

## CURRICULUM VITAE

### Joseph Thachil Francis, PhD

Associate Professor of Physiology and Pharmacology  
State University of New York Downstate Medical Center  
Department of Physiology and Pharmacology  
Program in Neural and Behavioral Sciences and Program in Biomedical Engineering  
joint with NYU-POLY. The Robert F. Furchgott Center for Neural & Behavioral Science.

## BACKGROUND

### Education

- 1994 Bachelor of Science in Biology With Honors, State University of New York at Buffalo. Thesis title : "Chemorepellents in Paramecium and Tetrahymena". Honors Research Adviser: Todd M. Hennessey, PhD, Professor of Biology.
- 2001 Ph.D, Neuroscience, The George Washington University. Thesis Title: "Synchronization Between Electric Fields and Neural Ensembles". Thesis Adviser: Steven J Schiff, MD, PhD, Professor of Neurosurgery, Engineering Science and Mechanics and Physics.

### Employment:

- 1992-1994 Undergraduate Research Assistant, The Honors Program in Biological Sciences, State University of New York at Buffalo. Adviser: Todd M. Hennessey, PhD, Professor of Biology
- 1995-1998 Graduate Research Assistant, Neuroscience Program, The George Washington University, and Children's Research Institute of the Children's National Medical Center. Adviser: Steven J Schiff, MD, PhD, Professor of Neurosurgery, Engineering Science and Mechanics and Physics.
- 1999 Graduate Research Assistant, Mathematics Department, George Mason University. Adviser: David Walnut, PhD, Professor of Mathematics.

- 1998-2001      Research Assistant, Neuroscience Program, The George Washington University and The Krasnow Institute for Advanced Study at George Mason University. Advisers: Stephen J Schiff, MD, PhD, Professor of Neurosurgery, Engineering Science and Mechanics and Physics. Bruce Gluckman, PhD, Associate Professor of Engineering Sciences and Mechanics and Neurosurgery and Paul So, PhD, Associate Professor of Physics.
- 2001-2002      Post-Doctoral Fellow, Department of Biomedical Engineering, Johns Hopkins University. Adviser: Reza Shadmehr, PhD, Professor of Biomedical Engineering.
- 2002-2004      Post-Doctoral Fellow, Department of Physiology and Pharmacology, State University of New York Downstate Medical Center. Adviser: John King Chapin, PhD, Professor of Physiology and Pharmacology.
- 2004 – 2006      Research Assistant Professor, Department of Physiology and Pharmacology, State University of New York Downstate Medical Center.
- 2006 – 2012      Assistant Professor of Physiology and Pharmacology, State University of New York Downstate Medical Center.
- 2012 – present      Associate Professor of Physiology and Pharmacology, State University of New York Downstate Medical Center.

**Fellowships:**

- 1992 – 1993      Department in Biological Sciences SUNY at Buffalo Undergraduate Training Fellowship. Title of work : “Chemorepellents in Paramecium and Tetrahymena” Adviser: Todd M. Hennessey, PhD, Professor of Biology
- 1999              Mathematics Department at George Mason University Graduate Research Fellowship. David Walnut, PhD, Professor of Mathematics.
- 1996 – 1998      Program in Neuroscience The George Washington Medical School Graduate Fellowship. Title: “Synchronization Between Electric Fields and Neural Ensembles”. Adviser: Steven J Schiff, MD, PhD, Professor of Neurosurgery, Engineering Science and Mechanics and Physics.

**Honors and Awards:**

1993	Golden Key National Honor Society.
1994	Graduated With Honors in Biological Sciences SUNY Buffalo.
1999	2nd Place in the Poster Competition at The George Washington Medical Center Research Day.

**Professional Memberships:**

1996 – present	Society for Neuroscience
2006 – present	American Association for the Advancement of Science (AAAS)
2006 – present	The American Physiological Society
2008 – 2010	New York Academy of Science
2008 – present	Institute of Electrical and Electronics Engineers (IEEE)

**SERVICE**

**University Services:**

2006 – present	Reviewer, Annual Research Day School of Graduate Studies SUNY Downstate Medical.
2006 – present	Interviewer, SUNY Downstate College of Medicine
2006-present	Interviewer, SUNY Downstate, School of Graduate Studies
2007- 2009	Nominations, Elections, Ballots and By-laws Committee School of Graduate Studies. (Elected position)
2009-present	Executive committee of the BME Program, SUNY Downstate School of Graduate Studies (Elected position)
2014	University Conflict of interest committee
2014	Search committee for Department of Comparative medicine Chair.

**Scientific Community Services:**

2002 – present	Reviewer for: Journal of Neuroscience, Experimental Brain Research, Journal of Neurophysiology, PlosOne, IEEE Transactions On Neural Systems And Rehabilitation Engineering, IEEE Engineering in Medicine and Biology* *>8 reviews/annum
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20010 – present      Reviewer of articles for, and Chairman of sessions at Institute of Electrical and Electronics Engineers Engineering in Medicine and Biology annual meetings.

## **TEACHING**

### **Teaching and Mentoring Experience:**

#### **College of Medicine:**

1996 – 1997      Assistant in Neuroanatomy laboratory. The George Washington University Medical School.

2006 – 2007      Lecturer, Basic Mechanisms of Clinical Neuroscience, SUNY Downstate Medical Center.

2008 - present      Cardiophysiology lectures for the Medical School (3/annum) SUNY Downstate Medical Center

2012 - present      Lecture to Neurology residents. SUNY Downstate Medical Center

2014 - present      Problem based learning (PBL) Medical School(8/annum) SUNY Downstate Medical Center

#### **College of Health Related Professions:**

2008 – present      Lecturer, Cardiophysiology Conferences (2/annum) SUNY Downstate College of health related professions

2011 – present      Lecturer, Synapses Conference, SUNY Downstate College of health related professions.

2010 – present      Lecturer, Physical Therapy Motor Control Course (2/annum), SUNY Downstate Medical Center College of health related professions

2013 – present      Lecturer, Physiology, Motor control (3/annum), SUNY Downstate Medical Center College of health related professions

#### **School of Graduate Studies:**

1997      Graduate Teaching Assistant for Neuroanatomy, Department of

Anatomy, The George Washington Medical School.

2006 – 2009 Co-Course Director for Biomedical instrumentation course. (2 sessions/annum) Department of Physiology and Pharmacology SUNY Downstate Medical Center and Joint program in Biomedical Engineering POLY.

2007 - present Director of and sole lecturer, Computational Motor Control and NeuroRobotics course. (14 sessions/annum). Department of Physiology and Pharmacology, SUNY Downstate Medical Center.

2011 – present Lecturer, Scientific Writing course on grants and funding opportunities (1/annum). Department of Physiology and Pharmacology, SUNY Downstate Medical Center.

**Undergraduate:**

1998 - 2000 Lecturer, Basic Biology Laboratory. Full semester (13 /annum), Department of Biological Sciences, George Mason University, Fairfax, VA.

**Thesis Advisor:**

2004 – 2011 Mulugeta Semework, PhD (PhD, NBS, May, 2011) Thesis title “Microstimulation for Somatosensory Neuroprosthesis: Mapping direct responses and afferent modulation in somatosensory cortex and ventral posterolateral thalamus subnuclei”. Present position: Postdoctoral fellow, Dr. Semework is continuing his primate work with Michael E. Goldberg, MD, Professor of Brain and Behavior, Department of Neuroscience, Columbia University College of Physicians and Surgeons.

2005 – 2011 Pratik Chhatbar MD, PhD (PhD (BME), May, 2011) Thesis title “Towards implementing impedance control in sensorimotor neuroprosthesis”. This work focused on using force and position control in a brain machine interface in non-human primates. Present position: Postdoctoral fellow, Neurosciences Department, Medical University of South Carolina, with Prakash Kara, PhD, Assistant Professor of Neuroscience, Dr. Chhatbar has a Nature publication in press.

2008 – 2012 Marchello DiStasio, MD-PhD student (PhD (BME) completed May, 2012) Thesis title “Application of hemodynamic prefrontal cortex desirability signals as reinforcers in machine learning”. He is now

taking on a residency in Boston at Beth Israel Deaconess in pathology.

- 2008 – 2012 Lee Von Kraus, PhD candidate (NBS). Formerly a student of John Chapin, PhD, this student joined my laboratory in 2009 and is scheduled to defend his PhD thesis in December 2012. His thesis work, which focuses on the influence of Protein Kinase M-zeta on sensorimotor learning. He has published 3 papers, with 2 in review. He is presently running a start up company in NYC based on brain stimulation.
- 2008 – 2013 Brandi Marsh, MD-PhD candidate (BME). Her thesis work focuses on development of a reinforcement learning brain machine interface and reward like signals in the sensorimotor cortex. She is now in her 4th year of medical school.
- 2009 – present John Choi, PhD (BME) graduate student. His thesis work, which focuses on an inverse control system for a somatosensory neuroprosthesis resulted in 5 publications. He will propose his thesis within four months and is expected to defend his thesis within the year.
- 2009 – 2013 Jordan Iordanu, MD-PhD candidate (BME). His thesis work focused on the role of Protein Kinase M-zeta in the maintenance of somatosensory receptive and stimulus fields in the naïve and trained animal (rat and primate). He is currently back in medical school, he plans to become a neurosurgeon.
- 2011 – present David McNeil, MD-PhD candidate (BME). He is presently working on several projects involving invasive and non-invasive BMI/BCI.
- 2013 – present Aditya Tarigoppula, PhD candidate (BME). He is presently working on utilizing reward related activation in M1 for a reinforcement learning based BMI.
- 2013 – present Peng Gao, PhD candidate (BME). She is currently working on determining changes in learning associated molecules in the rat and primate, such as PKMzeta and other associated LTP molecules.
- 2013 – Present Jack Hessburg, MD/PhD candidate (BME) is working on several aspects of BMI/BCI.
- 2014 – present Yoa Zhao, PhD candidate (BME) just joined the lab and will be working on BMI decoding.

## **Masters, Undergraduate and High school Students:**

- 2003 Tim Hansen, PhD. After obtaining his BS from Cornell, Dr. Hansen worked as a technician in my laboratory, then obtained his PhD at DUKE University, with Miguel Nicolelis, MD, PhD, Professor of Neurobiology, Biomedical Engineering and Psychological and Brain Sciences, and is now a postdoctoral fellow at UCSF with Phillip Sabes, PhD. He is collaborating with us on the DARPA REPAIR project.
- 2008 Shamik Chakraborty, MD. While in the Brooklyn College MD program with SUNY Downstate, Dr. Chakraborty did a Summer Undergraduate Research Program project in my laboratory, then obtained his MD degree from SUNY Downstate, and is now a resident in Neurosurgery at North Shore. While in my laboratory, Shamik and Gregory Perrin (see below) obtained preliminary data on Protein Kinase M-zeta, later published in Public Library of Science One 2010.
- 2008 – 2010 Gregory Perrin, BS (Brooklyn College). After a Summer Undergraduate Research Program project in my laboratory, Gregory obtained a Masters degree from Brooklyn College, and recently applied for admission to the School of Graduate Studies, SUNY Downstate.
- 2010 – present Aditya Tarigoppula, MS (NYU-POLY). A key member of my laboratory group for two years whose work focuses on brain machine interfacing, he plans to apply to graduate school in the near future.
- 2010 – present Daniel Fischer (Summer high school student). He won two awards for his work on Protein Kinase M-zeta at the NYC Science and Engineering Fair: The Yale Science and Engineering Association Award, and the Frank W. and Jan J. Stahl Memorial Award for Technical Excellence. He continues to work in the laboratory while finishing high school.
- 2010 Jeff Walker. BS (Northwestern) worked for one summer in the laboratory and is now a PhD student in the Neuroscience graduate program, University of Chicago.
- 2011 Nicholas Rotella, BS (Cooper Union) worked in the laboratory with Aditya Tarigoppula (see above); they recently published some of their work on reinforcement learning brain machine interface systems in IEEE Engineering in Medicine and Biology journal. He is

now a PhD student in the Computational Neuroscience program at the University of Southern California.

- 2011 Irving Campbell, BS (MS student at NYU-POLY) worked in the laboratory with Brandi March and Adi Targoppula (see above) on reinforcement learning brain machine interface, and will complete his MS degree in 2012.
- 2011 Rian Shams (BS student in BME, University of Binghamton) was a summer volunteer in the laboratory, and worked with Marcello DiStasio on fNIRS (see above). He recently applied for admission to graduate programs in BME.
- 2012 Vlad Moraru, a Midwood High School student, is working with John Choi (see above) on creating a somatosensory neuroprosthesis, with Vlad learning to run computer simulations.
- 2012 Andrew Lithen, an Intel Summer high school student at the University of Albany at Islip High School, is working with David Bernat, PhD (see below) on non-invasive fNIRS/EEG BMI systems.

### **Post Doctoral Fellows**

- 2010 - 2012 Weiguo Song, PhD (Control Theory and Engineering, Beijing), worked on S1 processing and information flow between units under different contextual conditions such as spike time dependent microstimulation. He submitted X manuscripts to Y for review, and is now doing another post doc on spinal cord injury at CUNY.
- 2010 – 2011 Kwangteck Kim, PhD, BME (Purdue University), worked toward developing a virtual 3-D world with haptic interface. Present position: Research Scientist, Advanced Research Institute in LG Electronics, Seoul, South Korea.
- 2011-2012 Janina Ferbinteanu, PhD (University of Toronto Neuroscience). She is now an Assistant Research Professor of Physiology and Pharmacology at SUNY Downstate, and has now set up her own laboratory with funds from an R21 grant involving hippocampal and striatal studies in the rat.
- 2012 - 2013 David Bernat, PhD (Cornell Astrophysics) is working on a project involving fNIRS/EEG in humans and non-human primates. Went to google.



- 2011 - 2013            Chen Chen, PhD (BME) (University of Connecticut), is working on development of somatosensory neuroprosthesis in non-human primates. Went to work with Advanced Bionics.
- 2011 - 2013            Arthi Srinivasan, PhD (BME) (University of Southern California), is working on development of somatosensory neuroprosthesis in non-human primates. Joined a patient legal firm.

## Research

### Funded Awards: (Total to date 16M\$)

1.     NIH R01 Towards an Autonomous Brain Machine Interface. **1.6 M\$ total**. 05/15 – 04/19.
2.     NY State DOH Spinal Cord Injury Board. **\$348,000**. Principal investigator. 24/7 Use of a Fully Integrated Bi-Directional Autonomous Brain Machine Interface in Non-Human-Primates. (Recommended for funding).
3.     NY State DOH Spinal Cord Injury Board. **\$119,000**. Principal investigator. Generation of an Autonomous Brain Machine Interface. 10-1-2014 – 2-28-2015.
4.     NY State DOH Spinal Cord Injury Board. **\$212,000**. Principal investigator. Toward the generation of an autonomous brain computer interface in humans. 12-1-2014 – 3-31-2015.
5.     NY State DOH Spinal Cord Injury Board. **\$34,000**. Principal investigator. State supported Bridge funding grant for the below award due to lack of funds from the Foundation. 2013-2014.
6.     Christopher and Dana Reeve Foundation. Principal Investigator Joseph Thachil Francis. Development Of A Somatosensory Neuroprosthesis Via VPL Microstimulation In The Presence Of Spinal Cord Injury. This award was set for **\$150,000** but due to low donations they were only able to give us a gift of **\$25,000** toward our ongoing research.
7.     Defense Advanced Research Projects Agency (**DARPA**) Creating the Synthetic Brain Through Hybrid Computational and Biological Systems: Repairing and Replacing Neural Networks. Phase 2. Principal Investigator Joseph Thachil Francis. Amount of award **\$6,063,148.00** 04/01/2012 – 10/31/2015
8.     Defense Advanced Research Projects Agency (**DARPA**). Creating the Synthetic Brain Through Hybrid Computational and Biological Systems: Repairing and Replacing Neural Networks. Phase 1. Principal Investigator Joseph Thachil Francis. Amount of award **\$6,814,557.00** 03/31/2010 – 04/1/2012

9. NYS Department of Health Neural Spinal Cord Injury Research Board. Prosthesis To Restore Touch Sensation In Spinal Cord Injury. Principal Investigator John King Chapin, Co-Principal Investigator Joseph Thachil Francis. Amount of award **\$300,000.00** 04/01/2007 – 05/31/2010
10. NYS Department of Health Spinal Cord Injury Research Board. Forced Based Brain Machine Interface. Principal Investigator Joseph Thachil Francis. Amount of award: **\$324,000.00** (April 2007 – May 2010).
11. National Academies of Science Keck Futures Initiative. Comparing And Contrasting Electrophysiological Properties Of And Biological Response To Chronically Implanted Electrode Arrays (our new ceramic multi contact, traditional Micro-wires, and the Cyberkinetics array). Principal Investigator Joseph Thachil Francis. Amount of award: **\$75,000.00** (May 2007 – April 2009).
12. Deans Initiative SUNY Downstate Medical Center. Principal Investigator Joseph Thachil Francis. Amount of award: **\$19,000.00**

**Patents:**

1. Biomimetic Multichannel Neurostimulation (Provisional Application Filed)
2. Autonomous Brain-Machine Interface (Provisional Application Filed)

**Current and past Collaborations:**

1. Reza Shadmehr, PhD, is Professor of Biomedical Engineering, Johns Hopkins University. Dr. Shadmehr is my postdoctoral mentor with whom I have continuously collaborated to date. He is participating in the DARPA REPAIR project.
2. José Principe, PhD, is Distinguished Professor, BellSouth Professor, Director of Computational Neuro Engineering Laboratory, and IEEE Fellow at the University of Florida Gainesville, and I have been collaborating since 2002. We have written several grants together and plan to submit an application to the National Robotics Initiative funded by the National Science Foundation. Dr. Principe is also a member of my DARPA REPAIR team. Most of our joint work involves development of a somatosensory neural prosthesis. In addition we are working on new mathematics for reinforcement learning architectures.
3. José Fortes, PhD is the AT&T Eminent Scholar and Professor of Electrical and Computer Engineering and Computer Science at the University of Florida where he founded and is the Director of both the Advanced Computing and Information Systems Laboratory and the multi-university NSF Industry-University Cooperative Research Center on Autonomic Computing. Dr. Fortes is helping link our

computational models with the real-time primate experiments for the DARPA REPAIR project.

4. Justin Sanchez, PhD, is Associate Professor of Biomedical Engineering at Miami University and now a DARPA program manager. Dr. Sanchez and I have been collaborating since 2003, and he is a member of my DARPA REPAIR team. We are developing a reinforcement learning brain machine interface for use with non-human primates.
5. José Carmena, PhD, is Associate Professor of Electrical Engineering and Cognitive Neuroscience, University of California Berkeley. We have been collaborating since 2001 and have participated in 3 grants together. The 1<sup>st</sup> was a DARPA project led by Miguel Nicholas, MD, PhD, Professor of Neurobiology, Biomedical Engineering and Psychological and Brain Sciences, DUKE University on brain machine interfacing. The 2<sup>nd</sup> was a grant from the National Academies of Science Keck Futures Initiative, on which I was Principal Investigator. The 3<sup>rd</sup> is my DARPA REPAIR project that aims at developing an In Silico version of sensorimotor control system. I expect our ongoing collaboration will continue.
6. Bruce Gluckman, PhD is Associate Professor and Associate Director of the Center for Neural Engineering, Department of Engineering Sciences and Mechanics, Department of Neurosurgery, Pennsylvania State University. Dr. Gluckman was a mentor to me when I was a graduate student and we have continued to collaborate since that time, writing grants and publishing together. Dr. Gluckman developed electrodes capable of discharging continuous current without erosion, which will be tested as a part of my somatosensory neural prosthesis project.
7. Karen Moxon, PhD is Associate Professor, School of Biomedical Engineering, Science & Health Systems and Associate Professor, Department of Neurobiology and Anatomy, Drexel University. Dr. Moxon was a collaborator on my National Academies of Science Keck Futures Initiative grant, along with Jose Carmina, PhD (see above). We have written several other grants together and I look forward to our future collaborations as she develops cutting edge multi contact electrodes that we have beta tested for her in the past.
8. Randall Barbour, PhD is Professor of Pathology, SUNY Downstate. Dr. Barbour and I have written several grants together and wrote the DARPA REPAIR grant application together. This work revolves around near infrared spectroscopy and its use in brain machine interfacing as well as determining if it can be used to predict single unit activity or local field potentials. This noninvasive recording technique will be coupled with EEG for several new grants that I am preparing with some of my postdoctoral fellows as a part of our robotics initiative.
9. William Lytton, MD is Professor of Physiology and Pharmacology, Biomedical Engineering and Neurology, SUNY Downstate. Dr. Lytton joined my DARPA

REPAIR team as an expert on building large-scale neural simulations, and we continue to collaborate to date.

10. Peter Bergold, PhD is Professor of Physiology and Pharmacology SUNY Downstate. We are presently working on identifying and characterizing changes in the EEG associated with traumatic brain injury and subsequent administration of pharmaceuticals he has determined help treat demyelination that occurs from such brain insults.
11. Peter Allen, PhD is Professor of Computer Science at Columbia University. We are presently working on combining his lab's work on autonomous reaching and grasping with robotic systems and our BMI work utilizing non-invasive tools such as EEG/fNIRS.

#### **Peer Reviewed Journal Publications:**

1. Towards an Autonomous Brain Machine Interface: Integrating Sensorimotor Reward Modulation and Reinforcement Learning. Marsh BM, Tarigoppula A, Chen C and **Francis JT**. (The Journal of Neuroscience, 2015).
2. Kernel Temporal Differences for Neural Decoding. Bae, J, Sanchez LG, Pohlmeier EA, **Francis JT**, Sanchez JC and Principe JC. Computational Intelligence and Neuroscience Volume 2015 (2015), Article ID 481375.
3. Towards real-time communication between in vivo neurophysiological data sources and simulator-based brain biomimetic models. Lee G, Matsunaga Am Dura-Bernal S, Zhang W, Lytton WW, **Francis JT** and Fortes JAB. Computational Surgery, November 2014, 3:12.
4. Motor cortex microcircuit simulation based on brain activity mapping. Chadderdon GL, Mohan A, Suter BA, Neymotin SA, Kerr CC, **Francis JT**, Shepherd GMG and Lytton WW. Neural Comput. 2014 Jul; 26(7):1239-62. **[Cover]**
5. Neural Decoding with Kernel-based Metric Learning. Brockmeier A, Choi J, Kriminger E, **Francis JT** and Principe JC. Neural Comput. 2014 Jun; 26(6):1080-107.
6. A tensor product kernel framework for multi-scale neural activity decoding and control. Li L, Brockmeier A, Choi JS, **Francis JT**, Sanchez JC and Principe JC. Computational Intelligence and Neuroscience Volume 2014 (2014), Article ID 870160
7. Tactile Information Processing in Primate Hand Somatosensory Cortex (S1) during Passive Arm Movement. Song W and **Francis JT**. Journal of Neurophysiology November 2013 **Vol.** 110 **no.** 9, 2061-2070

8. Reinforcement learning of 2-joint virtual arm reaching in a computer model of sensorimotor cortex. Neymotin SA, Chadderdon GL, Kerr CC, **Francis JT** and Lytton WW. Neural Compt December 2013, Vol. 25, No. 12, Pages 3263-3293. **[Cover]**
9. Use of frontal lobe hemodynamics as reinforcement signals to an adaptive controller. Distasio MM, **Francis JT**. PLoS One. 2013 Jul 22;8(7)
10. Cortical plasticity induced by spike triggered micro stimulation in the Primates met a sensory cortex. PLoS One. Song W, Kerr CC, Lytton WW, **Francis JT** 2013;8(3):e57453
11. Towards a naturalistic brain machine interface: hybrid torque and position control allows generalization to novel dynamics. Chhatbar PY, **Francis JT**. PLoS One. 2013;8(1): e52286
12. Towards a real-time interface between a biomimetic model of sensorimotor cortex in the robotic arm. Salvador Dura-Bernal, George Chadderdon, Samuel Neymotin, **Joseph T Francis** and William Lytton. Pattern recognition letters: special issue on multimodal interfaces, 2013.
13. Dynamically repairing and replacing neural networks: using hybrid computational and biological tools. Sanchez, J., Lytton W., Carmena J., Fortes J., Barbour R. and **Francis JT**. IEEE Pulse 2012 Jan; 3(1):57-9 **[Cover]**
14. An Electric Field Model for Prediction of Somatosensory (S1) Cortical Field Potentials Induced by Ventral Posterior Lateral (VPL) Thalamic Microstimulation. Choi JS, DiStasio MM, and **Francis JT**. IEEE Transactions on Neural Systems and Rehabilitation Engineering 2012 Mar; 20(2): 161-9.
15. Plasticity in sensorimotor cortex. **Francis J.T.** and Song W. Neural Plasticity Volume 2011 (2011), Article ID 31073
16. An Adaptive Inverse Controller for Online Somatosensory Microstimulation Optimization. Li L., Brockmeier A., **Francis JT.**, Sanchez JC, and Principe J.C. To appear in IEEE EMBS 2011.
17. Erasing Sensorimotor Memories via PKMzeta Inhibition. Von Kraus L.M., Sacktor T.C., **Francis J.T.** PLoS One 19/06/2010 Vol 5 Issue 6 pages e11125
18. A bio-friendly and economical technique for chronic implantation of multiple microelectrode arrays. Chhatbar P.Y., von Kraus L.M., Semework M. and **Francis JT**. J Neurosci Methods 16/02/2010 Vol 188 issue 2 pages 187-94

19. Proprioceptive and Cutaneous Representations in the Rat Ventral Posterolateral (VPL) Thalamus. **Francis J.T.**, Xu S. and Chapin J.K. *J Neurophysiol.* 2008 Feb 20, Vol 99 issue 5 pages 2291-304; **[Cover]**
20. Error Generalization as a Function of Velocity and Duration: Human Reaching Movements. **Francis J.T.** *Exp Brain Res.* 2008 Mar;186(1):23-37. Epub 2007 Nov 20.
21. Neural ensemble activity from multiple brain regions predicts kinematic and dynamic variables in a multiple force field reaching task. **Francis J.T.** and Chapin J.K. *IEEE Transactions on neural systems and rehabilitation engineering.* Vol. 14, NO. 2, June 2006.
22. The Influence of Inter-Reach-Interval on Motor Learning. **Francis J.T.** *Exp Brain Res* Vol 167, Number 1, Nov 2005, 128-131.
23. A Novel Torque Manipulandum for Small Animals. **Francis J.T.**, Chapin JK. *IEEE Transactions on Biomedical Engineering* 2004 Jun; 51(6):963-965.
24. Sensitivity of Neurons to Weak Electric Fields. **Francis J.T.**, Gluckman B.J. and Schiff S.J. *J Neuroscience* 2003, 23(19):7255-61.
25. Quantifying Generalization from Trial-by-Trial behavior of Adaptive Systems that Learn with Basis Functions: Theory and Experiments in Human Motor Control. Donchin O, **Francis J.T.** and Shadmehr R. *J Neuroscience* 2003, 23(27):9032-45.
26. Differentiability implies continuity in neuronal dynamics. **Francis JT**, So P, Gluckman GJ, and Schiff SJ *Physica D*, 2001 (148)175-181
27. Early seizure detection. Jerger KK, Netoff TI, **Francis JT**, Sauer T, Pecora L, Weinstein SL and Schiff SJ *J Clin Neurophysiol*, 2001 May, 18(3):259-68
28. Periodic Orbits: A Novel Language for Neuronal Dynamics. So P., **Francis J.T.**, Netoff TI, Gluckman BJ and Schiff SJ. *Biophysical Journal*, **74**, 2776-2785, 1998.
29. Chemorepellents in Paramecium and Tetrahymena. **Francis JT** and Hennessey TM *Journal of Eukaryotic Microbiology.* **42**: (1) 78-83 Jan-Feb 1995.
30. Oxidants Act as Chemorepellents in Paramecium by Stimulating an Electrogenic Plasma-Membrane Reductase Activity. Hennessey TM, Frego LE and **Francis JT** *Journal of Comparative Physiology A-Sensory Neural and Behavioral Physiology.* **175**: (5) 655-665 Nov 1994.

**Peer Reviewed Conference papers:**

1. Repairing lesions via kernel adaptive inverse control in a biomimetic model of sensorimotor cortex. Li K, Dura-Bernal S, **Francis JT**, Lytton WW and Principe JC. (7th International IEEE EMBS Neural Engineering Conference, 2015)
2. Electronically induced contrast enhancement in whisker S1 cortical responses fields. Von Kraus L and **Francis JT**. IEEE Engineering in Medicine and Biology Soc., 2014
3. Correntropy Kernel Temporal Differences for Reinforcement Learning Brain Machine Interfaces. Bae J, Sanchez LG, **Francis JT** and Principe JC. Neural Networks (IJCNN), 2014 International Joint Conference on
4. Reinforcement learning of a 2 joint virtual arm reaching in a computer model of sensorimotor cortex. Samuel Neymotin, George Chadderdon, Cliff Kerr, **Joseph T. Francis** and William Lytton. *BMC Neuroscience* 2012, **13**(Suppl 1):P90
5. Properties of a temporal Difference Reinforcement Learning Brain Machine Interface Driven by a Simulated Motor Cortex. Tarigoppula A., Rotella N and **Francis J.T.** Conf Proc IEEE Eng Med Biol Soc. 2012;2012:3284-7
6. Subspace Matching Thalamic Microstimulation to Tactile Evoked Potentials in Rat Somatosensory Cortex. Brockmeier A.J., Choi J.S., Emigh M.S., Li L., **Francis J.T.** and Principe J.C. Conf Proc IEEE Eng Med Biol Soc. 2012;2012:2957-60. doi:.
7. Decoding Stimuli from Multi-source Neural Responses. Li L., Choi J.S., **Francis J.T.**, Sanchez J.C. and Principe J.C. Conf Proc IEEE Eng Med Biol Soc. 2012; 2012: 1331-4.
8. Reinforcement learning via kernel temporal difference. Bae J, Chhatbar P.Y., **Francis J.T.**, Sanchez J.C. and Principe J.C. IEEE End Med Biol Soc. 2011; 2011;5662-5
9. Optimizing Microstimulation using a Reinforcement Learning Framework. Brockmeier A. J., Choi J.S., DiStasio M.M., **Francis J.T.** and Principe, J.C. IEEE EMBS 2011
10. Sparse coding of movement-related neural activity. DiStasio M.M., Chhatbar P.Y. and **Francis J.T.** IEEE SPMB 2011.
11. Evaluating Dependence in Spike Train Metric Spaces. Seth S, Brockmeier A.J., Choi J.S., Semework M., **Francis J.T.**, Principe JC. To appear in 2011 International Joint Conference on Neural Networks in IEEE Computational Intelligence Society Journal.

12. An adaptive decoder from spike trains to micro-stimulation using Kernel Least-Mean-Squares (KLMS). Li L., Park M., Seth S., Choi J., **Francis J.T.**, Sanchez J., Principe J.C., IEEE Machine Learning for Signal Processing (MLSP) 2011.
13. Control of a Center-Out Reaching task using a Reinforcement Learning Brain-Machine Interface. Sanchez J.C., Tarigoppula A., Choi J.S., Marsh B.T., Chhatbar P.Y., Mahmoudi B. and **Francis J.T.** Neural Engineering (NER), 2011 5th International IEEE/EMBS Conference on pg. 525-528.
14. A Novel family of Non-parametric cumulative based Divergences for Point Processes. Seth S., Park I., Brockmeier A., Semework M., Choi J.S., **Francis J.T.** and Principe J.C. Advances in Neural Information Processing Systems 23. 2119-2127 2010.
15. Comparison of Force and Power Generation Patterns and their Predictions under Different External Dynamic Environments. Chhatbar P.Y. and **Francis J.T.** Conf Proc IEEE Eng Med Biol Soc. 2010;2010:1686-90 2010.
16. Electrostimulation as a prosthesis for repair of Information Flow in a Computer Model of Neocortex. Kerr CC, Neymotin SA, Chadderdon G, Fietkewicz C, **Francis JT**, and Lytton WW IEEE Trans Neural Syst Rehabil Eng. 2012 Mar;20(2): 153-60.

#### **Book Chapters:**

1. **Francis, J.T.**The neural representation of Kinematics and Dynamics in multiple brain regions: The use of force field reaching paradigms in the Primate and Rat In Mechaniosensitivity in Cells and Tissues: Nervous system. Springer, 2008.
2. Jerger K.K., Netoff T.I., **Francis, J.T.**, Sauer T., Pecora L.M., Weinstein S.L. and Schiff S.J. Comparison of Methods for Seizure Detection. In: Epilepsy as a Dynamic Disease. Milton J., Jung P. Springer, New York, 2003

#### **Papers in Preparation:**

1. Tactile information gating through distinct frequency channels during passive arm movements in awake primate. Weiguo Song and **Francis JT**.
2. Role of PKMzeta and LTP in the maintenance of somatosensory receptive fields in the naïve adult rat and monkey.
3. Tracking changes in PKMzeta during sensorimotor learning.
4. Neural Modulation of Primary Sensorimotor Cortex.

#### **Papers In submission:**



1. Somatosensory Neuroprosthesis From a Neurophysiological and Control Engineering Perspective: Recreating Tactile Cortical Responses Via Optimization Of Thalamic Microstimulation. J Neuroscience to be sent back for 2<sup>nd</sup> round of review.

**Poster Presentations:** (Partial List)

1. **Francis J.T.**; Marsh B.; DiStasio M. Correlates of Desirability in the Primary Motor Cortex of Primates. Neural Control of movement Venice Italy April 2012.
2. Chhatbar, P.Y.; **Francis J.T.** Use of Hybrid torque plus position controller towards more realistic movement profiles of neurally controlled devices. 41st Annual Meeting of the Society-for-Neuroscience Location: Washington, DC, USA Date: November 12 -16, 2011.
3. Neymotin, S. A.; Kerr, C.; **Francis, J. T.**; Lytton W. Attentional modulation of receptive fields in a computer model of the thalamocortical system 41st Annual Meeting of the Society-for-Neuroscience Location: Washington, DC, USA Date: November 12 -16, 2011.
4. Neymotin, S. A.; Kerr, C. C.; Chadderdon, G.; **Francis J.T** and Lytton W. Restoring physiological oscillations using neuroprosthetic spike-timing-dependent plasticity in computer model of neocortex. 41st Annual Meeting of the Society-for-Neuroscience Location: Washington, DC, USA Date: November 12 -16, 2011
5. Iordanou J.C. and **Francis, J.T.** Developing an Automated System for Training Rats in a Skilled Reaching Task" Presented at SUNY Downstate Annual Research Day March 9th 2011 (received Travel award)
6. March B. **Francis J.T.** Reinforcement Learning Brain Machine Interfaces in Macaques. Presented at SUNY Downstate Annual Research Day March 9th 2011 (received Travel award)
7. Semework, M.; Xu, S.; Song, W.; **Francis J.T.** Somatosensory neuroprosthesis via microstimulation: Comparison between s1 cortex and vpl thalamus. 41st Annual Meeting of the Society-for-Neuroscience Location: Washington, DC, USA Date: November 12 -16, 2011
8. **Francis, J. T.**; Chapin, J.; Lytton, W.; et al. Creating the synthetic brain through hybrid computational and biological systems repairing and replacing neural networks. 40th Annual Meeting of the Society-for-Neuroscience Location: San Diego, CA, USA Date: November 13 -17, 2010
9. Chhatbar, P.Y., Semework, M., Xu, S., Marsh, B.T. and **Francis, J.T.** (2010, October). *Towards Real-time Force Control in a Brain-Machine Interface*, Poster

presented at: 5<sup>th</sup> Annual NIH National Graduate Student Research Festival; Bethesda, MD.

10. Semework, M., Xu, S. and **Francis, J.T.** 2010. Mapping Direct Responses and Afferent Modulation in Thalamo-cortical Networks in Microstimulation for Somatosensory Neuroprosthesis. Poster presented at: Society for Neuroscience Annual Meeting 2010; San Diego, CA.
11. Xu, S., Hawley, E., von Kraus, L.M., Semework, M., Chapin, J. K., and **Francis, J.T.** A multichannel constant current stimulator for intracortical stimulation. . Poster presented at: Society for Neuroscience Annual Meeting 2010; San Diego, CA.
12. Semework, M., Xu, S., Choi, J.S. and **Francis, J.T.** 2010. Somatosensory Neuroprosthesis: Custom-fitting Microstimulation Parameters. Poster presented at: Society for the Neural Control of Movement 19th Annual Conference; Naples, FL.
13. Semework, M., Song, W., Xu, S. and **Francis, J.T.** 2010. Microstimulation in Awake Monkey with Chronic Ventral Posterolateral Thalamus (VPL) and Somatosensory Cortex (S1) Implants. Poster presented at: DARPA Neural Engineering Science and Technology (NEST) Forum. San Diego, CA.
14. Chhatbar, P.Y. and **Francis, J.T.** (2010, April). *Real-time Control of Movements with Neural Signals Predicting Force-related Variables*, Poster presented at: Annual Research Day 2010, SUNY Downstate Medical Center; Brooklyn, NY.
15. Linking Action and Perception in the Mammalian Thalamus Marcello M. DiStasio and **Joseph T. Francis**. Fifth International Workshop Statistical Analysis of Neuronal Data (SAND5). Pittsburgh, PA. 2010.
16. John S. Choi, Marcello M. DiStasio, **Joseph T. Francis**. Predicting VPL Thalamus LFP Modulation Induced by Microstimulation with a 3D Electric Field Model. DARPA NEST Forum. San Diego 2010
17. Chhatbar, P. Y.; Semework, M.; Xu, S.; **Francis J.T.** Force control in a brain-machine interface 40th Annual Meeting of the Society-for-Neuroscience Location: San Diego, CA, USA Date: November 13 -17, 2010
18. **Francis, J.T.**, von Kraus, L.M. and Sacktor, T.C., Erasing sensorimotor memories via PKM zeta inhibition. SFN Annual Meeting Chicago 2009.
19. Chhatbar, P.Y., Semework, M., **Francis, J.T.**, Relationship between neural activity in multiple sensorimotor cortices and force-related variables during primate reaching movements. SFN Annual Meeting Chicago 2009.

20. Xu, S., Semework, M., Rozenboym, A.V., Chhatbar, P.Y., **Francis, J.T.** and Chapin, J.K., Neurophysiological effects of microstimulation in rat and monkey somatosensory thalamus. SFN Annual Meeting Chicago 2009.
21. Chhatbar, P.Y., Semework, M., **Francis, J.T.** (2009, October). *Relationship between Neural Activity in Multiple Sensorimotor Cortices and Force-related Variables during Primate Reaching Movements*. Poster presented at: Society for Neuroscience Annual Meeting 2009; Chicago, IL.
22. Chhatbar, P.Y., Semework, M., von Kraus, L.M., Rozenboym, A. and **Francis, J.T.** (2009, May). *Long-term Stability of Cortical Neural Ensemble Recordings between Different Microelectrode Array Types*. Poster presented at: Society for the Neural Control of Movement 19th Annual Conference; Waikoloa, HI.
23. Semework, M., Chhatbar, P.Y., Rozenboym, A.V., von Kraus, L.M., Xu, S., Chapin, J. K., and **Francis, J.T.** 2009. Somatosensory Neuroprosthesis: Where Best to Stimulate: Peripheral, VPL or Cortical? Poster presented at: Society for the Neural Control of Movement 19th Annual Conference; Waikoloa, HI.
24. Chhatbar, P.Y., Semework, M., von Kraus, L.M. and **Francis, J.T.** (2008, November). *Comparison Study of the Long-term Stability of Cortical Neural Ensemble Recordings between Different Types of Microelectrode Arrays*. Poster presented at: Society for Neuroscience Annual Meeting 2008; Washington, DC.
25. Semework, M., Chhatbar, P.Y., von Kraus, L.M., Hawley, E., Xu, S., Chapin, J. K., and **Francis, J.T.** 2008. Can Micro-stimulation in the Proprioceptive Brain Areas Mimic Novel Dynamic Force Perturbations Applied to the Arm? Poster presented at: Society for Neuroscience Annual Meeting 2008; Atlanta, GA.
26. **Francis, J.T.**, Rozenboym, A., Xu, S., von Kraus, L.M., Semework, M., Chhatbar, P.Y. and Chapin, J.K. (2008, January). *On the Way to a Somatosensory Neuro-Prosthesis*. Poster presented at: The New York Spinal Cord Injury Research Board symposium- From the Bench to Bedside: The Latest Discoveries in SCI Research; New York Academy of Sciences; New York, NY
27. Chhatbar, P.Y., von Kraus, L.M., Hawley, E., **Francis, J.T.** and Chapin, J.K. (2007, April). *An Apparatus for Punctate Cutaneous Stimulation of the Arm and Fingers of the Bonnet Macaque: Implications for a Fully Integrated BMI (award winner)*. Poster presented at: Annual Research Day 2007, SUNY Downstate Medical Center; Brooklyn, NY.
28. **Francis, J.T.** Error generalization as a function of velocity: human reaching movements. Society for Neuroscience Annual Meeting. Atlanta GA, 2006.

29. Rozenboym A., Xu S., von Kraus L.M., Semework M., **Francis, J.T** and Chapin J.K. Micro-stimulation in somatosensory thalamus elicits naturalistic responses in cortical networks. Society for Neuroscience Annual Meeting. Atlanta GA, 2006.
30. **Francis, J.T.** and Chapin J.K., Neural ensemble activity from multiple brain regions predicts kinematic and dynamic variables in a multiple force field reaching task in the Rat. Society for Neuroscience Annual Meeting. Washington DC, 2005.
31. Rozenboym A., Xu S., von Kraus L.M., Semework M., Chapin J.K. and **Francis, J.T.** Neuronal ensemble representation of cutaneous stimuli in the somatosensory cortex of awake and anaesthetized macaques. Society for Neuroscience Annual Meeting Washington DC, 2005.
32. Xu S., Li L., **Francis, J.T.**, Talwar, S.K. and Chapin J.K. Spatiotemporal encoding in rat somatosensory cortex of electrical stimulation in sensory thalamus. Society for Neuroscience Annual Meeting.2003.
33. Li L., Xu S., Hawley E.S., **Francis, J.T.**, Talwar S.K. and Chapin J.K. Spatiotemporal encoding in rat somatosensory cortex of electrical stimulation in sensory thalamus. Society for Neuroscience Annual Meeting. 2003.
34. **Francis, J.T.**, Xu S., Rodriguez D. and Chapin J.K. Mapping the Ventroposterior lateral thalamus: cutaneous and proprioceptive representations. Society for Neuroscience Annual Meeting, 2003.
35. Huang V, **Francis J.T.** and Shadmehr R. Temporal Gain Field of Motor Memory. Society for Neuroscience annual meeting. 2003.
36. Donchin, O., **Francis, J.T.** and Shadmehr, R. Explaining motor learning using a simple dynamical system. Society for Neuroscience Annual Meeting.2002.
37. **Francis,J.T.**, So,P., Gluckman, B.J., Netoff, T.I. and Schiff, S.J., Synchronization Between a Neuronal Ensemble and a "Natural" Electric Field at Physiologically Relevant Strengths. Society for Neuroscience Annual Meeting. Miami, 1999.
38. **Francis, J.T.**, So, P., Gluckman, B.J., Netoff, T.I. and Schiff, S.J., Differentiability Implies Continuity in Neuronal Dynamics. Annual Computational Neuroscience Meeting. Pittsburgh, 1999.
39. **Francis, J.T.**, So, P., Gluckman, B.J., Netoff, T.I. and Schiff, S.J., Differentiability Implies Continuity in Neuronal Dynamics. Fifth SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 1999.

40. **Francis, J.T.**, So, P., Gluckman, B.J., Netoff, T.I. and Schiff, S.J., Differentiability Implies Continuity in Neuronal Dynamics. Research Day at The George Washington Medical Center, 1999.
41. **Francis, J.T.** So, P., Gluckman, B.J., Netoff, T.I. and Schiff, S.J., Deterministic structure in data from a free running neuronal ensemble: a comparison of three non-linear tests for determinism. *Society for Neuroscience Abstracts*, vol 24, pg. 1214,1998.
42. **Francis, J.T.**, So, P., and Schiff, S. J., Description of Cyclic patterns in Neuronal ensemble Activity. *Society for Neuroscience Abstracts*, vol 23, pg 380, 1997
43. **Francis, J.T.**, So, P., and Schiff, S.J., Periodic Orbits in Neuronal Ensemble Activity. *Society for Neuroscience Abstracts* 22: 2085, 1996.
44. Schiff, S.J., So, P, **Francis, J.T.** and Gluckman, B.J., Nonlinear time series analysis of physiological and pathological brain dynamics, Bonn, Germany, 1999
45. Schiff, S.J., **Francis, J.T.**, So, P and Gluckman, B.J., Smithsonian Associates Seminar Series, Campus on the Mall, Dynamical Neuroscience: From Top-Down to Bottom-Up and Beyond, The Smithsonian Institution, 1999.
46. So, P., **Francis, J.T.**, Gluckman, B.J; Netoff, T.I. and Schiff, S.J., "Nonlinear Dynamics in Neuronal Ensembles", Dynamics Days 1999 Como Italy, Villa Olmo, Como, Italy, June 1999.
47. So, P., Gluckman, B.J., **Francis, J.T.**, Netoff, T. and Schiff, S.J., Characterization of Complex Neuronal Dynamics using Unstable Periodic Orbits. Presented at the American Physical Society, Los Angeles, 1998.
48. Gluckman, B.J., So P., **Francis, J.T.**, Netoff, T. and Schiff S. J., Prediction and Tracking of Complex Neuronal Dynamics using Unstable Periodic Orbits. Presented at the American Physical Society, Los Angeles, 1998.
49. Netoff, T.I., So P., Gluckman B.J., **Francis, J.T.** and Schiff S.J., Understanding Interspike Interval Variability. Society for Industrial and Applied Mathematics, Snow Bird Utah, (1999)
50. Netoff, T.I., Gluckman, B.J., So, P., **Francis, J.T.** and Schiff S.J., Searching for nonlinear interactions between cells in neuronal networks. *Society for Neuroscience Abstracts*, vol 24, pg 1160, 1998
51. Netoff, T.I., So, P., Gluckman, B.J, **Francis J.T.** and Schiff, S.J., Detecting Patterns of Activity in Single Cell Recording. *Society for Neuroscience Abstracts* vol 23, pg 482

52. So, P., **Francis, J.T.**, Gluckman, B.J., Netoff, T.I. and Schiff, S.J., "Characterization of Complex Neuronal Dynamics by Unstable Periodic Orbits", Gordon Research Conference on Bio- electrochemistry, New England College, NH, July 1998.
53. So, P., **Francis, J.T.**, Gluckman, B.J., Netoff, T.I., Schiff, S.J., "Periodic Orbits: A New Language for Neuronal Dynamics", George Mason University, Fairfax, Virginia, November 1997.

#### **Invited Talks and Oral Presentations:**

1. Plenary speaker Brain Matters V – Arizona conference May 29<sup>th</sup> 2015.
2. Francis JT. Toward a Fully Bidirectional and Autonomous Brain Machine Interface. University of Houston Mar 2015.
3. Francis JT. Erasing sensorimotor memories II: The role of PKMzeta dependent LTP in S1 receptive fields and behavior in the experimentally naive rat and primate. To be presented in Amsterdam April 2014 at the Neural Control of Movement Annual Meeting.
4. Francis JT. Fully Integrated and Autonomous Brain Machine Interface. Columbia Universality BME seminar series Feb 2014.
5. Francis JT, Marsh B, Chen C and Tarigoppula A. Reward modulation of the sensorimotor cortex and its use in a reinforcement learning brain machine interface. NYU-Poly BME colloquium Dec 2013.
6. Francis JT, Marsh B, Chen C and Tarigoppula A. Reward modulation of the sensorimotor cortex and its use in a reinforcement learning brain machine interface. NCM 2013 Puerto Rico.
7. Tarigoppula A., Rotella N and **Francis J.T.** Properties of a temporal Difference Reinforcement Learning Brain Machine Interface Driven by a Simulated Motor Cortex. IEEE EMBS 2012 34<sup>th</sup> Annual International Conference of the IEEE Engineering in Medicine and Biology Society.
8. Brockmeier A.J., Choi J.S., Emigh M.S., Li L., **Francis J.T.** and Principe J.C. Subspace Matching Thalamic Microstimulation to Tactile Evoked Potentials in Rat Somatosensory Cortex. IEEE EMBS 2012 34<sup>th</sup> Annual International Conference of the IEEE Engineering in Medicine and Biology Society.
9. Li L., Choi J.S., **Francis J.T.**, Sanchez J.C. and Principe J.C. Decoding Stimuli from Multi-source Neural Responses. IEEE EMBS 2012 34<sup>th</sup> Annual International Conference of the IEEE Engineering in Medicine and Biology Society.

10. Marsh B., **Francis J.T.**, Reinforcement Learning Brain Machine Interfaces in Macaques co-Chair neuroprosthetic nanosymposium SFN meeting Oct 2012.
11. **Francis J.T.**, On the road to a fully integrated Brain Machine Interface: Somatosensory neuroprosthesis and more. UCSD Joint INC-IEM Neuroengineering Seminar. 04/09/2012
12. **Francis, J.T.**, Creating the Synthetic Brain Through Hybrid Computational and Biological Systems: Repairing and Replacing Neural Networks. Johns Hopkins BME Department April 2011.
13. Bae, Jihye; Chhatbar, Pratik; **Francis, Joseph T** and Principe J. Reinforcement Learning via Kernel Temporal Difference; et al. IEEE 33rd Annual International Conference of the IEEE Engineering-in-Medicine-and-Biology-Society (EMBS) Boston, MA Date: AUG 30-SEP 03, 2011
14. Li, Lin; Park, Il Memming; Seth, Sohan; **Francis J.T** and Principe J.C. An Adaptive Decoder From Spike Trains To Micro-Stimulation Using Kernel Least-Mean-Squares (KLMS)IEEE 21st IEEE International Workshop on Machine Learning for Signal Processing (MLSP): Chinese Acad Sci, Inst Automat, Natl Lab Pattern Recognit (NLPR), Beijing, 2011
15. Seth, Sohan; Brockmeier, Austin J.; Choi, John S.; **Francis J.T** and Principe J.C. Evaluating dependence in spike train metric spaces IEEE Conference: International Joint Conference on Neural Networks (IJCNN) Location: San Jose, CA Date: JUL 31-AUG 05, 2011 International Joint Conference On Neural Networks (IJCNN) Pages: 2645-2652 Published: 2011
16. **Francis, J.T.**, Creating the Synthetic Brain Through Hybrid Computational and Biological Systems: Repairing and Replacing Neural Networks. NYU-POLY 2011.
17. **Francis, J.T.**, Creating the Synthetic Brain Through Hybrid Computational and Biological Systems: Repairing and Replacing Neural Networks. Brooklyn College 2011.
18. **Francis, J.T.**, Creating the Synthetic Brain Through Hybrid Computational and Biological Systems: Repairing and Replacing Neural Networks. NEST Conference San Diego 2010.
19. Chhatbar, P.Y. and **Francis, J.T.** (2010, September) Comparison of Force and Power Generation Patterns and their Predictions under Different External Dynamic Environments. Oral Presentation presented at: 32nd Annual International Conference of the IEEE Engineering in Medicine and Biology Society; Buenos Aires, Argentina.

20. Chhatbar, P.Y. and **Francis, J.T.** (2010, June). Real-time Control of Movements with Neural Signals Predicting Force-Related Variables. Oral Presentation presented at: 28<sup>th</sup> Annual AAPI Convention; Washington, DC.
21. Chhatbar, P.Y., Semework, M., Xu, S., Marsh, B.T., **Francis, J.T.** (2010, November). *Force Control in Brain-Machine Interface*. Oral Presentation presented at: Society for Neuroscience Annual Meeting 2010; San Diego, CA.
22. **Francis, J.T.**, Creating the Synthetic Brain Through Hybrid Computational and Biological Systems: Repairing and Replacing Neural Networks 2010 CMM Workshop on Brain Neuromechanics, July 26-28, 2010, at the Fields Institute Toronto Canada.
23. **Francis, J.T.**, 2009. Neural Control of Movement. Erasing Sensorimotor Memories via PKMzeta Inhibition. Hawaii.
24. **Francis, J.T.** and Chapin J.K., On the path to a fully integrated Brain Machine Interface. International Conference on Brain Controlled Interfacing. Rensselaerville NY, 2005.
25. **Francis, J.T.**, On the Sensitivity of Neural Ensembles to Electric Fields. University of Alabama Birmingham Department of Biomedical Engineering. 2002
26. **Francis, J.T.**, On the Sensitivity of Neural Ensembles to Electric Fields. Mount Sinai Department of Physiology. 2000
27. **Francis, J.T.**, On the Sensitivity of Neural Ensembles to Electric Fields. Johns Hopkins Department of Biomedical Engineering. 2000