Henrick Aduda Kola

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Professional Summary & Research Interests

Dynamic and detail-oriented Graduate Teaching Assistant and PhD Candidate at the University of North Dakota with a strong background in bioinformatics, neurovascular biology, and computational image analysis. Experienced in RNA-seq data processing, vascular morphometrics, and machine learning applications in biomedical imaging. Skilled in data and image analysis approaches utilizing Python, R and bash scripting and FIJI with demonstrated success in research design, mentoring, and scientific communication. Currently pursuing doctoral research focused on integrating neurovascular and inflammatory systems in Alzheimer's disease pathophysiology.

Education

University of North Dakota, PhD in Biology – Grand Forks, ND, USA Aug 2022 – Present

- *Thesis: Integrating Neuro-Vascular-Inflammatory Systems and Cell Vulnerability in Alzheimer's Disease Etiology and Progression*
- *Coursework: Scientific Writing, Advanced Imaging, Bioinformatics, Research Design, and Statistical Analysis*
- *Cum GPA: 4.0*
- Expected graduation date: August 2026

University of North Dakota, Graduate certificate in Communicating Science – Online May 2023 – May 2025

Modules

- Principles of Professional Communication (3cr)
- Persuasion & Persuasive (3cr)
- Science Communication (3cr)

Pwani University, MSc in Bioinformatics – Kilifi, Kenya Oct 2018 – May 2022

- *Thesis: Evaluate Viral Hemorrhagic Fever Outbreaks in Uganda to Distinguish Continued Human-to-Human Transmission via Survivors from Zoonotic Spillover Events (2000-2019). Successfully defended and passed thesis examination*

Jomo Kenyatta University of Agriculture and Technology, BSc in Biotechnology – Nairobi, Kenya Sept 2013 – Nov 2017

- Honors: Second Class Honors (Upper Division)
- *GPA: 3.35/4*

Professional Experiences

Graduate Teaching Assistant, University of North Dakota – Grand Forks, ND, USA August 2022 – Present (academic-year only)

- Assisted in instruction for Physiology of Organs and Systems, Histology, Cell Biology, Developmental Biology, and Introduction to Biology (courses for Majors and non-Majors)
- Prepared laboratory equipment and materials; guided students through physiological experiments and data interpretation.
- Graded laboratory assignments, providing constructive feedback to enhance analytical and critical thinking skills.
- Facilitated active learning assignments founded in primary literature, including support for development of and assesment for student presentations on course-based projects.

Graduate Research Assistant, University of North Dakota – Grand Forks, ND, USA May 2025 – Aug 2025

Nanoparticle TEM segmentation and Nanoremediation project

- Developed a transmission electron microscopy (TEM)-based analysis pipeline to conduct nanoparticle morphometric quantification, incorporating pixel-based classification using Trainable Weka Segmentation and Python-based image analysis of size, shape, and eccentricity metrics. This pipeline has been used to quantify differences across nanomaterials synthesis approaches with distinct compositions. The data generated from the novel approach that I developed are currently part of two manuscripts in preparation.

- Collaborated on a research project titled, "Nanozymes: Promising Frontiers in Detection and Nanoremediation of Environmental Pollutants". For this work, I conducted the primary literature meta-analysis; wrote the "Computational Approaches" section on nanozyme design for environmental remediation, detailing applications of Density Functional Theory, machine learning, and deep learning in catalytic optimization, and designed the publication's graphical abstract illustrating experimental and computational integration. I am the 2nd author on this manuscript that is currently in review.

Retinal Image Analysis

- Completed Advanced Topics in Biomedical Sciences Imaging course, where my class project focused on quantitative analysis of astrocyte reactivity in Alzheimer's disease models. I developed an image-analysis workflow using ROI-based preprocessing, noise reduction, and Trainable Weka segmentation to quantify GFAP-positive astrocytes in $App^{NL\text{-}G\text{-}F}$ mouse hippocampal tissue. The project demonstrated elevated GFAP expression in AD mice and illustrated how computational imaging can reveal neuroinflammatory signatures relevant to disease progression.
- Performed mouse retina microdissection and prepared retinal whole mounts for immunolabelling to detect neural, glial and vascular cell populations in Wild-type and AD mice.
- Processed images in Fiji/ImageJ, which included noise subtraction, background correction, brightness/contrast adjustment, and channel splitting. I applied Ilastik pixel-classification segmentation and refined the resulting masks by removing artifacts in Fiji.
- Conducted quantitative analyses including Sholl-based branching measurements, branch-point detection from binarized masks, and tortuosity quantification using Python packages (*scikit-image, skan, NumPy*).
- Calculated vessel density by merging ROI polygons into a unified tissue mask. Then, generated thresholded vessel images and computed vessel density from calibrated vessel-area measurements. Verified mask accuracy through quality-control overlays in Fiji and Python.

Graduate Research Assistant, University of North Dakota – Grand Forks, ND, USA May 2024 – Aug 2024

- Performed a bioinformatics database search for nanozymes developed for use in detecting or assessing metabolic disorders (GEO database).
- Conducted extensive literature search associated with nanozymes and metabolic dysfunction. Developed a report of findings and presented the results at our monthly Nanozyme group meetings.
- Researched computational predictive modelling algorithms being used to design nanozymes and identified strategies to develop novel approaches and applications for nanozyme design.

Graduate Research Assistant, University of North Dakota – Grand Forks, ND, USA May 2023 – Aug 2023

- Conducted *In silico* sample preparation and handling of RNA-seq brain and colon samples.
- Conducted a literature search of previous research associated with probiotics intervention in mice, particularly linked to neurodegenerative diseases.
- Performed RNA sequence data quality control, sequence analysis, and differential expression analysis of telencephalon and hippocampus samples from mice, comparing wild type versus an Alzheimer's disease mouse model, $App^{NL\text{-}G\text{-}F}$.

Graduate Student Researcher, International Centre of Insect Physiology and Ecology (ICIPE) – Nakiwogo Rd, Entebbe, Uganda Sept 2019 – Oct 2019

MSc in Bioinformatics Program hosted at Uganda Virus Research Institute (UVRI)

- Collated publicly available sequence data from recent MVD & RVF outbreaks in Uganda.
- Utilized genetic diversity & divergence measures to investigate whether recent MVD outbreaks are due to continued transmission via survivors or a fresh outbreak from natural hosts.
- Determined the level of phylogenetic linkage of select MVD outbreaks to distinguish zoonotic spillover events from outbreaks caused by continued transmission via survivors.

Fellowship Intern, Fellowship.AI – Remote work Sept 2021 – Dec 2021

- Cleaned and structured large-scale medical imaging datasets for predictive modeling.
- Implemented ResNet50 and DenseNet121 deep learning architectures for implant detection, achieving 77 % validation accuracy.
- Presented progress reports to the executive leadership and contributed to the final project documentation.

Laboratory Intern, Kenya Medical Research Institute – Mbagathi Rd, Nairobi, Kenya Apr 2018 – July 2018

- Detected point mutations in *Plasmodium falciparum* using nested conventional PCR to identify drug resistance markers.
- Diagnosed *Wuchereria bancrofti* and *Schistosoma mansoni* using a light microscopy and Kato-Katz diagnostic techniques.
- Monitored HIV-infected patient samples, performing baseline CD4 counts using FACSCalibur and FACSCount flow cytometers.
- Cultured *Leishmania* parasites and performed vector infection studies in sand flies, including parasite cultivation, counting, staining, and lesion measurements.
- Supported malaria parasite cultivation and microscopy for diagnostic and experimental purposes, contributing to infectious disease surveillance and drug resistance monitoring.

Laboratory Intern, Kenya Plant Health Inspectorate Services – Karen, Nairobi, Kenya May 2016 – Aug 2018

- Characterized quarantine plant pathogens using conventional and real-time PCR assays, contributing to national agricultural biosecurity efforts.
- Diagnosed Maize Lethal Necrosis Disease (MLND) via real-time PCR to support crop health surveillance and early detection.
- Performed NCM-ELISA diagnostics for *Ralstonia solanacearum* in potato samples to aid in bacterial wilt management.
- Conducted entomological classification and identification of quarantine pests (including thrips and whiteflies) for pest risk assessment and trade compliance.
- Supported export certification and phytosanitary inspections, verifying consignments against international standards and issuing phytosanitary certificates for compliant exporters.
- Contributed to the development of harmonized, science-based phytosanitary measures, enhancing Kenya's agricultural trade reliability.

Skills

Programming & Scripting: Python (NumPy, Pandas, Scikit-Learn), Bash scripting, R programming, machine learning (supervised & unsupervised algorithms)

Data Science & Computational Analysis: Data cleaning, feature selection, hyperparameter tuning, statistical modeling, computational modeling, high-performance computing in Linux

Bioinformatics: Biological database querying (NCBI), API-based data extraction, next-generation sequencing analysis, phylogenetic and viral genomic analysis

Image Analysis: Pixel-based segmentation (ilastik, Trainable Weka), advanced image analysis in Python (NumPy, Pandas, Skan) and Fiji: Sholl analysis, Branch point analysis, tortuosity analysis and vessel density analysis

Experimental Laboratory Skills: Retina microdissection and flat-mount preparation, PCR, Kato-Katz, immunolabelling and fluorescent marker application

Professional Skills: Workflow design, analysis pipeline development, workload planning, mentorship, scientific communication, technical writing

Outreach, Mentorship, and Professional Experiences

- Participated in the East Africa Network of Bioinformatics Training Residential Course (June 2019 – August 2019).
- Attended the International Society for Computational Biology Conference (June 2020 – July 2020).
- Oral presenter at the H3ABioNet-Fogarty Collaborative Research Seminar Series (July 2020).
- Oral presenter at the H3AFRICA Consortium Meeting (September 2020).
- Mentored an undergraduate Bioinformatics Strategic Intern (Trevor Mugoya) at UVRI, providing training in Bash scripting, NCBI database use, phylogenetic and viral genomic analysis, and essential professional skills including effective communication, scientific writing, and research reproducibility (May - Oct 2019).
- Served as co-facilitator in the Teaching and Research in Natural Sciences For Development in Africa (TREND): Python beginner virtual workshop (July 2022).
- Acted as co-facilitator during Bionformatic Hub of Kenya Initiatives outreach programs and monthly seminar series (July 2022).
- Member of the International Society for Computational Biology (November 2022 – Present).

- Member of the Society for Developmental Biology (November 2022 – Present).
- Oral Presenter, *114th Annual Meeting of the North Dakota Academy of Science* (April 14–15, 2023).
- Mentored undergraduate students in Neuroscience and Nutrition Seminar Course (BIOL491/503), guiding research topic selection, presentation development, and discussion facilitation (Spring 2023).
- Participant in the 'Mentors Helping Mentors' workshop series by UND Graduate School (January – February 2024).
- Poster presenter at the Canadian Society for Molecular Biosciences meeting in Winnipeg, Canada (May 6–8, 2024).
- Attendee at the International Society for Computational Biology (ISCB) Virtual Conference (July 12–16, 2024).
- Bridge Peer Mentor at UND International Center – mentored a graduate student (Arhita Das) in cultural integration, career development, and social adaptation (August 2024 – May 2025).
- Oral Presenter, *115th Annual Meeting of the North Dakota Academy of Science* (March 15–16, 2024).
- Judge at the 2024 North Dakota State Science and Engineering Fair, evaluating Middle and High School projects (April 5, 2024).
- Judge at the Science Fair, Sacred Heart School, East Grand Forks, MN : evaluated 7th, 9th, and 10th grade projects (January 14, 2025).
- Oral Presenter, *116th Annual Meeting of the North Dakota Academy of Science* (April 4–5, 2025).
- Provided hands-on mentorship to undergraduate researchers in vascular image preprocessing, processing, and computational analysis using Fiji; cultivated independent research skills, data-driven reasoning, and professional scientific communication aligned with best practices in neurovascular imaging research (efforts ongoing).
- Engaged with regional internship program participants at the InternGF Summer Cohort Closing Ceremony and Networking Dinner, fostering university–industry connections (Grand Forks, ND; August 7, 2025).
- Peer-mentored graduate student (Herbert Che Mughe) in scientific writing and editing, figure design and data visualization, and transmission electron microscopy (TEM) image analysis (May - October 2025).

Leadership and Service

Vice President, Biology Graduate Student Association – Grand Forks, ND, USA Aug 2025 – Present

- Coordinated departmental and student engagement activities, including the annual Biology Graduate Student Welcome Picnic, fostering faculty–student interaction.
- Served on the organizing committee for departmental office clean-up and workspace organization initiatives.
- Contributed to efforts to design and post graduate student biography flyers to enhance departmental visibility and collaboration.

Organizing Secretariat, Bioinformatics Hub of Kenya Initiative – ICIPE, Nairobi, Kenya Aug 2025 – Present

- Planned, facilitated, and managed public communications for scientific trainings, seminars, and monthly graduate-student talks, expanding national bioinformatics outreach and capacity-building efforts
- Launched and organized an outreach event as Organizing Secretary for the Bioinformatics Hub of Kenya Initiative, bringing together graduate students to share their career journeys and inspire undergraduates at the Technical University of Kenya; nearly 100 students attended, demonstrating strong engagement and impact."

Honors and Awards

1. East African Network for Bioinformatics Training (EANBiT) Scholarship Fellowship Award
October 2018 – October 2020

2. Full Tuition Waiver and Teaching Assistant Stipend, University of North Dakota
August 2022 – Present (academic year only)

3. Best Poster Award, 8th Annual Epigenetics and Epigenomics Symposium, University of North Dakota
May 18–19, 2023

4. Barbara Ann Earwick Summer Research Award, University of North Dakota
May 2023

5. Research Award, Academic Programs and Student Awards Committee, University of North Dakota
Fall 2024

Research Training and Professional Certifications

Coursera/IBM, Tools for Data Science Orientation – Online Sept 07, 2021

Modules

- Overview of Data Science Tools — Introduced open-source, cloud, and commercial tools used by data scientists, including core categories of software and platforms.
- Languages of Data Science — Covered Python, R, SQL, and additional languages (Scala, Java, C++, JavaScript, Julia) and criteria for choosing tools for data work.
- Packages, APIs, Data Sets, and Models — Learned common data science libraries, REST APIs, open datasets, and how machine-learning models are used to make predictions.
- Jupyter Notebooks and JupyterLab — Worked with Jupyter environments, kernels, notebook architecture, and cloud-based Jupyter platforms.
- RStudio & GitHub — Introduction to R and RStudio for visualization; learned Git/GitHub fundamentals including repositories, commits, branches, pull requests, and version control workflows.
- IBM Watson Studio — Explored Watson Studio, created cloud projects, built notebooks, tested kernels, and connected to GitHub for publishing.

Coursera/IBM, Data Science Orientation – Online July 04, 2021

Modules

- Defining Data Science and What Data Scientists Do — Fundamentals of data science, data-driven problem-solving, daily activities of data scientists, required skills, and key algorithms/data formats.
- Data Science Topics — Big data fundamentals, societal and business applications, cloud-based data handling, data mining basics, and introductory machine learning & deep learning concepts.
- Applications and Careers in Data Science — Real-world data science use cases, how organizations leverage data for decisions, employer-valued skills, and insights into data science career pathways.
- Data Literacy for Data Science — Core understanding of how data is generated, stored, accessed, and processed within repositories and large-scale data environments.

Coursera/IBM, Introduction to Data Analytics – Online January 9, 2021

Modules

- What is Data Analytics — Types of analytics, analysis workflow, data roles, and the modern data ecosystem.
- The Data Ecosystem — Data structures, repositories, ETL basics, and big-data tools (Hadoop, Spark, Hive).
- Gathering & Wrangling Data — Data sourcing, importing, cleaning, and preparation techniques.
- Data Mining & Visualizing Data — Statistical analysis, pattern detection, and data visualization fundamentals.
- Career Opportunities — Data-focused career paths, required skills, and practical data-analysis tasks.

CITI Program – Initial Biosafety Training, IBC Principal Investigators and Staff, University of North Dakota – Grand Forks, ND, USA Jan, 2025

Modules

- NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules — Jan 15, 2025
- Human Gene Transfer Research — Jan 15, 2025
- Dual Use Research of Concern (DURC) — Jan 16, 2025
- Animal Biosafety — Jan 15, 2025
- Biohazard Risk Assessment — Jan 13, 2025
- Medical Surveillance — Jan 15, 2025
- Risk Management: Personal Protective Equipment — Jan 15, 2025
- Risk Management: Laboratory Design — Jan 15, 2025
- Risk Management: Emergency and Spill Response — Jan 15, 2025
- Risk Management: Work Practices — Jan 16, 2025
- Laboratory-Acquired Infections — Jan 13, 2025
- Work Safely with Sharp Instruments — Jan 15, 2025
- Centrifuge Precautions — Jan 15, 2025
- Disinfection and Sterilization — Jan 16, 2025
- Safe Sharps Devices — Jan 16, 2025
- Risk Management: Engineering Controls — Jan 16, 2025

Institutional Compliance and Safety Training, University of North Dakota – Grand Forks, ND, USA August 2022 - Present

Modules

- Data Privacy and Security (HIPAA Overview) — July 2023
- Data Privacy and Confidentiality Training — October 2022
- Civil Rights & Title IX Compliance Training — October 2025
- Nondiscrimination and Title IX (In-Person) — September 2024
- Sexual Violence Awareness for Employees (Campus SaVE Act) — August 2022
- Discrimination Awareness in the Workplace — August 2022
- Annual Notification of University Policies (FY 2023–FY 2025) — April 2023–October 2025
- Run Hide Fight – Active Threat Response Training — May 2024
- Back Injury and Lifting Safety (Laboratory and Custodial Versions) — 2023–2025
- Slips, Trips, and Falls Prevention — 2023–2025
- Employee Safety Orientation — August 2022
- Bloodborne Pathogen Training for Laboratory Personnel — Oct 27, 2025

Verified International Academic Qualifications, World Education Services – Remote Feb 2022

Formal International Credential Verification and Evaluation for Bachelor of Science in Biotechnology.

Professional References/Mentors

1. Diane Darland (Thesis Advisor)
Chester Fritz Distinguished Professor, Biology
Starcher Hall Room 113,
10 Cornell St Stop 9019,
Grand Forks, ND 58202-9019.
Email: diane.darland@und.edu

2. Colin Combs (Thesis Advisory Committee Member/Collaborator)
Department Chair, Sr. Assoc. Dean / Assoc AVPR, Research Affairs
School of Medicine & Health Sciences Room W316,
1301 North Columbia Road Stop 9037,
Grand Forks, ND 58202-9037.
Email: colin.combs@und.edu

Publications

- Kola, Henrick Aduda. *Evaluate viral hemorrhagic fever outbreaks in Uganda to distinguish continued human-to-human transmission via survivors from zoonotic spillover events (2000–2019).* Pwani University, Thesis for Masters of Science degree in Bioinformatics, Submitted to Pwani University Library 26 Aug 2021; Degree conferred in May 2022

Manuscript in Review

- Mughe, H. C., Kola, H. A., Ersan, M. S., Darland, D. C., & Zhao, J. X. (2025). *Nanozymes: Promising frontiers in detection and nanoremediation of environmental pollutants. Energy & Environmental Sustainability.* Manuscript submitted for publication.

Manuscript in Preparation

- Kola, H. A., Rosenberg, L. N., Martinelli, J. C., Combs, C. K., & Darland, D. C. (In preparation). *Retinal vasculature alterations in Alzheimer's disease.* Alzheimer's & Dementia.