

Dominic P. Tanzillo

MATHEMATICS AND NEUROSCIENCE · NASA SPACE UNIVERSITY RESEARCH ASSOCIATE

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Education

Duke University

B.S. IN MATHEMATICS AND B.S. IN NEUROSCIENCE

Durham, NC 27708

August 2016 - May 2021

- I have a cumulative **GPA of 3.95** after 6 semesters of coursework.
- Pursuing graduation with distinction in both mathematics and neuroscience.
- Currently, I am taking leave of absence to pursue my USRA Internship at NASA's Johnson Space Center.
- In spring of 2018, I took a personal leave of absence for following the loss of my father.

Unitek EMT College

NATIONALLY REGISTERED EMERGENCY MEDICAL TECHNICIAN

Fremont, CA 94538

March 2018 - April 2018

Honors & Awards

DUKE AWARDS

May 2020 **Phi Beta Kappa - Junior Admit**, Duke University
May 2019 **Student Marshall**, Duke University Graduation
May 2019 **Dean's List**, Duke University
Dec 2018 **Dean's List with Distinction**, Duke University
Dec 2017 **Dean's List**, Duke University
May 2017 **Dean's List**, Duke University
Dec 2016 **Dean's List with Distinction**, Duke University

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Work Experience

NASA Undergraduate Space Research Association - USRA

RESEARCH ASSOCIATE

Johnson Space Center - Houston TX

January 2020 - August 2020

- Under the supervision of Frank Delgado in the Spacecraft Software Engineering Branch (ER-611), I am working to develop the Pilot Training Next Software suite to improve United States Air Force pilot education.
- I am testing biometric feedback devices for accuracy and reliability and then coding Python and C++ programs to receive real-time data for integration into machine learning paradigms. Overall, the project seeks to quantify cognitive state of pilot in real time and relating it to physiological states of arousal and performance in simulations.
- My role involves preparing the data for analysis in deep learning AI algorithms as well as reviewing the learned relationships and confirm they conform to physiological and neuroscientific principles. I engage in features engineering to adjust equations and variables within the models to optimize predictions.
- Throughout the internship, I help the lab during demonstrations of the software and testing the acquisition of data. This includes learning and then demonstrating USAF pilot flight maneuvers.
- At the end of the tour, I will provide a report to the engineering branch on the outcomes I managed to achieve during my rotation.

Intern Space Program

SIMULATIONS BRANCH CHIEF

Johnson Space Center - Houston, TX

January 2020 - Present

- Headed a five person division to develop lightweight flight models for predicting and tracking the trajectory of an intern amateur rocket.
- I implemented new protocols to receive data from rocket and to develop a real-time models to better assist recovery of the rocket.
- Developed new models to add stochastic variations and fluid dynamics to launch trajectory and create a probability map of outcome locations.
- Mentored fellow interns in the usage of differential calculus, inertial estimates, and gravitational mechanics to build their own models.

Bittner Development, LLC

TUTOR, TEXTBOOK EDITOR, AND CODER

Redwood City, CA 94061

March 2015 - June 2018

- I tutored students from 2nd to 12th grade in mathematics and science courses to providing both foundations to help students catch up to piers and acceleration sessions to skip courses.
- I developed individualized curriculum for students with learning disabilities to help them appreciate math.
- I edited digital sociological textbooks to ensure they are properly ported to the digital format, checking for accuracy and consistency in the formatting and proper usage of alternative text. Editing the mistakes required basic fluency in HTML.
- I wrote alternative text for a multi-variable textbook to describe mathematical objects for a blind students. This involved taking images in the textbook and distilling the relevant information to help the student gain a geometric understanding of calculus.

Research and Instruction Experience

Duke University - Department of Mathematics and Statistics

Duke University - Durham, NC 27708

RESEARCH ASSISTANT FOR DR. HAU-TIEN WU

May 2019 - Present

- Dr. Wu's Medical Information and Signal, Theory and Application (MISTA) Lab is a mathematics and statistics lab that works to apply mathematical models to better read and process physiology signal data.
- I developed a MATLAB program to remove noise electrocardiogram (ECG) signals using a paradigm previously applied to electroencephalography (EEG).
- I utilized fast Fourier transformations to estimate the heart-rate and QRS-complex shape in especially noisy ECG signals. Rather than throw away this data, these techniques illustrated an ability to recover the information. This work intends to, in real-time remove the noise from heart rate monitors.
- Current work involves collaboration with cardiologists from Wake University Medical School to apply these algorithms and optimize results for real-time analyses.
- I received acknowledgements for proofreading and suggesting edits to a published paper. I am working to publish a paper to graduate with distinction in spring of 2021.

Duke University School of Medicine - Department of Neurobiology

Duke University - Durham, NC 27708

RESEARCH ASSISTANT FOR DR. FAN WANG

August 2017 - December 2019

- In Dr. Wang's Lab, I study the caudal spinal trigeminal nucleus (SpV), a central hub in reporting whisker somatosensory information and guiding rhythmic whisking behaviors.
- I built Jove microcircuit electrodes to detect spiking in SpV head-free and head-fixed mice. My mentor then surgically implants these head-probes. We are able to very precisely determine the neurons we record from by integrating optogenetically tagging of SpV neurons.
- I secured a **Duke Summer Neuroscience Program Grant** for \$4,500 to further my project over the summer of 2019. The grant involved weekly business development meetings to improve public speaking, formatting academic research, and poster design.
- I gave a poster presentation at the **Duke Undergraduate Research Showcase** on July 26, 2019 presenting on my summer work.
- I developed and built a fully automated t-maze to simplify training the mice to run the maze. I build the maze from 3D printed parts and wired an Arduino board to control the maze with my own code.
- I trained the mice to operate on a new maze schema; rather than depend on two separate reward ports, the mice respond to a single reward port thus removing bias from the task and increasing the difficulty of associating behavior with reward.
- I mentored a high school student to gain basic lab investigation techniques and use of 3D printing software and design.

University of California San Francisco School of Medicine: Neurosurgery

San Francisco CA, 94115

UNDERGRADUATE RESEARCHER WITH DR. LARSON

May 2017 - June 2018

- I collected the data and ran the calculations to determine the effectiveness of an algorithm that merges CT scans with MRI scans. This software is used in most stereo-tactic surgeries but the error rate had never been quantified.
- I found statistically significant errors of at least a millimeter and a biasing of the having shifts in the posterior regions of the brain.
- I handed off my work to Drs. John Burke and Paul Larson to write the report.
- The research results were presented at the **American Society and Joint Section of Stereotactic and Functional Neurosurgery (ASSFN)** on June 5, 2018.
- I am the second name on a paper currently under review in several neurosurgery journals.

Leadership

Trinity College of Arts and Sciences - Duke University

Duke University - Durham, NC 27708

SPACE MEDICINE HOUSE COURSE INSTRUCTOR

August 2020 - May 2021

- Beginning in November 2019, I started developing a House Course (a for credit, undergraduate led course at Duke University) on the subject of space medicine. I worked with Duke professors, doctors across the country, NASA researchers to help bring the principles of space medicine to undergraduates.
- I have setup in person and video lectures with relevant scientists, engineers, and astronauts to help students appreciate all of space medicine.
- With the SEDS (Students for the Exploration and Development of Space) USA organization, I am designing the materials to open source the course and allow students across the country to watch the recorded lecturers and access the course materials. The intention is to allow other students to host the course at their own school or at least learn the materials and help share knowledge in space medicine.

Students for the Exploration and Development of Space (SEDS) USA

Duke University - Durham, NC 27708

CO-PRESIDENT AND FOUNDER OF DUKE'S CHAPTER

April 2020 - Present

- I helped found Duke's branch of SEDS. Taking advantage of Duke's research hospital and engineering school, SEDS Duke emphasizes the astrophysics and space medicine.
- Established monthly speakers and research presentations to have NASA and Duke scientists demonstrate research.
- Working with our engineering branch to participate in design challenges.
- In June 2020, my essay on the three types of scientists will be published in SEDS's monthly periodical.
- In June 2020, I will be featured on the On-Orbit Podcast to discuss the role of medicine in space travel.
- Currently working with UNC and NC State's Chapters to setup cross campus collaboration including visits of other schools.

NASA Johnson Space Center Pathways Program

Johnson Space Center - Houston, TX

OUT AND ALLIED LIAISON AND GENERAL BODY SCRIBE

January 2020 - Present

- I serve as the intern representative for the Out and Allied Employee Research Group. This means directing fellow interns to LGBT+ resources and helping advertise pertinent events.
- I developed a forum for all interns to recognize the accomplishments and achievements of others intended to foster excellence and community.
- I generate a directory to help interns reference the notes of previous interns and provide notes to improve project hand off between intern rotations.
- I documents best-practices to provide information for future interns as well as detail the culture of the pathways program to make a on boarding guide.
- Setting up virtual Pride Month to help interns and NASA employees celebrate during quarantine on the 50th anniversary of pride parades in the United States.

Duke University EMS

Duke University - Durham, NC 27708

STANDARD OPERATING PROCEDURES CHAIRMAN

October 2019 - Present

- In 2018, Duke University EMS transitioned to event medicine and has needed to update our Standard Operating Procedures (SOPs).
- I head a 12 person committee at biweekly meetings and delegate responsibilities to update and write over 50 SOPs to ensure compliance with state, national, and Life Flight procedures.
- I review all SOPs edited by the committee before submitting the final product to the larger organization for voting.
- I developed a style guide to ensure consistency across all SOP formatting.

Camp Kesem at Duke University

Durham, NC 27708

COLOR CORE LEADER

August 2019 - Present

- I head a 35 person fundraising group tasked with raising \$15,000 in the 2021 financial year to pay for Duke Camp Kesem's charity summer camp.
- I oversee the integration of 20 new members into our chapter and developed community programming to increase year-round participation.
- I lead on-the-ground preparations for Kesem's 2020 Make the Magic Gala tasked with raising \$30,000. I am handing off my two years of expertise running that event while allowing core members to contribute fresh energy and talent to preparing the event.

Round Table Dorm

Duke University - Durham, NC 27708

DORM PRESIDENT

January 2019 - December 2019

- Round Table is a selective living group at Duke University, seeking to find the benefits of a selective living group while also eliminating much of the undesirable elements of Greek culture. To do so, Round Table emphasizes the pillars of Student-Student, Student-Faculty, and Student-Community Interactions
- My tenure focused on improving programming for new members to encourage post-recruitment integration. I increased freshman involvement in all dorm-sponsored activities to higher than any other level.
- I collaborated with my community service chairs to completely redesign the dorms emphasis. We moved towards an annual project of working with an elementary school to found and coach their Science Olympiad Team
- Introduced a semester-long house cup to incentivize participation in dorm-activities throughout the semester. With these policy, Round Table saw our most successful fall semester as a dorm as involvement increased throughout the semester reversing a historic trend of losing engagement as the semester progressed.

Camp Kesem at Duke University: Executive Board

Durham, NC 27708

MAKE THE MAGIC CHAIR

August 2019 - Present

- I chaired a 16 person committee designed to plan and coordinate Camp Kesem at Duke's annual charity auction and dinner to raise over **\$17,000 in 2018** and **\$26,000 in 2019**. collectively this provided Camp Kesem to 85 children.
- I participated in weekly exec board meetings to steer and grow the chapter and report on progress in planning Make the Magic.
- I spoke at monthly general body meetings to update the chapter on fundraising progress and delegate invitation responsibilities
- In my second year I implemented a series of changing to increase attendance by 33%. I partnered with Duke's Jewish Center to increase out community outreach, designed a new email campaign to increase ticket sales and donations, and secured a partnership with Duke's Cancer Center to guarantee future venues.

Round Table Dorm

Duke University - Durham, NC 27708

VICE PRESIDENT OF FACULTY INTERACTION

January 2019 - December 2019

- I established biweekly events between students and Duke faculty.
- I acquired new funding sources to expand the frequency of faculty dinners hosted in the dorm.

Epworth and East House Freshman Dorms

Duke University - Durham, NC 27708

TREASURER

September 2016 - December 2019

- Although in neither freshman dorm, I served on the house council for both East House and Epworth to support the two smallest dorms
- I produce successful programming budget for the two separate dorms.
- I designed, collected orders, purchased, and distributed t-shirts for each house.
- I organized football watch parties to increase cohesion between the separate dorms.

Medical Experience

Health Courses Instructor

Durham, NC 27708

CERTIFIED AMERICAN HEART ASSOCIATION AND STOP THE BLEED INSTRUCTOR

November 2018 - Present

- As an American Heart Association trained CPR Instructor, I provide 4 hour CPR: Basic Life Support Courses for current and aspiring medical practitioners, foster parents, and engaged citizens.
- I am also a Stop the Bleed Instructor. I provide educational modules to schools and workplaces to provide medical responses in mass causality and active shooter incidents.
- Through Duke University EMS, I provide free training and refresher courses for hands only CPR. We work with on-campus organizations to train over 500 freshman annually helping Duke remain a NCEMSF Heart Safe Campus.

ReImagine Medicine

Duke University - Durham, NC 27708

UNDERGRADUATE RESEARCH FELLOW

May 2019 - December 2019

- ReImagine Medicine is a pioneering program seeking to introduce the medical humanities to aspiring healthcare professions to emphasize patient focused medicine. Across four weeks, I took part in many modules including music, drawing, puppetry, history, expressive writing, improv and ethics courses all with a focus on the medical practice.
- I shadowed non-doctor medical staff including chaplains, house keepers, and hospice workers to gain a larger appreciation of the hospital environment and power hierarchies.
- I participated Socratic dialogues with patients and doctors to gain understanding of the healthcare system, its flaws and potential remedies.
- I gave several educational presentations on the achievements of Cecily Saunders as well as the importance of mindfulness in the medical field.
- After we returned to Duke, we took part in a weekly course to explore themes initially developed over summer. In that time I shadowed Dr. Ray Barfield as in a pediatric cancer ward and saw him apply lessons discussed in ReImagine Medicine in the field.

Duke University EMS

Duke University - Durham, NC 27708

VOLUNTEER EMERGENCY MEDICAL TECHNICIAN

September 2018 - Present

- I am a Nationally Registered EMT certified to practice to North Carolina and California.
- I volunteers at Duke basketball and football games to care for patients and players.
- The emphasis of my education is on event medicine and mass causality incidents.
- I attend or instruct weekly continuing education courses to practice skills.
- I shadow Life Flight paramedics and nurses to observe rural medicine and flight medicine and confirm my interest in military medicine.

San Francisco Department of Veteran Affairs

San Francisco, CA 94121

SHADOWING AND GRAND ROUNDS

May 2017 - August 2017

- I attended weekly grand rounds to see the education of neurosurgeons at the University of California San Francisco medical school.
- I shadowed Dr. Paul Larson at the San Francisco VA to observe the practice of stereotactic neurosurgery in Parkinson's patients.

Volunteer Experience

Camp Kesem at Duke University

Duke University - Durham, NC 27708

COUNSELOR AND GENERAL BODY MEMBER

December 2016 - Present

- Camp Kesem is a charity summer camp designed to support children though and beyond a parent's cancer.
- I fundraise over \$1,000 each year to provide camp free of charge for our campers.
- I provide year-round support and outreach to campers by attending three events each school year and writing letters to the campers.
- I am a counselor for two campers each week to ensure they have an incredible camp experience.
- I specialize in working with campers with special needs including autism, ADHD, and William's Syndrome.

Engineering World Health

KCMC - Moshi, Tanzania

TANZANIAN FIELD ENGINEER

June 2018 - August 2018

- I worked on a Duke Engage Project designed to refurbish medical equipment in Tanzania's hospitals.
- I troubleshoot, repaired, and trained Tanzanian doctors, engineers, and hospital staff on 27 types of medical equipment.
- I received electrical engineering courses to repair equipment in field without manuals.
- I learned the Kiswahili language and had cultural classes to better overcome barriers.
- I worked at Kilimanjaro Christian Medical Center, one of Tanzania's largest hospitals, to refurbish over 40 pieces of medical equipment.
- I installed a backup power supply for the engineering department to allow for continued repair of medical equipment during frequent blackouts.

Chance Tutoring

Duke University - Durham, NC 27708

STEM AND SAT TUTOR

September 2016 - May 2017

- I volunteered as a tutor for Durham middle and high school students in math and science courses and SAT preparation.

Project Sunshine

Duke University - Durham, NC 27708

HOSPITAL VOLUNTEER

August 2016 - May 2017

- I volunteered in the waiting room of Duke's Children's Hospital to provide entertainment and support to children.

Project Heal

Duke University - Durham, NC 27708

HEALTH CARE INSTRUCTOR AND CHILD CARE VOLUNTEER

September 2016 - May 2017

- I worked with Latina populations to provide weekly health education modules and child care for mothers.
- I organized the 2016 Christmas Party.

Skills

Mathematics	Stochastic Calculus, Fourier Transformations, Abstract Algebra, Linear Algebra, Multivariable and Differential Calculus
Data Analysis	Deep Learning, Signal Processing, Probability, Regression Analysis, Calculus Based Statistics
Programming	Python, MATLAB, C/C++, LaTeX, Arduino, HTML
Engineering	Circuit Construction, 3D Modeling and Printing, Medical Device Troubleshooting, Real-Time Data Integration
Finance	Mathematical Finance, Volatility Management, Database Management, Supply Chain Analysis
Software	Microsoft Access, Adobe Photoshop and Illustrator, Final Cut Pro X, Bonsai, Autodesk Fusion 360
Medical	Emergency Medicine, Event Medicine, Mass Casualty Interventions, CPR Instruction, Stop the Bleed Instruction
Languages	English (Native), Spanish (Conversational), Kiswahili (Basic)