**SARAH FOBI MENSAH**

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**RESEARCH INTERESTS**

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**PROFESSIONAL EXPERIENCE**

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**Institute for Mathematical and Statistical Innovation, Chicago, Illinois**

**Data Science Bootcamp Participant** June 2025

* Engaged in hands-on training in Python, R, SQL, Git/GitHub, and Google Colab through an intensive workshop series.
* Collaborated with PhD students on data science exercises involving data wrangling, exploratory data analysis, statistical modeling, and reproducible research workflows.

**Montana State University, Bozeman, Montana**

**Graduate Researcher** August 2024 – present

* Conducted statistical analysis of microcalorimeter data to study chondrocyte heat generation toward improving knowledge of chondrocyte central metabolism.
* Applied a Generalized Least Squares (GLS) model to account for non-constant variance which helped to accurately assess the differences in total heat generation across cell groups.
* Led initial findings to a successful manuscript publication within 4 months and currently expanding the research through functional data analysis to examine heat generation curves over time.

**Graduate Research Assistant** December 2023 – May 2024

* Explored dimensionality reduction techniques, including sparse principal component analysis, to improve the interpretability and analysis of high-dimensional metabolomics data in the context of early osteoarthritis diagnosis.
* Investigated the potential of sparse contrastive PCA for reducing the dimensionality of metabolomics data, aiming to make the data more manageable and informative for identifying early molecular markers of osteoarthritis.
* Plan to develop predictive algorithms that could utilize reduced-dimensionality data, with the goal of enabling less invasive diagnostic methods, such as blood-based testing for the early detection of osteoarthritis.

Funded by: National Institute of Arthritis and Musculoskeletal and Skin Diseases (1R01AR081489-01A1)

**Statistical Consultant** January 2024 – May 2024

* Applied statistical methodologies includingmixed-effects models to assess survey responses and analysed the impact of a storybook-based training on Alzheimer’s disease education for children and adults, organised by Montana State University Extension under the direction of my collaborators.
* Provided clear communication of statistical methods to clients which ensured transparency throughout the analysis process and lead to informed decisions for program recommendations and development.

**Kwame Nkrumah University of Science and Technology, Kumasi, Ghana**

**Research Assistant** October 2021 - July 2022

* Assisted in constructing predictive models using six machine learning algorithms to classify alcohol and drug abuse based on risk factors across South Africa’s nine provinces.
* Supported the development and validation of machine learning models to predict alcohol and drug abuse using an imbalanced dataset.

**EDUCATION**

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**Ph.D. Statistics,** GPA: 3.91Expected 2027

Montana State University, Bozeman, MT

**M.S. Statistics**, GPA: 3.89 May 2024

Montana State University, Bozeman, MT

**B.S. Actuarial Science**, GPA: 3.89 September 2021

Kwame Nkrumah University of Science and Technology,Kumasi, Ghana

**TEACHING EXPERIENCE**

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Graduate Teaching Assistant, Department of Mathematical Sciences, MSU August 2022 – Present

Courses taught: STAT 216 (Introduction to Statistics), STAT 337 (Intermediate Statistics with R)

* Provided hands-on instruction with R software, teaching data wrangling, visualization, and interpretation, and guided students in performing statistical analysis and drawing data-driven conclusions.

**TECHNICAL SKILLS**

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**r**

**Programming Languages**: R (Markdown, Quarto), Python (Pandas, NumPy), SAS

**Database**: SQL

**Project Management Tool**: Git/GitHub

**Machine Learning Methods**: Random Forest, Naive Bayes, Support Vector Machines, Logistic Regression, Artificial Neural Networks, Decision Tree.

**Statistical Methods**: Regression analysis, Bayesian data analysis, Hypothesis testing, Experimental design

**PROFESSIONAL ASSOCIATIONS**

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Member, American Statistical Association March 2024 - present

Member, Royal Statistical Society January 2024 - present

**AWARD/ LEADERSHIP/ VOLUNTEER**

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**Volunteer,** Human Resource Development Council (HRDC), Bozeman, MT February 2025 - present

**Student Travel Award,** Department of Mathematical Sciences, MSU February 2025

**Ghana Scholarship Secretariat Award**, Government of Ghana May 2021

**Judicial Committee Chair,** Actuarial Science Students’ Association-KNUST Chapter September 2020 – August 2021 **Deputy Finance Chair,** Actuarial Science Students’ Association of Ghana September 2019 – May 2020

**PUBLICATIONS**

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**Peer reviewed**

Chondrocytes Embedded in Agarose Generate Distinct Metabolic Heat Profiles Based on Media Carbon Sources. *Annals of Biomedical Engineering, 1-9* (2025)*.*

* Determined if three-dimensionally encapsulated chondrocytes are capable of heat production toward improving knowledge of chondrocytes central metabolism.

Modeling of the Daily Dynamics in Bike Rental System Using Weather and Calendar Conditions: A Semi-Parametric Approach. *Scientific African* (2024): e02211.

* Proposed a robust method using penalized splines quasi-Poisson regression to model bike rentals, revealing hidden relationships not identified by traditional parametric models which informed future transportation strategies.

**Other**

Predictive Analysis of Misuse of Alcohol and Drugs using Machine Learning Algorithms: The Case of using an Imbalanced Dataset from South Africa. *Appl. Math* 17, no. 2 (2023): 261-271.

* Compared six supervised machine learning algorithms to predict alcohol and drug abuse across South Africa's nine provinces, proposing an optimal predictive model.

**In preparation**

Metabolic Heat Profiles in Chondrocytes: A Comparison of Functional and Integrated Data Approaches.

* Compared a functional approach that analyses heat curves over time to an integrated approach that aggregates instantaneous heat measurements over time.