Wesley Ray Lewis

PhD Computational Biology and Bioinformatics [in progress]
BS   Computational Biology
399 Willow Green Drive, Amherst, NY 14228
Phone: 716-566-0289
Email: wes.lewis@yale.edu
LinkedIn: https://www.linkedin.com/in/wesleyraylewis/
Certifications: HIPAA, CITI

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I.   Education

Yale University, New Haven, CT. USA
Computational Biology and Bioinformatics PhD, August 2019-May 2024
Yale Cancer Biology Training Program (CBTP) [NIH Certificate Program]

Thesis Advisor: Dr. Yuval Kluger

First Rotation: Dr. Mark Gerstein
Second Rotation: Dr. Smita Krishnaswamy
Third Rotation: Dr. Yuval Kluger
EC: Black Graduate Network, Yale Journal of Biology and Medicine, Yale SACNAS, Yale Jazz Combo Initiative

University of Rochester, Rochester, NY. USA
B.S. Computational Biology, August 2015-May 2019

Sweet Home Central High School, Amherst, NY. USA
International Academy and National Honor Society, September 2011-May 2015

Buffalo Engineering Awareness for Minorities (BEAM)
2010-2015
National Summer Transportation Institute (NSTI)
2012

II.   Awards, Honors, and Fellowships

University of Rochester:
  Dean's Scholarship
  Frederick Douglass Grant Award

External Scholarships, Honors, and Travel Awards:
  SACNAS National Meeting 2018:

Awarded a travel scholarship to present research poster *"Survey of Small Cell Lung Cancer via Single Nucleus RNA Sequencing"*
Buffalo Engineering Awareness for Minorities Scholarship
NSTI Scholarship
Louis Armstrong Jazz Award

III.   Publications

Garcea, Frank E., et al. "Direct Electrical Stimulation in the Human Brain Disrupts Melody Processing." *Current Biology*, vol. 27, no. 17, 2017, doi:10.1016/j.cub.2017.07.051.

AltMetrics/Highlights:

NPR's *All Things Considered*: https://www.npr.org/sections/health-shots/2017/08/25/545710598/this-music-teacher-played-his-saxophone-while-in-brain-surgery

NowThis: https://www.facebook.com/NowThisNews/videos/man-plays-saxophone-during-his-own-brain-surgery/961844480572343/

URMC Newsletter: https://www.urmc.rochester.edu/news/story/5127/patient-plays-saxophone-while-surgeons-remove-brain-tumor.aspx

Lewis, Wesley., et al. "Survey of Small Cell Lung Cancer via Single Nucleus RNA Sequencing." *SACNAS 2018 National Meeting: Abstract Handbook*

IV.   Presentations

CSHL Genome Informatics Meeting 2019*:*
"Exploration of Subtype-level Immune Cell Classification via the Prototypical Neural Network Model Protocell"

Broad Summer Research Symposium & Founders' Meeting 2018:
"Survey of Small Cell Lung Cancer via Single Nucleus RNA Sequencing"

SACNAS National Conference 2018:
"Survey of Small Cell Lung Cancer via Single Nucleus RNA Sequencing"

V.   Academic Research

Kluger Lab; Yale University [Thesis Laboratory]   06/2020-Present
PhD Student: Bioinformatics: Pathology & Mathematics

- Tested model parameters for feature selection under L1 Bernoulli space.
- Implemented a combination of graph neural network (GNN) architectures, message passing (MP), and transformers (BERT) to encode and predict binding affinities within a set of T-cell receptor sequences.
- Benchmarked methods for unsupervised gene signature detection via scRNA-seq implementations of GSEA and unsupervised graph factorization models (scHPF, NMF).
- Co-authored generalized data de-noising and differential abundance tasks as part of the Open Problems in Single Cell Analysis group, funded by the Chan Zuckerberg Initiative

Krishnaswamy Lab; Yale University   12/2019-5/2020
Rotation Student: Bioinformatics

- Investigated visualizations built exclusively from the RNA Velocity matrix, creating Velocity PHATE or V-PHATE.
- Implemented a straightening auto-encoder with cosine penalties for latent space regularization.
- Investigated optimal transport for batch correction of single cell data.

Gerstein Lab; Yale University   8/2019-11/2019
Rotation Student: Bioinformatics

- Integrated TeXP Deconvolution of transposable elements (TE's) for scRNA-seq data.
- Analyzed therapeutic response in terms of cell type and individual variant information in published scRNA-seq data.
- Generated analysis pipelines for LINE1 quantification in scRNA-seq

Preall Lab; Cold Spring Harbor Laboratory   6/2019-8/2019
Bioinformatics Intern: Genome Center

- Compared existing machine learning methods for subtype-level classification of scRNA-seq data in the immune cell compartment.
- Applied the novel prototypical neural network (PNN) -based model Protocell* to classify immune cell references.
- Conducted benchmarking of Protocell on raw immune cell data as well as denoised data under BISCUIT and MAGIC imputation protocols
- * Protocell public documentation can be found here: ashblib.github.io/protocell/

Broad Summer Research Program; Broad Institute of MIT and Harvard   6/2018-8/2018
Cancer Genomics Intern: Klarman Cell Observatory; Regev Lab

- With the collaboration of Dr. Charles Rudin's Laboratory at MSKCC, applied single cell and single nucleus RNA-seq methodologies to investigate cellular heterogeneity of patient-derived xenograft (PDX) small-cell lung cancer (SCLC) tissues.
- Performed novel single nucleus RNA-seq protocols (optimized from Habib et. al 2017's *DroNc-seq*) to enable sequencing of frozen, tissue-banked SCLC samples, illuminating the perturbed function and carcinogenesis of affected neuroendocrine cells.
- Utilized the Seurat package in R Studio, alongside integrated PCA and diffusion mapping tools in order to analyze multidimensional transcript data.
- Elucidated expression circuitry potentially underlying the pathogenesis of SCLC, along with lineage information regarding major copy number variations in SCLC.

Nedergaard Lab; Center for Translational Neuro-Medicine   2/2017–7/2017
Research Intern; SMD Unpaid Internship Program

- Performed rodent surgery under aseptic protocols.
- Investigated the role of glymphatic cerebrospinal fluid in accumulation of amyloid beta plaques within transgenic mouse models for Alzheimer's Disease
- Completed protocols for the preparation and staining of rodent brains via immunohistochemistry, along with sectioning and microscopy (2-photon, confocal, etc.)
- Utilized techniques for examining glymphatic function using physiological indicators, including manipulation of blood flow and DISCO processing.
- Designed experimental procedures for groups of transgenic mice and investigated novel delivery protocols for gene therapy via cisterna magna injection.

Mahon Lab; Concepts, Actions and Objects (CAOs) Lab   2/2016–12/2016
Lab Technical Assistant

- Presided over an array of healthy- and altered-brain cases, while working on an extended case study following a music teacher with tumor-related music processing deficits (constituting acquired amusia).
- Designed and programmed a vocalization/humming task (dM/dX programming), based on Isabelle Peretz' MBEA assessment. Recruited 12 musicians from the Eastman School of Music as well as 11 undergraduate control subjects from the University of Rochester.

- Optimized the humming task to work intra-operatively, when paired with electro-cortical stimuli. Co-ordinated with surgeons to map the subject's brain during the surgery, and subsequently to test the preservation of musical performance through a performance task (playing the saxophone).
- Used Excel and R Studio to isolate co-occurrence of music arrest with electrocortical stimuli.

Achievements:
The outcome of our amusia case study was my co-authorship on the paper *Direct Electrical Stimulation in the Human Brain Disrupts Melody Processing*, published in Current Biology on September 11th, 2017 (http://dx.doi.org/10.1016/j.cub.2017.07.051). This story was then showcased by multiple news organizations and featured on NPR's "All Things Considered" on August 25th, 2017, as well as being featured in a popular NowThis video titled "Music Teacher Plays Saxophone During Brain Surgery".

VI.   <u>Technical Experience</u>

Strong Memorial Hospital dept. of Surgical Pathology   5/2017–8/2018
Clinical Support Technician: Accessioning and Histology

- Collected and triaged all surgical specimens from hospital operating rooms, including frozen and priority samples.
- Dispersed information to hospital teams, including details on testing, prognosis, and protocols.
- Worked with both Accessioning and Histology staff, while communicating with nurses, PA's, and pathologists.
- Orchestrated histological staining (IHC/ICC) including input of relevant documentation and maintenance of control slides.
- Managed thousands of tissue blocks, within a 30-year file.
- Managed influx of surgical blocks and control slides to be subjected to genomic sequencing, clinical trials and tissue bank requests.

Achievements:
I began working with Histology just as a large-scale transition in workflow was taking place. This transition significantly increased workloads for the busy Histology staff, who were processing larger volumes of rush status cases. My role was instrumental in managing this heightened workflow and maintaining communication with physicians during the diagnostic process.

VII.   <u>Teaching Experience</u>

Yale Center for Biomedical Data Science   6/2020–6/2020
Teaching Assistant; Introduction to Biomedical Data Science and Health Informatics (2 wks)

- Coached participants through a suite of Google Colab notebooks, outlining topics such as topic modeling, Word2Vec, tokenization, and data mining for biomedical informatics.

Yale Departments of Genetics/SEAS   6/2020, 1/2021
Teaching Assistant; Machine Learning for Single Cell Analysis

- Led subgroups of participants through the analysis of four notebooks per day, detailing 6 hours of work per day, over the course of six course meetings per offering of the course (2x).
- Answered numerous questions on algorithmic details and implementations, while helping participants import and analyze second- and third-party datasets upon request.

Department of Chemistry   8/2018–5/2019
Teaching Assistant; Organic Chemistry I and II

- Conducted research in the effectiveness of univocal vs. dialogic styles of discourse as a workshop leader, through support of the University of Rochester Center for Excellence in Teaching and Learning (CETL). This resulted in a poster presentation at the 2018 CETL Poster Session and a research abstract.
- Instructed weekly workshop meetings as well as exam review sessions.

Achievements:
My research on the implementation of univocal and dialogic discourse in a chemistry setting ultimately led to a poster presentation at the 2018 CETL Symposium, where I shared the findings of this research and my thoughts on routes of further investigation.

Department of Clinical and Social Psychology   8/2017–12/2017
Teaching Assistant; PSY 101 & 181

- Served as a teaching assistant for both Introduction to Psychology (PSY 101) and Theory of Personality and Psychotherapy (PSY 181) under Dr. Christopher Niemiec, for the Fall 2017 Semester.
- Designed, defended, and instructed two Mini-Courses (8 total hours of lecturing), which focused on specific sub-domains within Psychology (101).
- Led two weekly discussion sessions (90-minutes each), introducing case studies from primary research in psychotherapy (181).
- Organized multiple debates for 20-30 students each, regarding philosophical questions in psychology.

Achievements:
During my time as a TA, I designed all materials and assignments for two mini-courses, namely ***Conflict and Purpose; The Psychology of Intimate Partner Violence (IPV)*** and ***The Psychology of Body Language and Non-Verbal Communication.*** The former specifically focused on highlighting the prevalence and signs of IPV, especially within marginalized groups, while providing breakdowns of the structure and function of local resources and hotlines. In designing and administering these courses, I learned a great deal about holding targeted discussions while honing skills in public speaking and leadership.

VIII. Leadership Activities

Black Graduate Network (BGN) at Yale   12/2020–Present

- I am the sitting Vice President and Co-Chair of the Black Graduate Network (BGN) at Yale. BGN is the central graduate student hub to interface between the University and alumni via the Yale Black Alumni Association (YBAA), Afro-American Cultural Center at Yale, Yale BBS Diversity and Inclusion Collective (YBDIC), among other organizations.

YBDIC-PATHS Mentorship Program   8/2020–Present

- Mentored one student (Ivan Arreola) under the Yale BBS Diversity and Inclusion Collective's PATHS mentoring program.
- Provided clear feedback and advise on PhD program eligibility, application materials, resources, and timelines.
- Gave insight and advice for preparing pre-doctoral fellowship applications (NSF-GRFP) as well as seeking recommendations from previous advisors.

Podcast Editor; Yale Journal of Biology and Medicine   9/2019–Present

- For YJBM's March 2021 Issue on Preventative Medicine, I hosted Dr. Emma Pierson, a former Rhodes Scholar and Forbes 30 under 30 in Science investigator. We discussed Emma's body of work in Women's Health, clinical disparities, systemic racism, and other areas of applied computation and analysis. Emma shared ideas on her future work as well as thoughts and experiences surrounding her evolving interests from a background in physics to graduate education and research in computer science, bio-informatics, and analysis of population data. Emma talked through the process by which she has used her analysis to reveal clinical insights and recommendations.
  YJBM Preventative Medicine Issue – Episode 1: Interview with Dr. Emma Pierson [Expected Release 3.15.21]
- Amid historic protests in the US and worldwide regarding police brutality and racism in America, I hosted Dr. Monica Bell for a special series episode on Racism and Health. We discussed extensively topics of protections against police prosecution, minimal harm for research subject recruitment within marginalized communities, and segregation of race and class in America.
  YJBM Special Series: Racism and Health – Episode 2: Interview with Dr. Monica Bell

- Along the theme of YJBM's June 2020 Issue on Medicinal Plants, I hosted Dr. Anja Loizaga-Velder for an in-depth discussion of the related history, tradition, and research on the use of psychedelic plants (namely, Ayahuasca) in Psychiatric contexts, the slow incorporation of these practices via key educators within clinical training programs, and the ethnic and cultural biases that affect dialogue within this field.
  YJBM Medicinal Plants Issue: Dr. Anja Loizaga-Velder Interview
- For YJBM's September 2019 Issue on Organelles, I joined Kelsie Kassel and Emma Carley in hosting both Dr. Megan King and Dr. Patrick Lusk, who are the joint investigators of the Lusk-King Laboratory at Yale. We discussed phase shifts in Cell Biology and the impact of these biophysical dynamics on localized processes like nuclear segmentation and translation.
  YJBM Organelles Issue: Episode II

Co-organizer and Mentor; Annual SigEp 19th Ward Spelling Bee   1/2016–5/2019

- I mentored dozens of students for the Sigma Phi Epsilon 19th Ward Spelling Bee, throughout four consecutive years, during which my coaching and mentorship of students between grades 4 and 8 led to the award of numerous scholarships. My role in this event directly enabled the advancement of diversity, equity, and inclusion by helping foster an informed transition from high school to college.

Safe Zone Trainings and Peer Advocacy   11/2016–2/2019

- I was active in the student-led Safe Zone organization at the University of Rochester 2016-2019. As part of this, I led many training sessions on LGBTQ+ allyship and community building.

Co-manager and Arranger; Luke Ciminelli Quintet   10/2011-7/2020

- Until the group's severance in July 2020, I actively managed the Luke Ciminelli Quintet and Small Ensemble. The quintet was highly active in the Buffalo NY area since its creation in 2011, and had been nominated for multiple local awards.

IX. Key Skills

- Experience with algorithmic programming, computational methods implementation, and data analysis
- Proficient with data structures, storage, and multiplatform accessibility
- Adept at leading discussions and keynote-style presentations
- Knowledgeable of wet-lab techniques, clinical specimen management and diagnostic pathology, and aseptic rodent surgery

X. Software

Development Proficiency:
- Java
- Python
- R
- Linux/Unix Shells
- ImageJ
- Microsoft Office

Intermediate Proficiency:

- mySQL
- Matlab