Raymond Lesiyon

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Research interests

Areas: Computational Biology, Network Analysis, Knowledge Graphs, Natural Language Processing (NLP), Large Language Models (LLM), Protein Language Models

Education

Michigan State University **East Lansing, MI**
M.Sc. in Computational Math Science and Engineering (CMSE), GPA - 3.94 *Aug 2021 – May 2023*

- **Coursework**: Mathematical Foundation for Data Science, Numerical Linear Algebra, Data Mining, Statistical Genetics, Genomic Data Handling: Unix and Python, Genomics and Sequencing Analysis, RNA-Seq Data Analysis

Michigan State University **East Lansing, MI**
B.Sc. in Biosystems Engineering — Minor in CMSE, GPA - 3.92 *Aug 2017 – May 2021*

- Graduated Magna Cum Laude
- MasterCard Foundation Scholar Program Recipient
- Dean's Honors List : Fall 2021 – Spring 2021
- MasterCard Foundation (MCF) Scholar Program Recipient, 2017
- **Coursework**: Bioinformatics and Computational Biology, Methods for Parallel Computing, Medical Microbiology

Research experience

Informatics Research Professional **Aug 2023 – Present**
University of Colorado, Anschutz *Aurora, CO*
Labs: **JRaviLab**, Department of Biomedical Informatics — CU Anschutz, **Wale Lab**, Microbiology and Molecular Genetics and Integrative Biology — MSU

Mentors: Dr. Janani Ravi, Dr. Nina Wale
Project 1: Evolution of bacterial traits in relation to its host association and pathogenicity

- Optimized phylogenetic regression analysis with modular R code, speeding up 200+ model iterations and improving insights into bacterial traits and pathogenicity.
- Applied Akaike Information Criterion (AIC) for model selection improving accuracy, and realiability of evolutionary biology research.

Project 2: MicroGenomeR an R data package for aggregating microbial phenotypic, and genotypic trait.

- Adapted Austraits multiple datasets integration pipeline to effectively harmonize 26+ microbial datasets into a central source with consistent units and trait values.
- Enabled efficient storing, and loading of microbial traits data at strain and species levels using memory-optimized file format: parquet and RDA.

Technical Aide **Jun – Aug 2021**
Michigan State University *East Lansing, MI*
Labs: **Juan Steibel Lab**, Department of Animal Science, MSU

Mentor: Dr. Juan Steibel

Project: Hyperparameter tuning for Long short-term memory (LSTM), model trained on Detecting Agonistic Behavior of Pigs in a Single-Space

- Leveraged Slurm workload manager for running LSTM deep learning algorithms on high-performance computing clusters, achieving optimized resource utilization and computational efficiency.
- Performed hyper-parameters tunning for LSTM model enhancing model performance on classifying agonistic pig's behaviors.

Biosensor Intern **Jun 2019 – Aug 2020**
Fraunhofer USA Inc. *East Lansing, MI*
Mentor: Dr. Suzanne Witt

Project: Immobilizing antibodies into Boron-doped diamond surface for detecting COVID-19 spike protein

- Designed and implemented a data visualization dashboard with Tkinter and Pandas, streamlining the analysis of data from 37 biosensor fabrication experiments and enhancing decision-making.
- Functionalized antibody biosensors on boron-doped diamond surfaces using N-hydroxysuccinimide(NHS) techniques, and tested their ability to detect COVID-19 spike protein through electrochemical impedance measurements.

Undergraduate Research Assistant **Jun 2019 – Aug 2020**
Michigan State University *East Lansing, MI*
Labs: **MIDI Lab**, Department of Biomedical Engineering, MSU

Mentor: Dr. Adam Alessio

Project: Classification of ovarion torsion using machine learning with radiological features

- Performed ovarion torsion classification with radiological features using decision trees classifiers, random trees, and logistic regression through Sci-kit learn
- Employed ROC curve, accuracy, specificity, and sensitivity metrics to evaluate models performance on ovarion torsion.

Industry experience

Software Development Intern **May – Aug 2022**
Amazon *Seattle, WA*
Project: Developing a central messaging single page application, consolidating messages from different pages

- Collaborated with teams to design a strategic integration plan, built a React/TypeScript single-page app to improve user experience.

Skills

Programming languages: Python, R, Matlab, C++

Computational tools: Unix/Linux, Git, High-performance computing clusters

Methodologies: Dimensional reduction - Principal Component Analysis(PCA), data analysis and visualization — tidyvverse, ggplot, pandas

Machine learning: Linear and Logistic regression, Support Vectors, K-means

Deep learning: Neural networks, Transformers — BERT, BioBERT

NLP: Term Frequency Inverse Document Frequency (TF-IDF), Text-embedding, LLM

Publications

1. Nina Wale*, **Raymond Lesiyon***, Clay Cressler, Janani Ravi. *Are bacterial (pathogens) special?*. Manuscript in preparation
2. **Raymond Lesiyon**, Janani Ravi. *MicroGenomeR: An R data package for integrating and harmonizing microbial data from various data sources.* Manuscript in preparation
3. Junjie Jan, Janice Siegford, Dirk Colbry, **Raymond Lesiyon**, Anna Bosgraaf, Chen Chen, Tomas Norton, Juan Steibel. *Evaluation of Computer Vision for Detecting Agonistic Behaviour of pigs in a Single-SpaceFeeding Stall Through Blocked Cross-Validation Strategies.* 10.2139/ssrn.4098711
4. Suzanne T Witt, Alexis Rogien, Diana Weiner, James R Siegenthaler, **Raymond Lesiyon**, Noelle Kurien, Robert Rechenberg, Nina Baule, Aaron Hardy, Michael Becker. *Boron doped diamond thin films for the electrochemical detection of SARS-CoV-2 S1 Protein.* 10.1016/j.diamond.2021.108542

Presentation

Research and Technical Talks

- **July 24**: **Bioc2024 International Conference**, MicroGenomeR an R data package for aggregating microbial phenotypic, and genotypic trait. Val Andel Institute, Grand Rapids Michigan

Posters

- **Aug 24**: **CU Anschutz Department of Biomedical Informatics Retreat**, Are (bacterial) pathogens special? Aurora, CO
- **June 24**: **Quantitative Cell and Molecular Biology Symposium**, Are (bacterial) pathogens special? Colorado State University, Fort Collins, CO
- **April 24**: **American Society of Microbiology Rocky Mountain Branch**, Are (bacterial) pathogens special? University of Colorado Boulder, Boulder, CO

Teaching experience

Graduate Teaching Assistant **Aug 2021 – May 2023**
Michigan State University, *Dept. of Computational Math Science and Eng.* *East Lansing, MI*
CMSE 802: Methods in Computational Modeling
CMSE 202: Computational Modelling and Data Analysis II

Academic Tutor **Jan 2019 – Aug 2021**
Michigan State University, *College of Engineering* *East Lansing, MI*

- Tutored STEM students in calculus and physics, providing guidance and support in their coursework

Service and Leadership

Educational Support Initiative **Aug 2023**
Kokwa Island Primary School *Baringo, Kenya*

- Led a school uniform donation initiative to provide uniform to 11 students from orphaned or low-income families, enhancing their access to education.

Academic Core Lead Tutor **Aug 2020 – May 2021**
Michigan State University, *Dept. of Computational Math Science and Eng.* *East Lansing, MI*

- Guided tutors for smooth tutoring center operations and organized STEM review sessions to prepare students for exams.

International Orientation Leader **Aug 2018**
Michigan State University, *Office of International Students* *East Lansing, MI*

- Guided a group of 10 international students throughout their first week of enrolling at MSU

Maji Safi ni Uhai Initiative **Oct 2019**
Kapkures community *Bomet, Kenya*

- Co-founderd Maji Safi ni Uhai Initiative, and secured $4000 from MCF program to drill water kapkures community in Bomet, Kenya

Community Need Assessment Leader **Mar – May 2017**
Baringo South *Baringo, Kenya*

- Lead a group of 10 students from Education and Social Empowerment Program(EaSEP) conduct community need assessment in Ilchamus community

Volunteer Teacher **Jan – June 2016**
Kokwa Primary School *Baringo, Kenya*

- Volunteered to teach STEM classes to grade eight students

Community Need Assessment Guide **Jan 2016**
Kokwa Island *Baringo, Kenya*

- Assisted in community need assesment in Kokwa Island with Friends of Kenya Schools and Wildlife (FKSW) by activating as a translator

Awards

- MSU Explore Computational Research Experience (ECRE), 2021
- MasterCard Foundation (MCF) Scholar Program Recipient, 2017