BIOGRAPHICAL SKETCH

NAME: Darrell, Megan

eRA COMMONS USER NAME (credential, e.g., agency login): MEGANDARRELL

POSITION TITLE: MD-PhD Student

EDUCATION/TRAINING:

Institution and Location	Degree	Start Date	Completion Date	Field of Study
Wheaton College (Norton, MA)	Bachelor of Arts	08/2017	05/2020	Bioinformatics
Albert Einstein COM (Bronx, NY)	MD, PhD	06/2022	05/2030 (Expected)	-

A. Personal Statement

My research career has consistently integrated both science and medicine, driven by my ultimate goal of becoming an active physician-scientist performing clinically informed research. The primary purpose of my research proposal, and the pursuit of both an MD and PhD, is to begin the unique journey of marrying science and medicine, utilizing clinical research to inform meaningful advancements in disease diagnostics and treatment.

Entering college at just sixteen years old, I firmly envisioned myself as a physician; I was fascinated by the physiology of disease and was extremely dedicated to improving health outcomes, but naïve to the breadth of scientific opportunity outside of clinical care. When selecting my undergraduate field of study, I was torn between neuroscience—captivated by the brain's unparalleled complexity—and bioinformatics, a unique program offered at Wheaton that seemed to represent an interdisciplinary blend of science and technology. Ultimately, I uncovered an unexpected enthusiasm for the logical rigor and creativity required of my computational coursework but was eager to find a way to integrate both interests. I chose to pursue my first research fellowship with Dr. Vivek Kumar at The Jackson Laboratory (JAX), where I aided in the development of a convolutional neural network that could non-invasively measure naturalistic gait patterns in neurological disease models. The application of computational methods to reveal insights into both brain function and behavior was incredibly fascinating to me, laying the foundation for my interest in data-driven neuroscience research. Excited to further explore how bioinformatics could inform clinical medicine, I pursued a postbaccalaureate fellowship with Dr. Hanna Kim at the NIH, where we investigated the pathogenesis of juvenile dermatomyositis (JDM)—a rare pediatric autoimmune disease—by cluster-based analysis of bulk and single-cell transcriptomic data. Each week, I met the patients involved in our clinical trials, which showed me how active research leveraging bioinformatics could have tangible benefits for patients. Moreover, my early research revealed the importance of seamlessly integrating clinical and analytical roles, especially in patient-centered research.

In pursuing an MD-PhD at Albert Einstein College of Medicine (Einstein), I sought to build on my previous scientific and academic experiences to bridge the gap between scientific discovery and clinical care. Toward this goal, I volunteered as a statistical consultant at Einstein and New York Medical College (NYMC) during my pre-clinical years, collaborating with physicians, statisticians and medical students to develop research questions and analyze clinical data across various specialties. Many of these projects focus on the prevalence of racial, ethnic, and gender disparities in healthcare, both for patients and medical trainees, underscoring the powerful role of research in identifying inequities in medicine. This work cultivated my passion for caring for vulnerable populations, particularly within pediatrics, where the impact of disparities can be especially profound. This, combined with my longstanding interest in neuroscience, has directed my focus toward understanding neurological and psychiatric conditions, which present a unique diagnostic challenge due to their complex and heterogeneous nature. Both fields offer an invaluable opportunity to redefine diagnostics and treatment through quantitative scientific inquiry and neurophysiological mechanisms, moving beyond current reliance on subjective symptomatology.

Under the guidance of Dr. Sophie Molholm and the Cognitive Neurophysiology Laboratory (CNL) team at Einstein, I am eager to further explore these passions by evaluating the neural processes underlying autism spectrum disorder (ASD). Working with Dr. Molholm, who also serves as the Director for the Intellectual and Developmental Disabilities Research Center (IDDRC) at Einstein, provides a unique opportunity to meet patients and self-advocates, enriching my understanding of the patient experience throughout the clinical research process. As I continue to learn and grow as a CNL trainee, I hope to expand and blend my cumulative skillsets in medicine, neuroscience and bioinformatics, working towards my goal of becoming a truly interdisciplinary physician-scientist. My dissertation will explore neural indices of cognitive, sensory and motor

processing in individuals with and without autism, with exciting potential applications for diagnostics and treatment in pediatric neurology. I am particularly excited to work directly with a clinical population while also developing valuable EEG acquisition and analysis skills, which will be widely beneficial to my future career as both a neuroscientist and physician. My evidenced passion in leveraging quantitative computational research to inform clinical advancements, combined with invaluable support from Dr. Sophie Molholm and the CNL team, will be instrumental in both the success of my research project and my professional journey.

B. Positions, Scientific Appointments and Honors

Positions & Scientific Appointments
2024 – Present	**Graduate Student (PhD),** Dr. Sophie Molholm, Neuroscience (Albert Einstein COM)
2022 – Present	**MD-PhD Student,** Albert Einstein COM
2020 – 2022	**Postbaccalaureate Fellow,** National Institutes of Health (NIAMS)
2019	**Summer Student Fellow,** The Jackson Laboratory

Teaching & Extracurricular Positions
2025 – Present	**Clinical Trainee,** Ambulatory Outpatient Continuity Clinic (Jacobi Medical Center)
2024 – Present	**Chief Peer Assistant,** Anatomy & Physiology (Albert Einstein COM)
2023 – 2024	**Peer Assistant,** Anatomy & Physiology (Albert Einstein COM)
2023 – Present	**Recruitment Chair,** MSTP Student Council (Albert Einstein COM)
2022 – Present	**Laboratory Teaching Assistant,** Anatomy & Physiology (Albert Einstein COM)
2020 – 2022	**Biomedical Science Mentor,** Prince George County (Washington, DC)
2019 – 2020	**Youth Therapeutic Mentor,** YMCA Reach and Rise Program (Attleboro, MA)
2019 – 2020	**NCAA Student-Athlete Advisory Board,** NCAA DIII Women's Soccer (Wheaton College)
2018 – 2020	**Peer Advisor,** NCAA DIII Women's Soccer (Wheaton College)
2018 – 2020	**Laboratory Teaching Assistant,** General & Organic Chemistry (Wheaton College)

Honors & Awards
2024	**Oral Presenter,** CNL Retreat (Einstein & University of Rochester)
2024	**Award of Excellence in Medical Education,** Poster Presenter at Einstein IMPact Day
2020	**Richard and Virginia Thornburgh Leadership Award,** Wheaton College
2017 – 2020	**May Fellows Honor Program,** Wheaton College
2017 – 2020	**Dean's List,** Wheaton College
2017 – 2020	**Trustee Merit Scholarship,** Wheaton College
2019	**Oral Presenter,** Annual Biomedical Research Conference for Minoritized Scientists
2019	**Oral Presenter,** Summer Student Symposium at The Jackson Laboratory
2018, 2019	**Candace Whiffen Dyal '76 Endowed Scholarship,** Wheaton College
2018, 2019	**NEWMAC Academic All-Conference,** Wheaton College
2018	**Award for Excellence in Hispanic Studies,** Wheaton College
2018	**Charles A. Dana Scholarship,** Wheaton College

C. Contributions to Science

1. Undergraduate Research, The Jackson Laboratory (JAX)
During JAX's 10-week Summer Student Program (SSP), I worked in Dr. Kumar's Genetics, Behavior and Addiction laboratory, aiding in the development of a convolutional neural network (CNN) that can extract highly accurate mouse pose estimation from video of an open field assay. Additionally, we were able to derive quantitative gait and stride cycle metrics by tracking paw location in each video frame. My direct role in the project involved analysis of Collaborative Cross F1 (CCF1) lines, including the eight founders. By identifying significant variance in stride cycles of founder strains, we effectively identified a genetic component to gait. Furthermore, we also utilized the CNN to evaluate stride patterns within neurological disease and addiction models, demonstrating utility of the network to provide quantitative and non-invasive markers of gait.

Publications:
Sheppard K, Gardin J, Sabnis G, Peer A, **Darrell M,** Deats S, Geuther B, Lutz C, Kumar V. (2022). Stride-level analysis of mouse open field behavior using deep-learning-based pose estimation. *Cell Reports, 38* (2). PMID: 35021077.

Accepted Abstracts & Presentations:

Darrell M, Sheppard K, Kumar V. Using a deep learning neural network to analyze mouse gait and levels of social interaction. Oral Presentation at: *Annual Biomedical Research Conference for Minority Students*; 2019 Nov 13-16. Anaheim, CA.

Darrell M, Sheppard K, Kumar V. Using a deep learning neural network to analyze mouse gait and levels of social interaction. Oral Presentation at: *Summer Student Symposium*. The Jackson Laboratory; 2019 Aug 8. Bar Harbor, ME.

2. Postbaccalaureate Research, National Institutes of Health

Under the mentorship of Dr. Hanna Kim, I led a series of multi-omic analyses to better understand etiology of juvenile dermatomyositis (JDM), which is a pediatric autoimmune disease characterized by inflammation in the blood, muscles, and skin. Primary evaluation included differential expression analysis of bulk RNA-sequencing data from peripheral whole blood, comparing 56 JDM patients and 60 matched healthy controls. Follow-up analysis included a machine learning pipeline and assessment of biological pathway dysregulation using Ingenuity Pathway Analysis (IPA). Use of computational cluster-based and classification models allowed for identification of unique gene categories specifically related to myositis specific autoantibody (MSA) subsets. I also worked on an exploratory single-cell RNA sequencing project to explore JDM pathogenesis in individual cell types. In this study, we evaluated evolution of single-cell JDM samples from different timepoints, providing a longitudinal transcriptomic study to evaluate the effects of novel treatment. In addition to performing bioinformatics analyses, I learned how to perform PBMC and RNA isolation, and observed the wet laboratory processes for both single-cell and bulk RNA-sequencing by the genomics core, expanding both my analytical and bench research skills.

Accepted Abstracts & Presentations:

The following are representative examples of a total of **21 abstracts & presentations** stemming from the work completed under this fellowship (7 first-author/presenter; 14 middle-author).

Darrell M, Chin A, Kim H. Peripheral transcriptomic analysis in juvenile dermatomyositis (JDM) with machine learning classification. (Virtual) Poster Presentation at: *Rheumatism Society of DC Fellows Forum*. 2021 May 19. Washington, DC.

Zajmi U, **Darrell M,** et. al. Top Peripheral Blood Transcriptomic Gene Modules Reveal Functional Annotation and Correlation with Clinical Traits in Juvenile Dermatomyositis (JDM) and Myositis Specific Autoantibody (MSA) Groups. Poster Presentation at: *American College of Rheumatology*; 2024, November 18. Washington, DC.

3. Graduate Research

i. Cognitive Neurophysiology Lab (CNL), Albert Einstein College of Medicine

My ongoing research in Dr. Sophie Molholm's laboratory investigates neurophysiological mechanisms underlying autism spectrum disorder (ASD) by electroencephalography (EEG). My initial project in the CNL evaluated auditory steady entrainment (ASSR) in a large, age-restricted cohort of 46 children with ASD, compared to typically-developing (TD) children and age-matched unaffected ASD siblings. Comprehensive group comparison demonstrated a significant broad-band delay in evoked auditory response in the ASD group during the time window leading up to steady-state entrainment, in which siblings had an intermediate response (between TD and ASD). Findings significantly correlated with clinical and behavioral measures of autism severity and detection sensitivity, respectively. Our results support the utility of neurophysiological response to ASSR as a potential endophenotypic biomarker for ASD diagnosis and treatment. For my dissertation research, I look forward to expanding my analytical skillset as we investigate the mechanisms underlying impaired attention in ASD, which is further detailed in the Research Strategy.

Accepted Abstracts & Presentations:

Darrell M, Vanneau T, Cregin D, Lecaj T, Foxe J, Molholm S. 27- & 40-Hz Auditory Entrainment Delay in Children with Autism Spectrum Disorder. Poster Presentation at: *International Society for Autism Research (INSAR)*; 2025, May 5. Seattle, WA.

Darrell M, Vanneau T, Cregin D, Lecaj T, Foxe J, Molholm S. 27- & 40-Hz Auditory Entrainment Delay in Children with Autism Spectrum Disorder. Poster Presentation at: *Intellectual and Developmental Disabilities Research Center (IDDRC) Annual Leadership Meeting*; 2024, October 10. Madison, WI.

Darrell M, Vanneau T, Cregin D, Lecaj T, Foxe J, Molholm S. 27- & 40-Hz Auditory Entrainment Delay in Children with Autism Spectrum Disorder. Poster Presentation at: *Society for Neuroscience*; 2024, October 6. Chicago, IL.

ii. Statistical Consulting Group, Albert Einstein College of Medicine

At Albert Einstein COM, I collaborate with physicians, statisticians, and medical students to develop and analyze clinical research projects. Most notably, I worked with Dr. Duong and his team to evaluate risk factors for long-COVID, including neuropsychiatric sequela associated with unmet social needs. I also co-led clinical projects with students across a variety of medical specialties, including dermatology, orthopedics, and surgery, to guide research questions and perform statistical analyses of big data.

Publications:

Eligulashvili A*, **Darrell M***, Gordon M, Jerome W, Fiori K, Congdon S, Duong T. (2024). Patients with unmet social needs are at higher risks of developing severe long COVID-19 symptoms and neuropsychiatric sequela. *Science Reports, 14*. PMID: 38565574.
* equal contribution, co-first author

Eligulashvili A*, **Darrell M***, Miller C, Lee J, Congdon S, Lee J, Hsu K, Yee J, Hou W, Islam M, Duong T. (2022). COVID-19 Patients in the COVID-19 Recovery and Engagement (CORE) Clinics in the Bronx. *MDPI, 13* (1). PMID: 36611411.
* equal contribution, co-first author

Axler E, Lu A, **Darrell M,** Vielemeyer O, Lipner SR. Surgical site infections are uncommon following nail biopsies in a single-center case-control study of 502 patients. *J Am Acad Dermatol*. 2024 May 15: PMID: 38754627.

Choi J, **Darrell M** et. al. (2025). Laser hair removal in patients with polycystic ovarian syndrome and darker skin: A case-control study. *Under review* in *J Am Acad Dermatol.* 2025, April.

Wang B, Bashier M, Fagan M, **Darrell M**, Horan D, Mehraban Alvandi L, Horn W, Kahn M. (2025). The Implications of Language Barriers on Postoperative Outcomes Among Older Adults with Hip Fracture. *Under review* in *Orthopaedic Trauma Association (OTA) International*. 2025, March.

Accepted Abstracts & Presentations:

Chao J, Parker-Fong K, Wang B, **Darrell M,** Horan D, Kahn M, Horn W. Comparison of 1-year mortality and in hospital ambulation rates in English and Spanish speaking geriatric patients after hip fracture surgery. Poster Presentation at: *American Orthopedic Association*; 2024, June 18-22. St Louis, MO.

Olivera J, Hashmi M, **Darrell M,** Faith I, Colon S, Sapin A, Chopra A. Hypercoagulability in Obesity: Factor VIII Levels Improve after Weight Loss induced by Laparoscopic Sleeve Gastrectomy. Poster Presentation at: *American Society for Metabolic and Bariatric Surgery*; 2024, June. San Diego, CA.

iii. Mill Etienne Diversity and Inclusion Lab (New York Medical College)

Mentored by Dr. Mill Etienne, I collaborated with students at New York Medical College to evaluate gender and racial disparities across a multitude of medical specialties and clinical trials. My primary project included a longitudinal analysis, spanning the past decade, evaluating gender disparity across all medical specialties, which demonstrated historical gender segregation in certain fields, despite gender parity in medical school. Specialties with greater gender disparity were significantly associated with increased training duration and higher compensation, highlighting the need for concerted efforts by medical institutions and lawmakers to increase gender diversity and re-evaluate training timelines.

Publications:

Darrell M, Williams D, Smith C, Faasuamalie P, Jerome W, Etienne M. Gender Disparities in Graduate Medical Education from 2012 to 2022: Patching the Holes in the Pipeline to Academic Medicine Leadership. Under Review in *Journal of Academic Medicine*; 2024, November.

Jain A, Vazquez M**, Darrell M,** Ogarro M, Salik I, Pisapia J. Gender Disparities in Neurosurgical Training: Evaluation of the Impact of Gender from Residency to Academic Leadership. Under Review in *Journal of Neurosurgery*; 2024, December.

Accepted Abstracts & Presentations:

The following are representative examples of a total of **18 abstracts & presentations** stemming from the work completed under this role.

Olivera J, Ramesh R, Williams D, **Darrell M,** Pura-Bryant J, Hashmi M, John D, Forest S, Bush E, Kilic A, Etienne M. Disparities in Cardiothoracic Transplantation: A Metanalysis of Participant Demographics in US-Based Heart Transplant Clinical Trials. Poster Presentation at: *Annual Meeting of the Society of Thoracic Surgeons*; 2024, April 27-30. Toronto, Canada.

Rakolle K, **Darrell M**, Etienne M. From Resident to Chair: Gender Disparities in Child Neurology Pipeline. Poster Presentation at: *American Neurological Association*; 2023 September 9-12. Philadelphia, PA.

D. Scholastic Performance

ALBERT EINSTEIN COM, M.D.		
YEAR	COURSE TITLE	GRADE
2023	Transition to Clerkship	P
2023	Step 1 Examination Preparation	P
2023	Bioethics	P
2023	Health System & Health Equity	P
2023	Intro to Clinical Medicine	P
2023	Integration Pre-Clerkship	P
2023	Endocrine System	P
2023	Infectious Diseases	P
2023	Musculoskeletal System	P
2023	Nervous System/Human Behavior	P
2023	Reproductive System	P
2022	Cardiovascular System	P
2022	GI/Liver System	P
2022	Hematological System	P
2022	Renal System	P
2022	Pulmonary System	P
2022	Molec. & Cell. Foundations of Medicine	P
2022	Clinical & Developmental Anatomy	P

ALBERT EINSTEIN COM, Ph.D.		
YEAR	COURSE TITLE	GRADE
2024	Quant. Skills for Biomed. Researcher II	P
2024	Quant. Skills for Biomed. Researcher I	P
2023	MSTP Thesis Mentor Reading Elective	P
2023	Modern AI in Biomedicine	P
2023	Principles of Neuroscience II	P
2022	Physiology: Membranes and Transport	P
2022	Pharmacology Physiology Pathology	P
2022	Principles of Neuroscience I	P

WHEATON COLLEGE (MA), B.A.		
YEAR	COURSE TITLE	GRADE
2020	Biochemistry	A
2020	Chemistry Seminar	A
2020	Mathematical Stats	A-
2020	Fundamentals of Business	A
2020	Philosophy: Logic	A+
2019	Med. Anthropology	B+
2019	Inorganic Chemistry	A-
2019	Chemistry of Natural Waters	A
2019	Database Systems	B+
2019	Theory of Probability	P
2019	Aqueous Equilibria	A-
2019	Data Structures	B+
2019	Journalism	A-
2019	Intro Physics II	B+
2019	Drugs and Behavior	A
2018	Genetics	A-
2018	Organic Chemistry II	B+
2018	Robots/Games/Prob. Solving	A
2018	Accelerated Stats	A
2018	Intro Physics I	A
2018	Cells and Genes	A
2018	Organic Chemistry I	A
2018	Writing: Beauty	A
2018	Basic Spanish II	A
2017	Chemical Principles	A
2017	Medical Mysteries & Diagnosis	A
2017	Basic Spanish I	A
2017	Sociology of the Body	A

*Albert Einstein College of Medicine **M.D. courses** are graded P (pass) or F (fail), with a passing cut-off of 65% and above or as decided by the course director.*

*Albert Einstein College of Medicine **Ph.D. courses** are graded H (honors), P (pass), or F (fail), with objective and subjective grading components and variable requirements.*

Wheaton College courses are all letter grades except for classes designated as P (pass) or F (fail).