Daniel Carbonero

danny.carbonero@gmail.com
d-carbo.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** 2019 - Present
Dissertation: "Machine Learning Framework for Analyzing Shifting Neuronal Network Dynamics in Calcium Recordings"
Advisors: John A. White, PhD & Mark Kramer, PhD

MS **Biomedical Engineering, Boston University** 2019 - 2022

BS **Biomedical Engineering, University of Miami** 2015 - 2019
GPA: 3.8, Cum Laude

PROFESSIONAL EXPERIENCE

Graduate Research Assistant March 2020-present
Neuronal Dynamics Laboratory (NDL), Department of Biomedical Engineering, Boston University
Advisor: John White, PhD

- Develop and adapt dimensionality reduction (DR) statistical techniques for analyzing neuronal network dynamics recorded using calcium imaging under various neural contexts.
- Design pipeline for characterizing neuronal network dynamics under: increasing concentrations of anesthetic sedation, and natural and artificial memory recall

Associate Engineer May 2019 – August 2019
Bio-Vitro Inc, Supervisor: Siddarth Rawal, MD

- Optimized previously constructed fluid handling platform for automated cell culture and cell signaling analysis under physiological conditions to be built and sent to collaborating labs.
- Assisted/troubleshot collaborators with use of their platform.

Undergraduate Research Assistant May 2018-August 2018
Research Experience for Undergraduates – Neurological Prosthesis Research Laboratory, Department of Biomedical Engineering, Duke University, Advisor: Warren Grill, PhD

- Modified and completely automated fully computational, Deep Brain Stimulation, Parkinsonian Neurological model for input of experimentally recorded data.
- Modeled Parkinson's in rat brain using experimental neuronal firing as input to simulate, characterize, and analyze Thalamus firing function to assess effectiveness of Deep Brian Stimulation as treatment for Parkinson's.

Undergraduate Research Assistant May 2017 – May 2019
Physiomimetic Microsystems Laboratory (PML), Department of Biomedical Engineering, University of Miami
Advisor: Ashutosh Agarwal, PhD

- Developed automated pipelines for microscope image data acquisition, processing, and analysis.
- Wrote front-end software to allow user to easily process and analyze images.
- Designed and manufactured an integrated, 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 in more clearly and concisely.

JOURNAL PUBLICATIONS

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" (in Preparation)

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" (submitted)

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 Cabonero**, A Alassaf, I Claure, E Jones, J Reda, A Bowles, W Bachelor, N Ziebarth, R Rodriquez, 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 Claure, 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 2021Annual 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 Claure, A Alassaf, A Bowles, E Jones, J Reda, W Bachelor, R Rodriquez, 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 Claure, 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.

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

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TEACHING EXPERIENCE

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

Graduate Teaching Fellow September 2020- December 2020
EK 125 – Introduction to Programming for Engineers
Department of Mechanical Engineering, Boston University

LEADERSHIP & MENTORING

Neuronal Dynamics Lab

- Mentored senior design team developing anesthesia classifier using standard neural recordings.

Understanding the Brain: Neurophotonics

- 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: Neurophotonics 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