Varenya Jain

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Education

University of Illinois Urbana-Champaign — Champaign, IL
Bachelor of Science in Integrative Biology, Minor in Electrical Engineering — *December 2024*

Experience

Student Researcher — Jan 2024 - May 2024
Illinois Natural History Survey - Tan Lab of Biodiversity Genomics — *Urbana, IL*

- Engaged in a phylogenomic study focusing on homology and ultraconserved elements within zebrafish genomes, enhancing understanding of evolutionary relationships.
- Managed and optimized bioinformatics workflows for high-throughput sequencing data analysis, involving quality control with FastQC, data trimming with BBDuk, and sequence assembly using SPAdes, Phyluce, and BUSCO to enhance phylogenomic reconstruction accuracy.
- Contributed to developing and refining a streamlined protocol for phylogenomic data extraction and analysis, while actively engaging in lab meetings to address technical challenges and strategize research methodologies.

Student Researcher — Aug 2023 - Dec 2023
Illinois Natural History Survey - Tan Lab of Biodiversity Genomics — *Urbana, IL*

- Conducted comprehensive research on morphological diversity in Sisoridae and Amphilidae catfish adaptation to fast water environments.
- Utilized Geometric Morphometrics in R Studio for precise quantification of body shape differences. Applied PCA and GPA statistical methods to explore correlations and variations.
- Presented comprehensive results, highlighting significant differences in shape disparity in relation to adhesive organ presence. Provided insights into the evolutionary constraints on body shape in fastwater-adapted catfishes.

Student Researcher | **Metabolomics & Proteomics Core Facilities** — June 2023 – Aug. 2023
Roy J. Carver Biotechnology Center — *Urbana, IL*

- Developed an untargeted metabolomics pipeline for post-processing, Quality Assurance/Quality Control, and data analysis.
- Provide support for data processing on LC-MS Untargeted Metabolite Profiling.
- Refine untargeted analyses to support various biomedical studies at the Carver Metabolomics Core.

SLC Conference Planning Committee | **IEEE** — Jan 2022 - Jan 2023
The Institute of Electrical and Electronics Engineers — *Chicago, Illinois, United States*

- Assisted in organizing and managing conference logistics, scheduling, and coordinating with stakeholders.
- Worked with Midwest Region 4 Committee members to develop and implement strategies for a successful conference.
- Proactively identified and addressed potential challenges during the planning process.

SPIN Research Intern | **The NEAT Project v4.0** — Aug. 2021 – Sep. 2022
National Center for Supercomputing Applications — *Champaign, IL*

- Designed NGS toolkit for HAL Cluster, increasing Parallel Processing speed by 7%, and streamlined Empirical Mutation and Sequencing Models. Revised bash scripts and input flags.
- Managed genomic pipeline (FASTA, FASTQ, SAM, BAM, VCF) and implemented relevant Bioinformatics algorithms: Smith–Waterman, BLAST, Localized String Alignment.
- Presented HPC for Computational Genomics findings at the NCSA Exhibition during UIUC's Engineering Open House and the REU FoDOMMaT/SPIN Showcases.

Outreach Committee Lead | **Pulse 2022** — Aug 2021 - Aug 2022
Department of Electrical and Computer Engineering — *Champaign, Illinois, United States*

- Coordinated materials and event location logistics with the ECE department during COVID-19.
- Develop Software to exhibit Computer Engineering principles: C++ Data Structures, Polymorphism, Command-Line Interface, Stack/Heap Memory Management, Address Space, etc.
- Design Hardware activities to guide freshmen through simulated Electrical Engineering projects: series vs parallel circuits, Pulse Width Modulation motor control, Thermistor and LDR implementation

Phys 211 Experienced Learning Assistant — Jan 2021 - Dec 2021
Loomis Laboratory Of Physics — *Urbana-Champaign Area*

- Continued the study of Physics pedagogy by instructing PHYS 211 labs, providing guidance to 30+ students.
- Answered student questions, clarified critical lecture material, and built/corrected IOLab setups.
- Developed advanced teaching, communication, and leadership skills through interactions with students and seminar presentations alongside lab staff.

IOT Research Lab Assistant | **Caesar Lab** Jan. 2021 – Jun. 2021
Coordinated Science Laboratory *Urbana, IL*

- Remodeled a Reinforcement Learning System intended for UAV-Assisted Emergency Response.
- Upgraded the fully-distributed communication environment for USAF usage.
- Implemented communication trees via Python Message Passing Interface (MPI) standard in under 6 months.

Research Intern | **Drs. Spitalnik, Hod, La Carpia** June 2018 - Aug 2018
Columbia University Medical Center - Lab of Transfusion Biology *New York, NY*

- Investigated the effects of transfusional iron overload on gut microbiota due to intravenous infusion.
- Conducted initial studies with a mouse model to retrieve data on iron-deficient erythropoiesis in blood donors and red blood cell recovery after transfusion of hematopoietic red blood transplant.
- Utilized basic Spearman Correlation meta-analysis of bacteria communities, performed blood analysis tests, and used Flow Cytometry to collect sample cell data.

Projects and Involvement

AM Radio | *ECE 210* Jan. 2022 – May 2022

- Construct a functioning AM Radio using a Superheterodyne Receiver; Convert digital .wav audio input to analog 3.5mm speaker output
- Utilize Fourier Transforms to convert Time domain signals to Frequency domain responses

Virtual Gloves | ***ECE 120 Honors*** Jan. 2021 – May 2021

- Develop a "virtual keyboard" by moving fingers attached to flex sensors and provide haptic feedback
- Collect data from flex resistors in Arduino Studio and use C++ to send output confirmations to LEDs

Membership: IEEE@UIUC, iRobotics, MRDC, Vex Robotics, ACM, SIGPWNY

Leadership

Conferences

- NCSA Letter of Outstanding Student Leadership Recognition (2023-2024)
- NCSA 2nd Annual Student Research Conference - Planning Committee, Panel Moderator, and Industry Chair (2024)
- ACMG Annual Clinical Genetics Meeting (Metro Toronto Convention Center) - Attendee, 2024
- ISPD 28th International Conference on Prenatal Diagnosis and Therapy (Westin Copley Place, Boston) - Attendee, 2024
- NCSA Student Research Conference - Planning Committee and Panel Moderator (2023)
- IEEE Nexus Region 4 Student Leadership Conference - Conference Planning Lead (2022-2023)

Presentations

- University of Illinois - Undergraduate Research Symposium (2024)
- National Center for Supercomputing Applications - SPIN Lightning Talks (2021-2022
- National Center for Supercomputing Applications - Engineering Open House (2021)

Teaching

- ECE PULSE - Outreach Committee Lead (2022)
- Loomis Laboratory Of Physics - "Expert Learning Assistant" for Mechanics (2021)

Volunteering

- UIUC ACM SIGPWNY - Contributed to solving cybersecurity "Capture the Flag" competitions and developed badge software for FallCTF
- De Dilse Charitable Inc. - Co-Founder and Lead Volunteer (2019-2022)
- Kaplen Jewish Community Center on the Palisades - Senior Science Counselor (2019)
- American Wheat Mission - Volunteer (2018)

Technical Skills

Lab Equipment: Flow Cytometer, Clinical Benchtop Centrifuge, ThermoFisher Q-Exactive Mass Spectrometer
Bioinformatics: BLAST+, Smith-Waterman, Biopython, Chromosome Analysis Suite (ChAS), Rstudio, OMIM, UCSC Genome Broswer, Ensembl, Illumina BaseSpace - DRAGEN Enrichment
Analytics Tools: Google Cloud (SDK, Analytics, BigQuery), HPC Clusters (Delta, Blue Waters)
Developer Tools: Git, GitHub, GitLab, Docker, VirtualBox, Kernel-based Virtual Machines (KVMs), Digital Ocean Droplets
Programming Experience: Bash, C/C++, CUDA, Python MPI, R
Hardware and Electronics: Breadboards, Raspberry Pi (Zero/3b/4), Arduino UNO, Intel MAX 10 FPGA
Electrical Engineering Fundamentals: Oscilloscope, Network Analyzer, RLC circuits, Operational Amplifiers, Band-Pass Filters, Quartus Prime utility, ModelSim utility, SystemVerilog