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Ressa Reneth Sarreal

4th-Year ECE PhD Candidate

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Portfolio: rsarreal3.github.io

Current 4th-year Electrical and Computer Engineering (ECE) PhD Candidate at the Georgia Institute of Technology (GT) with 6+ years experience developing biomedical technology such as magnetic stimulators and self-powered glucose sensors. **Areas of expertise:** neurophysics, biomedical devices, analog design, digital design, MEMS, object-oriented programming, physics. **Impact:** Actively working towards diversifying the working community through, program development, mentorship, and coaching.

Education

Doctor of Philosophy, ECE, Georgia Institute of Technology, GPA: 3.76/4.00 — **Aug 2018 — Present**

Master of Science, ECE, Georgia Institute of Technology, GPA: 3.75/4.00 — **Aug 2018 — May 2020**

- Relevant Coursework:
  ECE 4784 Engineering Electrophysiology
  BMED 6790 Information Processing Models of Neural Systems
  BMED 8813 Interfacing Eng Tech and Rehab
  ECE 6229 Intro to MEMS
  ECE 6200 Biomedical Applications in MEMS
  ECE 6350 Applied Electromagnetics
  ECE 6370 EM Radiation and Antennas
  ECE 6550 Linear Systems and Controls
  BMED 6517 Machine Learning in Biosciences
  ECE 6258 Digital Image Processing
  CS 7492 Simulation of Biology

Bachelor of Science, Computer Engineering, University of Maryland, Baltimore County, GPA: 4.00/4.00 — **June 2014 — May 2018**

- Relevant Coursework:
  CMPE 212 Principles of Digital Design
  CMPE 415 Programmable Logic Devices (TA)
  CMPE 306 Intro to Circuit Theory
  CMPE 314 Principles of Electronic Circuits (TA)
  CMPE 323 Signal/Systems Theory
  CMPE 330 EM Waves Transmission
  CMPE 310 Systems Design and Programming
  CMPE 315 Principles of VLSI Design
  CMPE 311 C Programming and Embedded Systems (TA)
  CMSC 341 Data Structures
  CMSC 411 Computer Architecture
  CMSC 481 Computer Networks
  CMSC 426 Principles of Computer Security
  CMSC 471 Artificial Intelligence

Experience

Graduate Research Assistant — **Aug 2018 — Present**
Translational BioSystems Group, GT — Atlanta, GA

- Design, fabricate, and characterize a microcoil array to develop a micromagnetic stimulator

Electrical Hardware Design Intern — **May 2021 — Aug 2021**
Honeywell Aerospace — Clearwater, FL

- Perform worst-case analysis on micro-inertial measurement unit
- Understand effects of space radiation on electrical components
- Learn about ring laser gyro systems for space applications

Graduate Student Senator — **Jan 2021 — May 2021**
Graduate Student Government Association, GT — Atlanta, GA

- Monitor GT legislation
- Assist with committee tasks for improving the GT student community
- Inform students on ongoing projects and legislation status

Instrumentation and Electronics Laboratory GTA **Aug 2018 — Dec 2018**
School of Electrical and Computer Engineering, GT Atlanta, GA

- Lead lab sessions to instruct non-ECE students on analog circuit concepts
- Debug circuits containing basic components such as op-amps, resistors, potentiometers, capacitors, diodes, etc
- Familiarize students with equipment such as function generators and oscilloscopes

Research Assistant and Project Lead **Dec 2015 — May 2018**
BioElectronics Laboratory, UMBC Baltimore, MD

- Develop and test electrodes of the self-powered glucose biosensor system and the dual glucose and lactate biosensor for organ preservation
- Understand analog circuit components for the self-powered glucose biosensor system
- Create a readout circuit and system

Peer Advisor **May 2016 — May 2018**
Meyerhoff Scholars Program, UMBC Baltimore, MD

- Provide academic guidance for Meyerhoff scholar cohorts
- Provide advice regarding research experience

Initiation Coordinator and Corresponding Secretary **May 2016 — May 2018**
Tau Beta Pi Engineering Honor Society, UMBC Baltimore, MD

- Manage current and potential members of Tau Beta Pi with regard to necessary induction forms, volunteering hours, and general body meeting attendance
- Introduce the honor society's mission of creating a conductive engineering community that holds value in service, cooperation, and cohesiveness

Programmable Logic Devices TA **Jan 2018 — May 2018**
Department of Computer Science and Electrical Engineering, UMBC Baltimore, MD

- Lead lab sessions where students gain experience programming FPGAs in Xilinx ISE
- Debug student FPGA projects

C Programming and Embedded Systems TA **Aug 2017 — Dec 2017**
Department of Computer Science and Electrical Engineering, UMBC Baltimore, MD

- Lead lab sessions where students gain experience in programming microcontrollers and other hardware in C
- Grade exams
- Debug student coding assignments and projects

Assistant Secretary **Aug 2016 — May 2017**
IEEE Student Chapter, UMBC Baltimore, MD

- Manage general and executive board meetings
- Manage emails, social media pages, and other points of contact
- Maintain attendance records

Electronic Circuits TA **Jan 2017 — May 2017**
Department of Computer Science and Electrical Engineering, UMBC Baltimore, MD

- Lead lab sessions where students gain experience in designing and creating analog circuits
- Debug and test student AM radio projects

Research Intern **June 2016 — Aug 2016**
Robotics Institute, Carnegie Mellon University Pittsburgh, PA

- Work in the Field Robotics Center on autonomous phenotyping robot development
- Develop a LIDAR-based crop row detection algorithm for autonomous navigation in Robot Operating System (ROS)

Physics I/II Learning Assistant **Jan 2015 — May 2016**
Department of Physics, UMBC Baltimore, MD

- Lead a discussion session where students practice performing physics calculations
- Grade homework and exams
- Host office hours for student questions and practice sessions

Development Intern **June 2015 — Aug 2015**
Empathic Design and Technology Lab, Drexel University Philadelphia, PA

- Develop an app for HIV-positive youth medication retention using user-centered development techniques
- Collaborate with clinicians from the Children's Hospital of Philadelphia
- Develop a research survey GUI for Caldwell University Cognitive Behavior researchers

Publications and Conferences

1. **RR Sarreal**, P Bhatti, "Development of Cochlear Implant Alternative Magnetic Stimulation Design" [Oral Presentation], *American Cochlear Implant Alliance Conference*, 2022.
2. **RR Sarreal**, P Bhatti, "Characterization and Miniaturization of Silver-Nanoparticle Microcoil via Aerosol Jet Printing Techniques for Micromagnetic Cochlear Stimulation", *Sensors*, 20(21), 6087, 2020.
3. **RR Sarreal**, and P Bhatti, "Development of Silver-Nanoparticle-Based Microcoil for Electromagnetic Cochlear Stimulation" [Oral presentation], *15th annual IEEE International Conference on Nano/Micro Engineered and Molecular Systems* 2020.
4. **R Sarreal**, and G Slaughter, "Dual Glucose and Lactate Electrochemical Biosensor" [Oral presentation], *13th annual IEEE International Conference on Nano/Micro Engineered and Molecular Systems*, pp 64-67, 2018.
5. T Kulkarni, A Holtschneider, **RR Sarreal**, and G Slaughter, "Dynamic modeling of direct electron transfer PQQ-GDH MWCNTs bioanode function" [Oral presentation], *12th annual IEEE International Conference on Nano/Micro Engineered and Molecular Systems*, pp 379-382, 2017.
6. **RR Sarreal**, T Mueller-Sim, and G Kantor, "Development of LIDAR-based, Autonomous Agricultural Robot Navigation Guidance System" [Poster presentation], *OurCS*, 2017.
7. **RR Sarreal**, T Kulkarni, and G Slaughter "Self-Powered Glucose Sensor" [Poster presentation], *Annual Biomedical Research Conference for Minority Students*, 2016.
8. G Marcu, N Dowshen, S Saha, **RR Sarreal**, N Andalibi, "TreatYoSelf: Empathy-driven behavioral intervention for marginalized youth living with HIV", *Proceedings of the 10th EAI International Conference on Pervasive Computing Technologies for Healthcare*, pp 69-76, 2016.

Projects

Details are available at the portfolio website: rsarreal3.github.io

Robot Swarm Tracking, Digital Image Processing, GT **May 2020 — Aug 2020**
- Track robot ID, location, and rotational orientation from video data of a swarm of 250 robots (programmed in Python)
- Approach real-time tracking

Health Classification using Cell Test Features, Machine Learning in Biosciences, GT **Jan 2020 — May 2020**
- Pre-process and classify whether a subject is healthy, based on several tubes of cell data (programmed in MATLAB)
- K-fold cross validation, linear regression, random forest classification methods were utilized

Parcel Tracking System, Capstone, UMBC **Aug 2017 — May 2018**
- Develop a low-power, freight shipment monitoring device that may be secured to a parcel
- With an Arduino Uno, integrate GPS, WiFi, and accelerometer functionality to determine the geographical location where a potentially damaging impact to the parcel occurs
- Store data for processing and analysis

Two-Way Set-Associative Cache, Principles of VLSI Design, UMBC **Jan 2018 — May 2018**
- Utilize Cadence software to design a two-way, set associative cache and learn how to design, implement, and simulate cache systems (programmed in VHDL)
- The cache can store 64 bytes by utilizing two sets of 32-byte cache
- Provide hierarchical chip design as well as the designs for each individual gate or circuit (NAND, NOR, multiplexers, etc)

FPGA Pong, Programmable Logic Devices, UMBC **Jan 2018 — May 2018**
- Develop a state machine for two-player pong (programmed in Verilog)
- Interface an FPGA with VGA to implement a game of pong
- Create unit tests for each individual component of the FPGA system
- Observe clock timing diagrams to troubleshoot the system

Parallelized MIPS Instruction Pipeline, Computer Architecture, UMBC **Aug 2017 — Dec 2017**
- Parallelize MIPS instruction execution pipeline when provided a list of instructions that must be executed (programmed in C)

Microcontroller Music Box, C Programming and Embedded Systems, UMBC **Aug 2017 — Dec 2017**
- Program a music box on the AVR Butterfly ATMega169 microcontroller where songs can be created, played, named, stored, and overwritten (programmed in C)

UDP TicTacToe, Computer Networks, UMBC **Aug 2017 — Dec 2017**
- Program a Tic Tac Toe game that may be played between a client and a server (programmed in Python)
- The client and server must communicate using UDP

Skills

Languages	English (Native), Tagalog (Proficient), Spanish (Educational Level)
Programming	C/C++, Python, Assembly, Verilog, VHDL
Hardware	MEMS cleanroom fabrication, Micro-scale soldering, 3D printing, Aerosol jet printing, Inkjet printing, Parylene coating, Profilometer characterization, Laser cutter
Software	MATLAB, COMSOL, LTSpice, PSpice, Cadence, AutoCAD, Fusion 360, Eagle PCB design, Xilinx ISE, Vivado, Visual Studio, ROS

Extracurricular Activities and Service

Member, UMT Student Program Committee, GT **Aug 2020 — Present**
- Discuss methods to incorporate into a program targeting the retention of underrepresented minority transfer students at the Georgia Institute of Technology

Member (1st-Degree Black Belt), Tech TKD, GT **Aug 2019 — Present**
- Practice the Korean martial art of Taekwondo with peers by performing poomsae (forms) and basic techniques
- Revitalize club Taekwondo at GT

Member (Brown-Gold Belt), Tech Taido, GT **Aug 2018 — Present**
- Participate in the Japanese martial art of Taido Karate by competing at regional locations in hokei (forms), and jissen (sparring)

Volunteer, Fernbank LINKS **April 2019**
- Create science demonstrations for children and youth interested in STEM fields

Member (1st-Degree Black Belt), Club Taekwondo, UMBC **Aug 2014 — Aug 2018**
- Participate in the Korean martial art of Taekwondo by competing at various regional locations in poomsae (forms), board breaking, sparring
- Volunteer for monitoring youth sparring matches

Volunteer, Movable Feast **Oct 2016**
- Create and package meals for families affected by HIV/AIDS

Volunteer, First Lego League **Oct 2014, Oct 2015**
- Assist in managing youth interested in solving basic engineering problems with Lego Mindstorm systems
- General event setup and cleanup

Awards & Honors

2018 GT President's Fellowship
2016 MARC U*STAR Scholar
2014 Meyerhoff Scholar; National Security Agency Scholar; Dean's List (for next four consecutive years); President's List (for next four consecutive years)