SUJAL BISTA, PH.D.

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PROFESSIONAL SUMMARY

Visionary software engineer and graphics researcher with 15+ 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.

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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

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- **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
  UMIACS 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

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