Nirali Somia

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EDUCATION

Washington University in St. Louis, Mckelvey School of Engineering **May 2024**
Bachelor of Science in Computer Science, Summa cum laude
Major in Computer Science | Minors in Biology and Writing
- Cumulative GPA: 3.97/4.00 | SAT: 1560
Massachusetts Institute of Technology
Anticipated PhD in Medical Engineering and Medical Physics

RESEARCH INTERESTS

I am passionate about developing interpretable and trustworthy deep learning methods and leveraging computational techniques to advance our understanding of biological systems and medicine.

RESEARCH EXPERIENCE

Cold Spring Harbor Laboratory **Cold Spring Harbor, NY**
PREP Scholar - Koo Lab *June 2024-June 2025*

-Enhanced diffusion models for genomic data in the small-data regime by implementing evolution-inspired data augmentation (EvoAug) and transfer learning techniques, improving model performance with limited datasets.
-Applied interpretability techniques, including attribution maps and feature visualization, to analyze neural network decision-making processes in genomic contexts, facilitating transparent and reliable model use.
-Contributed to a manuscript assessing the capabilities of large language models (LLMs) in genomics, revealing that current LLMs do not significantly outperform traditional approaches in cell-type-specific predictions.
-Explored generative AI applications in genomics to create accessible, interpretable models tailored to the challenges of data scarcity, advancing the potential for meaningful insights in genomic research.

New York University, Center for Data Science **New York, New York**
CURP Scholar - Lindsay Lab *June 2023-September 2023*

-Built and trained convolutional neural networks and autoencoders on MNIST and ImageNet datasets
-Worked with large, well known neural nets such as AlexNet and VGG-16 and analyzed output by layer
-Measured correlation between multiple model's relative activity levels and gradient values in order to identify the models most applicable to the human brain

Washington University in St. Louis, Neuroscience Department **St. Louis, Missouri**
Computational Research Assistant - Hengen Lab *January 2021-May 2023*

-Used machine learning models to analyze behavioral aspects of an Alzheimer's mouse model
-Utilized bash to access CPU and GPU cores to run large-scale, parallel computing tasks
-Filtered noise out of big data sets that map coordinates of animal's movement
-Analyzed behavioral aspects of wild type mice and Alzheimer's mice in order to find differences in locomotion before obvious neural disease onset

University of Minnesota, College of Biological Sciences **Minneapolis, Minnesota**
Biological Research Assistant - Chen Lab *September 2018-June 2019*

-Used the model genetic organism Caenorhabditis elegans (C. Elegans) to analyze L1 syndrome
-Observed the interaction of an L1-CAM and its possible interaction with a signaling pathway that is mediated by Ras.
-Discovered there was a significant increase in the severity of the protruding excretory pore phenotype in strains with mutations in both L1-CAM and Ras

PUBLICATIONS

1. Moseley-Alldredge M, Aragón C, Vargus M, Alley D, **Somia N**, Chen L. The L1CAM SAX-7 is an antagonistic modulator of Erk Signaling. bioRxiv [Preprint]. 2024 Sep 16:2024.09.14.613091. doi: 10.1101/2024.09.14.613091. PMID: 39345534;PMCID: PMC11429911.
2. Tang, Z., **Somia, N**., Yu, Y. *et al.* Evaluating the representational power of pre-trained DNA language models for regulatory genomics. *Genome Biol* 26, 203 (2025). https://doi.org/10.1186/s13059-025-03674-8

HONORS & AWARDS

MIT PEM Scholar 2025
Computational and Systems Biology Best Poster Presentation, ABRCMS 2024 2024
NIH PREP Scholar, Cold Spring Harbor Laboratory 2024
CURP Scholar, New York University 2023
BioSURF Research Grant Recipient, Washington University in St. Louis 2022
Engineering School Antoinette Frances Dames Award Recipient, Washington University in St. Louis 2022
Dean's List, Washington University in St. Louis 2020-2023

TEACHING AND MENTORSHIP EXPERIENCE

Washington University in St. Louis, Computer Science Department **St. Louis, Missouri**

Analysis of Algorithms Teaching Assistant *January 2024-May 2024*

-Facilitate student understanding of algorithmic concepts by leading recitation sessions and office hours, covering a diverse range of algorithm proofs and methodologies

-Evaluate student performance through grading assignments and exams, offering constructive feedback to foster continuous improvement in algorithmic problem-solving skills

-Design and conduct problem-solving sessions to reinforce theoretical concepts, aiding students in grasping the intricacies of algorithm analysis, with a specific emphasis on proving NP-complete algorithms.

Washington University in St. Louis, Computer Science Department **St. Louis, Missouri**

Analysis of Complex Networks Teaching Assistant *January 2024-May 2024*

-Cultivate an interactive and inclusive learning environment by encouraging student participation in discussions and group activities, promoting collaborative exploration of complex network concepts

-Organize and facilitate review sessions, aiding students in exam preparation and reinforcing key principles of complex network analysis

-Develop and deliver engaging instructional materials, including lecture content, assignments, and hands-on activities, to facilitate student learning and application of complex network analysis methodologies

Washington University in St. Louis, Computer Science Department **St. Louis, Missouri**

Intro to Data Science Teaching Assistant *September 2023-January 2024*

-Assisted in the instruction and facilitation of foundational data science concepts to students at the introductory level

-Organized and conduct practical workshops or coding sessions, reinforcing theoretical concepts through hands-on application

-Offered guidance on data science projects, assisting students in implementing data analysis techniques and solutions for real-world scenarios

Washington University in St. Louis, Computer Science Department **St. Louis, Missouri**

Intro to Artificial Intelligence Teaching Assistant *September 2023-January 2024*

-Facilitated and conduct instructional sessions on fundamental concepts in artificial intelligence for students

-Evaluated and grade assignments and exams, providing constructive feedback to aid in student comprehension

-Collaborated with the course instructor to refine curriculum content, ensuring alignment with current AI trends

Washington University in St. Louis, Computer Science Department **St. Louis, Missouri**

Logic and Discrete Mathematics Teaching Assistant *January 2021-May 2023*

-Supported and mentored 200+ students every semester by holding weekly office hours and helping them develop their understanding of course materials

-Graded homework and exams every semester as well as created the grading scales for multiple of these questions

-Mastered the specifics of logic proofs and mathematics as they relate to coding by teaching students concepts they are having trouble with

LEADERSHIP

Ashoka (South Asian Association) **St. Louis, Missouri**

Philanthropy and Social Awareness Chair *January 2022-May 2024*

-Organize partnerships with local charities (i.e. raised $3,500 for Asha for Education, a charity that promotes children's literacy in the slums of India, through the annual Diwali show)

-Promote awareness of current local and south asian matters throughout the student body by coordinating events, speakers, and fundraisers

Out Of The Blue Children's Literacy Club **St. Louis, Missouri**

Executive Board *September 2022-May 2024*

-Orchestrate weekly trips to elementary and middle schools in downtown St. Louis to help children learn to read and spell

-Arrange fundraisers to buy books to donate to schools in downtown St. Louis

Colour Magazine **St. Louis, Missouri**

Writer and Copy Editor *January 2021-May 2024*

-Edit multiple writing and visual art pieces in order to create a final spread for the magazine

-Write creative writing pieces to be published in the magazine showcasing the voices of people of color

Food Allergy Research & Education (FARE) **Minneapolis, Minnesota**

App Developer *June 2020-September 2020*

-Collaborated with other teens through FARE to create a user friendly app that educates users on how to use different types of epinephrine injectors, a device that saves allergic kids' lives

-Learned and helped teach HTML to other members of the FARE community

PRESENTATIONS

Poster Presentation

1. **Somia, N**., Koo, P. “Improving Regulatory Element Generation With DNA Discrete Diffusion in the Small Data Regime”, *ABRCMS 2024.* (Awarded Best Poster Presentation)

SKILLS & INTERESTS

-Languages and Frameworks: Python (PyTorch, TenserFlow, Pandas, Numpy, MatPlotLib, Seaborn, Scikit-learn), Java, JavaScript, HTML/CSS, C++, C, SQL, R, Proficiency in Microsoft Office and Google Suites

-Technical Skills: Machine Learning (Classification, Regression, Clustering), Data Analytics (Cleaning, Manipulation, Scraping, Visualizations), Inferential and Descriptive Statistics

-Current Books: Beloved, Math for Machine Learning, The Paper Menagerie

-Interests: Crocheting, Going on Long Walks, Swimming, Reading, Listening to music