

## *Curriculum Vitae*

### **Dr. Charles Clyde Peck III**

cpeck @ neuromentix . com

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#### **PROFILE:**

I have spent my career in world class industrial research institutions and startups requiring my participation in nearly every business and technical role. I have demonstrated both technical and organizational leadership throughout, which has been recognized at the highest organizational levels and by the National Academy of Engineering. My technical expertise:

- **Computer science:** object-oriented software architecture analysis, design, & development, artificial intelligence, machine learning, parallel & distributed computing, modeling & simulation, language design & implementation, automatic code generation, algorithm design, rapid prototyping...  
Key accomplishments: Designed the GIAS government standard; designed an autonomous problem solving system; developed new machine learning techniques; led development of a state of the art parallel, distributed simulation environment with a configuration specification language and automatic code generation; multiple rapid prototyping projects; 2 patents, 2 pending; 1 J (journal), 11 RC (referenced conference), 8 C (other conference papers); 3 TR (public technical reports).
- **Mathematics, statistics, and data analysis:** linear algebra, differential equations, calculus, real analysis, complex analysis, information theory, optimization, computational geometry, stochastic processes, probability, network analysis, statistical modeling and hypothesis testing...  
Key accomplishments: Developed novel theory of genetic algorithm function; analyzed technologies, systems, and scientific phenomena; designed technologies based on analysis; led neuroinformatics team; participated on international advisory boards; 1 J, 4 RC, 3 C papers, 1 TR.
- **Engineering:** systems engineering, signal processing, image processing, image reconstruction, digital logic and systems design, analog electronics design, mechanical design...  
Key accomplishments: Applied systems engineering methodology to characterize brain function and design technologies to replicate its capabilities; developed reconstruction techniques for multiple imaging and microscopy modalities; designed gate arrays, fiber optic transceivers, and a multiplexer that was on the market 20+ years; 3 patents, 1 pending, 1 published; 1 J, 3 RC papers
- **Science:** neuroscience, computational neuroscience, physics, computational biology, chemistry  
Key accomplishments: Led IBM's scientific involvement in the Blue Brain Project; developed theory of global brain function; developed a mechanistic theory of emotions; developed theory of cerebellar function; co-invented digitally control catalysis technique; 2 J, 2 RC, 1 book chapter, 2 C.

My organizational leadership expertise:

- **Programs and projects:** Program conception, proposal writing, project planning, resource allocation, teaming agreements, business development and marketing support, relationship management, customer interactions, demonstrations, reporting, contract negotiations, media relations...  
Key accomplishments: wrote numerous winning proposals worth more than \$7MM; planned, led, and executed these programs; negotiated teaming arrangements and contracts; facilitated \$20-\$100MM in corporate deals; gave numerous customer presentations; cited in many news articles
- **Personnel:** personnel management, hiring, performance assessment, development, mentoring...  
Key accomplishments: 15 years of personnel management and employee development, mentoring of employees and students, developed plans and opportunities for employee growth
- **Organizational management and administration:** Strategy, P&L responsibility, budgeting, intellectual property, DCAA-compliant accounting processes and audits, benefits management and administration, regulatory compliance, office management...  
Key accomplishments: launched NeuroMentix; founded two research departments; developed and implemented organizational strategies, managed and administered multiple organizations.

## EDUCATION:

- **Ph.D., Electrical Engineering**, University of Cincinnati, Cincinnati, OH (1993)  
Doctoral dissertation: “Analysis of Genetic Algorithms from a Global Random Search Method Perspective with Techniques for Algorithmic Improvement.”  
Dissertation contributions: Critique of existing genetic algorithm theory; proposal of alternative theory, numerous algorithmic enhancements and theoretical insights; application to neural net input selection, training and generalization; application to Space Shuttle Main Engine sensor fusion and fault detection.  
Academic and research concentrations: genetic algorithms, biological and artificial neural systems, cognitive modeling, AI, image processing, medical imaging, computer vision, signal processing
- **M.S., Electrical Engineering**, University of Cincinnati, Cincinnati, OH (1991)  
Master’s thesis: “Implementation and Analysis of an Efficient Cone-Beam Reconstruction Method.”  
Thesis contributions: Review of cone-beam tomography reconstruction prior art, proposal of highly efficient and effective artifact reduction technique, supercomputer implementation of novel reconstruction and artifact reduction techniques, experimental evaluation of simulated results.
- **B.S., Electrical Engineering**, Florida Atlantic University, Boca Raton, FL (1986)  
Senior project: Portable LCD and microcontroller-based EKG monitor
- **A.A.**, University of Florida, Gainesville, FL (1984, requested/granted 1986)  
Program: Freshman Honors Program

## PROFESSIONAL DEVELOPMENT:

- 401K Plan Administration, Spring 2016
- Compliance training over many years (workplace environment, diversity, export control, government contracting, ethics, digital security, business conduct, etc.)
- Intellectual property seminars on laws and development (every 1-2 years)
- Frequent seminars on leading edge research across domains (neuroscience, computational biology, artificial intelligence, supercomputing, mathematics, optimization, computer science, electrical engineering, statistics, computer vision, software methodologies, chemistry, nanotechnology, MEMS, business modeling, supply chain and ERP, issues in medical, energy, financial and other industries, etc.)
- Personal Branding, Spring 2013
- IBM’s MicroMBA, Spring 2011
- LEADing@IBM Professional Management: Giving Feedback, Spring 2007
- LEADing@IBM Employee Development: A Meaningful Dialogue, Spring 2007
- Basic Blue Management Training, Spring 2002
- Action Writing Skills, Spring 2000
- Personal Negotiation Skills, Spring 2000
- Senior Assessment & Development Institute, April 1998
- Project Leadership Course, September, 1997
- New Leader Development Program, April–August, 1997
- Object Oriented Analysis & Design, June, 1996
- Business Development, November, 1995
- Systems Engineering, September, 1995
- ClearCase Training, 1994
- ObjectStore Training, 1994

## EXPERIENCE:

**NeuroMentix, LLC**, Newtown, CT 7/13–Present

Positions: President, Chief Scientist, Founder

Responsibilities and accomplishments:

- **Leadership**

Responsibilities: Organization and project management; technical leadership; strategy development; business development; proposal preparation; relationship management; demonstrations; briefings; personnel management & development; contract negotiation; regulatory compliance; intellectual property

Key accomplishments: Launched and managed NeuroMentix; secured research funding from DARPA and the Army Research Office to develop biologically inspired automata; served as the principal investigator; hired a research scientist; administered all HR and back office functions, including contracts, benefits, DCAA accounting processes and audits, business and worker's compensation insurance, regulatory compliance, finance, and other functions; secured registered trademarks; designed, revised and managed the NeuroMentix.com website; established tools and cloud services

- **Research**

Responsibilities: Planning and conducting research; mathematical and statistical analysis; briefings; technical writing; patents

Key accomplishments: conceived, planned and led federally funded research to develop a new class of artificial intelligence technology modeled after the brain to realize brain capabilities that are beyond the state-of-the-art of AI today; led the research, design and development of a simulated automaton and its environment for training, testing, and evaluating the technology; the customer deemed the program a success and approved offering a follow on program based in part on NeuroMentix research

- **Consulting**

Responsibilities: Provide neuroimaging, cognitive science, and game design consulting services to a major research university and its industry partner; help write proposal for federal research funding

Key accomplishments: Provided consulting services; developed the image analysis protocol and wrote the image analysis section in the proposal.

- **Software development**

Responsibilities: Systems engineering, requirements analysis, software architecture analysis and design, project planning and decomposition, systems integration, software development, software development environment management, system administration, porting, testing, demonstration, documentation

Key accomplishments:

- ***Automaton simulation environment:*** parallel, distributed embedding of an ODE-based virtual robot with biologically realistic senses and muscles in a virtual environment within the Nest neural system simulator

Roles: requirements analysis, system architecture, concepts of operation development, project leadership, algorithm design, code review, testing...

Tools: C++, Python, OpenCV, OpenMPI, Open Dynamics Engine (ODE), Nest Simulator; Eclipse

Platforms: Linux (Ubuntu) virtual machines in VirtualBox running on Windows

- ***Candidate development package evaluation:*** multiple software development packages and tools were evaluated for integration with our development efforts

Tools: OpenCV, OpenMPI, OpenML, Tensor Flow, Caffe, Eclipse

- ***Independent component analysis of images:*** a system to decompose images into independent components for exploring various research and system design issues

Roles: Algorithm design, code development, testing, and use

Tools: Matlab/Octave

- ***Website design and modification:*** the neuromentix.com website

Roles: Specified content and design, made modifications to externally developed original version

Tools: HTML, CSS, Javascript

**IBM Research, T.J. Watson Research Center, Yorktown Heights, NY, 3/99–7/13**

Positions: Manager/Team Leader, Biometaphorical Computing Research, 6/01–7/13, Research Staff Member, 3/99–7/13

Responsibilities and accomplishments:

- **Leadership**

Responsibilities: Organizational, project and technical leadership; strategy development; relationship management with customers, collaborators, internal groups, & other stakeholders; demonstrations and briefings; marketing support; customer briefings; media relations; personnel management and development; mentoring; contract negotiations; task force participation

Key accomplishments: Established and led IBM's neuroscience, neuroinformatics, and cognitive science research program for 12 years, which produced numerous contributions to science and technology; established and led international research collaborations; recognized with a Research Division Accomplishment for contributions to the establishment of U. Melbourne for Victoria Life Sciences Computation Initiative; served as "Technical Resource" to the IBM community with contributions to task forces, corporate initiatives, Global Technology Outlooks, IBM Academy studies covering computer science, neuroscience, cognitive science, artificial intelligence, intellectual property, and computing technology; served on external advisory boards and committees; initiated and participated in organizational strategy efforts at multiple levels; developed team personnel; facilitated \$10-100MM in deals through marketing support; represented IBM's neuroscience research and machine learning efforts in the media and IBM advertising; facilitated and supervised 73 papers beyond those I co-authored.

- **Research**

Responsibilities: Planning and conducting research in neuroscience, neuroinformatics, simulation systems, modeling, cognitive systems, artificial intelligence, machine learning, imaging, high performance computing, and information theory; mathematical and statistical analysis; consulting; research collaborations; publishing peer reviewed research; scientific presentations; technical writing; patents

Key accomplishments: Computational and mathematical models of large scale neural systems from neurons to microcircuits, tissues, brain structures, and integrated brain systems; a theory of global brain function explaining much of perception, behavior generation, learning, and subjective experience; a computationally grounded theory of emotion; published analysis of neuroscientific data; recognized by IBM for contributions to the National Medal of Technology for the Blue Gene supercomputer (i.e., requirements specifications, applications, and demonstrations of BG's unique value); development of novel machine learning techniques; development of improved HRRT PET reconstruction and artifact reduction algorithms; contributions to the concepts of operation, architecture, knowledge representation and knowledge engineering methodology for an interactive document configuration system, which led to customer acceptance; conception and design of an interactive, annotated reading tool; invention of computer peripherals, including novel keyboard designs and eye gaze tracking technology, which were successfully licensed; 5 patents, 1 published, 4 pending; 3 journal, 15 refereed conference, 1 book chapter, & 10 other conference papers; 2 public technical reports.

Research details:

- **Theory-driven Modeling, 12/00–7/13**

Area summary: Computational or mathematical modeling of neural systems and automata using biological abstractions to enable biological capabilities and functional understanding.

Key projects: Global brain modeling, emotion modeling, system level cerebellum modeling, STDP effects on network function, cortical map formation, cortical dynamics, adult neurogenesis, pain, and the Biometaphorical Computing Adventurous Research project.

Accomplishments: A network theory for global brain function, grounded in threat avoidance, causal modeling constraints, and self-referential categorization, that explains a wide range of brain phenomena, including self-inference, certain perceptual and mental qualia, objective driven behavior, and learning; a computationally grounded theory of emotion; globally integrated model of the cerebellum explaining learning and behavioral capabilities; an Infomax-based topographic, self-organizing cortical map model; a recognition automaton; and multiple team contributions related to pain, adult neurogenesis, cortical dynamics, and STDP. Pubs: 16 personal, 11 team. Patents: 1 granted, 1 pending.

- **Data-driven Modeling, 05/05–7/13**

Area Summary: Highly detailed, carefully validated, computational modeling of neural tissue to replicate experimental phenomena, understand tissue function, and make scientifically testable predictions.

Key projects: The IBM/EPFL Blue Brain project (BBP) to produce a high fidelity model of the neocortical column running on an IBM Blue Gene/L supercomputer; an experimentally validated inferior olive/cerebellum model (IO); generative models of neuron morphologies; and ion channel modeling.

Accomplishments: Established participation in the BBP, negotiated IBM's role, and directed IBM's scientific and technical contributions, including key contributions: model parameterization and optimization techniques, model validation strategies, experimental design, touch detection of neural processes, and software analysis, design, and development; co-established an international IO modeling collaboration and directed development of a detailed model with unique gap junction and axon dynamics capabilities; oversaw development of computational techniques to reproduce dendritic morphologies and ion channel models; mentored the principal investigator and two interns; contributed machine learning techniques and design guidance for function approximation techniques applied to ion channel currents. Pubs: 2 personal, 6 team. Patents: 1 pending.

- **Neuroscientific Analysis, 05/05–7/13**

Area summary: Exploit high performance computing and novel, paradigm shifting analysis techniques to generate new insights and usable, interpretable information.

Key projects: Cortical color representation, fMRI analysis for disease markers, pain, ADHD, and causal relationships; ECoG/EEG/microelectrode analysis; connectomics; language and behavior

Accomplishments: Established multiple research collaborations; team recognized with IBM Research Accomplishment for “Network Analysis for Complex System Understanding and Classification;” pioneering contributions in the application of statistical network theory to the analysis of fMRI, ECoG, EEG, and language for classification, prediction, and understanding of brain and psychological phenomena; pioneering contributions in the application of autoregressive modeling and analysis of fMRI. Pubs: 2 personal, 32 team.

- **Neuroimaging, 08/09–7/11**

Area summary: Exploit high performance computing to expand the range of feasible algorithms, to improve image reconstruction quality, and to tailor techniques to the scientific questions pursued.

Key projects: HRRT PET reconstruction and corrections; high speed fMRI and compressed sensing; electron microscopy segmentation; ultramicroscopy

Accomplishments: Established a research collaboration with a strategic partner, satisfying a Research Division milestone; analyzed the HRRT PET machine and identified numerous approaches to increase spatiotemporal accuracy and reduce artifacts; developed a technique to exploit and correct subject motion using detected events; developed and demonstrated HRRT PET software leading to new reconstruction technique exploiting a priori information; proposed additional novel techniques for 4D reconstructions; worked with a research collaborator to identify techniques to improve ultramicroscopy resolution; oversaw team research into the use of compressed sensing to improve fMRI temporal resolution and projects to segment electronmicrographs of neuropil. 1 patent publication.

- **Machine Learning and Statistical Analysis Techniques, 05/05–7/13**

Area summary: Develop machine learning and statistical analysis techniques inspired by neuroscience or tailored to the magnitude, high dimensionality, and complexity of neuroscientific data.

Key projects: Sparse regression, Markov random fields, dimensionality reduction, novel classifiers

Accomplishments: Development of a simple classifier producing the probability of class membership; and team development of sparse regression techniques for making brain state predictions in spatio-temporal networks, MRF models of statistical relationships between spatially distributed, dynamical brain elements, Bayesian techniques for setting the MRF sparsification parameter, and development of algorithms for supervised dimensionality reduction. 13 team publications.

- **Simulation Environments and Software Infrastructure, 06/01–7/13**

Area summary: Develop tools that make it easy to exploit high performance computing platforms for complex neuroscientific analysis and for large scale neural system modeling.

Key projects: Model-Graph Simulator, Neural Tissue Simulator, touch detection analyzer, Octave on Blue Gene, GPU-based analysis

- Accomplishments: Member of the IBM Blue Gene Supercomputer team receiving the National Medal of Technology (I contributed requirements, scientific applications, and demonstrations); led the architecture and development for the Model-Graph Simulator (MGS), an MPI-based, multi-threaded, distributed time step simulation environment with a declarative specification language for composing models with arbitrary interfaces in a fixed interaction network and a model definition language for automated code generation; ported the MGS to Blue Gene to satisfy a Research Division milestone; oversaw team contributions of the Neural Tissue Simulator, a scalable, MGS-based compartmental neuron modeling environment able to model arbitrarily large neural tissues, uniquely including gap junctions and complex axonal phenomena; a Blue Gene-based neuron touch detection system to analyze and configure massive neural tissue models; a port of Octave to Blue Gene for parallel computation in a Matlab-like environment; and porting of neuroinformatics code to GPUs for performance comparison with P-Series processors. Pubs: 3 personal, 3 team
- **Interactive Document Configuration**, 3/99–12/00
 

Area summary: Develop interactive document configuration concepts, technologies, methodologies, and intellectual property. Deploy the application and supporting infrastructure within IBM.

Key project: Software Architecture, Logic And Reasoning Program (SOALAR), which used constraint-based reasoning as the driving artificial intelligence technology

Responsibilities: Technical leadership, analysis and design, system engineering, research, demonstration and engagement support, mentoring, and relationship management.

Accomplishments: Led analysis, proposed numerous enhancements and conceptual changes to the concepts of operation; led changes to the software architecture resulting in a faster, simpler, more extensible, capable and implementable design, more general document representation, an undo/redo architecture, and XML changes; proposed key enhancements to the knowledge representation and rule/constraint language, developed a knowledge engineering methodology and applied it to template analysis and development; provided extensive user interface review, feedback, recommendations, and usability solutions; provided planning, logistics, quality assurance, and review for all major events and engagements; managed relationships with internal and corporate partners
  - **Interactive Reading Tools**, 6/99–11/99
 

Area summary: Develop new tools and techniques to make reading text on computer screens easier and more natural and to improve comprehension, understanding, and reading performance

Key project: Reading Assistance Displays (READ)

Responsibilities: Principal investigator, technical & project leadership, and intellectual property

Accomplishments: Initiated project; developed key concepts and concepts of operation; designed and led development of modular, highly extensible component framework and test bed; led development of prototype components; mentored summer intern; successful demonstration and review
  - **Software development**

Responsibilities: Systems engineering, requirements analysis, software architecture analysis and design, project planning and decomposition, systems integration, software development, software development environment management, system administration, porting, testing, demonstration, documentation

Key projects:

    - **Model-Graph Simulator (MGS):** a state-of-the-art, general purpose simulation environment supporting dynamic loading, parameterization, and networking of arbitrary models, automatic load balancing in parallel and distributed computing environments with a declarative simulation specification language and a model definition language that automatically generates code stubs to limit programming for new models to just the desired behavior.
 

Roles: project leader, lead architect and designer, language designer, developer, tester...

Tools: C++, Flex, Bison, MPI, CVS, make, ZeroFault, Open Dynamics Engine (ODE)...

Platforms: Linux on the IBM Blue Gene Supercomputer, AIX on IBM P-Series machines
    - **Cortical modeling:** develop code to model full rank, overcomplete, and reduced dimension self-organized, topographic map formation consistent with information maximization and biology
 

Roles: algorithm developer, code architect, developer, tester

Tools: Matlab/Octave on Linux & Windows PCs, C++ with MGS on IBM Blue Gene or P-series
    - **HRRT PET:** code to replicate specialized reconstruction code using the machine interface, refactor it for IBM Blue Gene, add algorithmic enhancements and artifact reduction
 

Roles: Architect, code review, algorithm design, code development, testing

- Tools: C++, MPI  
Platforms: Linux on IBM Blue Gene and IBM P-Series
- **Cerebellum modeling:** an adaptive, non-linear dynamics oscillator based model for the cerebellum embedded in a global brain circuit, enabling different types of learning, posture independent gestural control, and smooth, efficient movements  
Roles: System and algorithm designer, code review, development  
Tools: Python with numpy, matplotlib/pylab, pygame, SWIG  
Platforms: MS Windows on PC, Linux on IBM P-Series
  - **Annotated reading tool:** a tool to present text dynamically with visual grammatical cues to accelerate reading and improve comprehension  
Roles: Architect, code review, development  
Tools: Java  
Platforms: MS Windows on a PC

**Columbia University**, New York, NY 8/06–12/08

Position: Assistant Adjunct Professor, Electrical Engineering Department

Responsibilities and accomplishments:

- **Teaching**  
Responsibilities: Develop and offer the graduate level course: “Global Brain Modeling” for the fall sessions of 2006, 2007, and 2008.  
Key accomplishments: Co-developed and co-taught the course. The course was so popular in its first year that it was also offered as an online, video course. Each year, I received very positive reviews, with some students indicating it was the best course they’ve ever taken.

**Lockheed Martin—Advanced Technology Laboratories**, Camden, NJ, 1/96–3/99

Positions: Technical leader/Manager, Advanced Distributed Architecture Research, 1/97–3/99; Principal Member of the Engineering Staff, 1/96–1/97

Responsibilities and accomplishments:

- **Leadership**  
Responsibilities: Program management and technical leadership for planning and executing \$1–2MM in applied research programs/year; write proposals and support new business development; interface with customers and technical community in technical and programmatic capacities; manage team and conduct employee performance reviews  
Key accomplishments: Recognized as technical resource for object-oriented architecture analysis and design, component-based application frameworks, distributed object technologies, and modeling & simulation; primarily responsible for winning \$6.5MM in new business (DDB, IDEX/CIIF, and ATIRP programs); key contributor to winning in excess of \$20MM in programs for Lockheed Martin; led development of multiple system prototypes; participated in government standards committees
- **Research**  
Responsibilities: Quickly learn customer problems, state-of-the-art solutions, related technologies, and the latest research; planning and conducting research in object-oriented architecture analysis for parallel and distributed systems, distributed communications middleware, networking quality-of-service protocols and algorithms, software engineering methodologies, and domain-specific problems for the DoD and intelligence communities; consulting; collaborations; rapid prototyping;  
Key accomplishments: Developed algorithms for managing quality-of-service over congested networks; designed the winning architecture for a DARPA program to ingest large amounts of heterogeneous and extensible data sources and allow standardized queries and operations to achieve sensor fusion and situation awareness in a dynamic environment; developed multiple C4I architectures; led rapid development of multiple system prototypes; designed the Geospatial Information Access Specification (GIAS), a National Imagery and Mapping Agency (NIMA) standard; recognized with many awards, including Lockheed Martin’s highest award: the NOVA Award for Technical Excellence.
- **Software development**  
Responsibilities: Quickly learn candidate software packages for system integration; systems engineering, requirements analysis, software architecture analysis and design, project planning and decomposi-

tion, systems integration, software development, software development environment management, system administration, porting, testing, demonstration, documentation

Key accomplishments: led design and development of multiple distributed system architectures, algorithms, protocols, and prototypes in the areas of networking quality-of-service, intelligence data handling, C4I systems, and planning systems

Tools: C/C++, CORBA IDL, TotalView, Iona Orbix (CORBA), Rogue Wave STL, Tool.h++, ClearCase, Sun Workshop, SparcWorks, Paradigm Plus, OMT STP, Purify, etc.

Sun Sparc: BSD Unix, SunOS, Solaris

Primary project details:

- **Advanced Telecommunications & Information Distribution Research Program (ATIRP), 2/97–3/99**  
Project summary: Design and develop technologies to enable information dissemination over contended, dynamic network configurations based upon tactical requirements.  
Responsibilities: Program management, technical lead and principal investigator for architectural analysis, distributed algorithm design, implementation, & analysis, and system development.  
Accomplishments: Conducted study and developed CORBA-compliant, object-oriented architecture for simulation enhanced situation awareness; developed distributed, scalable algorithm for network decongestion; effective technical program management, planning, and reporting;
- **IDEX/CIIF Prototype Implementation, 12/96–3/99**  
Project summary: Design and develop a CORBA-based interface to the Lockheed Martin IDEX system that is compliant with the NIMA Common Imagery Interoperability Facility (CIIF).  
Responsibilities: Program management, technical lead and principal investigator for architectural analysis, system development, and CIIF analysis.  
Approach: Initiated and led a rapid prototyping effort; participated in CIIF standards meetings; advocated for more extensible architecture, which became necessary with the CIO and DMA merge into NIMA; proposed GIAS architecture  
Accomplishments: Effective technical program management, planning, and reporting leading to a CORBA-compliant, object-oriented architecture and software implementation of a prototype CIIF-compliant IDEX interface. This work was recognized with a LM-ATL “Special Recognition Award.” Designed & proposed the Geospatial Information Access Specification (GIAS), which was adopted by NIMA as the baseline architecture. This work was recognized with LM-ATL’s highest honor: “Award of Distinction.”
- **IS2000, 1/96–2/97**  
Project summary: A CORBA-compliant product dissemination system for distributing intelligence products over contended resources, according to mission requirements and organizational policies.  
Responsibilities: Technical program management, technical lead and principal investigator for the architecture, algorithm development, and policy-based system management.  
Accomplishments: CORBA-compliant, object-oriented architecture; a scalable, distributed scheduling, planning, and decongestion algorithm; a policy-based system management; participation in NIMA’s Common Imagery Interoperability Facility standardization process; effective technical management and planning, timely reporting

**TASC (The Analytical Sciences Corporation), Arlington, VA, 12/93–1/96**

Position: Senior Staff Member

Responsibilities and accomplishments:

- **Leadership**  
Responsibilities: Technical resource for C++ and object-oriented design expertise; consulting; participate in the DoD simulation standards process; contribute to proposal preparation  
Key accomplishments: Developed the Federated Object Model development process, led the associated technology development and integration, influenced the Object Model Template working group; consulted with other programs at their request; selected by the customer to join the ARPA Synthetic Theater of War (STOW) program. Initiated paper on the application of object-oriented technologies for distributed, interactive simulations, leading to selection for a plenary session presentation.



- **Software development**

Responsibilities: Systems engineering, requirements analysis, object-oriented software architecture analysis and design, object-oriented software development using C++, systems integration, testing, demonstration, documentation

Key accomplishments: As the entity architecture task lead of the SimCore project, I developed an object-oriented entity architecture, the modeling API, code generation specifications, scenario generation and initialization, dynamic types and data marshalling, DIS PDUs and infrastructure, and the data collections and analysis architecture. Received “Most Significant Contribution Award” from SAIC, TASC’s customer.

Primary project details:

- **ARPA Synthetic Theater of War (STOW) Systems Eng. & Integ. Demo. (SEID), 8/95–1/96**  
Project summary: Integrate STOW Advanced Distributed Simulation family programs (AMG HLA, RTI, synthetic environments, synthetic forces, infrastructure...) into the STOW ’97 demonstration.  
Responsibilities: Task lead for the Federation Object Model (FOM) Integration  
Approach: Requirements analysis and analysis of interoperability and reuse issues; coordination with the Architecture Management Group’s Object Model Template (OMT) working group and across STOW teams to facilitate consensus on FOM-related approaches and technologies  
Accomplishments: Developed STOW SEID’s FOM development process, specified and led development of technologies for FOM use and integration, integrated the approach into the exercise development and documentation processes, influenced development of the OMT through the working group
- **ARPA War Breaker, SimCore, 12/93–8/95**  
Project summary: Development of SimCore, a distributed, interactive simulation (DIS) platform for integration of live and modeled participants in theater-wide war simulations to assess sensor coverage and threat detection capabilities.  
Responsibilities: Object-oriented design and programming using C++, task lead for the entity architecture, consulting to other projects, user point of contact, customer briefings  
Approach: I mastered the existing architecture, identified the critical areas that were deferred due to ambiguity and difficulty, and designed and implemented solutions.  
Accomplishments: Object-oriented entity architecture, modeling API, code generation specifications, scenario generation and initialization, dynamic types and data marshalling, DIS PDUs and infrastructure, and data collections and analysis architecture. Together, these enabled dynamic loading of simulated entities, parameterization through dynamic data types and data marshalling, and specification, initialization, and configuration of simulation scenarios through a graphical interface. Received “Most Significant Contribution Award” from SAIC, TASC’s customer.  
Tools: C++, ObjectStore (ODBMS), ClearCase, Sun Workshop, SparcWorks  
Platforms: Sun: BSD Unix, SunOS, Solaris; SGI: IRIX

**University of Cincinnati, Cincinnati, OH, 9/88–12/93**

Positions: Research Assistant (6/89–12/93), Teaching Assistant (9/88–6/89)

Overall responsibilities: Research, mathematical and statistical analysis, system and scientific programming, experimentation, technical writing, and assisting students

Key accomplishments: A mathematically rigorous theory for genetic algorithms; sophisticated software system for genetic algorithm applications, neural network optimization, VCR control and frame grabber level signal processing, and cone-beam tomography reconstructions; applied these to automatically produce results that exceeded those of experts; produced 4 journal and 7 conference papers.

Primary project details:

- **Fault Detection and Estimation of Space Shuttle Main Engine (SSME) Sensors**  
Responsibilities: Develop a neural network to predict SSME health given 218 sensor measures  
Approach: Proposed genetic algorithm for systematic input selection, applied neural networks for prediction of sensor values and sensor fusion, wrote suite of programs for processing raw test firing data, wrote object-oriented genetic algorithm and neural network libraries (>15,000 lines of code).

Accomplishments: Developed a mathematically rigorous theory for genetic algorithms leading to algorithmic enhancements, developed reusable, sophisticated object oriented software, produced a sensor list that outperformed one produced by a panel of experts, produced 1 journal and 3 conference papers

- **Plume Diagnostics of the SSME**

Responsibilities: Develop 4D visualization of SSME plume emissions recorded on videotape

Approach: wrote subroutine library for hardware-level control of frame grabber and VCR, wrote general purpose image acquisition, registration, and analysis software, performed plume visualization on a PIXAR imaging computer, wrote programs for multi-dimensional analysis of plume structures

Accomplishments: Demonstrated the feasibility of NASA's plume diagnostics strategy, developed a production analysis pipeline, eliminated original target signal as a candidate through highly accurate registration, produced 1 journal and 1 conference paper

- **Three-Dimensional Cone-Beam Tomography**

Responsibilities: Analyze, implement, and improve a novel 3D cone-beam reconstruction algorithm

Approach: Developed novel artifact reduction techniques from mathematics analysis, implemented novel cone-beam reconstruction algorithms on a Cray Y-MP supercomputer, and developed programs for the display, analysis, and manipulation of data sets.

Accomplishments: Characterized the accuracy and efficiency of the novel technique, showed improved performance with my proposed artifact reduction technique, developed novel Fourier domain interpolation technique for medical images, produced 1 journal and 2 conference papers

- **Teaching assistant for an introductory electronics course**

Responsibilities: Conducted a problem solving and discussion section, supervised a microprocessor lab

Accomplishments: Successfully assisted students and met all requirements of the position

**Consulting Engineer to KBS, Incorporated, Deerfield Beach, FL, 5/92–9/92**

Position: Electrical engineering consultant

Responsibilities: Transmission line analysis and electronic design to overcome the line termination problems inherent to SCSI-2 systems.

Major accomplishments: Two novel SCSI-2 transceiver designs solving this problem that exploited FET transistors in fast digital buffers as analog switches to couple the transmission line through a terminating resistor to either the ground or power source depending on the level of the signal detected by a comparator. Wrote a patent application and a technical paper.

**KBS, Incorporated, Coral Springs, FL, 10/86–9/88**

Position: Design Engineer

Responsibilities: Analog and digital product conception, design, and development; software design and development; mechanical design; customer consultations & support; all technical writing, reports, & manuals

Major accomplishments: Designed two gate arrays; developed three fiber optic transceivers, two RS-232 multiplexers (one was on the market for 20+ years), a printer buffer, an RF robotic controller, and automated test equipment; helped KBS grow from 3–30 people

**COMPUTING SKILLS:**

Languages: C/C++, Matlab, Java, Python, FORTRAN, BASIC, assembler.

Software Engineering: OpenCV, OpenMPI, MPI, Flex, Bison, CORBA IDL, TotalView, CVS, ZeroFault, Iona Orbix (CORBA), ObjectStore (ODBMS), Rogue Wave STL, Tool.h++, ClearCase, Sun Workshop, SparcWorks, Paradigm Plus, OMT STP, Purify, etc.

Other integrated systems: Open Dynamics Engine (ODE), Nest Simulator

Platforms and OS's: IBM P-series: AIX; IBM Blue Gene: Linux; Sun: BSD Unix, SunOS, Solaris; SGI: IRIX; Cray: UNICOS; IBMPC: Linux, Windows, MS-DOS; MacIntosh: Sys. 7/8; DEC VAX: VMS; Pixar

**HONORS & AWARDS:**

- IBM Thanks! Award for contributions to the Summer Internship program, 2012
- IBM “Research Division Accomplishment” for contributions to the establishment of the University of Melbourne for Victoria Life Science Computation Initiative, 2011
- Chosen at VP level to participate in the selective IBM MicroMBA course, Spring 2011
- National Medal of Technology presented to IBM for the Blue Gene Supercomputer by Obama, November 2009. My contributions were system requirements and scientific applications.
- IBM “Research Division Accomplishment” for “Network Analysis for Complex System Understanding and Classification,” 2009
- Peer-to-Patent Appreciation Award for patent analysis contributions cited by the USPTO, 2009
- IBM Thanks! Award for analysis of and contributions to the Peer-to-Patent web site design, 2008
- Designated as a “Technical Resource” by IBM, 2006
- “Bravo! Night on the Town” Award for Successful Project Leadership, IBM Research, February 2003
- “Bravo! Night on the Town” Award for SOALAR contributions, IBM Research, December 1999
- Designated as a “World Class Hire” by IBM Research, 1999
- National Academy of Engineering’s 1999 German/American Frontiers of Engineering, among 35 engineers selected from previous NAE FOE Symposia participants to represent the United States
- National Academy of Engineering’s 1998 Frontiers of Engineering Symposium<sup>1</sup>, among 83 engineers selected nationwide for “an annual event intended to bring together some of the nation's top engineers”
- NOVA Award — Technical Excellence, Lockheed Martin’s Highest Honor, for SW architectures, 1998
- Award of Distinction, Lockheed Martin - Advanced Technology Laboratories’ Highest Honor, 1997
- Special Recognition Award, Lockheed Martin - Advanced Technology Laboratories, December 1997
- Most Significant Contribution Award, presented by TASC’s customer, SAIC, May 1994

**Academic:**

- Received a Fellowship from NASA’s Space Engineering Center for System Health Mgmt. Technology
- Received a University Graduate Scholarship on a competitive basis
- Inducted into Tau Beta Pi Assoc., National Engineering Honor Society, Florida Atlantic University
- Recognized in Dean’s List multiple times, Florida Atlantic University
- Accepted into Freshman Honors Program, University of Florida

**BOARDS, WORKSHOPS, ADVISORY ROLES, and ORGANIZING COMMITTEES:**

- Advisory Board, BRAIN-Code, Ontario Brain Institute, Toronto, 2012–Present
- External Advisory Board, Neuroinformatics Doctoral Training Centre at the University of Edinburgh, 2006-2015
- Industry Advisory Panel, Rutgers Discovery Informatics Institute, 2012
- 1st INCF Workshop on Large-scale Modeling of the Nervous System, Stockholm, December, 2006
- National Academy of Engineering’s 2003 Japanese/American Frontiers of Engineering Organizing Committee, selected as the American co-organizer for the Multimedia Networking session, August 2003
- Subject matter expert advising on computational neuroscience programs, Jülich Supercomputing Centre, Jülich, Germany, 2011, 2012, 2013
- National Academy of Engineering’s 2002 Japanese/American Frontiers of Engineering Organizing Committee, selected as the American co-organizer for the Pervasive Computing session, August 2002

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<sup>1</sup> See <http://www.nae.edu/nae/nae.nsf/NAE+Programs/US+Frontiers+of+Engineering?OpenDocument>

## **CONFERENCE SESSION CHAIRS, TASK FORCES, and PROGRAM COMMITTEES:**

- IEEE Symposium Series on Computational Intelligence (SSCI) program committee: 2013
- Invited participation in Task Force on “Towards Human-like Intelligence”: 2013
- Nature and Biologically Inspired Computing (NaBIC) program committee: 2011, 2012
- Biologically Inspired Cognitive Architectures (BICA) program committee: 2011, 2012
- Session Chair, “Emotions in BICA, in humans and artifacts,” BICA 2011
- IEEE Workshop on Biomedical Applications for Digital Ecosystems, 2007
- IEEE Joint Conference on Neural Networks (IJCNN) 2006, 2011-2013
- Invited reviewer for multiple journals and other conferences.

## **AFFILIATIONS:**

- Biologically Inspired Cognitive Architectures (BICA) Society
- Society for Neuroscience
- Institute of Electronics and Electrical Engineers (IEEE), Computer Society
- Association for Computing Machinery (ACM)
- Tau Beta Pi Association, National Engineering Honor Society

## **PATENTS:**

### ***Granted:***

1. Title: Eye Gaze Control of Dynamic Information Presentation  
Patent Number: US 6,886,137  
Inventors: Charles Peck, John D. Mackay  
Assignment: IBM
2. Title: Gesture Sensing Split Keyboard and Approach for Capturing Keystrokes  
Patent Number: US 6,630,924  
Inventors: Charles Peck  
Assignment: IBM
3. Title: Method for Increasing the Signal to Noise Ratio in IR-based Eye Gaze Trackers  
Patent Number: US 6,959,102  
Inventors: Charles Peck  
Assignment: IBM
4. Title: Methods and Apparatus for Transmitting Signals through Network Elements for Classification  
Patent Number: US 7,287,015  
Inventors: Guillermo Cecchi, James Kozloski, Charles Peck, Ravishankar Rao  
Assignment: IBM
5. Title: Establishing Relationships Between Components In Simulation Systems  
Patent Number: US 7,756,691  
Inventors: Derek Carey, A. Ravishankar Rao, James Kozloski, Charles Peck  
Assignment: IBM

### ***Published:***

1. Title: Reconstruction of Images Using Sparse Representation  
Inventors: Rahul Garg, Rohit Madhukar Khandekar, Charles Clyde Peck, III, Nils Petter Smeds  
Assignment: IBM

### ***Pending:***

2. Title: Deconvolution and Segmentation Based on a Network of Dynamical Units  
Inventors: Guillermo Cecchi, A. Ravishankar Rao, James Kozloski, Charles Peck  
Assignment: IBM
3. Title: Systems, Methods and Computer Products for Controlling Multiple Machines Using a Seamless User-Interface to a Multi-display  
Inventors: Charles Peck, James Kozloski, Cesar Gonzales  
Assignment: IBM

4. Title: Electrochemical Control of Chemical Catalysis Using Single Molecule Motors and Digital Logic  
Inventors: Stanislav Polonsky, Charles Peck, Ajay Royyuru, Daniel Friedman  
Assignment: IBM
5. Title: Neural Network Simulation using Dynamic Action Potential Clamps  
Inventors: David Kaplan, James Kozloski, Charles Peck, John Wagner  
Assignment: IBM

## PUBLICATIONS:

### *Journal Papers:*

1. Karin B. Jensen, Guillermo Cecchi, Eva Kosek, Rikard K. Wicksell, Mike Kemani, Diana Kadetoff, Gunnar L. Olsson, Irina Rish, Charles Peck\*, Martin Ingvar, "Changing the brain's functional architecture with talk therapy," submitted to *JAMA Psychiatry* (\* Shared senior author with Martin Ingvar)
2. A.R. Rao, G.A. Cecchi, C.C. Peck, J. Kozloski., "Unsupervised segmentation with dynamical units," *IEEE Trans. Neural Networks*, Vol 19, No. 1, pp. 168-182, Jan 2008
3. J. Kozloski, K. Sfyarakis, S. Hill, F. Schürmann, C. Peck, H. Markram, "Identifying, Tabulating, and Analyzing Contacts between Branched Neuron Morphologies," *IBM Journal of Research and Development special issue on Massively Parallel Computing*, 52:1/2(43-55), 2008
4. Charles C. Peck and Atam P. Dhawan. "Input Variable Selection for SSME Parameter Modeling using Genetic Algorithms." *IEEE Transactions on Aerospace and Electronic Systems*, January 1996.
5. Charles C. Peck and Atam P. Dhawan. "Genetic Algorithms as Global Random Search Methods: An Alternative Perspective." *Evolutionary Computation*, 3(1):39–80, July 1995.
6. Atam P. Dhawan, Peter J. Disimile, and Charles Peck III. "Three-dimensional temporal reconstruction and analysis of plume images." *Optical Engineering*, 31(11):2366–2373, November 1992.
7. Bruce D. Smith and Charles C. Peck III. "Implementations, comparisons and an investigation of heuristic techniques for cone-beam tomography." *IEEE Transactions on Medical Imaging*, 15(4):519-531, Aug. 1996.

### *Refereed Conference Papers:*

1. Peck, C., & Kozloski, J. (2011). The computational basis of emotions and implications for cognitive architectures. In A. V. Samsonovich, & K. R. Johannsdottir (Eds.), *Proceedings of the Second Annual Meeting of the BICA Society*. (pp. 269–281). IOS Press volume 233 of *Frontiers in Artificial Intelligence and Applications*.
2. A.R. Rao, G.A. Cecchi, C.C. Peck, J. Kozloski, "Efficient Segmentation in Multi-layer Oscillatory Networks", *Proc. IEEE Intl. Joint Conference on Neural Networks*, pp. 2966-2973, 2008
3. R. Rao, G. A. Cecchi, "Spatio-temporal Dynamics during Perceptual Processing in an Oscillatory Neural Network," *Proc. International Conference on Artificial Neural Networks*, 2:685-694, 2008
4. J. Kozloski, G.A. Cecchi, C.C. Peck & A.R. Rao, "Topographic Infomax in a Neural Multigrid," *Advances in Neural Networks – ISNN 2007*, Aug. 2007, pp 500-509, Springer –Verlag, Berlin,
5. A.R. Rao, G.A. Cecchi, C.C. Peck, J. Kozloski, "Emergence of Topographic Cortical Maps in a Parameterless Local Competition Network," *Advances in Neural Networks – ISNN 2007*, Aug. 2007, pp 552-561, Springer –Verlag, Berlin,
6. Charles C. Peck, Tyler Streeter, and James Kozloski, "An Integrated Cerebro-Cerebellar Model Demonstrating Associative Learning and Motor Control," *Proceedings of the 2007 Dynamic Brain Forum*, Riken Institute and Tamagawa University, Japan, Tamagawa Gakuen, 2007
7. J. Kozloski, G.A. Cecchi, C.C. Peck & A.R. Rao, "A network for computing topographic infomax with and overcome complete basis: Correlates with the neocortical microcircuit," *Proceedings of the 2007 Dynamic Brain Forum*, Riken Institute and Tamagawa University, Japan, Tamagawa Gakuen, 2007
8. A.R. Rao, G.A. Cecchi, C.C. Peck & J. Kozloski, "Performance characterization of an oscillatory neural network that achieves binding through phase synchronization", *Proceedings of the 2007 Dynamic Brain Forum*, Dynamic Brain Forum, Riken Institute and Tamagawa University, Japan, 2007
9. Y. Liu, G.A. Cecchi, A.R. Rao, J. Kozloski & C.C. Peck, "Inference and Segmentation in Cortical Processing," *Proceedings of the 18th Annual Symposium of the International Society of Optical Engineering on Electronic Imaging*, San Jose CA, 2006
10. A. R. Rao, G. A. Cecchi, C. C. Peck, J. R. Kozloski, "An optimization approach to achieve unsupervised segmentation and binding in a dynamical network." *IEEE International Joint Conference on Neural Networks*, 2006.
11. A.R. Rao, G.A. Cecchi, Kozloski & C.C. Peck, "Translation Invariance in a Network of Oscillatory Units," *Proceedings of the 18th Annual Symposium of the International Society of Optical Engineering on Electronic Imaging*, San Jose CA, 2006.
12. A. Ravishankar Rao, Guillermo Cecchi, Charles Peck, James Kozloski, "Evaluation of the effect of input stimuli on the quality of orientation maps produced through self-organization," *Proceedings of*

*the 14th Scandinavian conference on Image*, pp 810-820, Springer-Verlag, Berlin, Heidelberg, 2005, ISBN:3-540-26320-9 978-3-540-26320-3 doi>10.1007/11499145\_82

13. Charles C. Peck, James Kozloski, Guillermo Cecchi, and A. Ravishankar Rao, "A Biologically Motivated Classifier that Preserves Implicit Relationship Information in Layered Networks," Ribeiro et al, Eds., *Adaptive and Natural Computing Algorithms : Proceedings of the International Conference in Coimbra, Portugal, 2005*, May 2005, Springer-Verlag, Berlin
14. A. Ravishankar Rao, Guillermo Cecchi, Charles Peck, James Kozloski, "A model of the formation of a self-organized cortical representation of color," *2005 SPIE Human Vision and Electronic Imaging Proceedings*, San Jose, January 2005
15. Charles C. Peck, James Kozloski, A. Ravishankar Rao, and Guillermo Cecchi, "Simulation Infrastructure for Modeling Large Scale Neural Systems," Sloot et al, Eds., *Computational Science—International Conference on Computational Science 2003 Proceedings, Part IV*, pages 1127–1136, Melbourne, Australia, June 2003, Springer-Verlag, Berlin
16. Charles C. Peck, Atam P. Dhawan, and Claudia M. Meyer. "Genetic algorithm based input selection for a neural network function approximator with applications to SSME health monitoring." *In Proceedings of the 1993 IEEE International Conference on Neural Networks*, volume II, pages 1115–1122, San Francisco, CA, March 1993. IEEE, IEEE Press.
17. Prashanth Kini, Charles Peck, and Atam P. Dhawan. "Genetic algorithm based reconstruction in diffusion tomography." In Britton Chance, editor, *Photon Migration and Imaging in Random Media and Tissues*, volume 1888. January 1993. SPIE, SPIE.
18. B.D. Smith and C.C. Peck, "Implementation and comparison of a novel computationally efficient cone-beam reconstruction method," *SPIE Biomedical Image Processing and Three-Dimensional Microscopy*, San Jose, February 1992.
19. Charles C. Peck, Louis K. Arata, and Atam P. Dhawan. "A new interpolation technique for orthogonal sets of tomographic medical images." *In Proceedings of the IEEE International Conference on Systems Engineering*, pages 166–169. Dayton, OH, August 1991, IEEE, IEEE Press.
20. A. P. Dhawan, P. J. Disimile, and C. Peck III. "Four-dimensional reconstruction and analysis of plume images." *In Proceedings of the Fourth International Conference on Laser Anemometry: Advances and Applications*, volume 1, pages 373–385. American Society of Mechanical Engineers, 1991.

#### **Book Chapters:**

1. C.C. Peck, J.R. Kozloski, G.A. Cecchi, S. Hill, F. Schuermann, H. Markram, A.R. Rao, "Network Related Challenges and Insights from Neuroscience," in *Bio-Inspired Computing and Communication: First Workshop on Bio-Inspired Design of Networks, BOWIRE 2007 Cambridge, UK, April 2-5, 2007 Revised Selected Papers*, Lecture Notes in Computer Science, Volume 5151, Springer Berlin/Heidelberg, 2008

#### **Other Conference Papers & Abstracts:**

1. J. Kozloski, C.C. Peck, G.A. Cecchi & A.R. Rao, "Layer 2/3 Is A Neural Multigrid: Information Maximization In A Local Network Explains V1 Hypercolumn Formation," COSYNE (Computational and Systems Neuroscience) abstract, 2007.
2. C.C. Peck, T. Streeter, J. Kozloski, "An integrated cerebellum model explaining associative learning, timing prediction, and motor control," Society for Neuroscience Abstracts, 2006.
3. J. Kozloski, C.C. Peck, G.A. Cecchi, A.R. Rao, "A multilevel, multiscale model of cortical map formation and synaptogenesis," Society for Neuroscience Abstracts, 2006.
4. A.R. Rao, G.A. Cecchi, C.C. Peck & J. Kozloski, "Self-organizing cortical maps showing joint frequency and orientation selectivity," Society for Neuroscience Abstracts, 2006, selected for platform presentation (Selection rate: 1 of 8)
5. Charles Peck, Gokhan Caglar, James Kozloski, Ravi Rao, Guillermo Cecchi, "Large-Scale Neocortical Simulation on Blue Gene/L," 2005 Annual Meeting of the Society for Neuroscience, Washington, DC, November 2005
6. James Kozloski, Ravi Rao, Guillermo Cecchi, Charles Peck, "Topographic map formation by maximizing information from naturalistic images in a microcircuit-inspired model of V1," 2005 Annual Meeting of the Society for Neuroscience, Washington, DC, November 2005

7. Guillermo Cecchi, James Kozloski, Charles Peck, Ravi Rao, "Mesoscopic modeling of thalamo-cortical circuitry: large-scale topology, oscillations and synchronization," 2005 Annual Meeting of the Society for Neuroscience, Washington, DC, November 2005
8. James Kozloski, Charles Peck, Ravi Rao, Guillermo Cecchi, "Contour Completion and Figure-Ground Separation using Self-organizing Cortical Maps," 2004 Annual Meeting of the Society for Neuroscience, San Diego, October 2004
9. Charles Peck, James Kozloski, Guillermo Cecchi, Ravi Rao, "A Thalamo-cortical Microcircuit Model Addressing Oscillations and Run Away Excitation," 2004 Annual Meeting of the Society for Neuroscience, San Diego, October 2004
10. Charles Peck, Guillermo Cecchi, Ravi Rao, William Arnold, James Kozloski, "Specification and Simulation of Patterned Microcircuit Connectivity in a Large-Scale Edge Node Simulator," 2002 Annual Meeting of the Society for Neuroscience, Orlando, FL, November 2002
11. h
12. Timothy Doniere, Charles C. Peck, and Atam P. Dhawan. "SSME sensor validation through neural network function approximators." In *Proceedings of the Fifth Annual Space System Health Management Technology Conference*, Cincinnati, OH, April 1993, NASA Space Engineering Center for System Health Management Technology.
13. Charles C. Peck, Atam P. Dhawan, and Claudia M. Meyer. "Selection of input variables for SSME parameter modeling using genetic algorithms and neural networks." In *Proceedings of the Fourth Annual Space System Health Management Technology Conference*, pages 104–118, Cincinnati, OH, November 1992. NASA Space Engineering Center for System Health Management Technology.

***Publicly Available Technical Reports:***

1. J Kozloski, M Eleftheriou, B Fitch, C Peck, "Interoperable Model Graph Simulator for High-Performance Computing." *IBM Research Reports*, 2009.
2. A.R. Rao, G.A. Cecchi, Kozloski & C.C. Peck, "Unsupervised Segmentation with Dynamical Units," *IBM Technical Report RC23838 (W0512)*, 2005
3. Charles C. Peck, Atam P. Dhawan. "A review and critique of genetic algorithm theories." *Technical Report TR\_153/6/93/ECE*, Department of Electrical and Computer Engineering, University of Cincinnati, Cincinnati, OH, 45221, June 1993.
4. Charles C. Peck, Atam P. Dhawan, and Claudia M. Meyer. "SSME parameter modeling using neural networks and genetic algorithm based input selection." *Technical Report TR\_141/1/93/ECE*, Dept. of Electrical and Computer Engineering, University of Cincinnati, Cincinnati, OH, 45221, January 1993.



## PRESENTATIONS<sup>2</sup>

### Invited, Keynote/Plenary/Featured:

1. The Computational Brain: Can We Extend Objective Understanding to Subjective Experience?, *Brain Awareness Week Grass Lecture*, Carleton University, April 2012
2. Neuroscience and the Future of Computing, Keynote Speech, *CSI 32nd Annual Computer Security Conference & Exhibition*, Washington, DC, November 2005 ([www.gocsi.com](http://www.gocsi.com))
3. Neuroscience and the Future of Computing, Plenary Session: Brain Research and New Technologies, *BioVision 2005*, Lyon, France, April 2005 ([www.biovision.org](http://www.biovision.org))
4. Applications of Distributed Object Technology to DIS. *The Broad Interest Session of the 12th Workshop on Standards for the Interoperability of Distributed Simulations*, Orlando, FL, March, 1995

### Other Invited:

1. Neuroinformatics Research Careers in Industry, *University of Edinburgh*, August 2013
2. A Biologically-Constrained, Computationally Grounded Theory for the Emergence of Subjective Experience, *Workshop on Conscious and Unconscious Mental Functions, International Conference on Neural Networks (ICANN)*, Lausanne, Switzerland, September 2012
3. Understanding brain function, invited lecture for a psychology class, Housatonic Community College, March, 2012
4. Innovation in Neuroscience Research, *Public Policy Forum Leadership Summit on Innovation and the Human Brain*, Toronto, May 2011
5. "The Role of High Performance Computing for Understanding the Brain," HPCS 2010 (Canada's foremost HPC conference), Toronto, ON
6. High Performance Computing for Medical Imaging and Neuroscience Research, *Supercomputing Colloquium Series*, Stony Brook University, October 2008
7. Large-scale Neural System Modeling and Analysis, *Virtual Fly Brain Workshop*, Edinburgh, June 2008
8. Opportunities and Challenges for Improved HRRT PET Reconstruction Quality and Performance using the Blue Gene/L Supercomputer, *SIAM Conference on Mathematics for Industry*, Philadelphia, PA, October 2007
9. HRRT-PET Reconstruction and Correction Opportunities, *Stockholm Brain Institute Annual Retreat at Sandhamn*, August 2007
10. Network-related Challenges and Insights from Neuroscience, *BIOWIRE Workshop*, Cambridge University, UK, April 2007
11. The Blue Brain Project, *ATNS2005 Advanced Technologies in the Neurosciences, Translational Research, Health Policy*, Cambridge, MA, October 2005 (<http://www.cimit.org/atns/about.htm>)
12. Synchronization and the Binding Problem, *The Royal Institute of Technology (Kungliga Tekniska Högskolan - KTH)*, Stockholm, Sweden, October 2005
13. Large-scale Simulations of Neural Microcircuitry, *École Polytechnique Fédérale de Lausanne (EPFL)*, Lausanne, Switzerland, November 2004
14. A Thalamo-cortical Microcircuit Model Addressing Oscillations and Run Away Excitation, *2004 Annual Meeting of the Society for Neuroscience*, San Diego, October 2004
15. Global Brain Modeling, Neurosciences Institute, San Diego, November 2000
16. Genetic Algorithms as Global Random Search Methods. *The Genetic Algorithm Group*, George Mason University, Fairfax, VA, 1995
17. Analysis of Genetic Algorithms from a Global Random Search Method Perspective with Techniques for Algorithmic Improvement. *Naval Center for Applied Research in Artificial Intelligence*, Naval Research Laboratory, Washington, DC, 1994

### Other conference:

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<sup>2</sup> Presentations not listed include product & prototype demonstrations, design proposals & reviews, standards proposals, research reviews, customer presentations, capabilities briefings, management reviews & topics, and other informal presentations.

1. Applications of Distributed Object Technology to DIS. *The 11th Workshop on Standards for the Interoperability of Distributed Simulations*, Orlando, FL, September, 1994
2. A new interpolation technique for orthogonal sets of tomographic medical images. *IEEE International Conference on Systems Engineering*, Dayton, OH, August 1991.
3. Selection of input variables for SSME parameter modeling using genetic algorithms and neural networks. *The Fourth Annual Space System Health Management Technology Conference*, Cincinnati, OH, November 1992.

Conference Posters:

1. Layer 2/3 Is A Neural Multigrid: Information Maximization In A Local Network Explains V1 Hypercolumn Formation, *COSYNE (Computational and Systems Neuroscience)*, 2007
2. An integrated cerebellum model explaining associative learning, timing prediction, and motor control,” Society for Neuroscience, Atlanta, 2006
3. Large-Scale Neocortical Simulation on Blue Gene/L, 2005 Annual Meeting of the Society for Neuroscience, Washington, DC, November 2005
4. Topographic map formation by maximizing information from naturalistic images in a microcircuit-inspired model of V1, 2005 Annual Meeting of the Society for Neuroscience, Washington, DC, November 2005
5. Mesoscopic modeling of thalamo-cortical circuitry: large-scale topology, oscillations and synchronization, 2005 Annual Meeting of the Society for Neuroscience, Washington, DC, November 2005
6. Contour Completion and Figure-Ground Separation using Self-organizing Cortical Maps, 2004 Annual Meeting of the Society for Neuroscience, San Diego, October 2004
7. Simulation Infrastructure for Modeling Large Scale Neural Systems, *Computational Science—International Conference on Computational Science 2003*, Melbourne, Australia, June 2003
8. Biometaphorical Computing, 2003 Japan/America Frontiers of Engineering Symposium, NAE, Nara, Japan, 2003
9. Biometaphorical Computing, 2002 Japan/America Frontiers of Engineering Symposium, NAE, Nara, Japan, 2002
10. Specification and Simulation of Patterned Microcircuit Connectivity in a Large-Scale Edge Node Simulator, 2002 Annual Meeting of the Society for Neuroscience, Orlando, FL, November 2002
11. Genetic algorithm based input selection for a neural network function approximator with applications to SSME health monitoring. *The 1993 IEEE International Conference on Neural Networks*, San Francisco, CA, March 1993.

## **MEDIA COVERAGE:**

Topics and interviews listed below, resulting in greater than 200 articles, internationally, on TV, radio, magazines, newspapers, web, and wire services.

### On Biometaphorical Computing:

1. Clint Bolton, Internet News, 3/17/2005
2. Clint Witchalls, freelance (New Scientist, the Economist...), 3/18/2005 & 4/4/2005
3. Mark Hachman, ExtremeTech (PC Magazine), 3/22/2005
4. Michael Kanellos, West Coast Editor-at-Large, CNET, 3/22/2005
5. Laurie Friedman IBM Media Relations for BusinessWeek, 8/15/2005

### On artificial intelligence:

6. Aaron Ricalde, Information Week, 4/12/2005

### On the ICCS paper on the LENS simulation infrastructure:

7. Fred Hapgood, Cerebrum, 6/6/2005

### On the Blue Brain Project:

8. Clint Witchalls, freelance (New Scientist, the Economist...), 6/1/2005
9. Duncan Graham Rowe, New Scientist, 6/2/2005
10. Jim Giles, Nature, 6/2/2005
11. Keith Regan, E-Commerce Times, 6/2/2005
12. Peter Sayer, IDG, 6/3/2005
13. Sal Salamone, Bio-IT World, 6/3/2005
14. Forbes, 6/3/2005
15. Tim Pricket-Morgan, ComputerWire, 6/3/2005
16. Otis Port, BusinessWeek, 6/3/2005
17. Geoff Watts, BBC Radio, 6/7/2005
18. Antimio Cruz, El Universal of Mexico, 6/10/2005
19. Matthias Matting, German Focus Magazine, 6/13/2005
20. Paola Andrea Guevera, Cambio Magazine, 6/18/2005
21. Frederica Narancio, El Pais (Uruguay), 6/15/2005
22. Dave Talbot, MIT Technology Review, 6/17/2005
23. National Geographic Online, 6/22/2005
24. Mabel Espin Noboa, Diario El Universo, 6/22/2005
25. Susan Kruglinksi, Discover Magazine, 6/23/2005
26. Superinteressante magazine of Brazil, 6/24/2005
27. Mike Huss, Biotech Sweden, 7/31/2005
28. Dana Voth, IEEE Intelligent Systems Magazine, 8/3/2005
29. Randy Atkins, NAE/WTOPS Radio, 8/9/2005
30. Paula Parisi, Hollywood Reporter, 8/9/2005
31. Marcia Franque, El Mercurio de Valparaíso newspaper, 8/29/2005
32. María Paula Ospina P., Semana Magazine, Colombia, 9/7/2005
33. Matt Hamblen, ComputerWorld (Future Watch), 9/20/2005
34. David Kushner, Wired, 9/22/2005
35. María Castillo of Diario Hoy, Ecuadorian Newspaper, 10/24/2005
36. Guillermo Hansen of IBM Agencia de Prensa, Argentina, as intermediary, 11/11/2005
37. Rupert Goodwins, ZDNet UK, 2/28/2006
38. Steve Conway, IDC, 8/16/2006
39. James Netterwald, Genomics and Proteomics Magazine, 10/13/2006
40. Producer, World of Wonder, German TV, 12/20/2006
41. Leoleli Camargo, Rafael Corrêa of Veja Magazine, Brazil, 2/23/2007

### On the relationship between nature and technology:

42. Luca Tremolada, Il Sole-24 Ore, 8/8/2005

On the Virtual Fly Brain Workshop:

43. Jasper Hamill, Sunday Herald, 6/8/2008

On brain analysis and modeling:

44. The Prophets of Science Fiction: Mary Shelley episode, on the Discovery Science channel, 11/2011

On high technology firms in Connecticut:

45. Chris Bosak, News-Times, 10/10/2016

**CORPORATE COMMUNICATIONS/ADVERTISING:**

*“What Makes You Special” and “Innovation” Campaigns:* Biometaphorical Computing interview resulting in a video webcast used in both campaigns.

## TEAM PUBLICATIONS UNDER MY SUPERVISION AND LEADERSHIP:

2013

1. P. Zivic, F. Shifres, G.A. Cecchi, "Perceptual basis of evolving Western musical styles." *Proc. Natl. Acad. Sci. USA*, 2013
2. A.T. Baria, A. Mansour, L. Huang, M.N. Baliki, G.A. Cecchi, M.M. Mesulam, A.V. Apkarian, "Linking human brain local activity fluctuations to structural and functional network architectures," *Neuroimage*, 73, 144-155, 2013
3. Irina Rish, Guillermo Cecchi, Benjamin Thyreau, Bertrand Thirion, Marion Plaze, Marie Laure Paillere-Martinot, Catherine Martelli, Jean-Luc Martinot, Jean-Baptiste Poline, "Schizophrenia as a network disease: disruption of emergent brain function in patients with auditory hallucinations." *PLoS One* 8(1), e50625, Public Library of Science, 2013
4. H Memelli, B Torben-Nielsen, J Kozloski, "Self-referential forces are sufficient to explain different dendritic morphologies." *Frontiers in Neuroinformatics*, 7(1), Frontiers Media, 2013
5. A. Ravishankar Rao and Guillermo A. Cecchi, "Capacity limits in oscillatory networks: implications for sensory coding." *International Joint Conference on Neural Networks, IJCNN, IEEE*, 2013
6. A. Ravishankar Rao, Guillermo A. Cecchi, "Multisensory integration using sparse spatio-temporal encoding." *International Joint Conference on Neural Networks, IJCNN, IEEE*, 2013
7. Irina Rish and Genady Grabarnik, "Sparse signal recovery with exponential-family noise," book chapter, *Compressed Sensing & Sparse Filtering*, Springer, 2013
8. *Sparse Modeling: Theory, Algorithms, and Applications*. Irina Rish and Genady Grabarnik, CRC Press, 1st edition, ISBN-10: 1439828695, to be released Nov, 2013

2012

9. Machine Learning and Interpretation in Neuroimaging: International Workshop. MLINI 2011, Held at NIPS 2011, Sierra Nevada, Spain, December 16-17, 2011, Revised Selected and Invited Contributions Edited by Georg Langs, Irina Rish, Moritz Grosse-Wentrup, Brian Murphy Springer, 2
10. Guillermo A Cecchi, Lejian Huang, Javeria Ali Hashmi, Marwan Baliki, María V Centeno, Irina Rish, A Vania Apkarian, "Predictive dynamics of human pain perception." *PLoS computational biology* 8(10), e1002719, Public Library of Science, 2012
11. C. Diuk, D. Fernandez Slezak, I. Raskovsky, M. Sigman and G.A. Cecchi, "A quantitative philology of introspection." *Frontiers in Integrative Neuroscience*, 2012
12. J. Honorio, D. Samaras, I. Rish, G.A. Cecchi, "Variable selection for Gaussian graphical models." *Artificial Intelligence and Statistics (AISTATS)*, pp. 538-546, MIT Press, 2012
13. I. Rish, G.A. Cecchi, K. Heuton, "Schizophrenia classification using functional network features." *SPIE Medical Imaging*, 2012.
14. I. Rish, G.A. Cecchi, K. Heuton, N.N. Baliki, A.V. Apkarian, "Sparse regression analysis of task-relevant information distribution in the brain." *SPIE Medical Imaging*, 2012.
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