

Daniel Carbonero

danny.carbonero@gmail.com
dannycarbonero.github.io

RESEARCH INTERESTS

Develop novel, and adapt existing, computational methods for analysis of large neuroscientific data sets to further understand the brain. Specifically interested in adapting and applying these methods to calcium recordings to quantify and understand shifting of neuronal network dynamics in the cortices and hippocampus under varying stimulus contexts.

EDUCATION

PhD	Biomedical Engineering, Boston University Dissertation: "Machine Learning Framework for Analyzing State-Dependent Neuronal Network Dynamics in Calcium Recordings" Advisors: John A. White, PhD & Mark A. Kramer, PhD	2019 - Present
MS	Biomedical Engineering, Boston University	2019 - 2022
BS	Biomedical Engineering, University of Miami GPA: 3.8, Cum Laude	2015 - 2019

PROFESSIONAL AND RESEARCH EXPERIENCE

Graduate Research Assistant Neuronal Dynamics Laboratory (NDL), Department of Biomedical Engineering, Boston University Advisor: John White, PhD	March 2020-present
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- Develop and adapt dimensionality reduction (DR) machine learning methods for analyzing neuronal network dynamics recorded using calcium imaging under various neural contexts.
- Design analysis pipeline for rigorously characterizing neuronal network dynamics under: increasing concentrations of anesthetic sedation, and natural and artificial memory recall.

Associate Engineer Bio-Vitro Inc, Supervisor: Siddarth Rawal, MD	May 2019 – August 2019
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- Optimized design of previously constructed fluid handling platform for automated cell culture and cell signaling analysis under physiological conditions for production and sending to collaborating labs.
- Assisted/troubleshoot collaborators with use of produced platforms.

Undergraduate Research Assistant Research Experience for Undergraduates – Neurological Prosthesis Research Laboratory, Department of Biomedical Engineering, Duke University, Advisor: Warren Grill, PhD	May 2018-August 2018
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- Modified and completely automated a fully computational, Deep Brain Stimulation, Parkinson's Disease (PD) Neurological model to use experimentally recorded data as inputs.
- Modeled PD in rat brain using upstream recorded experimental neuronal firing as input to simulate, characterize, and analyze downstream Thalamus function and activity to assess effectiveness of Deep Brain Stimulation as treatment for PD.

Undergraduate Research Assistant Physiometric Microsystems Laboratory (PML), Department of Biomedical Engineering, University of Miami Advisor: Ashutosh Agarwal, PhD	May 2017 – May 2019
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- Developed automated pipelines for microscope image data acquisition, processing, and analysis.
- Wrote front-end software to allow end user to easily process and analyze images.
- Designed, prototyped, and manufactured an integrated and automated platform for continuous cell culture and dynamic cell secretion analysis of microphysiological systems.

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Student Analyst

January 2017 – May 2017

Department of Continuing International Education, University of Miami, Supervisor: Magaly Abreu

- Developed early iteration of real-time, self-updating student database to ease pulling of information.
- Created financial reports to present data more clearly and concisely.

JOURNAL PUBLICATIONS

- D Carbonero**, J Noueihed, MA Kramer, JA White, “Linear Dimensionality Reduction Methods for Analyzing Neuronal Network Dynamics in Calcium Recordings” (in preparation)
- J Noueihed, **D Carbonero**, FR Fernandez, JA White, “Balance of Excitation and Inhibition in the Primary Somatosensory Cortex Layer 2/3 Under Isoflurane Anesthesia” (in preparation)
- J Noueihed, **D Carbonero**, FR Fernandez, JA White, “Multisession Processing of Multiphoton Calcium Imaging” (under review)
- RR Besser, A Alassaf, **D Carbonero**, I Ortiz, R Maciel, M Saporta, A Agarwal, “A Compartmentalized Platform for In-Vitro Assembly of Neuromuscular Junctions and the Implications for Studying Charcot-Marie-Tooth Disease Type 2E” (under review)
- RR Besser, A C Bowles, A Alassaf, **D Carbonero**, R Maciel, M Saporta, A Agarwal, “A Chemically Defined Media for Culture of C2C12 Skeletal Muscle and Human Induced Pluripotent Stem Cell Derived Spinal Spheroids” [*Cellular and Molecular Bioengineering*](#)
- RR Besser, R Maciel, **D Carbonero**, A Alassaf, I Claire, E Jones, J Reda, A Bowles, W Bachelor, N Ziebarth, R Rodriguez, A Khan, M Saporta, A Agarwal: “Enzymatically Crosslinked Gelatin-Laminin Hydrogels for Applications in Neuromuscular Tissue Engineering”, [*Biomaterials Science*](#), 8(2), 591-606 HIGHLIGHTED AS COVER ARTICLE
- A Alassaf, G Tansik, V Mayo, L Wubker, **D Carbonero**, A Agarwal: “Engineering Anisotropic Cardiac Monolayers on Microelectrode Arrays for Non-invasive Analyses of Electrophysiological Properties” [*Analyst*](#), 145(1), 139-140 *included in themed collection on bioanalytical tools for enabling precision medicine*
- M Ishahak, L Birman, **D Carbonero**, J Hill, A Hernandez, S Rawal, A Agarwal: “Integrated platform for operating and interrogating organs-on-chips”, [*Analytical Methods*](#), 11(43), 5645-5651 (2019) *highlighted in the Emerging Investigator Series*
- RR Besser, M Ishahak, V Mayo, **D Carbonero**, I Claire, A Agarwal: “Engineered Microenvironments for Maturation of Stem Cell Derived Cardiac Myocytes”, [*Theranostics*](#), 8(1), 124-140 (2018)

CONFERENCE PUBLICATIONS

- D Carbonero**, J Noueihed, JA White, “Principal Component Analysis for Neuronal Network Analysis Under Isoflurane Sedation in Mice”, Society for Neuroscientists 2021 Annual Meeting, November 2021
- D Carbonero**, J Noueihed, JA White, “Principal Component Analysis for Neuronal Network Analysis Under Isoflurane Sedation in Mice”, Biomedical Engineering Society 2021 Annual Meeting, Orlando FL, October 2021
- R Besser, R Maciel, A Alassaf, **D Carbonero**, M Saporta, A Agarwal, “In Vitro Recapitulation of The Dysfunctional Neuromuscular Junction In Charcot-Marie-Tooth Disease”, TERMIS 2019 Annual Conference & Exhibition, Orlando FL, December 2019
- R Besser, **D Carbonero**, I Claire, A Alassaf, A Bowles, E Jones, J Reda, W Bachelor, R Rodriguez, A Khan, R Maciel, M Saporta, A Agarwal, “Enzymatically Crosslinked Gelatin-Laminin Hydrogels for Disease on Chip Applications”, Society for Biomaterials 2019 Annual Meeting, Seattle WA, April 2019
- D Carbonero**, K Kumaravelu, W M Grill, “Computational Analysis of Neural Activity Recorded during Subthalamic Nucleus Deep Brain Stimulation in a Rat Model of Parkinson’s Disease”, Biomedical Engineering Society 2018 Annual Meeting, Atlanta GA, October 2018
- R Besser, R Maciel, A Alassaf, **D Carbonero**, M Dvornik, I Claire, M Saporta, A Agarwal, “In Vitro Recapitulation of the dysfunctional neuromuscular junction in Charcot-Mari-Tooth disease”, Biomedical Engineering Society 2018 Annual Meeting, Atlanta GA, October 2018
- M Ishahak, L Alamda-Sabate, **D Carbonero**, S Rawal, A Agarwal, “Organ-on-Chip Platform with Integrated, Non-Invasive Oxygen Monitoring”, Pittcon 2018, Orlando FL., February 2018.

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D Carbonero, R Besser, A Agarwal, “TwitchRead: Analyzing Contraction in Engineered Skeletal Muscle Tissue Co-Cultured with Neurospheres”, Biomedical Engineering Society 2017 Annual Meeting, Phoenix AZ., October 2017

TEACHING EXPERIENCE

Graduate Teaching Fellow EK 381 – Probability, Statistics and Data Science for Engineers Department of Mechanical Engineering, Boston University	September 2021- December 2021
Graduate Teaching Fellow EK 125 – Introduction to Programming for Engineers Department of Mechanical Engineering, Boston University	September 2020- December 2020

LEADERSHIP & MENTORING

Neuronal Dynamics Lab

- Mentored senior design team developing a machine learning depth of anesthesia classifier using standard neural recordings.

Understanding the Brain: Neurophotronics – Yearly Symposium

- Led planning of 5th annual student led symposium
- Selected topic (Data Focused Neuroscientific Approaches: Taking a Deeper Look into Neural Networks), invited speakers, and chaired session.

AWARDS/HONORS

NSF Research Traineeship Program Understanding the Brain: Neurophotronics Trainee	2020
NIH Translational Research in Biomaterials Training Grant Trainee	2019
University of Miami College of Engineering Senior Design Industry Impact Award	2019
Alpha Eta Mu Beta - National biomedical engineering honor society	2019
Omicron Delta Kappa Honor Society - National leadership honor society	2019
Tau Beta Pi Honor Society -National engineering honor society	2018
University of Miami President’s Scholarship	2015

SKILLS

Programming: Highly Proficient in: Python, MATLAB

Comfortable with: HTML, CSS, R

Familiar with: C, C++, Java

Engineering Design: CAD, SOLIDWORKS, Rapid Prototyping

Software: Arduino IDE, COMSOL Multiphysics, ImageJ

Document Preparation: Microsoft Office, Adobe Illustrator

Certifications: Six Sigma Green Belt

Languages: Native in Spanish, fluent in English