TEMITOPE ADEOYE

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As a researcher, I apply systems biology strategies to uncover cell-specific mechanisms of synaptic dysfunction in Alzheimer's disease, using both biophysical modeling and bioinformatics techniques. My experience spans from whole cell biophysics to single-cell genomics and spatial transcriptomics. I'm looking for a role where I can apply my interdisciplinary background to develop innovative models that push the boundaries of computational biology and contribute to life-changing research in complex brain diseases and aging.

EDUCATION

University of South Florida, Tampa, USA

- MSc. Applied Physics: *Computational Biophysics and Neurobiology*. ***Aug. 2019 – Dec. 2023***
- PhD. Applied Physics: *Computational Biophysics and Neurobiology*. ***Aug. 2019 – Present***

University of Lagos, Lagos, Nigeria ***Sep. 2012 – Jan. 2017***

- BSc. Applied Physics: Electronics. First Class. (Hons)
- Cumulative G.P.A: 4.63/5.00. Class Rank: Best Graduating Student.

TECHNICAL SKILLS

- **Programming/Scripting Languages:** Python, R, Bash, MATLAB, SQL, FORTRAN
- **Machine Learning/Modelling Frameworks:** Keras, scikit-learn, TensorFlow, SciPy, statsmodels, PyTorch
- **Computing:** CUDA, mpi4py |
- **High Performance Computing:** Amazon Sagemaker, Terra Community Workbench, Google Cloud Platform
- **Code Development:** Git | Github | Docker | Anaconda
- **Research-relevant Libraries:** scanpy, squidpy, scvi-tools, hdWGCNA, GSVA, SCENIC+, ArchR, Biopython, bioinformatics tools for multi-modal single-cell RNA sequencing analysis.
- **Modelling and Mathematics:** computational and statistical biophysical modelling, neural data science, predictive modelling, network biology.

RESEARCH EXPERIENCES

Graduate Student Researcher, Computational Biophysics and Neurobiology ***May 2020 – Present***
University of South Florida *Tampa, Fl*
Advisor: Ghanim Ullah, PhD

Summary: Primary research has focused on applying theoretical and computational techniques as well as single-cell multi-omics to understand the molecular and cellular mechanisms of synaptic dysfunction in Alzheimer's disease (AD). This has involved investigating neuronal signaling pathways affected in AD and their impact on synaptic plasticity. These research experiences have resulted in two publications. Organizing multiple cross-disciplinary, multi-institution collaborations in biophysics and neurobiology, building, training, and leading a subgroup dedicated to using bioinformatics, network biology, and statistical techniques to address problems in single-cell genomics (scRNA-seq), epigenomics (scATAC-seq), and spatial transcriptomics.

Key achievements and responsibilities include:

- Developed and implemented computational models to simulate the pathogenesis of neurodegenerative diseases, with a focus on AD.
- Established cross disciplinary collaboration with the Parker Lab at the Department of Neurobiology and Behavior, University of California, Irvine, the to investigate the interplay between neuronal signaling and synaptic impairments.
- Designed and executed bioinformatics methods to analyze single-cell multi-omics data to uncover novel insights into the molecular basis of AD.
- Created the lab's first transcriptomic analysis pipeline to facilitate reproducible data processing and analyses
- Authored two peer-reviewed first-author publications in international as part of the PhD thesis.

- Presented research findings through oral and poster presentations at three local and international professional meetings and conferences.
- Oversaw the organization and maintenance of the lab's code repository.
- Provided mentorship and guidance to 3 graduate, undergraduate and summer interns.
- Presented findings in internal research group meetings.

Research Intern, Human Multi-omics ***May 2022 – Aug. 2022***
Cajal Neuroscience *Seattle, WA*
Mentor: Anatoly Buchin, PhD

Summary: Cajal Neuroscience is a drug discovery company focused on neurodegenerative disease, with the goal of building a platform for target discovery and validation at unprecedented scope and depth. In my role on the computational biology team, I focused on developing deep learning pipelines for mapping and contextualizing single-cell sequencing data to enable rapid integration of new datasets into reference atlases. I implemented an interpretable deep learning approach with explainable embeddings (expiMAP within scArches) to create biologically informed latent representations and deployed standardized bioinformatic workflows to decipher transcriptional mechanisms of disease cell states, differential expression patterns, and trajectories in Alzheimer's and Parkinson's disease (PD) models.

Key achievements and responsibilities include:

- Designed and implemented a transfer-learning-based pipeline for reference mapping to leverage cell type knowledge from a reference scRNA-seq atlas to infer the state of cells in query data.
- Developed a biologically informed deep learning pipeline for interpretable latent representation based on explainable mapping.
- Deployed pipeline to company's compute infrastructure (Software Development Kit (SDK)).
- Utilized the implemented pipeline for rapid integration of newly generated datasets into a reference atlas, contextualization of query datasets within the reference, rapid annotation of scRNA-seq queries, and discovery of novel populations, such as disease states unseen in the reference.
- Ingested publicly available scRNAseq and ATACseq data from human and mouse AD and PD studies into company's compute infrastructure.
- Conducted comprehensive analyses of scRNAseq and ATACseq datasets using standard analysis pipelines, including cell type identification and clustering, differential cell abundance, cell state trajectory inference, RNA velocity, co-expression analysis, and differential gene expression analyses using scanpy, scvi-tools, scGen, and scVelo.
- Routinely presented analysis results to Computational Biology and Preclinical teams to inform the Alzheimer's and Parkinson's Disease target prioritization database and guide the interpretation of relevant biology for prosecution in the in vivo/in vitro screening platforms.
- Summarized research methods and outcomes in formal reports and group meetings.
- Drafted the Computational Biology group's first ***Benchling*** documentation.

Bioinformatics Research Student ***Aug. 2021 – May. 2022***
University of South Florida *Tampa, FL*
Mentor: Dr. Vladimr Uversky

Summary: Investigated the role of intrinsic disorder in Ebola and Marburg virus proteins and its potential implications for virulence.

Key achievements and responsibilities include:

- Curated a comprehensive dataset of Ebola and Marburg virus proteins, along with their corresponding measures of intrinsic disorder, to enable a systematic analysis of the role of disorder in viral pathogenesis.
- Developed and implemented novel computational methods to quantify the effect of intrinsic disorder propensity in the binding partners of viral proteins.
- Built a suite of automated data processing pipelines to efficiently integrate and analyze information from ***Uniprot*** and ***STRING*** databases.
- Coordinated frequent meetings between team members to ensure effective, collaboration, and progress towards project goals.
- Drafted the original report of project findings into a clear and concise narrative for presentation.

Deep Learning for Neuroscience Research, Neuromatch Academy ***Aug. 2021 – Aug. 2021***

Summary: As part of a multidisciplinary research team, I contributed to the development of a deep-image reconstruction model that utilizes recorded neural activity from the visual cortex. Our findings established that the primary visual cortex encodes the majority of the information required for image reconstruction and can be independently employed for this purpose.

Key achievements and responsibilities include:

- Collaborated with a diverse team of 5 researchers to design and implement a deep-image reconstruction model that leverages recorded neural activity from the visual cortex to reconstruct visual stimuli.
- Fine-tuned and optimized AlexNet and ResNet to decode stimulus images from neural activity with high fidelity.
- Conducted rigorous analyses and experiments to demonstrate that the primary visual cortex encodes the majority of the information necessary for image reconstruction and can be used independently for this purpose.
- Presented findings to a larger group of researchers and participants.

Computational Neuroscience Research, Neuromatch Academy ***Jul. 2020 – Jul. 2020***

Summary: This work involved developing a prediction model to investigate the effects of trial history on the trial-to-trial variability of neural and behavioral data. Our findings revealed the significant role of trial history in explaining the trial-to-trial variability of behavioral and neural responses at stimulus onset. These findings challenged the common notion that variability in neural and behavioral data is often regarded as noise.

Key achievements and responsibilities include:

- Implemented advanced data preprocessing techniques to extract relevant features from high-dimensional neural data, enabling the identification of key factors influencing trial-to-trial variability.
- Designed and developed a Logistic Regression method that combines historical neural activity of the current trial with behavioral data to predict subject response type, providing a powerful tool for understanding the relationship between neural activity and behavior.

Undergraduate Researcher, Nonlinear Dynamics and Chaotic Systems ***Sep. 2015 – Nov. 2017***
University of Lagos *Lagos, NG*
Advisor: Kayode Ojo, PhD

- Undergraduate research experience focused on studying vibrational resonance in Van der Pol duffing oscillators driven by bi-harmonic forces.

PUBLICATIONS

Adeoye T., Shah S.I., Demuro A., Rabson D. A., Ullah G. *Upregulated Ca^{2+} Release from the Endoplasmic Reticulum Leads to Impaired Presynaptic Function in Familial Alzheimer's Disease*. **Cells** (2022). | **Paper** | **Code**.

Adeoye T., Shah S.I., Ullah G. *Systematic Analysis of Biological Processes Reveals Gene Co-expression Modules Driving Pathway Dysregulation in Alzheimer's Disease*. **Aging and Disease,** 2024). | **Paper** | **Code**.

POSTER PRESENTATIONS

Systematic Analysis of Biological Processes Reveals Gene Co-expression Modules Driving Pathway Dysregulation in Alzheimer's Disease. *Society for Neuroscience, Chicago, Illinois. (2024).*

Systematic Analysis of Biological Processes Reveals Gene Co-expression Modules Driving Pathway Dysregulation in Alzheimer's Disease. *Consortium for Synapses Under Stress (RU 2795), University of Twente, Enschede, Netherlands. (2023).*

Upregulated Ca^{2+} Release from the Endoplasmic Reticulum Leads to Impaired Presynaptic Function in Familial Alzheimer's Disease. *USF Health Research Day, University of South Florida, Tampa, US.* (2022)

HONORS AND AWARDS

Trainee Professional Development Award
Society for Neuroscience ***October 2024***
This award is given to graduate students who demonstrate scientific merit and excellence in research.

Tharp and Duckwall Summer Research Fellowship
University of South Florida ***May 2024 – Aug. 2024***
This award is given in recognition of students' accomplishments as a graduate student and in support of continuing research and scholarship activities.

University of Lagos Endowment Prize ***2012 – 2017***
This award is given to summa cum laude students who maintain a GPA of 4.5 and above (3.6 on a 4.0 scale) in each semester.

Dean's Award ***2017***
Honors recognizing the best graduating student from the program, the Department of Physics.

TEACHING

Graduate Teaching Assistant, General Physics Laboratory (PHY 2053L & 2048)
University of South Florida ***May 2019 – Present***

Summary: Implemented curriculum for undergraduate physics lab courses for biology and engineering majors, to teach practical applications of physics fundamentals through hands-on laboratory experiments. Designed and conducted labs on topics including mechanics, electricity, magnetism, and optics to reinforce theoretical concepts. Created quizzes, assignments, exams, and grading rubrics to evaluate student learning outcomes. Provided office hours and individualized instruction to support student success.

Graduate Research Assistant Mentor, Research Experience for Undergraduates (*REU*)
University of South Florida ***May 2021 – May 2022***

Summary: Mentored and coached two undergraduate students in the lab as part of the National Science Foundation (NSF) funded REU program while working as Research Assistant in the summer of 2021 and 2022. Findings of this projects were presented in a poster session at the American Physical Society (APS) March Meeting in 2022

SERVICE

President, Physics Graduate Student Committee ***May 2023 – May 2024***
University of South Florida

Summary: I lead the committee in advocating for and supporting physics graduate students. I expanded professional development offerings for physics graduate students, provided more networking and community building opportunities, and effectively advocated for student needs and concerns within the department and university.
My roles within PGSC include the following:

- Developed and maintained the **PGSC website.**
- Coordinated team of executives to organize departmental career talks and seminars.
- Spearheaded the planning and execution of professional and academic development workshops, including a workshop on applying to fellowships, scholarships, and internships.
- Launched the inaugural PGSC Three-Minute Thesis (3MT^{TM}) research competition, an in-person event featuring student talks and networking opportunities.
- Organized high-profile career talks featuring prominent speakers from academia and industry. These talks provided valuable professional development and networking opportunities for physics graduate students.

President, National Association of Physics Students ***Sep. 2015 – Oct. 2016***
University of Lagos

- Served as the graduate student representative on the physics department curriculum committee. In this capacity I provided input on course offerings, degree requirements, and other policies affecting graduate students**.** Tutored first-third year physics students.