

# Daniel Carbonero

[danny.carbonero@gmail.com](mailto:danny.carbonero@gmail.com)  
[dannycarbonero.github.io](https://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

<b>PhD</b>	<b>Biomedical Engineering, Boston University</b> 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
<b>MS</b>	<b>Biomedical Engineering, Boston University</b>	2019 - 2022
<b>BS</b>	<b>Biomedical Engineering, University of Miami</b> GPA: 3.8, Cum Laude	2015 - 2019

## PROFESSIONAL AND RESEARCH EXPERIENCE

<b>Graduate Research Assistant</b> Neuronal Dynamics Laboratory (NDL), Department of Biomedical Engineering, Boston University Advisor: John White, PhD	March 2020-present
<ul style="list-style-type: none"><li>• Develop and adapt dimensionality reduction (DR) machine learning methods for rigorous neuronal network dynamic analyses recorded using calcium imaging under various neural contexts.</li><li>• Design analysis pipeline for rigorously characterizing neuronal network dynamics under: increasing concentrations of anesthetic sedation, and natural and artificial memory recall.</li></ul>	
<b>Associate Engineer</b> Bio-Vitro Inc, Supervisor: Siddarth Rawal, MD	May 2019 – August 2019
<ul style="list-style-type: none"><li>• 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.</li><li>• Supported/troubleshoot collaborators with use of produced platforms.</li></ul>	
<b>Undergraduate Research Assistant</b> Research Experience for Undergraduates – Neurological Prosthesis Research Laboratory, Department of Biomedical Engineering, Duke University, Advisor: Warren Grill, PhD	May 2018-August 2018
<ul style="list-style-type: none"><li>• Modified and completely automated a fully computational, Deep Brain Stimulation, Parkinson's Disease (PD) Neurological model to use experimentally recorded data as inputs.</li><li>• Modeled PD in rat brain using upstream, experimentally recorded, neuron firing as input to simulate, characterize, and analyze downstream Thalamus function and activity to assess effectiveness of Deep Brain Stimulation as treatment for PD.</li></ul>	
<b>Undergraduate Research Assistant</b> Physiometric Microsystems Laboratory (PML), Department of Biomedical Engineering, University of Miami Advisor: Ashutosh Agarwal, PhD	May 2017 – May 2019
<ul style="list-style-type: none"><li>• Developed automated pipelines for microscope image data acquisition, processing, and analysis.</li><li>• Wrote front-end software to allow end user to easily process and analyze images.</li><li>• Designed, prototyped, and manufactured an integrated and automated platform for continuous cell culture and dynamic cell secretion analysis of microphysiological systems.</li></ul>	

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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

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- 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

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- D Carbonero**, J Noueihed, MA Kramer, JA White, “Linear Dimensionality Reduction for Analyzing Calcium Recordings”, Biomedical Engineering Society 2022 Annual Meeting, October 2022 (**Platform Oral Presentation**)
- 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

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- 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.
- 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

## INVITED TALKS

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|---|--------------------|
| <b>Neurophotonics Center Tech Talk Tutorial Series</b>  | September 22, 2022 |
| <b>Linear Dimensionality Reduction for Analyzing Calcium Recordings (a toolbox)</b>                         |                    |
| • Seminar series to spread awareness on technologies under development to foster collaboration between labs |                    |

## TEACHING EXPERIENCE

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

## LEADERSHIP & MENTORING

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- Neuronal Dynamics Lab**
- Mentored senior design team developing a machine learning depth of anesthesia classifier using standard neural recordings.
- Understanding the Brain: Neurophotonics – Yearly Symposium**
- Spearheaded planning of 5<sup>th</sup> annual student led symposium
  - Selected topic (Data Focused Neuroscientific Approaches: Taking a Deeper Look into Neural Networks), invited speakers, and chaired session.

## AWARDS/HONORS

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|--|------|
| 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 |

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## SKILLS

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**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