BIOGRAPHICAL SKETCH

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NAME: **SHAKIL RAFI**

eRA COMMONS USER NAME (credential, e.g., agency login): SARAFI

POSITION TITLE: POST-DOCTORAL FELLOW

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Start Date MM/YYYY	Completion Date MM/YYYY	FIELD OF STUDY
TROY UNIVERSITY, TROY, AL	BSC	01/2011	05/2015	PURE MATHEMATICS, PHILOSOPHY
UNIVERSITY OF ARKANSAS, FAYETTEVILLE, AR	MSC	08/2016	12/2019	PURE MATHEMATICS
UNIVERSITY OF ARKANSAS, FAYETTEVILLE, AR	PHD	01/2020	05/2024	APPLIED MATHEMATICS
UNIVERSITY OF ARKANSAS, DALE BUMPERS COLLEGE OF AGRICULTURAL, FOOD, AND LIFE SCIENCES, FAYETTEVILLE, AR	POST-DOCTORAL FELLOW	08/2024	PRESENT	BIOINFORMATICS AND COMPUTATIONAL BIOLOGY

A. Personal Statement

I am a Post-Doctoral Fellow at the Department of Agriculture at the University of Arkansas. My PhD was in Applied Mathematics where I focused on developing an algebraic framework for understanding feed-forward neural networks and gave strict upper bounds on the complexity of these neural networks in order to approximate certain solutions to differential equations. I am therefore also an expert in advanced machine learning techniques such as variational autoencoders and attentive transformers. In addition to my theoretical underpinnings, I have extensive knowledge and experience applying machine learning to real-world problems, for example in modeling the maternity cycle of clients at Arkansas Blue Cross and Blue Shield, investigating the inequality of ride-sharing access in Chicago during the pandemic, and revealing discrepancies in loan access during the pandemic of women and black owned businesses during the pandemic. My strong background in mathematics, and my years of experience translating theoretical concepts to real-world applications make me an ideal computational lead for this project.

B. Positions, Scientific Appointments and Honors

Positions and Employment
2024-Present Post-doctoral Fellow, Dale Bumpers College of Agriculture.
2023-2024 Lecturer, Department of Data Science, Sam M. Walton College of Business, University of Arkansas.
2023-2023 Intern, Health Economics Team, Arkansas Blue Cross and Blue Shield
2015-2016 Asst. Business Analyst. R.S.S. Wears Ltd.

Scientific Memberships
2022-2024 Treasurer, Graduate Student Colloquium, Department of Mathematics
2023, 2024 Lead Judge, Computer Science Category, Senior, Northwest Arkansas Regional Science and Engineering Fair.
2016-Present American Mathematical Society
2022-Present Society for Industrial and Applied Mathematics
2014-Present Alabama Eta Chapter of Pi Mu Epsilon, the national mathematics honor society.

Honors
2024: The SIAM travel grants award, Fayetteville, AR
2023: Selected by my department to attend the Summer Graduate School in Machine Learning at the Simons Laufer Mathematical Sciences Institute (formerly Mathematical Sciences Research Institute) at UC San Diego. San Diego, CA.
2022: Privileged to attend the Arkansas Summer Research Institute in Machine Learning, an NSF EPSCOR funded project. Fayetteville, AR
2021: The Lawrence Jesser Toll, Jr. Endowed Fellowship, Fayetteville, AR
2017: The Bangladesh-Sweden Travel Fund, Dhaka, Bangladesh
2011: The Millenium Scholar's Award, Troy University, Troy, AL

C. Contributions to Science

Rafi, S. *Gender Disparities in Arkansas, and Income Disparities in the US for the PPP Loan Program*. Preprints 2023, 2023090654. [Preprint]. Available from: https://doi.org/10.20944/preprints202309.0654.v1

Shakil Rafi , Arna Nishita Nithila . *Who rides Uber anyway? A census-tract level analysis and clustering of ride-shares for the city of Chicago during the era of the pandemic.* [Preprint]. TechRxiv. 2022. DOI: 10.36227/techrxiv.21076042.v2

Shakil Rafi. *A Clustering Look at Chicago Rideshares.* Poster session presented at: SIAM Mathematics of Data Science Conference '22. 2022. San Diego, CA.

Rafi S, Padgett J (2024). *nnR: Neural Networks Made Algebraic*. R package version 0.1.0, <https://CRAN.R-project.org/package=nnR>.

Rafi S., Padgett J., Nakarmi U. *Towards an Algebraic Framework For Approximating Functions Using Neural Network Polynomials*. arXiv. 2024. DOI: https://doi.org/10.48550/arXiv.2402.01058

Rafi S. *Maximal Parameter Estimates for Neural Networks and Uncertainties in Approximation*. Poster session presented at: SIAM Conference on Uncertainty Quantification '24. Trieste, Italy.

Rafi S. *Analysis and Construction of Artifcial Neural Networks for the Heat Equations, and Their Associated Parameters, Depths, and Accuracies.* [dissertation]; University of Arkansas. 2024, 303p.

Full list of publications and preprints can be found in Google Scholar:
https://scholar.google.com/citations?user=xbb3YbIAAAAJ&hl=en