

SUJAL BISTA, PH.D.

[240-505-8552](tel:240-505-8552) | sujal@umd.edu | www.umiacs.umd.edu/~sujal | [LinkedIn Profile](#)

PROFESSIONAL SUMMARY

Visionary software engineer and graphics researcher with 12+ years of hands-on experience building advanced systems in 3D graphics, AR/VR, and AI-powered visualization. Architected real-time rendering platforms used in national security and healthcare, led multimillion-dollar research initiatives, and delivered award-winning innovations at the cutting edge of computation and design. Equally fluent in code and strategy, combining deep technical expertise with executive-level leadership to turn complex ideas into functional, scalable solutions.

CORE QUALIFICATIONS

- **3D Graphics & Visualization:** Real-time rendering | CPU-GPU based optimization | Saliency & perception | Distributed ray tracing | Scientific & medical visualization | Physics based renderings | Spatial datasets
- **Immersive Technologies:** XR medical training modules | Cybersickness research | Depth Perception | Volumetric capture system
- **Machine Learning:** Medical segmentation & classification | Application of Generative AI | Dimension Reduction
- **Project & Team Leadership:** Cross-functional research management | Grant development | Hiring & mentoring | Executive-level coordination
- **Languages:** C/C++ | DirectX | OpenGL | WebGL | HLSL | GLSL | CUDA | CG | Python | C# | Java | Python | Assembly
- **Tools & Platforms:** 3D Studio Max | Motion Builder | Mudbox | MATLAB | Unity | Unreal
- **Other:** Game development | Physics engine programming | Spatial audio development | Socket programming

EDUCATION

Ph.D. in Computer Science

University of Maryland, College Park, MD | GPA: 3.90

May 2014

M.S. in Computer Science

University of Maryland, College Park, MD | GPA: 3.90

May 2010

B.S. in Computer Science

University of Maryland, College Park, MD

May 2005

EXPERIENCE

Director of Immersive Visualization Research Center

August 2024 – Present

Institute for Health Computing, University of Maryland, College Park, MD

- Conducted research on various topics related to graphics and immersive visualization, including cybersickness and scientific visualization.
- Developed a rendering framework for XR that is compatible with the latest devices, such as head-mounted displays and glasses-free TVs, that is aimed at medical and scientific applications.
- Led a team to create scalable XR training modules utilizing advanced techniques, including NeRF and Gaussian Splatting, to develop and deploy training scenarios for medical professionals efficiently.

Interim Co-Executive Director (Founding)

January 2023 – August 2024

Institute for Health Computing, University of Maryland, College Park, MD

- Co-led the founding of a new computational health institute, managing site selection, grant development, and academic/industry partnerships across multiple locations and disciplines.
- Recruited researchers and engineers across XR, AI, and bioinformatics domains; established three core research programs and directed team operations.
- Oversaw development of visualization tools and GenAI-based interfaces to support data analysis, 3D exploration, and medical training scenarios tailored for healthcare professionals and industry partners.
- Secured early-stage funding and coordinated with federal and state agencies to establish research infrastructure prioritizing science and economic development.

Independent Game Developer (Solo)

January 2016 – Present

Extra Fluffy Studios, Rockville, MD

- Designed and developed a fully playable stylized 3D platformer using C++, DirectX 12, HLSL, and custom-built physics, AI, sound, and rendering systems.
- Created original 3D models, character animations, and audio assets using 3D Studio Max, Mudbox, MotionBuilder, and Audacity, building unique assets and a complete soundscape.

Research Associate

May 2014 – January 2016

UM Institute for Advanced Computer Studies, University of Maryland, College Park, MD

- Developed a modular testbed for virtual and augmented reality applications, compatible with multiple devices, including curved hemispherical displays and modern head-mounted displays, to support visualization and cybersickness research.
- Created tools for visualizing and classifying EEG datasets to analyze the impact of nicotine and e-cigarettes.
- Implemented volume rendering and machine learning techniques to visualize and segment MRI data, advancing the study of traumatic brain injury.

Graduate Research Assistant

September 2008 – May 2014

Graphics and Visual Informatics Lab, University of Maryland, College Park, MD

- Built multi-view rendering systems and applied GPU-based optimizations using OpenGL, CG, and CUDA to support distributed immersive visualization, simulation, and real-time rendering of complex medical and scientific datasets.
- Developed and evaluated machine learning-based tools used for segmentation and classification leveraging diverse techniques such as Laplacian eigenmaps and contributed to six publications and award-winning research recognized by IEEE SciVis and ASME CIE.

Lead Graphics Programmer

July 2004 – July 2008

Center for Advanced Transportation Technology Laboratory, University of Maryland, College Park, MD

- Built real-time transportation visualization and simulation system used by **FEMA** during the **2008 Presidential Inauguration**, optimized rendering of massive satellite data, and implemented dynamic visual effects using C++, OpenGL, and GLSL.

Software Developer

June 2002 – September 2004

Atomic Engineering Corporation, Gaithersburg, MD

- Developed spectral analysis tools using C++ to identify molecular compositions, analyzed raw lab data, and converted them into structured formats, improving analysis speed and usability.

Computer Lab Assistant

September 2000 – June 2002

Montgomery College, Rockville, MD

- Provided programming support for students, maintained hardware/software in academic labs, and performed OS/network troubleshooting for over 200 systems.

AWARDS & HONORS

- **Larry S. Davis Doctoral Dissertation Award**, Best Dissertation in Computer Science 2014
- **IEEE SciVis Best Paper Award** 2014
- **ASME CIE Best Paper Award** 2012
- **Charley V. Wootan Award**, Best Paper in Transportation Policy 2007
- **NSF Computer Science, Engineering, and Mathematics Scholarship** 2001 – 2002, 2003 – 2004

PUBLICATIONS

- **HoloCamera: Advanced Volumetric Capture for Cinematic-Quality VR Applications**
Jonathan Heagerty, Sida Li, Eric Lee, Shuvra Bhattacharyya, Sujal Bista, Barbara Brawn, Brandon Y Feng, Susmija Jabbireddy, Joseph Jaja, Hernisa Kacorri, David Li, Derek Yarnell, Matthias Zwicker, Amitabh Varshney
IEEE Transactions on Visualization and Computer Graphics, 30(5), pp. 2767–2775 (Paper) 2024
- **Kinetic Depth Images: Flexible Generation of Depth Perception**
Sujal Bista, Ícaro Lins Leitão da Cunha, Amitabh Varshney
The Visual Computer, 33(10), pp. 1357–1369 (Paper)(Video) 2017
- **Tracking Fluctuation Hotspots on the Yeast Ribosome Through the Elongation Cycle**
Sujal Bista, Amitabh Varshney, Serdal Kirmizialtin, Karissa Y. Sanbonmatsu, and Jonathan D. Dinman.
Nucleic Acids Research, 45(8), pp. 4958–4971 (Paper) 2017
- **Video Fields: Fusing Multiple Surveillance Videos into a Dynamic Virtual Environment**
Ruofei Du, Sujal Bista, Amitabh Varshney
Proc. 21st Int'l Conference on Web3D Technology (Paper)(Video) 2016
- **Visual Knowledge Discovery for Diffusion Kurtosis Datasets of the Human Brain**
Sujal Bista, Jiachen Zhuo, Rao P. Gullapalli, Amitabh Varshney
In *Visualization and Processing of Higher Order Descriptors for Multi-Valued Data*, Springer, pp. 213–234 (Paper) 2015

- **Visualization of Brain Microstructure Through Spherical Harmonics Illumination of Spatio-Angular Fields**
Sujal Bista, Jiachen Zhuo, Rao P. Gullapalli, Amitabh Varshney
IEEE Transactions on Visualization and Computer Graphics, 20(12), pp. 2516–2525 [Best Paper Award] (Paper) (Video). 2014
- **Using GPUs for Realtime Prediction of Optical Forces on Microsphere Ensembles**
Sujal Bista, Sagar Chowdhury, Satyandra K. Gupta, Amitabh Varshney
ASME Journal of Computing and Information Science in Engineering, 13(3), pp. 031002. (Paper) (Video) 2013
- **Using GPUs for Realtime Prediction of Optical Forces on Microsphere Ensembles**
Sujal Bista, Sagar Chowdhury, Satyandra K. Gupta, Amitabh Varshney
Proc. ASME IDETC/CIE [Best Paper Award] (Paper) (Video) 2012
- **Speeding Up Particle Trajectory Simulations Under Moving Force Fields Using GPUs**
Rob Patro, John P. Dickerson, Sujal Bista, Satyandra K. Gupta, Amitabh Varshney
ASME Journal of Computing and Information Science in Engineering (Paper) 2012
- **MDMap: A System for Data-Driven Layout and Exploration of Molecular Dynamics Simulations**
Robert Patro, Cheuk Yiu Ip, Sujal Bista, Samuel Cho, Dave Thirumalai, Amitabh Varshney
IEEE Symposium on Biological Data Visualization (Paper) (Video) 2011
- **Social Snapshot: A System for Temporally Coupled Social Photograph**
Robert Patro, Cheuk Yiu Ip, Sujal Bista, Amitabh Varshney
IEEE Computer Graphics and Applications, 31(1), pp. 74–84 (Paper) (Video) 2011
- **Global Contours**
Sujal Bista, Amitabh Varshney
UMLACS Technical Report, CS-TR-4957 (Paper) 2010
- **Wide-Area, Four-Dimensional, Real-Time, Interactive Transportation System Visualization**
Michael L. Pack, Phillip Weisberg, Sujal Bista
Transportation Research Record, pp. 97–108 [Best Paper Award] (Paper) (Video) 2007
- **Four-Dimensional Interactive Visualization System for Transportation Management and Traveler Information**
Michael L. Pack, Phillip Weisberg, Sujal Bista
Human Performance, Simulation and Visualization: Journal of the Transportation Research Board, pp. 152–158 (Paper) 2005

PRESENTATIONS

- **Visualization of Brain Microstructure through Spherical Harmonics Illumination of Spatio-Angular Fields**
Sujal Bista, Jiachen Zhuo, Rao P. Gullapalli, Amitabh Varshney
Presented at *IEEE TVCG Special Session on Visualization, ACM SIGGRAPH*, Los Angeles, CA August 2015
- **Visualization of Brain Microstructure through Spherical Harmonics Illumination of Spatio-Angular Fields**
Sujal Bista, Jiachen Zhuo, Rao P. Gullapalli, Amitabh Varshney
Presented at *IEEE Scientific Visualization (SciVis) Conference*, Paris, France November 2014
- **Using GPUs for Realtime Prediction of Optical Forces on Microsphere Ensembles**
Sujal Bista, Sagar Chowdhury, Satyandra K. Gupta, Amitabh Varshney
Presented at *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (IDETC/CIE)*, Chicago, IL August 2012

ACTIVITIES

Weightlifting

- Volunteer Coach, Mach 10 Weightlifting 2015 – Present
- 5th Place, 56kg Men, US National Weightlifting Championships 2012
- 1st Place, 56kg Men, Maryland State Championships 2011

Wushu Martial Arts

- 2nd in Intermediate Changquan and Staff in USA Wushu Kungfu Federation National Championships 2005
- 2nd in Intermediate Changquan, Mantis, and Staff in 8th International Wushu-Kungfu Festival & Championships 2004
- 3rd in Intermediate Changquan in 8th Annual Collegiate Wushu Championship 2004
- President, Terp Wushu Club, University of Maryland 2004
- Vice-President, Terp Wushu Club, University of Maryland Fall 2003
- Developer & Manager, Wushu Judging Software for collegiates and national team trials 2005 – 2016