REX N. TIEN

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- Neural engineer with 9 years of research experience in experimental motor neuroscience and brain computer interfaces.
- Expert in implantable cortical microelectrode array systems and statistical analysis of neural and behavioral data.
- Specialist in non-human primate electrophysiology experiments including task design, animal training and surgery.
- Effective science communicator with multiple peer-reviewed publications, conference presentations and talks
- Passionate about improving lives by advancing clinical brain computer interfaces and through outreach volunteering.

RESEARCH EXPERIENCE

8/2011 – 8/2020 (Expected) **Doctoral Research** University of Pittsburgh Advisor: Dr. Andrew Schwartz
- Investigated how populations of neurons in primary motor, premotor and parietal cortex of the macaque contribute to the control of grasping and manipulation of objects with different learned or perceived affordances.
- Analyzed high-dimensional neural spike data, motion-capture kinematics, EMG and force sensor data using advanced statistical and machine learning techniques in Python and MATLAB.
- Created a novel microelectrode array implant guidance system leveraging MRI, CAD, CAM and 3D printing for rapid, precise, reliable insertion in multiple brain areas; fabricated implant components; performed two surgeries.
- Developed a method to automatically adapt task difficulty to train a naïve user of a robotic neural prosthetic.
- Characterized the neural signatures of long-term learning during neural prosthetic control of a computer cursor.

9/2010 – 5/2011 **Undergraduate Thesis** Princeton University Advisor: Dr. Philip Holmes
- Designed, fabricated and programmed a bio-mimetic lamprey robot controlled via a simulated spinal cord.

5/2010 – 9/2010 **Research Assistant** University of Miami Advisor: Dr. Fabrice Manns
- Coded wavefront aberration analysis software for online evaluation during Phaco-Ersatz ocular lens replacement.

6/2009 – 9/2009 **Research Assistant** Princeton University Advisor: Dr. Elie Bou-Zeid
- Installed and validated SODAR systems and other meteorological sensors; analyzed scintillometer data.

TEACHING EXPERIENCE

1/2013 – 5/2013 **Teaching Assistant** BIOE 1580: Biomedical Application of Signal Processing

9/2012 – 12/2012 **Seminar Series Leader** BIOE 3095: Classical Concepts in Motor Control
- Created and led a one semester journal club style seminar series to review early studies in motor neuroscience.

1/2012 – 5/2012 **Teaching Assistant** BIOE 1632: Biomechanics 3: Biodynamics of Movement

EDUCATION

University of Pittsburgh – Pittsburgh, PA GPA: 4.0/4.0 8/2020 (Expected)
PhD, Department of Bioengineering, Neural Engineering Track

Center for the Neural Basis of Cognition – Pittsburgh, PA 8/2020 (Expected)
Interdisciplinary graduate training program

Princeton University – Princeton, NJ GPA: 3.3/4.0 5/2011
Bachelor of Science in Engineering, Mechanical Engineering
Certificates of Proficiency: Neuroscience, Robotics & Intelligent Systems, Engineering Biology

Shaker High School – Latham, NY GPA: 99/100 6/2006

RELEVANT COURSEWORK AND SKILLS

Data Acquisition and Analysis: Intracortical electrophysiology, Electromyography, Motion capture, Force sensing, Filtering and signal processing, Statistical analysis and modeling of neural data, Machine learning, Dimensionality reduction, Data visualization, Primate behavioral training, Behavioral task design and automation

Neuroscience: Primate microelectrode implant neurosurgery (planning and execution), Neuroanatomy, Neurophysiology, Systems neuroscience, Cognitive psychology, Computational models of neural systems

Engineering: Computer aided design and manufacturing, 3D Printing, Control systems design, Robotics, Biomechanics

Programming Languages: MATLAB, Python, Arduino, C++

Software Proficiency: Microsoft Office Suite, LaTeX, Plexon suite, Blackrock Central, Vicon Nexus, SolidWorks, Mastercam, OpenSim, ITK Snap, MeshLab, Autodesk 3DS Max, Photoshop, GIMP

PEER-REVIEWED JOURNAL ARTICLES

1. Zhou, X., Tien, R. N., Ravikumar, S., & Chase, S. M. (2019). **Distinct types of neural reorganization during long-term learning**. *Journal of Neurophysiology, 121*(4), 1329-1341.

PEER-REVIEWED CONFERENCE PAPERS

1. Williams, J. J., Tien, R. N., Inoue, Y., & Schwartz, A. B. (2016, August). **Idle state classification using spiking activity and local field potentials in a brain computer interface**. In *2016 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)* (pp. 1572-1575). IEEE.
2. Suway, S. B., Tien, R. N., Jeffries, S. M., Zohny, Z. Clanton, S. T., McMorland, A. J., & Velliste, M. (2013, November). **Resting state detection for gating movement of a neural prosthesis**. In *2013 6th International IEEE/EMBS Conference on Neural Engineering (NER)* (pp. 665-668). IEEE.

CONFERENCE PRESENTATIONS AND TALKS

1. Tien, R. N., A. B. Schwartz. "**Leveraging MRI, CAD, CAM and 3D printing to implant five microelectrode arrays in three nodes of the macaque frontoparietal grasp network**." Poster session presentation at Society for Neuroscience Annual Meeting, Chicago, IL, October 19-23, 2019.
2. Tien, R. N. "**Engineering a Quintuple Array Implant Procedure**." University of Pittsburgh Bioengineering Breakfast Seminar Series presentation, Pittsburgh, PA. February 28, 2019.
3. Tien, R. N., A. B. Schwartz. "**Grip affordances are encoded in conjunction with grasping movements in M1**." Poster session presentation at Society for Neuroscience Annual Meeting, San Diego, CA. November 3-7, 2018.
4. Tien, R. N., A. B. Schwartz. "**Neural signatures of object manipulation affordance knowledge in M1**." Poster session presentation at the Center for the Neural Basis of Cognition Retreat, Pittsburgh, PA. May 5, 2018.
5. Williams, J. J., R. N. Tien, Y. Inonue, A. B. Schwartz. "**Detecting and utilizing the idle state in an intracortical brain-computer interface**." Poster session presentation at International BCI Meeting, Pacific Grove, CA, May 30 – June 3, 2016.
6. Zhou, X., R. N. Tien, S. M. Chase. "**Distinct timescales of cortical reorganization in a long-term learning task using an intracortical brain-computer interface**." Poster session presentation at International BCI Meeting, Pacific Grove, CA, May 30 – June 3, 2016.
7. Tien, R. N., S. Perel, A. B. Schwartz. "**Beyond kinematic and EMG tuning: object-related activity in M1 single neurons and populations during grasping**." Poster session presentation at COSYNE, Salt Lake City, UT, February 25-28, 2016.
8. Zhou, X., R. N. Tien, S. M. Chase. "**Distinct Timescales of cortical reorganization in a long-term learning task**." Poster session presentation at COSYNE, Salt Lake City, UT, February 25-28, 2016.
9. Zhou, X., R. N. Tien, S. M. Chase. "**Distinct timescales of cortical reorganization in a long-term learning task**." Nanosymposium presentation at Society for Neuroscience annual meeting, Chicago, IL, October 17-21, 2015.
10. Tien, R. N., S. Perel, A. B. Schwartz. "**Object-specific single neuron and population activity in rhesus macaque primary motor cortex during a reach-to-grasp task**." Poster session presentation at Society for Neuroscience Annual Meeting, Washington DC, November 15-19, 2014.
11. Williams, J. J., R. N. Tien and A. B. Schwartz. "**Psychophysical, neural, and learning curve metrics toward optimizing training with a brain computer interface**." Nanosymposium presentation at Society for Neuroscience annual meeting, Washington DC, November 15-19, 2014.
12. Tien, R. N. "**Engineered Learning: Establishing a Systematic Method for Training a Naive Neural Prosthesis User**." CNBC Brain Bag student research presentation. March 31, 2014.
13. Tien, R. N. "**A Neuromechanical Model for Bio-Mimetic Control of a Robotic Lamprey**." Senior thesis with design presentation. Department of Mechanical and Aerospace Engineering, Princeton University, May 2011.

VOLUNTEER ACTIVITIES

8/2012 – present **Volunteer Member, Bass Section** – The Mendelssohn Choir of Pittsburgh
- Monthly performances with the Pittsburgh Symphony Orchestra, including at Carnegie Hall in New York City

1/2019 – present **Voting Member** – IEEE Reporting Standards for InVivo Neural Interface Research Working Group

3/2012 – 3/2019 **Category Judge** – Annual Pittsburgh Regional Science and Engineering Fair

5/2015 and 5/2018 **Grand Awards Judge** – Intel International Science and Engineering Fair
- Judged the Robotics and Intelligent Machines category twice

4/2012 – 4/2014 **Biomedical Engineering Society Graduate Chapter** – Vice President
- Coordinated the prospective student visiting weekend; represented Pitt at the national BMES conference twice

8/2013 – 11/2013 **Course Instructor** – SciTech Festival, Carnegie Science Center, Pittsburgh, PA
- Created and taught an interactive seminar on brain-machine interfaces for middle school students.