

CURRICULUM VITAE**Paul Sajda, B.S., M.S.E., Ph.D.****Associate Professor of Biomedical Engineering****Columbia University**

351 Engineering Terrace, MC8904, 1210 Amsterdam Avenue, New York, NY 10027

T (212) 854-5279 **F** (212) 854-8725 **E** psajda@columbia.eduwebpage: <http://liinc.bme.columbia.edu>***A. Field of Specialization***

Neural Engineering: Computational modeling of visual processing, neuroimaging of visual function and decision making, image and signal processing in cluttered and noisy environments, brain computer interfaces which synergistically couple biological and computer vision systems, biological and machine learning.

B. Academic Training***Colleges and Universities Attended***

- 1985-1989 Undergraduate study in Bioelectrical Engineering,
Department of Electrical Engineering and Computer Science
Massachusetts Institute of Technology, Cambridge, MA
B.S. in Electrical Engineering
Bachelors Thesis: "Machine Implementation of a Human Motor Task:
The Yo-Yo Robot" (Sponsor: Prof. Christopher Atkeson)
Awarded Best Undergraduate Thesis in Electrical Engineering (Adler award)
- 1989-1994 Doctoral graduate study in Bioengineering and Computational Neuroscience,
Department of Bioengineering
University of Pennsylvania, Philadelphia, PA
M.S.E. in Bioengineering
Ph.D. in Bioengineering
Doctoral Thesis: "Reverse Engineering of Intermediate-level Vision: Surface
Segmentation and Depth-from-Occlusion" (Thesis Supervisor: Prof. Leif Finkel)
Awarded Best Doctorial Thesis in Bioengineering (Pollack award) and
Neuroscience (Flexner award)

Fellowships and Honors

- 1988 Eta Kappa Nu
- 1989 David Adler Memorial Thesis Prize for Outstanding Undergraduate Thesis
Research in Electrical Engineering, MIT
- 1989 University Fellow, University of Pennsylvania
- 1991 Graduate Fellow, Office of Naval Research National Defense Science
and Engineering
- 1993 Louis and Josepha B. Flexner Award for the Outstanding Ph.D. Dissertation
in the Neurosciences, University of Pennsylvania
- 1994 Solomon R. Pollack Award for the Outstanding Ph.D. Dissertation

	Bioengineering, University of Pennsylvania
1996	Sarnoff Technical Achievement Award for "Computer Aided Diagnosis"
2002	National Science Foundation CAREER Award
2006	Elevated to Senior Member of the IEEE
2008	Awarded Japan Society for the Promotion of Science (JSPS) Fellowship
2009	Elected Fellow of the American Institute for Medical and Biological Engineering (AIMBE)

Society Membership

Fellow	American Institute for Medical and Biological Engineering, since 2009
Sr. Member	Institute of Electrical and Electronic Engineers, since 1994
Member	Engineering in Medicine and Biology Society, since 2000
Member	American Association for the Advancement of Science, since 2000
Member	Association for Research in Vision and Ophthalmology, since 1992
Member	Society for Neuroscience, since 2002

Review and Advisory Activities

Publications Reviewed

Annals of Biomedical Engineering
 Brain Research
 Cerebral Cortex
 Computer Vision and Image Understanding
 European Conference on Computer Vision
 EURASIP Journal of Applied Signal Processing
 Frontiers in Neuroscience
 Handbook of Brain Theory and Neural Networks (editor M. Arbib)
 IEEE Signal Processing Letters
 IEEE Transactions on Biomedical Engineering
 IEEE Transactions on Medical Imaging
 IEEE Transactions on Neural Systems and Rehabilitation Engineering
 IEEE Transactions on Neural Networks
 IEEE Transaction on Pattern Analysis and Machine Intelligence
 IEEE Transactions on Systems, Man and Cybernetics
 Journal of Neural Engineering
 Journal of the Optical Society of America
 Journal of Neurophysiology
 Journal of Neuroscience Methods
 Journal of Neuroscience
 Journal of Vision
 Journal of Visual Communication and Image Representation
 Neural Network Simulation Environments (editor J. Skrzypek)
 Neural Computation
 Neural Information Processing Systems (NIPS)
 Neuroscience Letters
 PLOS Computational Biology

Proceedings of the National Academy of Science
 Signal Processing Journal
 Trends in Cognitive Science
 Vision Research

Editorial

Assoc. Ed. IEEE Transactions on Biomedical Engineering, since 2002
 Assoc. Ed. Frontiers in Perceptual Science, since 2009
 Assoc. Ed. IEEE EMBC Annual Meeting Neural Engineering Theme (3 year appt, 2008-2011)
 Co-Editor Special issue on "Blind Signal Separation and Deconvolution"
 in International Journal of Imaging Systems and Technology, 2005
 Co-Editor Special issue on "Brain Computer Interfaces", IEEE Signal Processing Magazine,
 January 2008

Society Committees

Member IEEE Defense & Engineering R&D Committee (2006-2007)
 Member IEEE EMBS Technical Committee on Medical Imaging and Image Processing
 (2007-present)
 Member IEEE EMBS Technical Committee on Neuroengineering (2008-present)

Grant Reviews

Panelist NIH Review Panel Member (NCRR) (2003-Present)
 Panelist NSF BES Review Panel (2002-Present)
 Reviewer Department of Defense (2005)
 Reviewer SERC Singapore (Mar, 2004)
 Reviewer FWF (Austria Science Foundation) Reviewer
 Reviewer Yorkshire Cancer Institute
 Reviewer CCNY University Committee on Research Awards

Conference Chairmanships and Program Committees

Session IEEE Workshop on Neural Networks for Signal Processing, 1997
 Chairman
 Co-organizer and Co-chair Workshop "Directions in Brain-Computer Interface Research", Neural
 Information Processing Systems 2001, Whistler CANADA
 Program Committee IEEE Workshop on Learning in Computer Vision and Pattern Recognition, 2003
 Program Committee IEEE EMBS Conference on Neural Engineering, 2003
 Chair, Biological Control Systems Session
 Co-chair Neural Circuits and Networks Session, IEEE EMBS, 2004
 Program Committee 2005 IEEE Workshop on Learning in Computer Vision and Pattern Recognition
 Program Committee 2nd International Conference on Neural Engineering, Washington D.C., 2005
 Organizing Committee 2006 IEEE Conference on Engineering in Medicine and Biology, New York

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and Theme
Chair

Co-organizer and Co-chair Workshop on Applied Neural Computing, (August 2006), New York

Program Committee IAPR Workshop on Cognitive Information Processing (CIP-2008), Santorini Greece

Program Committee European Signal Processing Conference (EUSIPCO08), Lausanne, Switzerland

Steering Committee IEEE EMBS Conference on Neural Engineering, 2009, Antalya, TURKEY

Organizing Committee and Theme Chair 2010 IEEE Conference on Engineering in Medicine and Biology, Buenos Aires ARGENTINA

External Invited Seminars, Colloquia & Conference Talks

June 1992 “The NEXUS Neural Simulation Environment”, McDonnell Summer Program in Cognitive Neuroscience, Dartmouth, NH

May 1993 “Reverse Engineering of Intermediate-level Vision: Surface Segmentation and Depth-from-Occlusion”, Army Research Laboratory, Aberdeen, MD

November 1993 “Surface Segmentation and Depth-from-Occlusion”, NEC Research Institute, Princeton, NJ

November 1993 “Reverse Engineering of Intermediate-level Vision: Surface Segmentation and Depth-from-Occlusion”, David Sarnoff Research Center, Princeton, NJ

November 1993 “Intermediate-level Vision: Surface Segmentation and Depth-from-Occlusion”, Rutgers University, NJ

March 1994 “Intermediate-level Vision: Surface Segmentation and Depth-from-Occlusion”, Massachusetts Institute of Technology (Media Lab), MA

September 1994 “Construction of illusory Surfaces by Intermediate-level Visual Cortical Networks”, Massachusetts Institute of Technology (Center for Biological and Computational Learning), MA

September 1994 “Data Fusion with a Hierarchical Neural Network”, ONR Workshop on Sensor Fusion, Woods Hole, MA

October 1994 “A Hierarchical Image Probability Model for Mammographic Mass Detection”, United States Senate, Washington, D.C.

November 1994 “A Hierarchical Image Probability Model for Mammographic Mass Detection”, Neural Networks in Medicine, Denver, CO

April 1995 “A Hierarchical Image Probability Model for Mammographic Mass Detection”, Rossmann Laboratories, Department of Radiology, Univ. of Chicago, IL

June 1996 “Training Neural Networks for Computer-aided Diagnosis: Experience in the Intelligence Community”, United States Congress, Washington, D.C.

- April 1997 Training Neural Networks for Computer-aided Diagnosis: Experience in the Intelligence Community”, Office of Women's Health (DHHS), Washington, D.C.
- July 1997 “Hierarchical Neural Networks for Object Recognition: Applications to Mammographic Computer-aided Diagnosis”, Princeton University, NJ
- October 1997 “Hierarchical Neural Networks for Object Recognition: Applications to Mammographic Computer-aided Diagnosis, University of Pennsylvania, PA
- April 1998 “Neuroscience-inspired Assisted Target Recognition”, National Reconnaissance Office, Washington, D.C.
- August 1998 “Training Neural Networks for Computer-Aided Diagnosis: Experience in the Intelligence Community”, Pacific Medical Technology Symposium, Honolulu, HI
- March 1999 “Neurocomputational Models for Exploiting Context in Visual Scene Analysis” SRI, Menlo Park, CA
- May 1999 “Hierarchical Neural Networks for Object Recognition: Applications to Mammographic Computer-aided Diagnosis”, School of Engineering, Harvard University, MA
- December 2000 “Neurocomputational Models for Exploiting Context in Visual Scene Analysis”, Biologically-based Computer Vision Invited Workshop, NIMA, Washington, D.C.
- September 2002 “A Multi-scale Probabilistic Network Model for Detection, Synthesis and Compression in Mammographic Image Analysis”, Department of Radiology, Medical Image Processing Group, University of Pennsylvania
- December 2002 “Multi-scale Probabilistic Models of Natural Images Applications to Medical Image Analysis”, Siemens Corporate Research, Princeton, NJ
- April 2003 “Single-trial Detection of Visual Recognition and Discrimination Events in EEG: Enabling Cognitive Interfaces”, Brain Signal Processing Group, RIKEN, JAPAN
- April 2003 “Bayesian Network Models for Inferring Intermediate-level Visual Representations” University of Tsukuba, JAPAN
- July 2003 “Single-Trial Detection of Visual Recognition and Discrimination Events in EEG: Enabling Cognitive Interfaces “Siemens Corporate Research, Princeton, NJ
- August 2003 “Scene Construction and Recognition: A Probabilistic Framework for Integration within and between Cortical Hypercolumns”, NIMA Neuroscience Enabled Computer Vision Symposium, Washington, D.C.
- August 2003 “Recovery of Constituent Spectra Using Non-negative Matrix Factorization”, SPIE Wavelets X, San Diego, CA
- September 2003 “Spatial Signatures of Visual Object Recognition Events Learned from Single-trial Analysis of EEG“, IEEE Engineering in Medicine and Biology Annual Meeting, Cancun, MEXICO
- February 2004 “Mechanisms of Spatial Summation in a Single Layer Spiking Neuron Model of Macaque Striate Cortex”, Department of Biomedical Engineering, City College of New York
- June 2004 “Single-Trial Detection of Visual Recognition and Discrimination Events in EEG”, Departments of Psychology and Cognitive Neuroscience, Princeton University

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- July 2004 “Mechanisms of Spatial Summation in a Single Layer Spiking Neuron Model of Macaque Striate Cortex”, SJTU University, Shanghai CHINA
- July 2004 “Blind Recovery of Biochemical Markers of Brain Cancer in MRSI”, Sichuan University, Chengdu CHINA
- July 2004 “Identifying the Cortical Origins of Response Time Variability: Single-Trial Detection of Visual Recognition and Discrimination Events in EEG”, Tsinghau University, Beijing CHINA
- September 2004 “Inferring Direction of Figure Using a Recurrent Integrate-and-Fire Neural Circuit”, IEEE Engineering in Medicine and Biology Annual Meeting, San Fransisco, CA
- October 2004 “Linear Spatial Weighting for Single Trial Discrimination in Electromagnetic Brain Imaging”, NIPS Workshop on Brain Computer Interfaces, Whistler & Vancouver CANADA
- October 2004 “Single-trial Detection of Visual Recognition and Discrimination Events in EEG”, Department of Biomedical Engineering, Oregon Graduate Institute, Portland, OR
- October 2004 “Mechanisms of Spatial Summation in a Single Layer Spiking Neuron Model of Macaque Striate Cortex”, Neurosciences Institute, Oregon Health Sciences University, Portland, OR
- April 2005 “Bayesian Cortical Networks for Contextual Integration”, National Geospatial-Intelligence Agency, Washington, D.C.
- April 2005 “Single-trial Detection of Visual Recognition and Discrimination Events in EEG and fMRI” Emerging Technologies in Medical Imaging, Istanbul TURKEY
- October 2005 “Cortically-coupled Computer Vision”, DARPA Neurotechnology for Intelligence Analysis, Washington, D.C.
- February 2006 “Single-trial Neuroimaging: Identifying Neural Correlates of Trial-to-Trial Behavioral Variability”, Annual Interdisciplinary Conference, Jackson Hole, WY
- May 2006 “Cortically-coupled Computer Vision”, DARPA Neurotechnology for Intelligence Analysis, Santa Fe, NM
- August 2006 “Cortically-coupled Computer Vision”, IEEE Workshop on Applied Neural Computing, New York, NY
- September 2006 “Contextual Integration in Cortical Networks”, NGA Academic Research Partnership Annual Meeting, National Academy of Sciences, Washington, D.C.
- October 2006 “Linear Multivariate Analysis of EEG for Uncovering Neural Signatures of Perceptual Decision Making”, Society for Neuroscience Satellite Workshop on Network Analyses for the Cognitive and Clinical Neurosciences: Surveys and Critiques of fMRI, PET, and MEG/EEG Applications, Atlanta, GA
- December 2006 “Cortically-coupled Computer Vision”, Workshop on Current Trends in Brain-Computer Interfacing, Whistler & Vancouver, CANADA
- February 2007 “Circuitry & Classification of V1 Simple & Complex Cells”, Annual Interdisciplinary Conference, Jackson Hole, WY
- March 2007 "Single-trial Neuroimaging: Identifying Neural Correlates of Trial-to-Trial Behavioral Variability", Department of Biomedical Engineering, University of California, Irvine. Irvine, CA
- March 2007 "Single-trial Neuroimaging: Identifying Neural Correlates of Trial-to-Trial

- Behavioral Variability", Department of Psychology, University of Glasgow, SCOTLAND
- April 2007 "Machine Learning for the Detection and Diagnosis of Disease", New York Academy of Sciences, New York, NY
- April 2007 "Single-trial Neuroimaging: Identifying Neural Correlates of Trial-to-Trial Behavioral Variability", Department of Computer Science, University of Hawaii, Honolulu, HI
- June 2007 "When Does the Brain Know That a Decision is Difficult to Make?", Human Brain Mapping Symposium on Perceptual Decision Making, Chicago, IL
- August 2007 "Spatio-temporal Linear Filters for Decoding Brain State: Application to Performance Augmentation in High-throughput Tasks", Workshop on Innovation in Computational Approaches for Brain-Machine Interfaces, Inter. Joint. Conf. on Neural Networks, Orlando FL.
- August 2007 "Spatio-temporal Linear Filters for Decoding Brain States", 2nd APCTP Summer School for Brain Dynamics, Daejeon, KOREA
- September 2007 "Using EEG and fMRI to Characterize the Cortical Networks Underlying Perceptual Decision Making in the Human Brain", Ohio State University, Columbus OH.
- February 2008 "EEG-Informed fMRI Reveals Spatiotemporal Characteristics of Perceptual Decision Making", Annual Interdisciplinary Conference, Jackson Hole, WY.
- April 2008 "Spatio-temporal Linear Filters for Decoding Brain States" DARPA Workshop on Foundations of Neurally Enabled Human Machine Interfaces, Arlington VA.
- May 2008 "Integrating EEG and fMRI for inferring Cortical Networks Underlying Rapid Decision Making", Max Planck Institute, Berlin Germany
- July 2008 "Decoding Neural Activity at Multiple Spatial and Temporal Scales: The Science and Engineering of Mind Reading", Neuromorphic Engineering Workshop, Telluride CO.
- July 2008 "Perceptual Decision Making via Sparse Decoding of Neural Activity from a Spiking Neuron Model of V1", Methods of Information Theory in Computational Neuroscience, Portland OR.
- September 2008 "Integrating EEG and fMRI for inferring Cortical Networks Underlying Rapid Decision Making" Center for Mind and Brain Studies, Princeton University, NJ.
- September 2008 "Cortical Processing Underlying Rapid Decision Making", Intelligence Science Board, Washington DC.
- September 2008 "A Large-scale Spiking Neuron Model of Visual Cortex as a Substrate for Optimizing Visual Perception", NGA Academic Research Partnership Annual Meeting, National Academy of Sciences, Washington, D.C.
- October 2008 "Integrating EEG and fMRI for inferring Cortical Networks Underlying Rapid Decision Making", RIKEN-BSI Forum, Tokyo, Japan
- October 2008 "Perceptual Decision Making via Sparse Decoding of Neural Activity from a Spiking Neuron Model of V1", Dept. of Computer Science, Tsukuba University, Japan

- November 2008 “Decoding Neural Activity at Multiple Spatial and Temporal Scales: The Science and Engineering of Mind Reading”, Institute of Statistical Mathematics, Tokyo, Japan
- April 2009 “Visually-driven Rapid Decision Making: Neuroscientific Findings and Applications to Brain Computer Interfaces”, Schnurmacher Institute for Vision Research Colloquia, SUNY State College of Optometry, New York, NY
- June 2009 “Single trial analysis of simultaneously acquired fMRI and EEG”, Bernstein Center for Computation Neuroscience, Berlin, GERMANY
- June 2009 “Single trial analysis of simultaneously acquired fMRI and EEG”, Centre for Cognitive Neuroimaging, Glasgow SCOTLAND

Internal Invited Seminars and Colloquia

- April 2001 “Predicting Motor Commands Using Magnetoencephalography (MEG)”, Neurobiology Seminar Series, Columbia University
- February 2002 “Neurocomputational Models for Medical Image Analysis: Capturing Contextual Cues for Improved Classification”, Department of Ophthalmology Research Seminar, Columbia University
- September 2002 “Linear Spatial Weighting for Single-trial Discrimination in Encephalography”, Department of Medical Informatics, Columbia University
- October 2002 “Multi-scale Probabilistic Models of Natural Images Applications to Medical Image Analysis”, Department of Applied Mathematics, Columbia University
- February 2006 “Single-trial Neuroimaging for Identifying Neural Correlates of Trial-to-Trial Behavioral Variability”, Sergievsky Center and the Taub Institute, Columbia University
- March 2006 “Single-trial Neuroimaging: Identifying Neural Correlates of Trial-to-Trial Behavioral Variability”, Department of Psychology, Columbia University
- October 2009 "Signal processing challenges for analysis of simultaneously acquired fMRI and EEG", Department of Electrical Engineering, Columbia University

Popular Press

- “The Brain”, History Channel documentary (November, 2008)
- “Brain-machine interfaces charge ahead”, Biosciences Technology (October, 2008)
- “Hacking Our Vision System” (video), IEEE Spectrum on-line (August 2008)
- “A Brainy Approach to Image Sorting”, IEEE Spectrum (April 2008)
- “Mind-Reading Machines”, Biztech (December 2007)
- “Brain-Computer Interfaces: Where Human and Machine Meet”, IEEE Computer Magazine (January 2007)
- “Aha! Someday, image analysis may take place at the speed of thought”, HSToday (August 2006)
- “Subliminal Search”, MIT Technology Review (July 2006)
- “Man and Machine Vision in Perfect Harmony”, New Scientist (July 2006)
- "This Is a Computer on Your Brain", Wired News (July 2006)
- “Eyesight to the Blind”, CIO Magazine (December 2001)

“Sensory Licenses Sarnoff Speech Enhancement Algorithms”, EE Times (May 1999)

Research Appointments

1987-1989 Research Assistant, MIT Artificial Intelligence Laboratory, MIT
 1989-1994 Research Assistant, Neuroengineering Laboratory, University of Pennsylvania
 2000-present Associate Professor, Biomedical Engineering and Radiology, Columbia University
 2000-present Director, Laboratory for Intelligent Imaging and Neural Engineering (LIINC), Columbia University
 2008-present Member, Graduate Group, Neurobiology and Behavior, Columbia University
 2008 Visiting Scientist, RIKEN Brain Sciences Institute, JAPAN

Departmental and University Committees

2000-2001 Engineering School Library Committee
 2000-2005 Biomedical Engineering Imaging Search Committee
 2000 Inaugural Symposium Hospitality Committee
 2000-2007 Biomedical Engineering Undergraduate Committee
 2000-2003 BME Sophomore Advising
 2001-2006 Chair, Laboratory Committee
 2003 Speaker, SEAS Family Weekend
 2003 Speaker, SEAS Engineering Invitationals
 2005-2006 Faculty Mediator
 2005-2007 Member of University Task Force on Diversity (chaired by Jean Howard and Norma Graham)
 2005-2007 DBME ABET Committee
 2005-2007 Chair, Undergraduate Curriculum Committee
 2006-present Member DBME Administrative Committee
 2007 Chair, BME Faculty Search Committee (Neural Engineering)
 2007 Chair, ABET Committee
 2008 Member, SEAS Global Development Team
 2008 Member Faculty Advisor Committee NWC Science Building
 2008 Member Provost Committee on the Future of Science and Engineering at Columbia
 2009 University Tenure Ad-hoc
 2010 SEAS Tenure Ad-hoc

C. Teaching Experience

Courses Taught

{Number in brackets for Columbia courses is the mean score of the overall instructor evaluation (from 1.0-lowest to 5.0-highest). Scores for individual faculty members are not available for team-taught courses. These courses are identified by [N/A].}

1989 Teaching Assistant for seminar Motor Control and Motor Learning, Massachusetts Institute of Technology

- 1992 Course Assistant for McDonnell Foundation Summer Institute in Cognitive Neuroscience, Dartmouth Medical School
- 1992 Teaching Assistant for the Introduction to Bioengineering, University of Pennsylvania
- 1993 Teaching Assistant for graduate course Computational Neuroscience and Neuroengineering, University of Pennsylvania
- 2001 Instructor, BMEN E4894, Biomedical Image Analysis (Enrollment 5 students) [4.0]
- 2001 Instructor, BMEN E6480, Computational Neural Modeling and Neuroengineering (Enrollment 5 students) [5.0]
- 2001 Director, BMEN E3810, Biomedical Engineering Laboratory I (Enrollment 40 students) [N/A]
- 2002 Instructor, BMEN E6480, Computational Neural Modeling and Neuroengineering (Enrollment 9 students) [4.5]
- 2002 Instructor, BMEN E3910, Biomedical Engineering Design (Enrollment 35 students) [4.0]
- 2002 Section Instructor, BME E3810, Biomedical Engineering Laboratory I (Enrollment 38 students) [N/A]
- 2003 Section Instructor, BMEN 6001, Advanced Quantitative Physiology (Enrollment 34 students) [N/A]
- 2003 Instructor, BMEN 3910, Biomedical Engineering Design (Enrollment 39 students) [3.5]
- 2003 Instructor, BMEN 3820, Quantitative Physiology II (Enrollment 48 students) [3.8]
- 2003 Section Instructor, BMEN 6001, Advanced Quantitative Physiology (Enrollment 42 students) [N/A]
- 2003 Section Instructor, BME E3810, Biomedical Engineering Laboratory I (Enrollment 63 students) [N/A]
- 2004 Instructor, BMEN 3910, Biomedical Engineering Design (Enrollment 43 students) [4.0]
- 2004 Instructor, BMEN E6480, Computational Neural Modeling and Neuroengineering (Enrollment 24 students) [3.9]
- 2004 Section Instructor, BME E3810, Biomedical Engineering Laboratory I (Enrollment 72 students) [N/A]
- 2004 Section Instructor, BMEN 6001, Advanced Quantitative Physiology (Enrollment 42 students) [N/A]
- 2005 Instructor, BMEN E3910, Biomedical Engineering Design (Enrollment 59 students) [4.1]
- 2005 Instructor, BMEN E4420, Biomedical Signal Processing and Signal Modeling (Enrollment 17 students) [4.0]
- 2005 Instructor, BMEN E3910, Biomedical Engineering Design (Enrollment 69 students) [3.3]
- 2005 Section Instructor, BMEN 6001, Advanced Quantitative Physiology (Enrollment 32 students) [N/A]
- 2005 Section Instructor, BME E3810, Biomedical Engineering Laboratory I (Enrollment 56 students)
- 2006 Instructor, BMEN E4420, Biomedical Signal Processing and Signal Modeling (Enrollment 13 students) [4.6]
- 2007 Instructor, BMEN E4420, Biomedical Signal Processing and Signal Modeling

- (Enrollment 8 students) [4.5]
- 2007 Instructor, BMEN E6480, Computational Neural Modeling and Neuroengineering (Enrollment 9 students) [4.4]
- 2007 Instructor, BMEN E4894, Biomedical Imaging (Enrollment 22 students) [3.6]
- 2008 Instructor, BMEN E4420, Biomedical Signal Processing and Signal Modeling (Enrollment 21 students) [4.1]
- 2008 Module Instructor BMEN E 3810, Biomedical Engineering Lab 1 (Enrollment 58 students)

Graduate Students and Postdoctoral Fellows Supervised

Postdoctoral Fellows

- Jim Wielaard, Ph.D. Postdoctoral Fellow (2001-2005). Large-scale conductance based neuronal models of primary visual cortex. Current position: Associate Research Scientist, Columbia University.
- Kyungim Baek, Ph.D. Postdoctoral Fellow (2002-2005). Bayesian models of cortical integration. Current position: Assistant Professor, University of Hawaii.
- Robin Goldman, Ph.D. (2004-2005, co-mentor with T. R. Brown). Simultaneous recordings of fMRI and EEG to assess cognition and perception. Current position: Associate Research Scientist, Columbia University.
- Mads Dyrholm, Ph.D. (2006-2008). Multivariate methods for analysis of EEG and fMRI. Current position: President of Machlea Engineering.
- Eric Pohlmeier, Ph.D. (2008-Present). Real-time, closed-loop brain computer interfaces for monitoring visual attention.

Doctoral Students

- Adam Gerson, Ph.D. (Thesis defended June 2006. Ph.D. conferred October 2006.) Currently in Medical School at University of South Florida. Dissertation title: "A System for Single-trial Spatiotemporal Analysis of the Electroencephalogram based on Linear Discrimination". Masters Thesis: "Unsupervised Unmixing Methods for Brain Signal Analysis".
- Shuyan Du, Ph.D. (Thesis defended June 2006. Ph.D. conferred October 2006) Currently Member of Research Staff Sanofi-Aventis. Dissertation title: "Machine Learning for Recovering Spectral Signatures of Disease". Awarded the Michael Merickel Award for Best Student Paper in Medical Imaging. SPIE Medical Imaging Conference (2004).
- Marios Philiastides, Ph.D. (Thesis defended May 2007, conferred October 2007.) Currently Research Scientist, Max Plank Institute, Berlin Germany. Dissertation

Title: “Spatiotemporal Characteristics of the Neural Correlates of Perceptual Decision Making in the Human Brain”. (Thesis Awarded Distinction).

- An Luo, Ph.D. (Thesis defended, May 2008, conferred October 2008) Currently Research Scientist Neurosky Inc. Thesis title “Spatio-temporal EEG Analysis for Tracking Brain State during Complex Visual Tasks”
- Xiaowei Li, Ph.D.(Thesis defended May 2007, conferred October 2007). (co-mentor with X.E. Guo) Currently Research Scientist Columbia University Medical Center. Thesis title “Topological Modeling of Trabecular Bone Imaged via CT and MRI.”
- Jianing Shi, (Candidate January 2010). Sparse Decoding of Neural Activity
- Jennifer Walz (Candidate May 2012). Simultaneous EEG and fMRI for Characterizing Perceptual Decision Making
- Dave Jangraw (Candidate May 2013). Using TMS to Identify Cortical Networks Involved in Perceptual Decision Making
- Bin Luo (Candidate May 2014). Brain-computer Interfaces for Image Retrieval

Masters Students

- Won-Young (Jason) Lee, May 2008, Perturbing cortical networks underlying perceptual decision making using transcranial magnetic stimulation.
- Sudhin Thomas M.S. May 2005, Image analysis using matrix decompositions (current position: Ph.D. candidate at Cornell).
- Michael Prerau M.S. May 2003, EEG correlates of perfect pitch (current position: Ph.D. candidate at Boston University).
- Feng Han M.S. May 2002, Probabilistic Inference in Visual Saliency (current position: Ph.D. candidate at Berkeley).
- Sakellarios Zairis May 2009. Brain Computer Interfaces for Image Triage. (current position: M.D./Ph.D. candidate at Columbia Medical School).

Undergraduate Students Supervised

- Jeremy Lewi B.S. May 2004, Machine Learning for Visual Processing, *SEAS Valedictorian* (current position: Research Engineer at Intellis Corporation).
- Gaurav Singal, May 2005, Cue Integration for Visual Tracking (current position: M.D./Ph.D. candidate at Harvard/MIT HST).
- Megan deBettencourt, May 2009, fMRI Analysis of Perceptual Decision Making

Doctoral Dissertation Committees

- Elsa D. Angelini (Advisor, A. Laine) Quantification of Cardiac Function with Real-time Three-dimensional Ultrasound
- Yinpeng Jin (Advisor, A. Laine) Multi-scale Processing for 3D Tomographic Images
- Dong-Qing Zhang (Advisor: Shih-Fu Chang, EE) Statistical Part-based Model for Object/Scene Detection
- Volodymyr Nikolenko (Advisor: Rafael Yuste, Biological Sciences) Two-photon Uncaging for Inferring Intracortical Connectivity
- Etay Ziv (Administrative Advisor: Paul Sajda; Research Advisor: Chris Wiggins, Applied Physics and Applied Math) Quantitative, Predictive Modeling of Biochemical Networks: A Machine Learning and Information-theoretic Approach
- Ting Song (Advisor: Andrew Laine) Optimization of MR Protocols for Spatial-Temporal Analysis of 4D Dynamic Renal Images
- Sandhitsu Das (Advisor: Leif Finkel, University of Pennsylvania, Dept. of Bioengineering) Cortical Mechanisms for Spatiotemporal Integration and Biological Motion Recognition
- Yingli Yang (Advisor: T.R. Brown, Chair of Thesis Committee: P. Sajda) Sequence Development and Data Processing of Echo Planar Chemical Shift Imaging
- Christoforos Christoforou (Advisors: R. Haralick and L. Parra, CCNY) The Bilinear Brain: Bilinear Methods for EEG Analysis and Brain Computer Interfaces.
- X. Henry Zhang (Advisor: X.E. Guo) High Resolution Imaging Based Patient Specific Biomechanical Assessment of Bone Quality.

D. Employment Record

1989-1994	Research Assistant, Neuroengineering Laboratory, University of Pennsylvania
1994-1996	Member of Technical Staff, Sarnoff Research Center
1996-1997	Technology Leader, Adaptive Image & Signal Processing, Sarnoff Research Center
1997-2000	Head, Adaptive Image & Signal Processing Group, Sarnoff Research Center
2000-present	Associate Professor, Biomedical Engineering and Radiology, Columbia University

Patents

4,892,405	Method and apparatus for providing quality assurance and calibration assurance in a spectrophotometer, January 1990
6,018,728,	Method and apparatus for training a neural network to learn hierarchical representations of objects and to detect and classify objects with uncertain training data, January 2000
6,208,983	Method and apparatus for training and operating a neural network for detecting breast cancer, March 2001

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- 6,324,532 Method and apparatus for training a neural network to detect objects in an image, November 2001
- 6,454,410 Mosaicing and enhancement of images for ophthalmic diagnosis and documentation, September 2002
- 7,013,283 System and method for providing programming content in response to an audio signal, March 2006
- Pending Single trial detection in encephalography, File no. AP35205 070050.2052

Consulting

- 2000-2001 Sarnoff Corporation, Princeton, NJ. Worked with technical staff and program managers to develop strategies for commercialization of several medical imaging technologies.
- 2001-2004 Biofield Corporation, Alpharetta, GA. Assisted with the development and evaluation of pattern classification techniques for a new class of breast cancer diagnostic tool. Assisting in FDA Pre-Market (PMA) Approval Process for the company's products.
- 2007-present Neuromatters LLC, New York, NY. Founder and Chairman of the Board. Design and development of Cortically-Coupled Computer Vision systems for multimedia search and retrieval.

E. Publications

Journal Publications and Rigorously Reviewed Full-Length Proceedings Papers

1. P. Sajda and L.H. Finkel (1992) NEXUS: A simulation environment for large-scale neural systems. *Simulation*:59(6), pp. 358-364.
- 2., P. Sajda and L.H. Finkel (1992) Simulating biological vision with hybrid neural networks. *Simulation*:59(1), pp. 47-55.
3. L.H. Finkel and P. Sajda (1992) Object discrimination based on depth-from-occlusion. *Neural Computation*: 4(6), pp. 901-921.
4. P. Sajda and L.H. Finkel (1994) Dual mechanisms for neural binding and segmentation and their role in cortical integration, In *Advances in Neural Information Processing Systems 6*, J. Cowan, G. Tesauro and J. Alspector, eds. pp. 993-1000.
5. L.H. Finkel and P. Sajda (1994) Constructing visual perception. *American Scientist*: 82, pp. 224-237.
6. P. Sajda and L. H. Finkel (1995) Intermediate-level visual representations and the construction of surface perception, *Journal of Cognitive Neuroscience* 7(2), pp. 267-291.
7. P. Sajda, C. Spence, S. Hsu and J. Pearson (1995) Integrating neural networks with image pyramids to learn target context, *Neural Networks* 8(7/8), pp. 1143-1152.
8. K. Sakai, P. Sajda, S.C. Yen and L. Finkel (1997) Coarse-grain parallel computing for very large scale neural simulations in the NEXUS simulation environment, *Computers in Biology and Medicine* 27(4), pp. 257-266.
9. P. Sajda and C. Spence (1998) Applications of multi-resolution neural networks to mammography, In *Advances in Neural Information Processing Systems 11*, M. J. Kearns, S. A. Solla, D. A. Cohn, eds., MIT Press, pp. 938-944.

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48. J. Wielaard & P. Sajda (2007) Effects of long-range connectivity in V1 on orientation tuning and surround suppression: Experiments using a large-scale model, *Society for Neuroscience, 37th Annual Meeting, San Diego CA, Nov 3-7*. Abstract# 920.13
49. M. Dyrholm, M.G. Philiastides, R. Goldman, T.R. Brown and P. Sajda (2007) Decoding fMRI with temporal integration: Learning the hemodynamical response function *Society for Neuroscience, 37th Annual Meeting, San Diego CA, Nov 3-7*. Abstract# 104.8
50. R. I. Goldman, M. G. Philiastides, D. Friedman, C-Y Wei, and P. Sajda (2007) Stimulus-locked and response-locked single-trial analysis for simultaneous EEG/fMRI, *Society for Neuroscience, 37th Annual Meeting, San Diego CA, Nov 3-7*. Abstract# 126.11
51. M.G Philiastides and P. Sajda (2007) EEG-informed fMRI reveals the cortical origins of temporally-specific EEG components identified during perceptual decision making, *Society for Neuroscience, 37th Annual Meeting, San Diego CA, Nov 3-7*. Abstract# 232.4
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53. J. Shi, J. Wielaard and P. Sajda (2008) Sparse decoding of neural activity in a spiking neuron model of V1. *Computational and Systems Neuroscience Meeting, Salt Lake City, UT, #321*.
54. C.W. Wei, R.I. Goldman, P. Sajda and T.R. Brown (2008) Effects of High Field MR Scanner on Simultaneous EEG Data Quality for Single-Trial Discrimination, *International Society for Magnetic Resonance in Medicine 15th Scientific Meeting & Exhibition, Toronto Canada, May 3-9*, Abstract #3625.
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57. M.G. Philiastides, P. Sajda, H. Heekeren (2009) Categorization of accumulated sensory evidence: a flexible link between decision and action, *Cognitive Neuroscience Society Annual Meeting, March 21-24, 2009, San Francisco, CA, F94*.
58. A. Luo, L.C. Parra and P. Sajda (2009) We Find Before We Look: Neural Signatures of Target Detection Preceding Saccades During Visual Search, *Journal of Vision*.
59. J. Shi, J. Wielaard, R.T. Smith, P. Sajda (2009) Perceptual Consequences of Macular Disease Evaluated Using a Model of V1, *ARVO 2009 #3057*.
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61. J. Wielaard and P. Sajda (2009) Inferring circuitry from spike trains in large-scale models of LGN and V1, *Society for Neuroscience Annual Meeting, Chicago IL, Oct 17-22*. Abstract# 261.7/X.5
62. P. Sajda and L.C. Parra (2009) Coupling neural correlates of rapid decision making with computer vision to enable visual information triage, *Society for Neuroscience Annual Meeting, Chicago IL, Oct 17-22*. Abstract#306.2

63. J. Shi, J. Wielaard and P. Sajda (2009) Modeling attention via conductance changes in LGN and primary visual cortex, *Society for Neuroscience Annual Meeting, Chicago IL, Oct 17-22*. Abstract#804.6

Publications outside primary research area

1. X.E. Guo, L. Wei, P. Sajda and A.F. Laine (2003) New finite element modeling technique of trabecular bone based on digital topological analysis. In *Medical Imaging 2003: Image Processing*, Kenneth M. Hanson, Editor, Proceedings of SPIE Vol. 5032
2. L. Wei, P. Sajda, A.F. Laine, X.E. Guo (2003) A novel approach to model trabecular bone using topological image analysis, *49th Annual Meeting of the Orthopaedic Research Society*.
3. X.S. Liu, P. Sajda, P.K. Saha, F. Wehrli and X.E. Guo (2004) Skeleton micro-architecture predicts elastic modulus of trabecular bone, *2004 BMES Annual Meeting*, Abstract# 447.
4. X.S. Liu, P.K. Saha, F. Wehrli, P. Sajda, X.E. Guo (2005) Contribution of micro-architecture to the elastic modulus of trabecular bone. *Transactions of the 51th Annual Meeting of the Orthopaedic Research Society*, Washington, D.C., February 20-23, Abstract #192.
5. X.S. Liu, P. Sajda, P.K. Saha, F. Wehrli and X.E. Guo (2005) A 3D morphological analysis based on individual trabeculae segmentation for human trabecular bone, *Biomedical Engineering Society Annual Meeting*, Baltimore, MD, September 28-October 1, Abstract# 952.
6. X.S. Liu, A.H. Huang, P. Sajda, X.E. Guo (2006) Simulating 3D architectural and mechanical changes in human trabecular bone during menopause, *Transactions of the 51st Annual Meeting of the Orthopaedic Research Society*, Chicago, IL March 19-22.
7. X.S. Liu, P. Sajda, P.K. Saha, F.W. Wehrli, X.E. Guo (2006) A 3D morphological analysis of trabecular bone based on individual trabeculae segmentation, *Transactions of the 51st Annual Meeting of the Orthopaedic Research Society*, Chicago, IL March 19-22, 2006
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9. X.S. Liu, A.H. Huang, P. Sajda, X.E. Guo (2006) Realistic simulation of 3D architectural and mechanical alterations in human trabecular bone during menopause, *ASME Summer Bioengineering Conference*, Amelia Island, FL, June 22-26.
10. X.S. Liu, A. Gupta, G. Bevill, P. Sajda, K.M. Keaveny, X.E. Guo (2006) Micromechanical analysis of human vertebral trabecular bone at individual trabecula level, *ASME Summer Bioengineering Conference*, Amelia Island, FL, June 22-26, 2006.
11. X.S. Liu, P. Sajda, P.K. Saha, F.W. Wehrli, X.E. Guo (2006) Quantification of the roles of trabecular micro-architecture and trabecular type in determining the elastic modulus of human trabecular bone, *Journal of Bone and Mineral Research*, 21(10) 1608-1617.
12. X.S. Liu, A.H. Huang, **P. Sajda**, X.E. Guo (2006) Realistic simulation of 3D architectural and mechanical alterations in human trabecular bone during menopause, *5th World Congress of Biomechanics*, Munich GERMANY, July 29-August 4, 2006.
13. X.E. Guo, X.S. Liu, P. Sajda (2006) Simulation of 3D architectural and mechanical changes in human trabecular bone during menopause, *2006 Biomedical Engineering Society Annual Meeting*, Chicago, IL, October 11-14, 2006.

14. X.S. Liu, **P. Sajda**, X.E. Guo (2006) Simulating microstructural and mineralization changes during the treatment of postmenopausal osteoporosis by bisphosphonate, *53rd Annual Meeting of the Orthopaedic Research Society*, San Diego, CA, February 11-14, 2007.
15. X.H. Zhang, X.S. Liu, P. Sajda, P.K. Saha, F.W. Wehrli, X.E. Guo (2007) Roles of trabecular rods in determining elastic moduli of human vertebral trabecular bone, *53rd Annual Meeting of the Orthopaedic Research Society*, San Diego, CA, February 11-14, 2007.
16. X.S. Liu, **P. Sajda**, P.K. Saha, F.W. Wehrli, G. Bevill, T.M. Keaveny and X.E. Guo, (2007) Orientation analyses of individual trabecular plates and rods: An application of complete volumetric decomposition, *ASME 2007 Summer Bioengineering Conference*, Keystone, CO, June 20-24, 2007.
17. X.S. Liu, X.H. Zhang, P. Sajda, P.K. Saha, F.W. Wehrli and X.E. Guo (2007) Contributions of trabecular rods of various orientations in determining the elastic properties of human vertebral trabecular bone, *ASME 2007 Summer Bioengineering Conference*, Keystone, CO, June 20-24, 2007.
18. X.S. Liu, A.H. Huang, X.H. Zhang, P. Sajda, B. Ji and X.E. Guo (2008) Dynamic simulation of three dimensional architectural and mechanical alterations in human trabecular bone during menopause, *Bone*. Aug;43(2):292-301
19. X.S. Liu, G. Bevill, T.M. Keaveny, P. Sajda, X.E. Guo (2009) Micromechanical analyses of vertebral trabecular bone based on individual trabeculae segmentation of plates and rods, *J Biomech*. Feb 9;42(3):249-56

F. Research Grants and Contracts Awarded

Active Grants

Those in which Principal Investigator or co-Principal Investigator

Title	Sponsor/Agency	Amount (total cost)	Dates
Multimodal Neuroimaging for Mapping Decision Making in the Human Brain R01- MH085092-01A1 (Sajda, PI)	NIH/NIMH	\$1,772,320	8/09-7/14
Cortically-Coupled Computer Vision Phase 3 N10PC20050 (Sajda, PI)	DARPA ¹	\$1,419,028	2/10-8/11
Cortically-Coupled Computer Vision Phase 2 NBCHC080029 (Sajda, PI)	DARPA ¹	\$2,885,252	10/07-04/10
A Large-Scale Spiking Neuron Model of Visual Cortex as a Substrate for	NGA	\$513,627	3/07-10/10

¹ DARPA: Defense Advanced Project Agency

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Optimizing Visual Perception
HM1582-07-1-2002
(Sajda, PI)

Those in which co-Investigator

Biomedical Image Engineering of Macular Images 1R01EY015520-01A2 (Smith, PI; Sajda, Co-I)	NIH/NEI	\$2,551,292	9/05-9/10
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Implicit Learning In Osteocyte Network Under Mechanical Loading 1RC1AR058453-01 (Guo, PI; Sajda, Co-I)	NIH/NIAMS	\$1,000,000	9/9-8/11
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Micro-Mechanical Modeling of Trabecular Bone 1R01AR051376-01A1 (Guo, PI; Sajda, Co-I)	NIH/NIAMS	\$2,265,826	5/06-5/11
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Training Grants and Conference Grants

Title	Agency	Amount	Dates
Workshop on Hybrid Neuro-Computer Vision Systems IIS- 0958402 Change and Sajda (co-PIs) Columbia University Vision Training Grant (Sajda, Mentor)	NSF NIH/NEI	\$50,000 NA	10/09-7/10 01-present

Past Grants

A Non-invasive Single-trial In Vivo Neuroimaging System (R21/R33 EB004730) (Sajda, PI)	NIH/NIBIB ²	\$1,470,000	8/04-7/09
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Cortically-Coupled Computer Vision HM1582-05-C-0043 (Sajda, PI)	DARPA ³ /NGA	\$1,064,288	10/05-9/07
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² NIH/NIBIB: National Institutes of Health/National Institute for Biomedical Imaging and Bioengineering

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CAREER: Probabilistic Models for Integrating Biochemical and Morphological Markers for Cancer (BES-01-3380) (Sajda, PI)	NSF4	\$367,257	6/02-5/07
Bayesian Cortical Networks for Contextual Integration HM1582-05-C-0008 (Sajda, PI)	NGA ⁵	\$977,000	10/04-9/07
Bayesian Hypercolumns for Intelligent Image Analysis (N00014-01-1-0625) (Sajda, Co-PI)	ONR/MURI	\$917,010	5/01-4/07
Metabolic Patterns in ¹ H NMR Spectra of Biofluids, R33 (DK070301-01) (Brown, PI. Sajda, Co-PI)	NIH/NIDDK	\$1,900,000	9/04-7/08
Augmented Visual Search with Real-Time EEG Analysis (Sajda, PI)	DARPA	\$174,000	5/03-12/04
Scene Construction and Recognition: A Probabilistic Framework for Integration Within and Between Cortical Hypercolumns (NMA201-02-C-0012) (Sajda, PI)	NIMA	\$313,375	10/01-10/04
Neural Models for Perceptual Salience for Augmented Cognition (#4900000156) (Sajda, PI)	DARPA	\$22,926	3/03-12/03
Adaptive Brain-Computer Interfaces for Augmented Cognition and Action (Sajda, Co-PI)	DARPA	\$325,151	4/02-12/03
Development of an MEG Brain-Computer Interface (Sajda, PI)	NIMA/Sarnoff	\$75,498	9/00-6/01

³ DARPA: Defense Advanced Project Agency

⁴ NSF: National Science Foundation

⁵ NGA: National Geospatial-Intelligence Agency

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Information Theory for Computer-Aided Diagnosis (DAMD17-98-1-8061) (<i>Sajda, PI</i>)	U.S. Army Medical Command	\$475,000	8/98-8/01
Medical Technology Transfer and Development (<i>Sajda, PI</i>)	NIMA/DARPA	\$2,000,000	3/00-7/01
Perceptually Optimized Workstation for Image Analysts (<i>Sajda, PI</i>)	NIMA	\$275,000	8/99-7/00
Neuroscience Inspired Image Analysis (<i>Sajda, PI</i>)	NIMA	\$300,000	4/98-6/99
Pattern Analysis Algorithms for Breast Cancer Detection (<i>Sajda, PI</i>)	Biofield Corporation	\$750,000	6/97-2/99
Breast Cancer Technology Transfer (<i>Sajda, Co-PI</i>)	NRO ⁶	\$1,000,000	10/96-12/98
Clinical Evaluation of Intelligence Community Computer-Aided Diagnosis Technologies (DHHS no. 282-96-0026) (<i>Sajda, Co-PI</i>)	DHHS ⁷	\$150,000	9/96-12/98

⁶ NRO: National Reconnaissance Office

⁷ DHHS: Department of Health and Human Services (DHHS)