

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

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

T (212) 854-5279 F (212) 854-8725 E [psajda@columbia.edu](mailto:psajda@columbia.edu)webpage: <http://iinc.bme.columbia.edu>**Field of Specialization**

Neural Engineering: Using principles of reverse neuroengineering to characterize the cortical networks underlying perceptual and cognitive processes, such as rapid decision making, in the human brain. My laboratory pursues both basic and applied neuroscience research projects, with emphasis on non-invasive multi-modal neuroimaging, visual perception, brain-computer interfaces, application of machine learning to analysis of neural data and computational modeling of large neural systems.

**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 Doctoral Thesis in Bioengineering (Pollack award) and  
Neuroscience (Flexner award)

**Research Appointments and Employment**

- 1987-1989 Research Assistant, MIT Artificial Intelligence Laboratory, MIT  
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  
2000-2012 Associate Professor, Biomedical Engineering and Radiology,  
Columbia University

- 2012-present 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
- 2015-present Visiting Professor, University of Glasgow

### **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)
- 2011 Elected Editor-in-Chief of IEEE Transactions on Neural Systems and Rehabilitation  
Engineering
- 2012 Elected Fellow of the IEEE
- 2012 National Academies Keck's Future Initiative (NAKFI) Invited Member: "The Informed  
Brain in a Digital World"
- 2016 Elected Fellow of the AAAS

### **Society Membership**

- Fellow American Association for the Advancement of Science, since 2000
- Fellow American Institute for Medical and Biological Engineering, since 2009
- Fellow Institute of Electrical and Electronic Engineers, since 1994
- Member Engineering in Medicine and Biology Society, since 2000
- Member Association for Research in Vision and Ophthalmology, since 1992
- Member Association for Computing Machinery, since 2010
- Member Society for Neuroscience, since 2002

### **Offices Held in Professional Societies**

- Chair IEEE BRAIN Initiative (2015-present)

Member	Non-voting member of IEEE Administrative Committee (2011-present)
Member	Publications Committee of IEEE EMBS (2011-present)
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)

### **Editorships of Journals or Other Scholarly Publications**

Editor in Chief	IEEE Transactions on Neural Systems and Rehabilitation Engineering (2012-2017)
Assoc. Ed.	IEEE Transactions on Biomedical Engineering, since 2002
Assoc. Ed	IEEE Transactions on Neural Systems and Rehabilitation Engineering
Assoc. Ed	Frontiers in Perceptual Science, since 2009
Assoc. Ed.	IEEE EMBC Annual Meeting Neural Engineering Theme (2008-2017)
Review Ed.	Frontiers in Decision Sciences, since 2010
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
Co-Editor	Special issue on "Single-trial analyses of behavioural and neuroimaging data in perception and decision-making", Frontiers in Perceptual Science 2011
Co-Editor	Special Issue of the Proceedings of the IEEE, Advanced NeuroTechnologies for Brain Initiatives (ANTBI), 2017

### **Conference Chairmanships and Program Committees**

Session Chairman	IEEE Workshop on Neural Networks for Signal Processing, 1997
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	2 <sup>nd</sup> International Conference on Neural Engineering, Washington D.C., 2005
Organizing Committee and Theme Chair	2006 IEEE Conference on Engineering in Medicine and Biology, New York

Co-organizer and Co-chair  
Program Committee 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  
Program Committee 2011 International Conference on Machine Learning (ICML), Seattle WA  
Program Committee 2011 IEEE International Conference on Neural Engineering, Cancun MEXICO  
Technical Program co-Chair 2011 IEEE CAS-FEST Workshop on Brain Machine Interfaces, Rio de Janeiro, BRAZIL  
Organizing Committee and Theme Chair 2011 IEEE Conference on Engineering in Medicine and Biology, Boston MA  
Co-Organizer (2013) NSF Workshop on Mapping the Brain, Arlington, VA.  
Program Committee 2013 IEEE International Conference on Neural Engineering, San Diego, CA  
Steering Committee 2015 IEEE BRAIN Grand Challenges Workshop, Washington, DC.  
International Program Committee 2015 IEEE International Conference on Neural Engineering, Montpellier, FRANCE  
Program Committee 2015 4<sup>th</sup> International Workshop on Symbiotic Interaction, Berlin GERMANY  
Co-Chair 2015 Army Research Lab Workshop on Brain Computer Interfaces, Aberdeen MD  
Co-Program Chair 2017 IEEE International Conference on Neural Engineering, Shanghai CHINA

### Review Panels

Panelist NIH Review Panel Member (NCR, CVP, SEP, BRAIN) (2003-Present)  
Panelist NSF Review Panel Member (BES, IIS, CRCNS) (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  
 Reviewer British MRC (2011)  
 Reviewer Wellcome Trust

### **Publications Reviewed**

Annals of Biomedical Engineering, Brain Research, Cerebral Cortex, Computer Vision and Image Understanding, Current Biology, European Conference on Computer Vision, EURASIP Journal of Applied Signal Processing, Experimental Brain Research, Frontiers in Decision Sciences, Frontiers in Neuroscience, Frontiers in Perceptual Science, Handbook of Brain Theory and Neural Networks (editor M. Arbib), Human Brain Mapping, 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, Psychophysiology, PLOS Computational Biology, Proceedings of the National Academy of Science (PNAS), Signal Processing Journal, Trends in Cognitive Science, Vision Research

### **Invited Talks**

#### ***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
- 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", 2<sup>nd</sup> 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
- February 2010 “Sparse decoding of neurodynamics generated by a large-scale model of V1”, Annual Interdisciplinary Conference, Jackson Hole, WY.
- February 2010 “Cortically-coupled Computer Vision”. Invited Keynote Address at 2010 International Conference in Intelligent User Interfaces, Hong Kong CHINA.
- May 2010 “Cortically-coupled Computer Vision”. Translational Neuroscience Branch, Army Research Laboratory, Aberdeen, MD.
- June 2010 “Finding the Needle in the Haystack with BCI”, Invited speaker, Beyond Brain Machine Interface Workshop: From Senses to Cognition, Long Beach, CA.
- September 2010 “Working with DARPA as an Academic”, invited keynote speaker at DARPA Young Faculty Award Ceremonies. Arlington VA.
- October 2010 “Single-trial Analysis of Simultaneously Acquired fMRI and EEG: A Window Into Latent Brain States”, Psychology Colloquium, Princeton University.
- December 2010 “Single-trial Analysis of Simultaneously Acquired fMRI and EEG: A Window Into Latent Brain States”, Bioengineering Seminar Series, University of Pennsylvania
- February 2011 “Cortically-Coupled Computer Vision: A Closed-loop BCI for Image Search”, Annual Interdisciplinary Conference, Jackson Hole, WY.
- March 2011 “Single-trial Analysis of Simultaneously Acquired fMRI and EEG: A Window Into Latent Brain States”, Biomedical Engineering Seminar Series, University of Minnesota.
- June 2011 “Cortically-Coupled Cognitive Navigation”, DARPA BioNav Workshop, Washington DC.
- July 2011 “Cortically-Coupled Computing: A Paradigm for Mutually-Derived Situational Awareness “Army Research Laboratory, Aberdeen Maryland.
- October 2011 “Cortically-coupled Computer Vision”, ARO Workshop on Decision Making, Evanston, IL.
- October 2011 "Single-trial Analysis of Simultaneously Acquired fMRI and EEG: A Window into Latent Brain States", Department of Biomedical Engineering, Johns Hopkins University
- June 2012 “Cortically-Coupled Computing for Media Retrieval”, Keynote talk at *ACM International Conference on Multimedia Retrieval*, Hong Kong, CHINA
- June 2012 “Cortically-Coupled Computing for Image Search”, Invited Plenary 2nd Beijing BCI Symposium, Tsinghau University, CHINA.

- October 2012 “Cortically-Coupled Computing for Image Search”, Bioengineering Seminar Series, Georgia Tech, GA
- March 2013 "Using Simultaneous EEG/fMRI to Elucidate the Cortical Networks Underlying Rapid Decision Making and Perceptual Discrimination", Workshop on Multimodal Neuroimaging, Institute for Pure & Applied Mathematics UCLA
- June 2013 “Multimodal Neuroimaging of Perceptual Decision Making”, Workshop on Neuroimaging Data Analysis, Statistical and Applied Mathematical Sciences Institute, NC.
- September 2013 “Neurally and ocularly informed graph-based models for searching 3D environments” Mathematical Biosciences Institute Colloquium, Ohio State University, OH.
- November 2013 “Neurally and ocularly informed graph-based models for searching 3D environments” Plenary Speaker, IEEE Neural Engineering Conference, San Diego CA.
- January 2014 “Simultaneous EEG/fMRI: Why Bother?” The Center for Biomedical Imaging, Medical University of South Carolina, Charleston, SC.
- February 2014 “Neurally and ocularly informed graph-based models for searching 3D environments” Swartz Center for Cognitive Neuroscience, San Diego CA.
- March 2014 “Simultaneous EEG/fMRI: Why Bother?”, Center for Functional fMRI, UCSD, San Diego CA.
- March 2014 “Your eyes give you away: Pupillary responses, EEG dynamics, and applications for BCI”, Institute for Neural Computation, UCSD, San Diego CA.
- June 2014 “Your eyes give you away: Pupillary responses, EEG dynamics, and applications for BCI”, JHU-APL Applied Neuroscience Seminar, Baltimore MD
- October 2014 “Capturing the "Aha" Moment: Neural Dynamics of Attentional Orienting in the Human Brain”, Invited Seminar Department of Biomedical Engineering, Johns Hopkins University, MD.
- November 2014 "Neural Correlates of Spatiotemporal Event Recognition: Application to Brain-Computer Interfaces for Video Exploitation", Keynote address, International Workshop on Perception Inspired Video Processing, ACM Multimedia 2014 conference, Orlando FL.
- January 2015 Neural Correlates of the “Aha” Moment: Enabling brain-computer interfaces for labeling our environment, NYC Machine Learning Seminar, NY, NY.
- May 2015 “Capturing the "Aha" Moment: Neural Dynamics of Attentional Orienting in the Human Brain” Computational Biology Center Seminar, IBM Watson Research, Yorktown Heights, NY
- October 2015 “Capturing the "Aha" Moment: Neural Dynamics of Attentional Orienting in the Human Brain” ECE Distinguished Speaker Series, University of Texas, San Antonio, San Antonio TX
- October 2015 “Capturing the "Aha" Moment: Neural Dynamics of Attentional Orienting in the Human Brain” BME Seminar Series, City College of New York, CUNY, New York, NY.
- November 2015 “Capturing the "Aha" Moment: Neural Dynamics of Attentional Orienting in the Human Brain” BME Seminar Series, NJIT, Newark, NJ.
- October 2016 "Neural Correlates of the 'Aha' Moment: Enabling Brain-Computer Interfaces for Labeling Our Environment". Invited Plenary Speaker, SMC

- Brain Machine Interface Workshop, Budapest Hungary.
- November 2016 "Neural correlates of enhanced perception-action coupling in rapid decision making: Lessons from baseball", Plenary Speaker, pre-SFN Workshop on Advanced Neurotechnologies for Brain Initiatives. San Diego CA.
- December 2016 "Neural Correlates of the 'Aha' Moment: Enabling Brain-Computer Interfaces for Labeling Our Environment". Invited MNE and IEEE Seminar Virginia Commonwealth University, Richmond Virginia

### ***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
- November 2011 "Single-trial Analysis of Simultaneously Acquired fMRI and EEG: A Window into Latent Brain States", New York State Psychiatric Institute
- March 2013 "Multimodal Neuroimaging of Perceptual Decision Making", University Seminar, Cognitive and Behavioral Neuroscience
- September 2014 "Measuring the Brain's 'Aha' Moment", Explore the Frontiers of the Mind, Zuckerman Mind Brain and Behavior Institute, Carlyle Hotel, NY NY
- March 2016 "Neural correlates of enhanced perception-action coupling in rapid decision making: Lessons from baseball" Teachers College Neuroscience Seminar Series, Columbia University, NY, NY

### ***Popular Press***

- May 1999 "Sensory Licenses Sarnoff Speech Enhancement Algorithms", EE Times
- Oct 1999 "Spies in the Sky vs. Breast Cancer: High Tech Wizards Spotting Tumors Missed by Doctors", New York Daily News
- Dec 2001 "Eyesight to the Blind", CIO Magazine
- Jul 2006 "This Is a Computer on Your Brain", Wired News
- Jul 2006 "Man and Machine Vision in Perfect Harmony", New Scientist
- Jul 2006 "Subliminal Search", MIT Technology Review

Aug 2006	“Aha! Someday, image analysis may take place at the speed of thought”, HSToday
Jan 2007	“Brain-Computer Interfaces: Where Human and Machine Meet”, IEEE Computer Magazine
Dec 2007	“Mind-Reading Machines”, Biztech
Apr 2008	“A Brains Approach to Image Sorting”, IEEE Spectrum
Aug 2008	“Hacking Our Vision System” (video), IEEE Spectrum on-line
Oct 2008	“Brain-machine interfaces charge ahead”, Biosciences Technology
Nov 2008	“The Brain”, History Channel documentary
Feb 2010	“Your Brain’s Search Engine”, Forbes Video Breakout
Nov 2010	“Computers Get Help from the Human Brain”, MIT Technology Review
Dec 2010	“Computer Vision”, Radio Interview, WTOP and National Academy of Engineering
Oct 2011	“Ailment: Too Much Information Cure: Mind-Reading Machines”, Discover Magazine
Nov 2011	“Black Friday, and Happy Christmas Shopping from your neurons!”, Significance Magazine
Mar 2012	BBC Documentary “Out of Control”, highlighted research on brain computer interfaces for image search
Jul 2012	“From Bench to Bunker How a 1960s discovery in neuroscience spawned a military project”, The Chronicle of Higher Education
Mar 2013	“This is Your Brain on Baseball”, Psychology Today
Dec 2013	“The Power of the Unconscious”, BBC World Radio
Dec 2013	“Five Mysteries of the Brain”, BBC News
May 2014	“Wearable Computers Will Transform Language” IEEE Spectrum
July 2014	“NeuroScout Gets into Batters’ Heads to Rate Hitters”, Scientific American
Jan 2015	“THE NEXT BIG BRANIAC”, New York Observer
Jun 2015	“Those Virtual Feelings”, Motherboard
July 2015	“Take me out to the Brain Game”, SB Nation
Nov 2015	“New IEEE Brain Initiative A No-Brainer” IEEE Technical Community Spotlight
Aug 2016	“Scientists examine what happens in the brain when a bat tries to meet a ball”, The Washington Post

### 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
2011-12	Chair, Neuroengineering Faculty Search Committee
2013-	Co-Director, Center for Neural Engineering and Computation (CNEC)
2013-	Executive Committee, Columbia Data Science Institute (DSI)
2014-	Advisory Committee, Presidential Scholars in Society and Neuroscience

### **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)
- 2010 Instructor, BMEN E4420, Biomedical Signal Processing and Signal Modeling (Enrollment 14 students) [4.3]
- 2010 Instructor, BMEE E6030, Neural Modeling and Neuroengineering (Enrollment 6 students) [4.7]
- 2011 Instructor, BMEN E4420, Biomedical Signal Processing and Signal Modeling (Enrollment 15 students) [3.8]
- 2011 Instructor: EEBM E6099: Topics in Computational Neuroscience and Neuroengineering: Brain Computer Interfaces (Enrollment 16 students) [3.7]
- 2013 Instructor, BMEN E4420, Biomedical Signal Processing and Signal Modeling (Enrollment 26 students) [4.6]
- 2013 Instructor, BMEE E6030, Neural Modeling and Neuroengineering (Enrollment 5 students) [4.5]
- 2013 Instructor, BMEN E4420, Biomedical Signal Processing and Signal Modeling (Enrollment 23 students) [4.0]
- 2014 Instructor: EEBM E6099: Topics in Computational Neuroscience and Neuroengineering: Brain Computer Interfaces (Enrollment 17 students) [4.9]
- 2015 Instructor, BMEN E4420, Biomedical Signal Processing and Signal Modeling (Enrollment 33 students) [4.25]

- 2015 Instructor, BMEN E4010, Biomedical Signal Processing and Signal Modeling (Enrollment 85 students) [4.35]
- 2016 Instructor, BMEN E4420, Biomedical Signal Processing and Signal Modeling (Enrollment 15 students) [4.33]

### Graduate Students and Postdoctoral Fellows Supervised

#### *Postdoctoral Fellows*

- Jim Wielaard, Ph.D. (CCNY) 2001-2005. Large-scale conductance based neuronal models of primary visual cortex. Current position: Industry Consulting Associate Professor, NYU.
- Kyungim Baek, Ph.D. (University of Colorado) 2002-2005. Bayesian models of cortical integration. Current position: Assistant Professor, University of Hawaii.
- Robin Goldman, Ph.D. (UCLA) 2004-2005, co-mentor with T. R. Brown. Simultaneous recordings of fMRI and EEG to assess cognition and perception. Current position: Research Scientist, University of Wisconsin, Madison.
- Mads Dyrholm, Ph.D. (Technical University of Denmark) 2006-2008. Multivariate methods for analysis of EEG and fMRI. Current position: DSP Engineer, Jabra.
- Eric Pohlmeier, Ph.D. (Northwestern) 2008-2010. Real-time, closed-loop brain computer interfaces for monitoring visual attention. Current position: Research Scientist, Johns Hopkins University Applied Physics Lab.
- Jason Sherwin, Ph.D. (Georgia Tech) 2010-2014. Situational awareness and the human brain. Current position: Research Assistant Professor, SUNY Downstate; CEO deCervo LLC.
- Bryan Conroy, Ph.D. (Princeton University) 2010-2013. Mathematical models for fusing simultaneous EEG and fMRI. Current position: Member of Research Staff, Philips Research North America.
- Sergül Aydore Ph.D. (USC) (2014-2015) Deep learning for neural signal processing. Current position: JP Morgan Chase Data Science Analytics
- Stefan Haufe Ph.D. (Technical University of Berlin, Marie Curie Fellow) 2014-2015. Simultaneous EEG-fMRI for assessment of Major Depressive Disorder.
- Sameer Sapuro, Ph.D. (UCSD) 2014-2016. Neural markers of cognitive workload and decision confidence.
- Noam Schneck Ph.D. (Swarthmore) 2014-Present. Tracking neural markers of psychiatric disease.

- Nick Waytowitch Ph.D (Old Dominion) 2015-Present. Real-time brain-computer interface systems. Joint postdoc with Army Research Laboratory
- Josef Faller Ph.D. (TU Berlin) 2015-Present. Real-time measurement of cognitive control during an aircraft boundary avoidance task.
- Andrew Goldman (University of Oxford) 2015-Present. Neural basis for musical improvisation

### *Doctoral Students*

- Adam Gerson, Ph.D. (Thesis defended June 2006. Ph.D. conferred October 2006.)  
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". Current position: MD at the University of South Florida.
- Shuyan Du, Ph.D. (Thesis defended June 2006. Ph.D. conferred October 2006)  
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). Currently position: Research Staff, Bristol-Meyers Squibb.
- Marios Philiastides, Ph.D. (Thesis defended May 2007, conferred October 2007.)  
Dissertation title: "Spatiotemporal Characteristics of the Neural Correlates of Perceptual Decision Making in the Human Brain" (Thesis Awarded Distinction). Currently position: Associate Professor, University of Glasgow.
- An Luo, Ph.D. (Thesis defended, May 2008, conferred October 2008) Dissertation title: "Spatio-temporal EEG Analysis for Tracking Brain State during Complex Visual Tasks". Current position: Director of Research, Neurosky Inc.
- Xiaowei Li, Ph.D.(Thesis defended May 2007, conferred October 2007). (co-mentor with X.E. Guo) Dissertation title: "Topological Modeling of Trabecular Bone Imaged via CT and MRI." Current position: Assistant Professor, University of Pennsylvania.
- Jianing Shi, (Thesis defended February 2010, conferred May 2010). Dissertation title: "Linking Neural Activity with Perceptual Decision Making via Sparse Decoding". Current position: co-Founder Zap Surgical Systems and FemtoMetrix.
- Jennifer Walz (Thesis defended November 2013, conferred May 2014). Dissertation title: "Exposing Internal Attentional Brain States using Single-Trial EEG Analysis with Combined Imaging Modalities". Current position: Postdoctoral fellow, Florey Institute of Neuroscience and Mental Health.
- Xiaowei Zou (Thesis defended March 2014, conferred May 2014; co-sponsor with T.R. Brown MUSC) Dissertation title: "Magnetic Resonance Imaging Applications of Pseudo-



Random Amplitude Modulation”. Current position: Postdoctoral fellow, UCSF.

- David Jangraw (Thesis defended May 2014, conferred May 2014). Dissertation title: “Neural and Ocular Signals Evoked by Visual Targets in Naturalistic Environments”. Current position: Postdoctoral fellow, NIH/NIMH.
- Bin Lou (Thesis defended Feb 2015, conferred May 2015). Dissertation title: “The Time Course of a Perceptual Decision: Linking Neural Correlates of Pre-stimulus Brain State, Decision Formation and Response Evaluation”
- Jordan Muraskin (Thesis defended April 2015, conferred May 2015). Tentative dissertation title: “Using neuroimaging to investigate the effect of expertise on rapid perceptual decision making”
- Linbi Hong (Candidate December 2016): Correlations Between Trial-to-trial Variations in EEG and Pupil Size Reveals Neural Correlates of the Locus Coeruleus.
- Tao Tu (Candidate May 2018): Machine learning for fusion and inference of simultaneous EEG/fMRI
- Victor Shih (Candidate May 2020): A Brain-Deep AI Interface for inferring user state for guiding human-machine interaction.

#### *Masters Students (selected)*

- 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).
- Atin Saha May 2011: Neural signals of solvable versus unsolvable visual puzzles.
- Neil Weiss May 2016: Virtual reality for BCI.

#### Undergraduate Students Supervised (selected)

- 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 2010, Statistical methods for improving EEG/fMRI sensitivity (current position: Ph.D. student in Neuroscience at Princeton University)
- Sona Bose Roy May 2017. Real-world flight navigation and cognitive work-load

Doctoral Dissertation Committees (selected from over 50)

- 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.
- Amin Katouzian (Advisor: A.F. Laine) Quantifying Atherosclerosis: IVUS Imaging For Lumen Border Detection And Plaque Characterization
- Noah Lee (Advisor: A.F. Laine) Synergizing Human-machine Intelligence: Visualizing, Labeling, and Mining the Electronic Health Record

- Gary Yi Hou (Advisor: E. Konofagou) Biomechanical assessment and monitoring of thermal ablation using Harmonic Motion Imaging for Focused Ultrasound (HMIFU)
- David Guillaume(Advisor: A.F. Laine) Compressive Sensing Applied to Medical Ultrasound Image Formation

### 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
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
7,835,787/ 8,731,650	Single trial detection in encephalography, November 2010/May 2014
8,671,069	Rapid Image Annotation Via Brain State Decoding And Visual Pattern Mining. March 2014
Pending	Neural correlates of baseball pitch classification: File docket no. 070050.4745
Pending	Mobile, Neurally-Assisted Personal Assistant; Col. IR #CU13178; File docket no. 070050.5087

### 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.
2014-present	deCervo LLC, New York, NY. Scientific Advisor. Developing brain-computer interfacing technology to efficiently and accurately measure how and when athletes make decisions specific to their sport.
2016-present	BrAIQ, New York NY, co-Founder and Scientific Advisor. Focus on developing technology that uses neuro-physio markers of arousal, stress and engagement to build trust between human and machine in autonomous vehicles. Selected as one of the 9 teams in NYC Media Lab Combine (include \$25K gift to Columbia to

support startup) and one of 12 out of 500 teams for TechStars Mobile (\$120K investment).

## Publications

### Journal Publications

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. L.H. Finkel and P. Sajda (1994) Constructing visual perception. *American Scientist*: 82, pp. 224-237.
5. 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.
6. 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.
7. 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.
8. J. Asmuth, B. Madjarov, P. Sajda and J. Berger, (2001) Mosaicking and enhancement of slitlamp biomicroscope fundus images, *British Journal of Ophthalmology*, 85, pp. 563-565.
9. L. Parra, C. Alvino, A. Tang, B. Pearlmutter, N. Yeung, A. Osman, and P. Sajda, (2002) Linear spatial integration for single trial detection in encephelography, *NeuroImage*, 17, pp. 223-230.
10. P. Sajda, C. Spence and J. Pearson (2002) Learning contextual relationships in mammograms using a hierarchical pyramid neural network, *IEEE Transactions on Medical Imaging*. 21 (3) pp. 239-250.
11. P. Sajda, A. Laine and Y. Zeevi (2002) Multi-resolution and wavelet representations for identifying signatures of disease, *Disease Markers*. invited submission, 18, pp. 339-363.
12. L. Parra and P. Sajda (2003) Blind source separation via generalized eigenvalue decomposition, *Journal of Machine Learning Research: Special issue on ICA*, 4(Dec), pp. 1261-1269.
13. L. Parra, C. Spence, A. Gerson and P. Sajda (2003). Response error correction: A demonstration of improved human-machine performance using real-time EEG monitoring, *IEEE Transactions on Neural Systems and Rehabilitation Engineering* 11, pp. 173-177.
14. P. Sajda, A. Gerson, K-R Mueller, B. Blankertz and L. Parra (2003) A data analysis competition to evaluate machine learning algorithms for use in brain-computer interfaces, *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 11, pp. 184-185.
15. L. Parra, C. Alvino, A. Tang, B. Pearlmutter, N. Yeung, A. Osman, and P. Sajda, (2003) Single-trial detection in EEG and MEG: Keeping it linear, *Neurocomputing*. (52-54), pp. 177-183.
16. P. Sajda, C. Spence and L. Parra (2003) A multi-scale probabilistic network model for detection, synthesis and compression in mammographic image analysis, (invited submission) *Medical Image Analysis*, 7(2) pp. 187-204.
17. P. Sajda and K. Baek (2004) Integration of form and motion within a generative model of visual cortex, (invited submission) *Neural Networks: Special Issue on Vision and Brain*, 17

- (5/6) 809-821. Also in *Vision and Brain: How the Brain Sees / New Approaches to Computer Vision*, edited by S. Grossberg, L. Finkel and D. Field. Elsevier, 2004.
18. P. Sajda, S. Du, T.R. Brown, R. Stoyanova, D.C. Shungu, X. Mao, and L.C. Parra (2004) Non-negative matrix factorization for rapid recovery of constituent spectra in magnetic resonance chemical shift imaging of the brain, *IEEE Transactions on Medical Imaging*, 23(12): 1453-1465.
  19. K. Baek, and P. Sajda (2005) Inferring figure-ground using a recurrent integrate-and-fire neural circuit. *Neural Systems and Rehabilitation Engineering, IEEE Transactions on*. 13 (2), 125 -130.
  20. L.C. Parra, C.D. Spence, A.D. Gerson and P. Sajda (2005) Recipes for the linear analysis of EEG, *NeuroImage* 28(2): 326-41.
  21. A.D. Gerson, L.C. Parra, and P. Sajda (2005) Cortical origins of response time variability during rapid discrimination of visual objects, *NeuroImage*. 28(2): 342-53.
  22. M.G. Philiastides and P. Sajda (2006) Temporal characterization of the neural correlates of perceptual decision making in the human brain, *Cerebral Cortex*. 16(4): 509-518, Apr. 2006. (cover article)
  23. C. Spence, L. Parra and P. Sajda (2006) Varying complexity in tree structured distribution models, *IEEE Transactions on Image Processing*, 15(2): 319- 330.
  24. A. Luo and P. Sajda (2006) Learning discrimination trajectories in EEG sensor space: Application to inferring task difficulty, *Journal of Neural Engineering*, 3(1):L1-L6.
  25. M.G. Philiastides, R. Ratcliff and P. Sajda (2006) Neural representation of task difficulty and decision making during perceptual categorization: a timing diagram, *Journal of Neuroscience*, 26(35): 8965-75. (cover article)
  26. P. Sajda (2006) Machine learning for detection and diagnosis of disease, *Annual Review of Biomedical Engineering*, (invited). Vol 8, 537-565.
  27. A.D. Gerson, L.C. Parra and P. Sajda (2006) Cortically-coupled computer vision for rapid image search, *Neural Systems and Rehabilitation Engineering, IEEE Transactions on*. 14(2) 174-179.
  28. J. Wielaard and P. Sajda (2006) Circuitry and the classification of simple and complex cells in V1, *Journal of Neurophysiology*, 96(5) 2739-2749.
  29. J. Wielaard and P. Sajda (2006) Extraclassical receptive field phenomena & short-range connectivity in V1. *Cerebral Cortex*, published online Dec 22, 2005. vol 16:11, 1531-1545. (cover article)
  30. Q. Zhao, R. Stoyanova, S. Du, P. Sajda, T.R. Brown (2006) HiRes - A Tool for Comprehensive Assessment and Interpretation of Metabolomic Data, *Bioinformatics* 22:20, 2552-2554.
  31. M.G. Philiastides and P. Sajda (2006) Causal influences in the human brain during face discrimination: a short-window directed transfer function approach, *IEEE Transactions on Biomedical Engineering*, 53(12), 2602-2605.
  32. J. Wielaard and P. Sajda (2007) Dependence of response properties on sparse connectivity in a spiking neuron model of the lateral geniculate nucleus, *Journal of Neurophysiology*, 2007 Dec;98(6):3292-308.
  33. M.G. Philiastides and P. Sajda (2007) EEG-Informed fMRI Reveals Spatiotemporal Characteristics of Perceptual Decision Making, *Journal of Neuroscience*, Nov 28; 27(48):13082-91.
  34. S. Du, X. Mao, P. Sajda and D. Shungu (2008) Automated Tissue Segmentation and Blind Recovery of 1H MRSI Spectral Patterns of Normal and Diseased Human Brain, *NMR in Biomedicine* Jan;21(1):33-41.
  35. L.C. Parra, C. Christoforou, A. D. Gerson, M. Dyrholm, A. Luo, M. Wagner, M. G.

- Philiastides, P. Sajda (2008) Spatio-temporal linear decoding of brain state: Application to performance augmentation in high-throughput tasks, *IEEE Signal Processing Magazine*, vol. 25, no. 1, pp. 95-115.
36. Y. Su, S. Thakur, K. Sasan, S. Du, P. Sajda, W. Huang, L.C. Parra, (2008) Spectrum Separation Resolves Partial Volume Effect of MRSI as Demonstrated on Brain Tumor, *NMR in Biomedicine*, Nov;21(10):1030-42.
  37. M. Dyrholm, R. Goldman, P. Sajda, T.R. Brown (2009) "Removal of BCG artifacts using a non-Kirchhoffian overcomplete representation", *IEEE Transactions on Biomedical Engineering*, 56(2): 200-204.
  38. A. Luo and P. Sajda (2009) Comparing neural correlates of visual target detection in serial visual presentations having different temporal correlations. *Front. Hum. Neurosci.* 3:5. Epub 2009 Apr 21
  39. R. Ratcliff, M.G. Philiastides, P. Sajda, (2009). Quality of Evidence for Perceptual Decision Making is Indexed by Trial-to-Trial Variability of the EEG. *Proceedings of the National Academy of Sciences*, 106(16):6539-44
  40. R.I. Goldman, C-Y Wei, M.G. Philiastides, A.D. Gerson, D. Friedman, T.R. Brown, P. Sajda (2009) Single-trial discrimination for integrating simultaneous EEG and fMRI: Identifying cortical areas contributing to trial-to-trial variability in the auditory oddball task, *Neuroimage*, Aug 1;47(1):136-47
  41. P. Sajda, M. G. Philiastides, L. C. Parra (2009) Single-trial Analysis of Neuroimaging Data: Inferring Neural Networks Underlying Perceptual, Decision Making in the Human Brain, *IEEE Reviews In Biomedical Engineering*, (invited) Vol 2, 97-109.
  42. C. Christoforou, R. Haralick, P. Sajda, L. C. Parra (2010) Second-Order Bilinear Discriminant Analysis, *Journal of Machine Learning Research*, 11(Feb):665–685.
  43. P. Sajda, L.C. Parra, C. Christoforou, B. Hanna, C. Bahlmann, J. Wang, E. Pohlmeier, J. Dmochowski, -Fu Chang (2010) In a Blink of an Eye and a Switch of a Transistor: Cortically-coupled Computer Vision", *Proceedings of the IEEE* vol 98(3): 462-478.
  44. J. Shi, W. Yin, S. Osher and P. Sajda (2010) A Fast Hybrid Algorithm for Large Scale l1-Regularized Logistic Regression, *Journal of Machine Learning Research*, 11(Feb):713–741.
  45. J. Dmochowski, P. Sajda, L.C. Parra (2010) Weighted Maximum Likelihood is a Nearly Optimal Solution to the Cost-Sensitive Learning Problem, *Journal of Machine Learning Research*, vol. 11: 3313-3332.
  46. E.A. Pohlmeier, J. Wang, D.C. Jangraw, B. Lou, S-F Chang and P. Sajda (2011) Closing the loop in cortically-coupled computer vision: a BCI for searching image databases, *Journal of Neural Engineering* 8: 036025
  47. M. deBettencourt, R.I. Goldman, T.R. Brown and **P.Sajda** (2011) Adaptive Thresholding for Improving Sensitivity in Single-Trial Simultaneous EEG/fMRI, *Front. Psychology* 2:91. doi: 10.3389/fpsyg.2011.00091
  48. C.R. Pernet, P. Sajda and G.A. Rousselet (2011) Single-trial analyses: why bother? *Frontiers in Psychology*: 2 (00322) doi: 10.3389/fpsyg.2011.00322
  49. J.V. Shi, J. Wielaard, R.T. Smith and P. Sajda (2011) Decoding of simulated neurodynamics predicts the perceptual consequences of age-related macular degeneration, *Journal of Vision*. Dec 5;11(14):4. doi: 10.1167/11.14.4.
  50. J.P. Dmochowski, P. Sajda, J. Dias Joao and L.C. Parra (2012) Components of ongoing EEG with high correlation point to emotionally-laden attention -- a possible marker of engagement? *Frontiers in Human Neuroscience*, 6 (00112), doi: 10.3389/fnhum.2012.00112
  51. P. Sajda (2012) Neural correlates of the time course of the waxing and waning of attention

- Front Psychol.* 2012;3:377. doi: 10.3389/fpsyg.2012.00377.
52. M. Worrying, P. Sajda, S. Santini, D.A. Shamma, A.F. Smeaton and Q. Yang (2012) Where Is the User in Multimedia Retrieval? *MultiMedia, IEEE* 19(4): 6-10
  53. J. Sherwin, J. Muraskin and P. Sajda (2012) You Can't Think and Hit at the Same Time: Neural Correlates of Baseball Pitch Classification. *Front. Decision Neurosci.* 6:177. doi: 10.3389/fnins.2012.00177
  54. J. Muraskin, M.B. Ooi, R.I. Goldman, S. Krueger, W.J. Thomas, P. Sajda and T.R. Brown (2013) Prospective active marker motion correction improves statistical power in BOLD fMRI, *Neuroimage*, (68) 154-161, doi: 10.1016/j.neuroimage/2012.11.
  55. Y. Li, B. Lou, X. Gao and P. Sajda (2013) Post-stimulus endogenous and exogenous oscillations are differentially modulated by task difficulty. *Front. Hum. Neurosci.* 7:9. doi: 10.3389/fnhum.2013.00009
  56. J. Shi, J. Wielaard, R.T. Smith and P. Sajda (2013). Perceptual Decision Making "Through the Eyes" of a Large-scale Neural Model of V1. *Front. Psychol.* 4:161. doi: 10.3389/fpsyg.2013.00161
  57. J. Sherwin, P. Sajda (2013) Musical experts recruit action-related neural structures in harmonic anomaly detection: Evidence for embodied cognition in expertise *Brain and Cognition* 83 (2), 190-202
  58. J. M. Walz, R. I. Goldman, M. Carapezza, J. Muraskin, T. R. Brown, and P. Sajda (2013) Simultaneous EEG-fMRI Reveals Temporal Evolution of Coupling between Supramodal Cortical Attention Networks and the Brainstem, *J Neurosci.* 2013 Dec 4;33(49):19212-22
  59. B.R. Conroy, J.M. Walz and P. Sajda (2013) Fast bootstrapping and permutation testing for assessing reproducibility and interpretability of multivariate FMRI decoding models, *PLoS One* Nov 14;8(11):e79271.
  60. J.C. Dias, P. Sajda, J.P. Dmochowski, L.C. Parra (2013) EEG precursors of detected and missed targets during free-viewing search, *J. Vision*, Nov 12;13(13):13.
  61. B. He, T. Coleman, G.M. Genin, G. Glover, X Hu, N Johnson, T Liu, S Makeig, P. Sajda, K. Ye (2013) Grand challenges in mapping the human brain: NSF workshop report, *IEEE TBME*, Nov;60(11):2983-92.
  62. J. M. Walz, R. I. Goldman, M. Carapezza, J. Muraskin, T. R. Brown, and P. Sajda (2014) Simultaneous EEG-fMRI Reveals a Temporal Cascade of Task-Related and Default-Mode Activations During a Simple Target Detection Task, *Neuroimage*, 102 pt1, 229-39.
  63. B. Lou, Y. Li, M.G. Philiastides and P. Sajda (2014) Prestimulus alpha power predicts fidelity of sensory encoding in perceptual decision making, *Neuroimage*, Feb 15; 87:242-51.
  64. L. Hong, J. M. Walz, and P. Sajda (2014) Your eyes give you away: prestimulus changes in pupil diameter correlate with poststimulus task-related EEG dynamics., *PLoS ONE*, vol. 9, no. 3, p. e91321, 2014
  65. D.C. Jangraw, J. Wang, B. Lance, S-F Chang and P. Sajda (2014) Neurally and ocularily informed graph-based models for searching 3D environments, *Journal of Neural Engineering* 11(4):046003
  66. D. Rosenthal, P. DeGuzman, L. Parra and P. Sajda (2014) Evoked Neural Responses to Events in Video," *IEEE Journal of Selected Topics in Signal Processing*, 8(3), 358-365.
  67. D.C. Jangraw, M. Gribetz, A. Johri and P. Sajda (2014) NEDE: An Open-Source Scripting Suite for Developing Experiments in 3D Virtual Environments, *Journal of Neuroscience Methods* 235 (2014) 245–251
  68. R. Smith, R. Post, A. Johri, M. Lee, Z. Ablonczy, C. Curcio, T. Ach, and P. Sajda, (2014) Simultaneous decomposition of multiple hyperspectral data sets: signal recovery of unknown fluorophores in the retinal pigment epithelium, *Biomed. Opt. Express* 5, 4171-

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37. J. Wielaard and P. Sajda (2006) Large-scale simulation of the primary visual cortex *American Physical Society March Meeting; Baltimore, MD, Abstract: C1.00141*.
38. M.G. Philiastides, R.I. Goldman and P. Sajda (2006) Cortical areas correlated with distinct sources of uncertainty for the categorization of faces, *12th Annual OHBM Meeting*.
39. R.I. Goldman, A.D. Gerson, M.G. Philiastides, D. Friedman, T.R. Brown and P. Sajda (2006) The effect of simultaneous EEG/fMRI on the fidelity of single-trial EEG components, *12th Annual OHBM Meeting*.
40. J. Wielaard and P. Sajda (2006) A large scale model of extraclassical surround suppression in macaque LGN, *Society for Neuroscience, 36th Annual Meeting, Atlanta,*

- GA, Oct. 14-18. Abstract# 240.4
41. P. Sajda, J. Wielaard, S. Du, J. Shi and R.T. Smith (2006) Linking retinal pathology to cortical function using a large-scale spiking neuron model of V1, *Society for Neuroscience, 36th Annual Meeting, Atlanta GA, Oct. 14-18*. Abstract# 640.1
  42. J. Wielaard and P. Sajda (2007) A model of extra-classical surround suppression in the lateral geniculate nucleus (LGN) *Computational and Systems Neuroscience Meeting, Salt Lake City, UT, #181*.
  43. J. Shi, J. Wielaard and P. Sajda (2007) Extraclassical responses in V1 modeled via modulated cortical conductances, *Computational and Systems Neuroscience Meeting, Salt Lake City, UT, #91*.
  44. R. I. Goldman, A. D. Gerson, M. G. Philiastides, D. Friedman, T. R. Brown, and P. Sajda (2007) Quality of single-trial discrimination in simultaneous EEG/fMRI, *International Society for Magnetic Resonance in Medicine 14th Scientific Meeting & Exhibition, Berlin GERMANY, May 19-25, 2007*.
  45. P. Sajda, J. Wielaard, S. Du, J. Shi and R.T. Smith (2007) Assessing the cortical response to macular disease via a large-scale spiking neuron model of V1, *ARVO 2007, #2347*.
  46. Dyrholm, R. Goldman, M.G. Philiastides, T.R. Brown and P. Sajda (2007) Bilinear discriminant analysis for ICA component selection in EEG, *13th Annual OHBM Meeting, June 10-14, Chicago, IL*.
  47. J. Shi, J. Wielaard and P. Sajda (2007) Linear decoding neural activity from a spiking neuron model of V1, *Society for Neuroscience, 37th Annual Meeting, San Diego CA, Nov 3-7*. Abstract# 394.5
  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
  52. A. Luo and P. Sajda (2007) Behavioral and electrophysiological differences for target identification in natural sequence versus rapid serial visual presentation (RSVP), *Society for Neuroscience, 37th Annual Meeting, San Diego CA, Nov 3-7*. Abstract# 666.3
  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.
  55. J. Shi, J. Wielaard, M. Busuic, R.T. Smith, P. Sajda (2008) Using a Spiking Neuron Model of V1 as a Substrate for Mapping Visual Stimuli to Perception, *ARVO 2008, #4497*.
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- Neuroscience, 38th Annual Meeting, Washington DC, Nov 15-19. Abstract# 514.12*
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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  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*
  64. J. Shi, J. Wielaard, R.T. Smith, P. Sajda (2010) Coupling Retinal Imaging With Psychophysics to Assess Perceptual Consequences of AMD, *ARVO 2010 #1044*.
  65. N. Lee, A.A. Fawzi, P. Sajda, A.F. Laine, G. Martin, M.S. Humayun, R.T. Smith (2010) On Hyperspectral Signatures of Drusen, *ARVO 2010 #4934*.
  66. M. deBettencourt, R. Goldman, T. Brown and P. Sajda (2010) Adaptive Thresholding to Improve Sensitivity in Single-Trial Simultaneous EEG/fMRI, *16th Annual OHBM Meeting, June 6-10, Barcelona, SPAIN.# 1234*
  67. J. Walz and P. Sajda (2010) Time Domain vs. Frequency Domain Single-Trial EEG Analysis of a Perceptual Decision-Making Task, *16th Annual OHBM Meeting, June 6-10, Barcelona, SPAIN.# 1279*
  68. J Shi, J Wielaard, RT Smith and P. Sajda (2010) A modeling approach for assessing the cortical and perceptual consequences of age-related macular degeneration *Society for Neuroscience, 37th Annual Meeting, San Diego CA, Nov 13-17, 393.5/III16*
  69. MG Philiastides, P. Sajda and HR. Heekeren (2010). Common Neural Substrates for Choice Confidence and Evidence Accumulation in Human Decision Making. *Front. Neurosci. Conference Abstract: Decision Neuroscience From Neurons to Societies*. doi: 10.3389/conf.fnins.2010.82.00020
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  73. J. Muraskin, P. Sajda, M.B. Ooi, R. Goldman, T.R. Brown (2011) Real time motion correction improves statistical power in fMRI *Society for Neuroscience, 38th Annual Meeting, Washington DC, Nov 12-16, 619.06/XX90*
  74. J.S. Sherwin, B. Conroy, A. Gupta and P. Sajda (2011) Single-trial EEG decoding of enharmonic pitch-change in American popular music *Society for Neuroscience, 38th*

- Annual Meeting, Washington DC, Nov 12-16, 722.01/XX53*
75. J. Sherwin, B. Conroy, A Gupta and P. Sajda (2011). Tracking learning of change in American popular music using single-trial EEG decoding. *Front. Comput. Neurosci. Conference Abstract: BC11 : Computational Neuroscience & Neurotechnology Bernstein Conference & Neurex Annual Meeting 2011*. doi: 10.3389/conf.fncom.2011.53.00003
  76. J. Muraskin, P. Sajda, R. Goldman, W. Thomas, M. Ooi, T. Brown. (2012) Prospective active marker motion correction improves statistical power in group fMRI, *ISMRM 2012*, #0594
  77. J. Walz, J. Muraskin, R. Goldman, T. Brown, P. Sajda. (2012) Single-Trial EEG Discriminant Components Acquired During 3T fMRI, *ISMRM 2012*, #2147
  78. J.S. Sherwin and P. Sajda. (2012) Expectation violation from single-trial EEG decoding: Differences between expert and novice cellists. 2012 Organization for Human Brain Mapping, June 10-14, Beijing, CHINA. #5088
  79. J.M. Walz, J. Muraskin, R.I. Goldman, T.R. Brown, and P. Sajda (2012) "The Superposition of Task-dependent and Default Mode Networks During a Mundane Target Detection Task," *18th Annual Meeting of the Organization for Human Brain Mapping*, June 10-14, Beijing, China #5292
  80. J.M. Walz, L. Hong, and P. Sajda (2012) "Correlates of Pupil Diameter and Single-Trial EEG Variability in an Auditory Oddball Task," *18th Annual Meeting of the Organization for Human Brain Mapping*, June 10-14, Beijing, China. #5451
  81. B. Lou, Y. Li, J.M. Walz, and P. Sajda (2012) "Post-stimulus Trial-by-trial EEG Variability Indexes Mean and Variance of Pre-stimulus  $\alpha$  Power," *18th Annual Meeting of the Organization for Human Brain Mapping*, June 10-14, Beijing, China. # 1080
  82. D.C. Jangraw and P. Sajda (2012) Interactions of working memory and visual perception in saccade-locked EEG, *Society for Neuroscience, 39th Annual Meeting, New Orleans LA, Oct 13-17*, 175.13/CC10
  83. J.M. Walz, M. Carapezza, J. Muraskin, R.I. Goldman, T.R. Brown and P. Sajda (2012) BOLD fMRI correlates of spontaneous eye blinks detected using simultaneously-acquired EEG *Society for Neuroscience, 39th Annual Meeting, New Orleans LA, Oct 13-17*, 301.23/EEE13
  84. L. Hong, J.M. Walz and P. Sajda (2012) Temporally specific EEG components correlate with perceived anticipation and task engagement, *Society for Neuroscience, 39th Annual Meeting, New Orleans LA, Oct 13-17*, 462.03/W6
  85. Y. Li, B. Lou, X. Gao and P. Sajda (2012) Exogenous oscillations index task difficulty in perceptual decisions, *Society for Neuroscience, 39th Annual Meeting, New Orleans LA, Oct 13-17*, 494.08/CCC25
  86. J.S. Sherwin, J. Muraskin and P. Sajda (2012) Neural signatures of rapid recognition of a baseball pitch: Spatio-temporal evidence accumulation under time pressure, *Society for Neuroscience, 39th Annual Meeting, New Orleans LA, Oct 13-17*, 804.02/CCC73
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  88. D.C. Jangraw and P. Sajda (2012). "Constructing Mutually-Derived Situational Awareness via EEG-Informed Graph-Based Transductive Inference." Accepted abstract, IEEE Workshop on Brain-Machine-Body Interfaces (EMBC '12), San Diego, California.
  89. P. Sajda (2012) Neurally-Informed Graph-Based Transductive Models for Rapid Decision Making, *Eighteenth Army Conference on Applied Statistics*, Monterey CA, Oct 24-26
  90. B. Conroy, J. Walz and P. Sajda (2012) Fast Simultaneous Training of Generalized

- Linear Models (FaSTGLZ) for Multi-voxel Pattern Analysis in fMRI, *2<sup>nd</sup> NIPS 2012 Workshop on Machine Learning and Interpretation in NeuroImaging (MLINI 2012)*.
91. J.M. Walz, M. Carapezza, B. Lou, R.I. Goldman, T.R. Brown and P. Sajda (2013) Variability in distribution of fMRI BOLD response linked to prestimulus alpha power in simultaneously acquired EEG., *ISMRM 2013*, Salt Lake City, UT, #0756
  92. J. Muraskin, J. Sherwin and P. Sajda (2013) Simultaneous EEG/fMRI reveals Spatiotemporal Correlates of Baseball Pitch Recognition *Annual Meeting of the Organization for Human Brain Mapping*, Seattle, WA, #3620
  93. J.M. Walz, R.I. Goldman, J. Muraskin, B. Conroy, T.R. Brown, P. Sajda (2013) Brainstem Modulation of the P300: Evidence from Simultaneous EEG-fMRI *Annual Meeting of the Organization for Human Brain Mapping*, Seattle, WA, #3597
  94. B. Conroy, J.M. Walz and P. Sajda (2013) Fast validation testing of sparse classification and regression models for multi-voxel fMRI analysis *Annual Meeting of the Organization for Human Brain Mapping*, Seattle, WA, #1644
  95. B. Luber, D. Jangraw, A. Harrison, P. Sajda, S.H Lisanby (2013) Using Transcranial Magnetic Stimulation to Elucidate Interactions Between Top-Down and Bottom-up Brain Networks in Visual Decision Making, *Annual Cog. Neuro Meet. J. Cog. Neuro (Suppl)* , p 206.
  96. J. Muraskin, J. Sherwin and P. Sajda (2014) Spatiotemporal EEG Signatures Differentiating Baseball Players from Non-players *Annual Meeting of the Organization for Human Brain Mapping*, Hamburg, GERMANY, #1400
  97. J. Sherwin, J. Muraskin and P. Sajda (2014) Functional Connectivity of Pre-Stimulus BOLD fMRI Relates to Performance at Baseball Go/No-Go Task *Annual Meeting of the Organization for Human Brain Mapping*, Hamburg, GERMANY, #1738
  98. J. Sherwin, J. Muraskin and P. Sajda (2014) Functional connectivity of pre-stimulus bold fMRI distinguishes hits and misses in a spatio-temporal evidence accumulation task *Society for Neuroscience Annual Meeting, Washington DC.*, 20.05
  99. B. Lou and P. Sajda (2014) Perceptual salience and reward both influence feedback-related neural activity arising from choice, *Society for Neuroscience Annual Meeting, Washington DC.*,457.10/SS14
  100. S. Aydoore, V. Shi and P. Sajda (2015) Evoked EEG and Pupillary Measures Predictive of Choice Confidence in Complex Task Environments, players, *Annual Meeting of the Organization for Human Brain Mapping*, Honolulu HI, #1810
  101. S. Saproo, V. Shi, D. Jangraw and P. Sajda (2015) Evoked EEG Signatures Index Cognitive Workload in Human-Machine Interaction, *Annual Meeting of the Organization for Human Brain Mapping*, Honolulu HI, #2367.
  102. S. Dodhia, J. Muraskin, J. Sherwin, P. Sajda (2015) fMRI-EEG Reveals Expertise-Dependent Neural Circuits in the Post-Task Resting State *Annual Meeting of the Organization for Human Brain Mapping*, Honolulu HI, #1622
  103. Y.Tong, T. Ben Ami, A. Johri, R. Post, Z. Ablonczy, P. Sajda, CA Curcio, T. Ach, T. Smith; Hyperspectral Autofluorescence (AF) Characterization of Drusen in Donor Eyes with Age-Related Macular Degeneration (AMD). *Invest. Ophthalmol. Vis. Sci.* 2015;56(7):3956.
  104. T. Ben Ami, Y. Tong, P. Sajda, Z. Ablonczy, CA Curcio, T. Smith, T. Ach; Ex Vivo Hyperspectral Autofluorescence (AF) Imaging of Retinal Pigment Epithelium (RPE) in Human Donor Eyes with Age-related Macular Degeneration (AMD). *Invest. Ophthalmol. Vis. Sci.* 2015;56(7):4369.
  105. J. Muraskin, J. Sherwin, G. Lieberman, J.O. Garcia T. Verstynen J.M. Vettel & P. Sajda (2016) Using Multimodal Neuroimaging to Characterize the Brains of Baseball Hitters,

*Annual Meeting of the Organization for Human Brain Mapping, Geneva, SWITZERLAND, #2114*

106. I. Delis, P. Sajda and Q. Wang (2016) Neural correlates of visual-haptic decision making in a texture discrimination task, *Society for Neuroscience Annual Meeting, San Diego CA* 532.10 / ZZ14
107. A. Goldman and P. Sajda (2016) LDA classification of EEG reveals differences between improvising and non-improvising musicians in a musical Stroop task. *Society for Neuroscience Annual Meeting, San Diego CA*, 841.03 / KKK19

### **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
8. X.S. Liu, A. Gupta, G. Bevill, P. Sajda, K. M. Keaveny, X.E. Guo (2006) Micromechanical analysis of individual trabeculae in a  $\mu$ CT based nonlinear finite element model of human vertebral trabecular bone, *Transactions of the 51st Annual Meeting of the Orthopaedic Research Society*, Chicago, IL March 19-22, 2006
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
  20. X.S. Liu, X.H. Zhang, C.S. Rajapakse, M.J. Wald, J. Magland, K.K. Sekhon, M.F. Adam, P. Sajda, F.W. Wehrli, X.E. Guo (2010) Accuracy of high-resolution in vivo micro magnetic resonance imaging for measurements of microstructural and mechanical properties of human distal tibial bone, *J. Bone Miner Res*. 25(9):2039-50
  21. D. Jing, X.L. Lu, E. Luo, P. Sajda, P.L. Leong, X.E. Guo (2013) Spatiotemporal properties of intracellular calcium signaling in osteocytic and osteoblastic cell networks under fluid flow, *Bone*, 53(2) 531-540

## Research Grants and Contracts Awarded

### Active Grants

Those in which Principal Investigator or co-Principal Investigator

<i>Title</i>	<i>Sponsor/Agency</i>	<i>Amount (total cost)</i>	<i>Dates</i>
NRI: Collaborative Research: Multimodal Brain Computer Interface for Human-Robot Interaction Award 1513853 PI: Allen PI, Co-PI: Sajda	NSF	\$736,552 (Sajda lab: \$365,266)	5/16-5/19

Image Database and Neuroimaging Data Collection for Rapid Visual Decision Making DCS APX03-S005 PI: <u>P. Sajda</u>	Army Research Laboratory (ARL)	\$684,000	6/12-9/20
Cognition and Neuroergonomics Collaborative Technology Alliance (CaN CTA) Under prime contract W911NF-10-2-0022 PI: <u>P. Sajda</u>	Army Research Laboratory (ARL)	\$5,000,000 per year (Sajda lab: \$750,000 per year)	4/14-4/20
Neural correlates of learning and confidence during decision making and their utility in developing "intelligent" information technologies ES/L012995/1 PI: Philiastides, Co-PI: Sajda	ESRC	\$750,000 (Sajda lab: \$200,000)	4/15-4/18
RI: Medium: Assessing Speaker and Teacher Effectiveness through Gestural Analysis, EEG Recordings, and Eye Tracking Award 1513853 PI: Kender PI, Co-PI: Sajda	NSF	\$899,796 (Sajda lab: \$375,000)	9/15-8/18

Those in which co-Investigator

EEG/fMRI Controlled TMS Real-time Neural Feedback in Anti-Depressive Treatment R21/R33MH106775-01 PI: T.R. Brown, Co-I: <u>P. Sajda</u>	NIH/NIMH	\$3,211,339 (Sajda lab: \$800,016)	6/15-6/20
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Training Grants and Conference Grants

<i>Title</i>	<i>Agency</i>	<i>Amount</i>	<i>Dates</i>
Columbia University Vision Training Grant 5T32EY013933-09 (Mason, PI; Sajda, Mentor)	NIH/NEI	\$2,500,000	01-present
Core Support for Vision Research 1P30EY019007-01A2 Goldberg, PI; <u>P. Sajda</u> , Co-I	NIH/NEI	\$4,000,000	7/10-present

Past Grants

Multimodal Neuroimaging for Mapping Decision	NIH/NIMH	\$1,772,320	8/09-12/15
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## Making in the Human Brain

R01- MH085092-01A1

PI: P. Sajda, PI

Cortical Networks Underlying Rapid Decision Making W911NF-11-1-0219 PI: <u>P. Sajda</u>	Army Research Office (ARO)	\$1,033,255	5/11-12/15
Hyperspectral Imaging of the Normal and Age-related Macular Degeneration Fundus NEI R01 EY 021470 PI: PI: R.T. Smith, Co-I: <u>P. Sajda</u>	NIH/NEI	\$4,000,000 (Sajda share: \$150K)	4/11-3/15
Constructing Mutually-derived Situational Awareness via EEG –Informed Graph-based Transductive Inference Under prime contract W911NF-10-2-0022 PI: <u>P. Sajda</u>	Army Research Laboratory (ARL)	\$345,784	5/11-9/14
Cortically-Coupled Computer Vision Phase 3 N10PC20050 (Sajda, PI)	DARPA <sup>1</sup>	\$1,668,763	2/10-1/12
A Large-Scale Spiking Neuron Model of Visual Cortex as a Substrate for Optimizing Visual Perception HM1582-07-1-2002 (Sajda, PI)	NGA	\$513,627	3/07-10/10
Cortically-Coupled Computer Vision Phase 2 NBCHC080029 (Sajda, PI)	DARPA <sup>1</sup>	\$2,885,252	10/07-04/10
A Non-invasive Single-trial In Vivo Neuroimaging System (R21/R33 EB004730) (Sajda, PI)	NIH/NIBIB <sup>2</sup>	\$1,470,000	8/04-7/09
Biomedical Image Engineering of Macular Images 1R01EY015520-01A2 (Smith, PI; Sajda, Co-I)	NIH/NEI	\$2,551,292	9/05-9/10
Implicit Learning In Osteocyte Network Under	NIH/NIAMS	\$1,000,000	9/9-8/11

<sup>1</sup> DARPA: Defense Advanced Project Agency<sup>2</sup> NIH/NIBIB: National Institutes of Health/National Institute for Biomedical Imaging and Bioengineering

Mechanical Loading 1RC1AR058453-01 (Guo, PI: Sajda, Co-I)	NIH/NIAMS	\$2,265,826	5/06-5/11
Micro-Mechanical Modeling of Trabecular Bone 1R01AR051376-01A1 (Guo, PI: Sajda, Co-I)			
Workshop on Hybrid Neuro-Computer Vision Systems IIS- 0958402 Chang and Sajda (co-PIs)	NSF	\$50,000	10/09-7/10
Cortically-Coupled Computer Vision HM1582-05-C-0043 (Sajda, PI)	DARPA <sup>3</sup> /NGA	\$1,064,288	10/05-9/07
CAREER: Probabilistic Models for Integrating Biochemical and Morphological Markers for Cancer (BES-01-3380) (Sajda, PI)	NSF <sup>4</sup>	\$367,257	6/02-5/07
Bayesian Cortical Networks for Contextual Integration HM1582-05-C-0008 (Sajda, PI)	NGA <sup>5</sup>	\$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 1H 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

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<sup>3</sup> DARPA: Defense Advanced Project Agency

<sup>4</sup> NSF: National Science Foundation

<sup>5</sup> NGA: National Geospatial-Intelligence Agency



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12/3/16

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

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<sup>6</sup> NRO: National Reconnaissance Office

<sup>7</sup> DHHS: Department of Health and Human Services (DHHS)

