Lianne Sánchez-Rodríguez, M.S.

lsanch46@cougarnet.uh.edu | 787-709-3423

PROFESSIONAL PREPARATION

PhD Electrical Engineering	University of Houston (UH), Houston, TX, USA	Expected 2028
Advisor: Dr. José L. Contreras-Vidal		
Laboratory: Laboratory for Non-invasive Brain-Machine Interface Systems (NBMIS)		
M.S. Applied Biomedical Engineering	Johns Hopkins University, Baltimore, MD, USA	2022
B.S. Computer Engineering	University of Puerto Rico, Mayagüez, PR, USA	2019
Google Tech Exchange Program	Google Sunnyvale and Mountain View, CA, USA	2018

Relevant Coursework: Algorithms & Computer Programming, Embedded System Design, Advanced Programming, Introduction to Database Systems, Introduction to Machine Learning, Neural Networks, Introduction to Brain Computer Interfaces, Frontiers in Neuroengineering, Deep Neural Networks, Stochastic Processes

RESEARCH AND TEACHING EXPERIENCE

Mindspring NBMIS, IUCRC BRAIN Center — UH

Graduate Research Assistant - Project Lead, Houston, TX — August 2024 - Present

- Leading the development of an **EEG-based music generative AI**, harnessing brainwave data to create **personalized music compositions** for therapeutic and creative applications.
- Exploring innovative approaches to integrate real-time EEG data processing into music generation, contributing to the field of brain-computer interaction (BCI) and neurofeedback.
- Leading a sound literature review process to refine and optimize EEG signal interpretation for accurate music generation, ensuring high-quality auditory experiences aligned with affective user states.

BoA - Music in Medicine, NBMIS, IUCRC BRAIN Center — UH

Graduate Research Assistant, Houston, TX — January 2025 - Present

- The Brain on Arts study, funded by the National Science Foundation, to study connections between the brain and creativity, expression, and the perception of art.
- **Collected multimodal data** (e.g., EEG, motion capture, physiological signals) from renowned musicians, artists, and composers (n=5), including Mei Rui, Robin Scott, Richard Belcher, Yoonshin Song, and David Kaplan, during live classical music performances.
- **Segmented and processed data** to create detailed descriptors for neurophysiological analysis, contributing to the development of interactive frameworks for understanding the neural impact of music performance.

NeuroExo NBMIS, IUCRC BRAIN Center — UH

Graduate Research Assistant, Houston, TX — August 2023 - Present

- The NeuroExo, aims to improve the feasibility of at-home neurorehabilitation for patients with chronic stroke by providing a low-cost, portable, form-fitting, reliable, and easy-to-use system.
- Developed and implemented the Serial Peripheral Interface (SPI) protocol in C++, improving data collection efficiency for the NeuroEXO project.
- Optimized embedded system performance, increasing data sampling frequency by **525%** (from 40 Hz to 250 Hz) through rigorous testing and program enhancements.
- Conducted data acquisition from human subjects, collecting and processing multi-modal signals, including 5 EEG channels, 5 EOG channels, gyroscope, and accelerometer data, enhancing data quality for analysis.
- Performed longitudinal analysis of electroencephalography (EEG) data from chronic stroke participants **(n=5)** using MATLAB, providing critical insights into neurorehabilitation outcomes.
- Led the coordination and execution of a longitudinal study on healthy participants **(n=10)** with an **IRB-approved** experimental protocol, ensuring adherence to ethical research standards.
- Led data analysis efforts for **10 healthy participants** in the NeuroEXO BCI study, leveraging MATLAB and neuroscience principles to extract meaningful insights.

Senior Design Course Graduate Mentor **UH**

Graduate Mentor, Houston, TX August 2023 - Present

- Mentored 25 senior design students across five projects, fostering innovation and technical excellence in engineering solutions.
- Provided specialized guidance in embedded systems, software engineering, and technical documentation, ensuring high-quality project execution and professional skill development.

Endotracheal Intubation Researcher **Johns Hopkins University**

Graduate Researcher, Baltimore, MD January 2022 - June 2022

- Developed Python functions to perform image-based 2D-to-3D registration of a patient's upper airway using Blender API to extract the 3D model parameters and computer vision concepts such as the calibration matrix, extrinsic matrix, and radial distortions
- Developed Python scripts that led to an optimization framework using the Least Squares (LS) optimization algorithm

Problem Solving III: Technical Interview Course TA **University of Puerto Rico, Mayagüez**

Teaching Assistant, Mayagüez, PR August 2019 - December 2019

- Graded programming assignments submitted by undergraduate students via Leetcode in Java and Python languages, using parameters such as time and space complexity, timeliness, and additional test cases
- Assisted in the preparation of electronic teaching materials including quizzes, presentations, and assignments
- Managed eCourses platform for the course including uploads of electronic materials, grades, and grading rubrics

Biomechatronics: Signal Sensing Researcher **University of Puerto Rico, Mayagüez**

Undergraduate Research Assistant, Mayagüez, PR January 2019 - May 2019

- Launched and managed a research project to design solutions for identifying and classifying brain signals using non-invasive EEG modality
- Designed experiment procedure for subjects following IRB protocols
- Worked with the OpenBCI GUI tool to visualize signals and waves from human brain commands, as well as editing the open-source software in Processing language to adjust to the experimental needs

Biophysical Neural Network Simulation Tool Researcher **Georgia Institute of Technology**

Research Intern, Summer Research Experience, Atlanta, GA June 2017 - August 2017

- Learned about biophysical neural networks, neuron models, spike dependent plasticity
- Programmed in C and CUDA a simulation of a visual biophysical neural network (BNN) using the Izhikevich Neuron Model
- Simulated the human visual cortex neural activity when images and video where presented to the model

The Tech. Carnival Researcher **University of Puerto Rico, Mayagüez**

Undergraduate Research Assistant, Mayagüez, PR August 2016 - January 2016

- Designed hardware schematic and software flowcharts for imitation of the *Operation surgery* board game as part of a STEM outreach program for middle school kids
- Implemented circuit schematic composed of switches, buzzers, resistors, and LED lights which interfaced with an Arduino board
- Implemented software flowcharts in Sketch and C++ for the *Operation surgery* board game
- Wrote two educational guides that contained the engineering concepts needed to understand and build the *Operation surgery* board game for both teachers and middle school students of disadvantaged schools

Nanito (Game Development) Researcher **University of Puerto Rico, Mayagüez**

Undergraduate Research Assistant, Mayagüez, PR August 2014 - August 2015

- Designed concept levels for the "Nanito" educational video game, sponsored by the Nanotechnology Center for Biomedical, Environmental, and Sustainability Application (CREST), using nanotechnology topics for outreach purposes
- Implemented characters and objects for the "Nanito" video game in Gimp and Maya Autodesk

• Programmed in C# in Unity for the movements on objects for the "Nanito" video game

PROFESSIONAL EXPERIENCE

Medical Devices Engineering Development Program **Biosense Webster, Johnson & Johnson**

Engineer, Rotational Program, Irvine, CA August 2022 - December 2023

• Working with a cross-functional team to support product development efforts including working with suppliers, costs of goods sold, engineering builds, launches, and inventory.

Medical Devices Engineering Development Program **Biosense Webster, Johnson & Johnson**

Engineer, Summer & Fall Internship, Irvine, CA May 2021 - December 2021

• Worked with a cross-functional team to support engineering builds in manufacturing to evaluate the process and design changes, as well as leading coordination of the build plan
• Reduced timing to close Non-Conformance Reports (NCRs) by supporting documentation-related activities with suppliers
• Supported root cause investigation from the process qualification activity
• Supported APQ test reports and Supply Chain Readiness reports/presentations for the Lassostar product launch
• Successfully re-started Helios catheter commercial production under the protocol to support cases in Europe on time

Computer Engineering **Open and Embedded Systems Branch, MIT LL**

Engineer, Summer Internship Program, Lexington, MA June 2016 - August 2016

• Developed a comprehensive **toolchain** for rapid prototyping on **Raspberry Pi** and **Parallella** boards, reducing development time by approximately **30%**, significantly accelerating embedded systems workflows.
• Designed and implemented a **logistic classifier algorithm** in **C** for efficient characterization and performance benchmarking across multiple embedded platforms, speeding up analysis by about **25%**.
• Engineered and programmed an **Arduino RedBot** for light tracking using photoresistors, streamlining the setup process for the **MIT LL STEM outreach program** and significantly increasing children's engagement in robotics and STEM learning.

Cyber Engineering **Defend Branch, Department of Defense (DoD)**

Engineer, COOP Program, Fort Meade, MD August 2015 - December 2015

• Developed a solution to identify a person entering an unauthorized place with an unauthorized wireless device
• Implemented a script that works with sockets for the communication of a server and raspberry pi 2 and activates when an unauthorized device is detected
• Created application scripts to delete authentication tokens from employees registered device
• Updated and upgraded existing projects for operational deployment

PUBLICATIONS

Craik A, González-España JJ, Alamir A, Edquilang D, Wong S, **Sánchez Rodríguez L**, Feng J, Francisco GE, Contreras-Vidal JL. Design and Validation of a Low-Cost Mobile EEG-Based Brain–Computer Interface. Sensors. 2023; 23(13):5930. https://doi.org/10.3390/s23135930

J. J. González-España, **L. Sánchez-Rodríguez**, A. Craik, S. Wong, J. Feng and J. L. Contreras-Vidal, "Brain-eNet: Towards an Enabling Technology for BCI-IoT Systems," 2023 IEEE International Conference on Systems, Man, and Cybernetics (SMC), Honolulu, Oahu, HI, USA, 2023, pp. 3073-3078, doi: 10.1109/SMC53992.2023.10394117.

González-España, J. J., **Sánchez-Rodríguez, L.**, Pacheco-Ramírez, M. A., Feng, J., Nedley, K., Chang, S.-H., Francisco, G. E., & Contreras-Vidal, J. L. (2025). At-Home Stroke Neurorehabilitation: Early Findings with the NeuroExo BCI System. Sensors, 25(5), 1322. https://doi.org/10.3390/s25051322

PRESENTATIONS

M. Rui and D. Kaplan, "Dueling Brains," live performance in collaboration with M. A. Pacheco-Ramírez, A. Aguilar-Herrera, Y. E. Lima-Carmona, **L. Sánchez-Rodríguez**, and J. L. Contreras-Vidal, Music in Medicine Initiative, MD Anderson Cancer Center, Houston, TX, Mar. 27, 2025. [Online]. Available: https://www.youtube.com/live/-2EoPXJW4Hg?si=5y-T07VrljEfbaPy

M. Rui and D. Kaplan, "Grace and Fire," live performance in collaboration with M. A. Pacheco-Ramírez, A. Aguilar-Herrera, Y. E. Lima-Carmona, **L. Sánchez-Rodríguez**, and J. L. Contreras-Vidal, Music in Medicine Initiative, MD Anderson Cancer Center, Houston, TX, Mar. 26, 2025. [Online]. Available: https://www.youtube.com/live/-2EoPXJW4Hg?si=5y-T07VrljEfbaPy

C. de Souza, A. Brandt, and B. Khaleghian, "Window into the Creative Mind," live performance in collaboration with M. A. Pacheco-Ramírez, A. Aguilar-Herrera, Y. E. Lima-Carmona, **L. Sánchez-Rodríguez**, and J. L. Contreras-Vidal, Music in Medicine Initiative, MD Anderson Cancer Center, Houston, TX, Mar. 1, 2025. [Online]. Available: https://www.youtube.com/live/ZnDbMV7NPTE?si=8T5EajC5QDv-Oq5y

M. Rui and Y. Song, "Music in Medicine Concert Series," live performance in collaboration with M. A. Pacheco-Ramírez, A. Aguilar-Herrera, Y. E. Lima-Carmona, **L. Sánchez-Rodríguez**, and J. L. Contreras-Vidal, Music in Medicine Initiative, MD Anderson Cancer Center, Houston, TX, Feb. 27, 2025. [Online]. Available: https://www.youtube.com/live/CAc4x0LTUQs?si=cwAq6y6Oh4Sh6b6i

M. Rui, R. Scott, and R. Belcher, "Musical Healing: Bridge and Dvořák," live performance in collaboration with M. A. Pacheco-Ramírez, A. Aguilar-Herrera, Y.E. Lima-Carmona, **L. Sánchez-Rodríguez**, and J. L. Contreras-Vidal, Music in Medicine Initiative, MD Anderson Cancer Center, Houston, TX, Jan. 9–10, 2025. [Online]. Available: https://www.mdanderson.org/patients-family/diagnosis-treatment/patient-support/music-in-medicine-initiative.html

"At-home Stroke NeuroRehabilitation with the NeuroEXO Brain-Machine Interface System". **L. Sánchez-Rodríguez**, M.A. Pacheco-Ramíre, J.J. González-España, K. Nedley, S.-H. Chang, G.E. Francisco, J.L. Contreras-Vidal. Poster Presented at Society for Neuroscience (SfN) Conference 2024, Chicago, IL, October 2024

"Mindspring: A Personalized Health Wearable Device for Stress Management in Teens". **Lianne Sánchez-Rodríguez**, Maxine A. Pacheco-Ramírez, Gabriel Baquero, Roscoe Ferguson, José L. Contreras-Vidal. Oral Presentation at IUCRC Brain Center Annual Meeting, Morgantown, WV, August 2024

"Mindspring: A Personalized Health Wearable Device for Stress Management in Teens". **Lianne Sánchez-Rodríguez**, Maxine A. Pacheco-Ramírez, Gabriel Baquero, Roscoe Ferguson, José L. Contreras-Vidal. Poster Presentation at IUCRC Brain Center Annual Meeting, Morgantown, WV, August 2024

"Mindspring: A Personalized Health Wearable Device for Stress Management in Teens". **Lianne Sánchez-Rodríguez**, Maxine A. Pacheco-Ramírez, José L. Contreras-Vidal. Pitch Presentation at Eleventh Annual Bayou Startup Showcase Sponsored by RED Labs Accelerator, The Ion, Houston, TX, August 2024

"Monitoring the effects of Levodopa (L-dopa) on Parkinson's disease based on EEG-based BCI". **Lianne Sánchez-Rodríguez**, José J. González-España, José L. Contreras-Vidal. Poster Presentation at IUCRC Brain Center Semi-Annual Meeting, Houston, TX, January 2024

"Monitoring the effects of Levodopa (L-dopa) on Parkinson's disease based on EEG-based BCI". **Lianne Sánchez-Rodríguez**, José J. González-España, José L. Contreras-Vidal. Poster Presentation at IUCRC Brain Center Annual Meeting, Tempe, AZ, August 2023

"Biomechatronics: Signal Sensing". Anel Martínez Gómez, Kristalys Ruiz Rohena, **Lianne Sánchez Rodríguez.** Poster Presented at Industrial Affiliates Program (IAP) Conference, Mayagüez, PR, May 2018

"The Tech. Carnival: A proposed Outreach Program for creating awareness of STEM fields in High School Students". Karina Martínez Reyes, Edna Rivera, **Lianne Sánchez Rodríguez**, Celeste M. Vázquez Lugo. Presented at Caribbean Celebration of Women in Computing (CCWiC) Conference, Mayagüez, PR, April 2016

"The Tech. Carnival: A proposed Outreach Program for creating awareness of STEM fields in High School Students". María Jiménez, Celeste M. Vázquez Lugo, Edna Rivera, Josué Albarrán, Ricardo Ferrer, Karina Martínez Reyes, Hernán Miranda, Christopher Feliciano, **Lianne Sánchez Rodríguez**, Pedro Rivera. Poster Presented at Industrial Affiliates Program (IAP) Conference, Mayagüez, PR, March 2016

"The Tech. Carnival: A proposed Outreach Program for creating awareness of STEM fields in High School Students". María Jiménez, Celeste M. Vázquez Lugo, Edna Rivera, Josué Albarrán, Ricardo Ferrer, Karina Martínez Reyes, Hernán Miranda, Christopher Feliciano, **Lianne Sánchez Rodríguez**, Pedro Rivera. Presented at Industrial Affiliates Program (IAP) Conference, Mayagüez, PR, March 2016

TECHNICAL SKILLS

- Fully Bilingual, fluent in English and Spanish
- Python, Java, C, C++, Assembly, Verilog
- Python Flask, HTML, CSS, Javascript
- Familiar with Blender API, Tensorflow, Keras
- PostgreSQL, Firebase
- MATLAB

LEADERSHIP ACTIVITIES

• Secretary, Student BRAIN Network UH	January 2025 - Present
• Graduate Mentor, UH	August 2023 - Present
• Graduate Mentor, REM Program UH	Summer 2024
• Graduate Mentor, REU Program UH	Summer 2023
• UPRM Coding Club Presenter, CAHSI student chapter	August 2019 - December 2019
• Mentor, CAHSI student chapter	January 2019 - May 2019
• Treasurer, CAHSI UPRM student chapter	August 2017 - August 2018
• Recording Secretary, HKN Honor Society, UPRM Student Chapter	August 2017 - August 2018

HONORS AND AWARDS

2024 URM Ethnic Minority & Disadvantaged Travel Awards to AIMBE Public Policy Institute
2024 Trainee Professional Development Award (TPDA) Society for Neuroscience (SfN)
2020 GEM Associate Fellow - Declined
2020 ECE Department Best Student Award University of Puerto Rico Mayagüez Campus
2019 Lockheed Martin Research Scholarship
2018 Henaac Conference 2nd place Google Technical Challenge
2018 Henaac Conference CAHSI Scholar
2018 Grace Hopper Celebration Scholar
2018 Rewriting the Code Fellow
2017 Texas Instruments, Inc. Scholarship