

# Daniel Carbonero

[danny.carbonero@gmail.com](mailto:danny.carbonero@gmail.com) | [Website](#) | [LinkedIn](#)

## INTERESTS

I enjoy being at the forefront of BioTech innovation, leveraging cutting-edge science to translate emerging technologies into healthcare solutions. Technically, my research develops machine learning methods for analyzing large neuroscientific data sets to understand the brain. I am excited, post research, to contribute deep technical expertise, along with an emerging commercialization and investing skill set, to drive innovation forward.

## 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: 3.8/4.0, Cum Laude	2015 - 2019

## PROFESSIONAL AND RESEARCH EXPERIENCE

<b>Graduate Research Fellow</b> <b>Kramer Neurodata &amp; Modeling Group, Department of Mathematics and Statistics, Boston University</b> Advisor: Mark A. Kramer, PhD	September 2020 – Present
<ul style="list-style-type: none"><li>• Applied transfer learning to implement and fine-tune pre-trained Long Short-Term Memory (LSTM) Deep Neural Networks (DNNs) for automatic spike ripple detection in human epilepsy voltage recordings.</li></ul>	
<b>Graduate Research Fellow</b> <b>Neuronal Dynamics Laboratory (NDL), Department of Biomedical Engineering, Boston University</b> Advisor: John A. White, PhD	March 2020 – Present
<ul style="list-style-type: none"><li>• Developed and adapted linear and non-linear dimensionality reduction (DR) machine learning methods for unsupervised neuronal network analyses of calcium recordings under unique neural contexts.</li><li>• Built constraining for Non-Negative Matrix Factorization DR to allow for semi-supervised analytical approaches to similar neuronal network dynamics.</li><li>• Constructed software wrapper packages to make complex machine learning methods more easily accessible and implementable to end users.</li><li>• Collaborated with experimental lab scientists to iteratively adapt and apply machine learning analysis methods to their collected data to answer groundbreaking, novel, and complex neurological questions.</li><li>• Designed analysis pipeline for rigorously characterizing neuronal network dynamics under: increasing concentrations of anesthetic sedation, natural and artificial memory recall.</li></ul>	
<b>Student Analyst</b> Office of Technology Development, Boston University, Supervisor: Frances Forrester, PhD	November 2023 – Present
<ul style="list-style-type: none"><li>• Carried out comprehensive analyses of academic technologies to assess commercial viability and facilitate commercialization of promising ones.</li><li>• Conducted in-depth market landscape research, outlining where a technology might fit within the commercialization pipeline and the industry environment.</li><li>• Drafted invention assessments, detailing a foundational understanding of a technology, its field, and commercialization potential.</li><li>• Composed one-page promotional marketing briefs, describing the technology and its potential to prospective partners (licensing, sponsored research, etc.).</li></ul>	

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## Venture Fellow

March 2023 – Present

Breakout Ventures

- Managed early deal-flow, leading initial investment calls, evaluating opportunities (scientific merit, market potential, IP, etc.), and drafting reports with strategic recommendations for the investment team.
- One of a limited number of fellows to have sourced deal-flow move into NDA diligence.
- Refined venture skills and proficiency with Breakout investment team, leveraging case studies to deepen understanding of successful biotech startup investing.
- Served as strategic partner in biotech hub of Boston, evaluating emerging technologies, startups, and entrepreneurs to source potential deals, and connect promising future opportunities with Breakout's resources.

## Analytics Consulting

January 2023 – Present

fit foodie living Inc

- Conceptualized, implemented, and maintain a data pipeline for scraping, cleaning, and processing data from an online platform to create and update an accessible customer database, supporting product launches and updates.

## Associate Engineer

May 2019 – August 2019

Bio-Vitro Inc, Supervisor: Siddarth Rawal, MD

- Optimized design of previously constructed fluid handling platform for unattended, automated, cell culture and cell signaling analysis under physiological conditions.
- Design was produced and sent to collaborating labs to make organs-on-chips more technically accessible.

## 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 a fully computational, Deep Brain Stimulation, Parkinson's Disease (PD) Neurological model to simulate networks of neurons using experimentally recorded data as inputs.
- Modeled PD brain using experimentally recorded, upstream, neuron firing as inputs to simulate and analyze downstream Thalamus activity, assessing effectiveness of Deep Brain Stimulation as treatment for PD.

## Undergraduate Research Assistant

May 2017 – May 2019

Physiomimetic Microsystems Laboratory (PML), Department of Biomedical Engineering, University of Miami

Advisor: Ashutosh Agarwal, PhD

- Developed automated software pipelines for immunohistochemical fluorescent microscope image data acquisition, processing, and analysis for reproducible quantification of organ-on-chip systems.
- Wrote front-end software packages to allow end users to easily and reproducibly process and analyze image data for various platforms (heart, neuro-muscular junction, metastasis).
- Designed, prototyped, and manufactured an integrated and completely automated platform for continuous cell culture and dynamic cell secretion analysis of these organ-on-chip systems.

## Student Analyst

January 2017 – May 2017

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

- Created early iteration of real-time, self-updating student database to consolidate information and ease access.
- Wrote financial reports to visualize large volumes of financial information clearly and intuitively.

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## AWARDS/HONORS

<b>F31 Ruth L. Kirschstein Predoctoral Individual National Research Service Award</b>	<b>2023</b>
NSF Research Traineeship Program Understanding the Brain: Neurophotonics Trainee	2020
<b>NIH Translational Research in Biomaterials Grant Funded Trainee</b>	<b>2019</b>
<b>Boston University Biomedical Engineering Distinguished Fellowship</b>	<b>2019</b>
<b>University of Miami College of Engineering Senior Design Industry Impact Award</b>	<b>2019</b>
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

**Machine Learning and Data Science:** Linear Dimensionality Reduction, Matrix Decomposition, Manifold Learning, Clustering, Unsupervised/Semi-Supervised/Supervised Learning, Deep Learning (Artificial Neural-Networks) Time Series Analysis, Image Analysis

**Data Science Software:** Scikit-Learn, Scipy, Statsmodels, Pandas, Tensorflow, Numba

**Programming:** Highly Proficient in: Python, MATLAB  
Comfortable with: HTML, CSS, R  
Familiar with: C++, Java

**High Performance Computing:** Unix, Linux, Remote Super Computing Clusters, Code Parallelization (Python, MATLAB), GPU Computing, git Version Control

**Engineering Design:** CAD, SOLIDWORKS, Rapid Prototyping

**Software:** Arduino IDE, COMSOL Multiphysics, ImageJ

**Document Preparation and Graphic Design:** Microsoft Office, Adobe Illustrator, Figma

**Certifications:** Six Sigma Green Belt

**Languages:** Native in Spanish, fluent in English

## LEADERSHIP & MENTORING

### Nucleate, Boston Chapter

#### Director of Communications

**June 2023 – May 2024**

- Directed the Communications team of Boston Nucleate, a student-led organization facilitating venture creation of life science spinouts.
- Overhauled and implemented entirely novel pipeline to standardize communications from Boston chapter to target audiences.
- Served as liaison between Nucleate headquarters, local Nucleate program participants, and the Boston leadership team, solving logistical issues as they presented, or delegating them to the appropriate personnel.
- Wrote all promotional and professional materials advertising Nucleate programming to the Boston biotech community.
- Collaborated with other directors to set weekly communication and agenda and improve current communications workflow.

#### Vice President of Communications

**November 2022 – May 2023**

- Built automated email pipelines to ensure both chapter leadership, and program participants were up to date on all organizational information.
- Worked with the communications team, and directors of other teams, to write and publish weekly newsletter.

### Neuronal Dynamics Lab - 2021-2022 Senior Design Team Advisor

**August 2021 – May 2022**

- Advised and mentored senior design team through development of random forest and support vector machine (SVM) depth of anesthesia classifiers using standard neural recordings.

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## JOURNAL PUBLICATIONS

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- D Carbonero**, J Noueihed, MA Kramer, JA White, “Non-Negative Matrix Factorization for Analyzing Neuronal Network Dynamics in Calcium Recordings” ([under review](#))
- ED Schlaflly, **D Carbonero**, CJ Chu, MA Kramer, “A data augmentation procedure to improve detection of spike ripples in brain voltage recordings” [Neuroscience Research](#)
- 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, AC 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](#), 13 (6), 605-619
- RR Besser, AC Bowles, A Alassaf, **D Carbonero**, I Claire, E Jones, J Reda, L Wubker, W Batchelor, N Ziebarth, R Silvera, A Khan, R Maciel, 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 *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

## CONFERENCE PRESENTATIONS

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- D Carbonero**, J Noueihed, MA Kramer, JA White, “Non-Negative Matrix Factorization for Analysis of Latent Neuronal Network and Sub-Network Dynamics”, Biomedical Engineering Society 2023 Annual Meeting, Seattle WA, October 2023
- D Carbonero**, J Noueihed, MA Kramer, JA White, “Linear Dimensionality Reduction for Neuronal Network Analysis Under Isoflurane Sedation in Mice”, Society for Neuroscience 2022 Annual Meeting, San Diego CA, November 2022
- D Carbonero**, J Noueihed, MA Kramer, JA White, “Linear Dimensionality Reduction for Analyzing Calcium Recordings”, Biomedical Engineering Society 2022 Annual Meeting, San Antonio TX, 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
- 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-Marie-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

## INVITED TALKS

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**Boston University Stochastic Processes in Neuroscience Seminar Series** Boston MA, December 2022  
**Principal Component Analysis as a Change of Basis for Neural Signals**

- Seminar series to discuss physical feasibility of stochastic models for neuroscientific data analysis.

**Boston University Neurophotonics Center Tech Talk Tutorial Series** Boston MA, September 2022  
**Linear Dimensionality Reduction for Analyzing Calcium Recordings (a toolbox)**

- Seminar series to spread awareness on technologies under development to foster collaboration between labs.

## TEACHING EXPERIENCE

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**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