Brian W Bush

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Mission

To research and develop high-quality, integrated analyses and analysis techniques for problems important to society through scientific computing, computational physics, data analysis/mining, and the modeling & simulation of complex systems.

Skills

Project Leadership

Successfully led complex software- and data-intensive research & development teams of a dozen people.

Experience writing proposals for the NSF, DOE, DOD, and DHS.

Research

Broad and innovative research, analysis, modeling, and simulation experience with complex systems and in disciplines ranging from transportation research to graph theory.

Data mining, statistical learning, approximate reasoning, and visualization expertise with massive data.

Strong theoretical physics basic research background, involving both analytic and numerical work.

Computing

Extensive scientific computing abilities (particularly simulation architecture, design, and implementation) and numerical methods/algorithms knowledge.

Comprehensive experience with object-oriented software engineering: analysis, architecture, design, coding, testing; Booch methodology and UML.

Design and development expertise with system architectures, frameworks/patterns/libraries/wrappers, data structures, and algorithms.

Languages: active use of C++ (1991–present), Haskell (2002–present), Java (1996–present), SQL (1992–present), XML/XSL (1998–present); familiarity with Prolog (1993–present); past use of Eiffel (1994–1997), FORTRAN (1979–1991), Pascal (1980–1985), PL/I (1982), POSTSCRIPT (1990–1992), SGML/DSSSL (1996–2001), Smalltalk (1993–1996), VRML (1996–2001).

Operating Systems: UNIX (1990–present), Linux clusters (1998–present), Windows (1992–present).

Software: databases—MySQL, Oracle, PostgreSQL, Derby; services—Globus, WSDL, WS-*, SOAP; geographic information systems—ArcGIS, GeoTools, WFS/WMS/GML; class libraries—STL, MPI, OpenMap, Boost, Eclipse RCP/EMF/Ecore; mathematics/statistics/visualization—Mathematica, R, GGobi; software engineering—SourceForge, Rational Rose, Together, Eclipse; configuration management—ClearCase, CVS, TeamWare, Subversion, GIT, Mercurial; simulation—DaSSF, Vensim, STELLA; ontology—OWL, RDF, Protégé, TopBraid Composer.

Application Areas: discrete-event and continuous simulation; graph and network analysis; mathematical and statistical modeling; data analysis, mining, and visualization; productivity tools.

Education

Ph.D. in Theoretical Physics, December 1990 [GPA 3.8]

Yale University, New Haven, CT

Curriculum: atomic, nuclear, and high energy physics; field theory, including the standard model; scattering theory; group theory and mathematical methods.

Dissertation Title: Shape Fluctuations in Hot Rotating Nuclei.

B.S. in Physics (with honor), June 1985 [GPA 4.0]

California Institute of Technology, Pasadena, CA

Curriculum: classical, quantum, and statistical physics; mathematical methods, including abstract algebra, complex analysis, asymptotics, and spectral theory; probability and statistics.

Senior Thesis: set upper limits on proton lifetime in several decay modes using IMB collaboration experimental data.

Continuing Education

Subject Areas: statistics, graph theory, fuzzy logic, information theory, genetic algorithms, neural networks, data mining, approximate reasoning, simulation; visualization; object-oriented analysis and design, data structures, algorithms, patterns, ontologies, effective user interface design, software testing and quality assurance, software engineering process; project leadership & facilitation.

Work Experience

Principal Engineer, 2008–present

National Renewable Energy Laboratory, Golden, CO

Led the Biomass Scenario Model (BSM) project, a system-dynamics simulation of the cellulosic biomass-to-biofuels supply chain. Developed an enhanced version of the Scenario Evaluation and Regionalization Analysis (SERA), an optimization tool for regional hydrogen infrastructure. Also collaborated on statistical and geospatial analyses of renewable energy systems (photovoltaics and wind-turbine farms) from technical, financial, and economic perspectives. Researched issues around supporting community decisions in their transition to more efficient and renewable energy use. Led a data-mining and analysis-automation project that is developing new statistical and machine learning methods for application to renewable energy information.

Technical Staff Member, 1993–2008

Los Alamos National Laboratory, Los Alamos, NM

Led numerous innovative research-oriented simulation projects (often several simultaneously) with teams of approximately one dozen people and with an emphasis on robust architecture and software quality. Collaborated as a software

architect, designer, and programmer on TRANSIMS, a multiyear, multimillion-dollar project to develop a transportation simulation system; led team for information and data handling research and development. Performed groundbreaking research on information theory, graph theory, and infrastructure (electric power, control communications, interdependence) assurance; architected, designed, and developed simulation software, analysis software applications, geographic information systems, and relational databases. As a Visiting Scientist at the National Center for Atmospheric Research (NCAR), recently began efforts to connect simulations of weather and climate to impact models for energy and infrastructure networks.

Director-Funded Postdoctoral Fellow, 1990–1992

Los Alamos National Laboratory, Los Alamos, NM

Developed theory and computer simulations of ultrarelativistic heavy-ion collisions, nuclear dissipation, shape diffusion, and level densities, and solvable nuclear models.

Research Associate, 1987–1992 (consultant), and Research Assistant, 1984–1987

Pacific-Sierra Research Corporation, W. Los Angeles, CA

Analyzed and developed computer simulations of large area urban fires, wildland fires, ignition phenomena; studied atmospheric and environmental impacts of nuclear weapons.

Research Assistant, 1988–1990, and National Science Foundation Graduate Fellow, 1985–1988

Yale University, New Haven, CT

Researched nuclear shape fluctuations, phase transitions, giant resonances, and Landau theory in hot rotating nuclei, comparing numerically computed predictions to available experimental data; investigated the shell model, level densities, nuclear damping, and pion-proton scattering.

Other Experience

Publication

Total of 185 publications (cited over 1000 times), including 30 in refereed journals such as *Science*, *PLOS ONE*, *Physical Review Letters*, and *Fuzzy Sets & Systems*, 28 in conference proceedings, 10 conference posters, three in submission process, one patent disclosure, and 101 technical reports. Software packages written in C++ (173k+ SLOC), FORTRAN (15k+ SLOC), Haskell (20k+ SLOC), Java (186k+ SLOC), and Smalltalk (30k+ SLOC).

Public Speaking

Speaker 16 times at scientific conferences/workshops and 73 times in seminar series; participant at seven other scientific and engineering conferences.