2024
Made an infinite runner for the 2024 GMTK Game Jam, with a character that changes size with speed and procedural obstacles.

3D Voxel Character Demo [Demo Link] April 2024
Developed a voxel character in Unreal Engine 5, with third-person movement, animations, and physics-based puzzles.

Hackathons & Competitions

Rube Goldberg Unreal Engine Challenge May 2025
3rd Place (Senior Division) — *Built a physics-driven 3D Rube Goldberg Machine*

STTE Foundation AI Hackathon April 2025
1st Place — *Developed an AI-driven health platform with a trained LLM for accurate personalized guidance*

Google DevFest Hackathon September 2024
1st Place — *Developed a 3D Interactive Education Platform with Learning Performance Tracking*

ACM-W AI Hackathon March 2024
2nd Place — *Applied Reinforcement Learning for Optimizing Walkable Urban Map Navigation*

Google Student Developer Club Hackathon April 2023
1st Place — *Built a full-stack collaborative wiki for sharing green and sustainable solutions*

Awards & Honors

"What a Researcher Looks Like!" Feature Series 2025
The University of Texas at El Paso — *Recognized for contributions to creative and computational research initiatives*

Houston Endowment Scholarship 2023 - 2025
The University of Texas at El Paso — *Merit-Based Award ($2,000 USD per year up to 4 years)*

College of Engineering Honors Program 2022 – 2025
The University of Texas at El Paso — *Recognized for Academic Excellence, Research Engagement, and Leadership Development*

College of Engineering Dean's List 2021 - 2025
The University of Texas at El Paso — *Academic Excellence Recognition*

ORISE Scholarship 2022
Oak Ridge Institute for Science and Education — *"Communicating Quantum" for Science Education ($1,000 USD)*

AI4ALL Apply AI 2022
The University of Texas at El Paso — *Certificate of Completion – 6 Months Applied AI Projects Program*

AI4ALL Discover AI 2022
The University of Texas at El Paso — *Certificate of Completion – 6 Months Introductory AI Program*

Leadership & Affiliations

Society for Advancement of Chicanos and Native Americans in Science (SACNAS) 2025
The University of Texas at El Paso — *Active Member*
Promoting diversity and inclusion in STEM through research and community engagement

Art & Computer Science (@artecs.utep) Student Org. 2024 – 2025
The University of Texas at El Paso — *President*
Lead a 15-member organization hosting weekly workshops on game development, geometry processing, computer graphics, and creative coding, bridging art and technology disciplines.

Apple Pathways Alliance 2023 – 2025
Apple Inc. — *Selected Member*
Participating in mentorship, technical training, and professional development focused on inclusion in technology.

Association for Computing Machinery (ACM) 2022 – 2023
The University of Texas at El Paso — *Member*
Engaged in computing projects, software development, and academic networking events.

Society of Hispanic Professional Engineers (SHPE) 2021 – 2022
The University of Texas at El Paso — *Outreach Chair*
Supported outreach initiatives for the local SHPE chapter, organizing STEM engagement and professional development programs.

Relevant Coursework

SGI Introduction to Geometry Processing | Parallel Computing | Machine Learning | Data Mining | Computer Vision | Applied Data Structures | Advanced Object-Oriented Programming | Software Engineering I & II | Operating Systems | Database Systems | Computer Architecture

Skills

Programming Languages

– Python, Java (Proficient); C++, C, C#, JavaScript, Bash (Intermediate)

Scientific Computing & Simulation

– Numerical Methods, Finite-volume and Finite-difference Solvers, Geometry Processing, Differentiable Rendering, Parallel Computing, High-performance Computing

Machine Learning & Data Analysis

– PyTorch, Scikit-learn, NumPy, Pandas, SciPy; Data Preprocessing, Model Training, Regression/Classification, Feature Extraction, Visualization, and Evaluation Metrics

Visualization & Rendering

– OpenGL, Polyscope, Matplotlib, Blender; Scientific and Physically-based Visualization, Shader Programming, and 3D Data Rendering

Tools & Environments

– Linux/WSL, Anaconda, Git, LaTeX, Google Cloud Run / Buckets, CI/CD Workflows

Speaking Languages

– English (C2 - Professional Proficiency), Spanish — (Native)