Nicholas F. Polys, Ph.D.

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Executive Summary

A visionary technology leader and researcher with 19+ years directing high-impact programs in visual computing, AI, and high-performance computing (HPC). Proven success leading cross-disciplinary teams, securing $17M+ in funded projects, and building partnerships across academia, government, and global standards organizations. Passionate about applying emerging technologies—immersive analytics, digital twins, and Web3D—to advance public good, education, and scientific discovery. Expert in human factor studies, spatial perception, and reasoning: assessing sensor and world models across biological, cultural, and digital minds.

Strategic Technology Leadership (AI, HPC, XR, Web3D)

- Program & Lab Development (Visionarium, Immersive Systems)
- Cross-Sector Partnerships (Federal Agencies, Academia, NGOs)
- Grant Strategy & Fundraising ($17M+ secured as PI/Co-PI)
- Team Leadership & Mentorship (52+ graduate mentees,14 staff)
- Nonprofit & Consortium Governance (Web3D Consortium, Metaverse Standards Forum)
- Open Standards & Digital Equity Advocacy

Selected Achievements

- **135+ peer-reviewed publications |** **h-index = 26 | i10-index = 53 |** 2,675+ citations
- **Invited** Keynotes: Web3D 2022, AMIA 2021; 1st White House Maker Faire
- **Best Paper Awards (ACM Web3D, IEEE VR);** ACM SIGGRAPH Featured Member
- Exhibits at **SIGGRAPH, Torpedo Factory, Moss** and the **Venice Architecture Biennale**
- Led international conferences (ACM Web3D multiple years, IEEE VR, SuperComputing)

Professional Experience

Director of Visual Computing Advanced Research Computing

Affiliate Professor, Computer Science **Virginia Tech** | Blacksburg, VA | 2007 – Present

- Lead vision, strategy, partnerships, and operations for advanced visualization and immersive analytics programs supporting research, education, and outreach; grew ARC staff from 3- to 19 staff and an annual HPC hardware budget of $3.5-4M
- Built and direct the **Visionarium Lab**, a flagship immersive analytics facility supporting interdisciplinary work in health, environment, design, and engineering with HPC, Vis, and VR
- Managed multimillion-dollar research project portfolios, staff, and partnerships across campus and external agencies (eg NSF, NIH, DoD, NASA, DOE, USDA)
- Developed technology platforms (digital twins, Web3D environments) used in **public health, environmental sustainability, and STEM education**
- Advised national initiatives including **NIH 3D Print Exchange, NIH Zebrafish Brain Browser, DoD Climate Resilience,** and **AI-driven nuclear safety** projects
- Fostered collaborations across academia, government labs, and industry to amplify societal impact and land-grant university mission: innovator, organizer, educator
- 56 graduate committees, Chairing 3 PhDs and 6 Masters degrees in CS; scores of undergraduates in wage and research credits; instructor of record for 12 semesters of 8 different CS classes (graduate and undergraduate)

Impact Highlights

- Designed the 2026 **Immersa Deck**, a world-class immersive visualization system
- Delivered Visual Computing solutions across health, civil engineering, geosciences, wireless communications, fluid dynamics, molecular dynamics, particle physics, reality capture, and environmental modeling, immersive education, and community engagement
- Enabler of open, scalable tools for education and public access to complex data

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Web3D Consortium (Nonprofit Standards Organization)

President & Board Director | 2000 – present

- Led international nonprofit advancing open 3D web standards for accessibility, interoperability, and innovation through several generations of technology
- Chaired global working groups and aligned stakeholders across academia, industry, and government
- Represent the community in **ISO, W3C, OGC, DICOM, INCIITS, and the Metaverse Standards Forum**
- Oversaw governance, strategic direction, technological innovation, and community growth

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Earlier Experience

Founder & CTO – VirtuWorlds LLC

- Cutting-edge Web3D platforms for 3D content management and spatial planning: adopted by organizations like Merck, Pfizer, and US Navy

Research & Technical Roles – Virginia Bioinformatics Institute

- Developed visualization systems for genetic analyses and biomedical simulation applications such as PathSim, 3D agent-based immune system simulation, Web services

Technical & Domain Expertise

- AI, HPC, Data Visualization, Immersive Analytics (XR/VR/AR)
- Digital Twins, Scientific Visualization, Web3D
- Fluent with Claude, ChatGPT, CoPilot, Gemini, Kimi, DeepSeek, Sam2, Trellis, …
- Programming: Python, JavaScript, C++, OpenGL/WebGL
- Systems: Linux/UNIX, Cloud & Distributed Computing
- Standards: X3D, Medical Imaging (DICOM), Web Technologies (W3C), Geospatial, BIM

Service & Community Impact

- Advisor, Reviewer, Editor for **NSF, NIH, DOE, DoD, and numerous research publications**
- Contributor to **open standards for digital interoperability and accessibility**
- Mentor to **dozens of students** advancing into academia, industry, and public sector roles
- Organizer of global workshops advancing **ethical AI and open 3D ecosystems**

Education

Ph.D., Computer Science
Virginia Tech 2006

B.A., Cognitive Science
Vassar College 1996

Dissertation: "Display Techniques in Information-Rich Virtual Environments" began my research journey into graphics, perception, spatial reasoning, and bias. Each project and prototype has taught us something new about how we can evaluate a user's attenuation, apprehension, inference, and understanding in a noisy, 4D world. ***Selected publications:***

- Nicholas **Polys**, Ayat Mohammed, and Ben Sandbrook. 2024. "Prompt Engineering for X3D Object Creation with LLMs". In Proceedings of the 29th International ACM Conference on 3D Web Technology (Web3D '24). Association for Computing Machinery, New York, NY, USA, Article 18, 1–7. https://doi.org/10.1145/3665318.3677159
- Nicholas F. **Polys**, Ayat Mohammed, Ben Sandbrook; Scaling to Perception: Challenges and Opportunities for Large-Scale Immersive Visualization Facilities. PRESENCE: Virtual and Augmented Reality 2025; 34 97–117. doi: https://doi.org/10.1162/pres_a_00442
- Dahshan M, **Polys** N, House L, North C, Pollyea RM, Turton TL, Rogers DH. Human–machine partnerships at the exascale: exploring simulation ensembles through image databases. Journal of Visualization. 2024 May 17:1-9. https://doi.org/10.1007/s12650-024-00999-7

Current and Pending

Available upon request ***(full CV includes all publications and professional activities)***