

Kenny Gruchalla, Ph.D.

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in kennygruchalla

I am an accomplished scientist and software engineer with over 20 years of experience in data visualization, human-computer interaction, energy systems, and scientific computing, across renowned scientific institutions such as NREL, NCAR, and NASA. I have led large-scale research projects, managed technical teams, and provided graduate student mentorship. I am primarily interested in developing interactive visualization and analysis techniques that provide tools for finding meaning in increasingly large and complex data.

EXPERIENCE

National Renewable Energy Laboratory (NREL)

Principal Scientist July 2024 – present

✳ Distinguished Member of Research Staff

Senior Scientist June 2009 – July 2024

I lead the design, development, and strategic direction of a high-visibility, state-of-the-art visualization and human-computer interaction (HCI) laboratory. This facility supports the analysis and communication of large, complex, multivariate data and functions as a prototyping environment for developing, evaluating, and transitioning emerging computing, visualization, and HCI technologies across the institution. I manage a multi-million-dollar annual budget and oversee multidisciplinary teams of scientists, engineers, and creative technologists. I regularly collaborate with C-level executives and senior stakeholders to ensure that laboratory capabilities align with institutional priorities, emerging research opportunities, and industrial partnerships. As Principal Investigator, I have successfully led a portfolio exceeding \$7 million in competitively funded research projects, managing diverse technical teams. I serve as both a technical manager and a hands-on contributor, remaining actively involved in visualization and HCI design and development, high-performance computing (HPC) simulation code, and the design and integration of advanced visualization hardware systems, including immersive environments and custom interaction devices.

University of Colorado at Boulder

Assistant Professor Adjoint March 2025 – Present

Assistant Professor Adjunct May 2011 – March 2025

Professional Research Assistant April 2001 – March 2006

I provide mentorship to doctoral-level students in the field of scientific data visualization, supporting the development of graduate students' research skills, including project design, data analysis, software development and effective visualization techniques. In my role as a professional research assistant, I contributed to the design and development of a decision support system, *RiverWare*, for the complex interplay of watershed physical processes, water ownership, and policy.

Colorado State University

Affiliate Faculty October 2021 – Present

I advise the development and execution of the Richardson Design Center (RDC) graduate certificate program in human-centered design thinking. I bring industry experience and technical expertise to my advising role, providing a valuable resource for faculty and students as they navigate the rapidly evolving field of VR.

National Center for Atmospheric Research (NCAR)

Visitor Appointment May 2006 - October 2008

I collaborated on design and development of VAPOR, a volume visualization suite for interactive exploration of large-scale time-varying multivariate CFD data.

Red Canyon Engineering

Principal Software Engineer June 2003 - June 2009

Software Engineering Consultant June 2000 - June 2003

I directed two NASA-funded projects, the Mars Flight Simulator and Lunar Base Simulator. Additionally, I performed software architecture and algorithm reviews for the Mars Odyssey and Genesis spacecraft programs, ensuring their technical validity and success.

Raytheon

Senior Analyst / Medical Officer July 2000 - February 2001

Technical Software Lead October 1997 - June 2000

Software Developer July 1995 - October 1997

I oversaw the data acquisition and visualization laboratory on the NSF's Antarctic research vessel, the Nathaniel B. Palmer. I also designed and developed advanced meteorological visualization tools for Cape Canaveral and Vandenberg space lift ranges, incorporating real-time and analysis algorithms, as well as image processing software for radar and satellite instrumentation. Additionally, I created a distributed satellite mission planning and scheduling software system, which featured interactive 2D computer graphic models for satellite and ground station resource allocation and 3D modeling tools for satellite payload constraint analysis.

EDUCATION

Ph.D. in Computer Science *Thesis: Progressive Visualization-Driven Multivariate Feature Definition and Analysis*
University of Colorado 2004-2009 (3.9/4.0)

M.S. in Computer Science *Thesis: Immersive Well-Path Planning: Investigating the added value of immersive visualization*
University of Colorado 1999-2003 (3.9/4.0)

B.S. in Computer Science
New Mexico Tech 1990-1995 (3.5/4.0)

AWARDS (SELECTED)

- 🏆 Distinguished Visitor, IEEE Computer Society, 2025 Class
- 🏆 ACM/Eurographics High Performance Graphics (HPG) 2024 Chair's Award
- 🏆 NREL Distinguished Member of Research Staff (2021-present)
- 🏆 American Physical Society DFD 2020 Gallery of Fluid Motion Award
- 🏆 NREL 2018 Innovation & Technology Transfer Outstanding New Partnership Award
- 🏆 NREL 2017 Innovation & Technology Transfer Outstanding Public Information Award
- 🏆 NREL 2014 Staff Award for Outstanding Achievement
- 🏆 NREL 2013 President's Award
- 🏆 DOE ACSR SciDAC 2011 People's Choice Award in Scientific Visualization
- 🏆 DOE ACSR SciDAC 2010 Outstanding Achievement in Scientific Visualization
- 🏆 Advanced Imaging Magazine 2005 Imaging Solutions of the Year

RESEARCH FUNDING (SELECTED)

>\$7M total competitive awards as PI

- EVision 2040: Visualizing a Path Toward Sustainable Mobility, **PI**, JOET, August 2024
- Immersive Visualization Architecture for the NYS Power Grid Digital Twin, **PI**, New York Power Authority, July 2024
- DEWA Energy Visualization Analysis, **co-PI**, Dubai Water and Energy Authority, December 2023
- Immersive Digital Twin Laboratory for Engineering Education, **PI**, Fort Lewis College, August 2023
- Collaborative Visualization and Analysis for the Control Room of the Future, **PI**, LDRD, October 2020

PUBLICATIONS (5 SELECTED)

60+ publications – 1000+ citations (g-index:31, h-index:16, i10-index:26, i1-index:56)

- K. Gruchalla, S. Molnar, and G. Johnson. Reevaluating Contour Visualizations for Power Systems Data. *IEEE Transactions on Smart Grid*, March 2023.
- S. Molnar, E. Bradley, K. Gruchalla. Oscillatory Spreading and Inertia in Power Grids. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, December 2021.
- B. Bugbee, B.W. Bush, K. Gruchalla, K. Potter, N. Brunhart-Lupo, V. Krishnan. Enabling Immersive Engagement in Energy System Models with Deep Learning. *Statistical Analysis and Data Mining: The ASA Data Science Journal*, June 2019.
- K. Gruchalla and N. Brunhart-Lupo. The Utility of Virtual Reality for Science and Engineering In W.R. Sherman (Ed.), *VR Developer Gems*, CRC Press, May 2019.
- B. Bush, N. Brunhart-Lupo, B. Bugbee, V. Krishnan, K. Potter, and K. Gruchalla. Coupling Visualization, Simulation, and Deep Learning for Ensemble Steering of Complex Energy Models. In proceedings of *Data Systems for Interactive Analysis DSIA'17*, October 2017.

EXPERTISE

Languages, Libraries, and Frameworks

- C++, JavaScript, R, Python, Lisp, Fortran, OpenGL Shading Language, CUDA
- Qt/QML, D3.js, React, WebGL, deck.gl, OpenGL, VTK, ITK, OpenInventor, NetCDF, MPI
- VAPOR, ParaView, Avizo, JMP, \LaTeX , Unity, Godot

Hardware Design and Integration

- Immersive projection environments, high-resolution display walls, projection mapping, HPC, HMD (Vision Pro, MagicLeap), 3D tracking systems, bespoke interaction devices

Research

- Scientific visualization, immersive visualization, human-computer interaction, high-performance scientific computing, energy systems modeling, data analysis, cognitive science

Skills

- Technical management, software engineering, visualization design, research, technical writing, public speaking, proposal development