Varenya Jain

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Education

University of Illinois Urbana-Champaign Class of 2024

Bachelor of Science in Integrative Biology, Minor in Computational Science and Engineering

- *Dean's List (Spring 2024)*
- Biology: Physiology, Anatomy, Bioinspiration, Evolution, Genetics, Behavioral Genetics, Genomics and Human Health, Biostatistics, Analysis of Biological Data in R, Programming for Genomics
- Electrical Engineering: Analog Signal Processing, Computer Systems and Programming, Digital Signal Processing, Probability with Engineering Applications, Applied Parallel Programming

Experience

Research Assistant February 2025 - Present

Robinson Lab, Rahel Hirsch Center für Translationale Medizin *Berlin Institute of Health - Charité*

- Collaborate with the Fetal Sequencing Consortium at Columbia University, The Broad Institute at MIT, and the University of New South Wales to develop a Genotype-Phenotype Database for rare diseases
- Train local Large-Language Models on Charité servers to extract Human Phenotype Ontology terms from prenatal ultrasound reports and raw ultrasound data into 'Phenopacket' records
- Utilize Beacon v2 protocol to request and transfer genotype-phenotype information between institutions via federated databases of de-identified data

Contract Bioinformatician December 2022 - Present

Advanced Genomics Institute and Laboratory Medicine *Paramus, NJ*

- Configure and optimize the Illumina ICA platform and BaseSpace Sequence Hub to enhance genomic data processing and bioinformatics capabilities.
- Establish SFTP-based data transfer workflows, ensuring seamless real-time collaboration and efficient management of large genomic datasets.
- Spearhead DRAGEN Enrichment workflows, improving variant calling pipelines for enhanced precision in genomic analyses.
- Led the Copy Number Variation (CNV) analysis, setting up DRAGEN Baselines for structural variant detection and integrating results into the Franklin by Genoox platform for downstream interpretation.

Student Researcher Jan 2024 - December 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, Scipio, and MEGAHIT to enhance phylogenomic reconstruction accuracy using the CAPTUS toolkit.
- Contributed to developing and refining a streamlined protocol for phylogenomic data assembly, 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, IL*

- 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 *Urbana, 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 *Urbana, IL*

- 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, IL*

- 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.

Hardware Projects

BadgeDev | *SIGPWNY* Aug. 2024 – Dec 2024

- Aid in software development for FallCTF participant, sponsor, and staff badges
- Assemble and perform QC on Pico soldering and test firmware before distribution
- Fix and replace badge firmware/hardware during event

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

LoopKit | ***Personal*** July. 2020 – Sep. 2021

- Adapt the LoopKit source code to customize a program for personal monitoring functionalities
- Modify Swift code to circumvent authentication requisites for bolus delivery within the Loop system
- Implement precision adjustments to default carb absorption parameters, optimizing glycemic control dynamics

Student Organization 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 Tools: BLAST+, Smith-Waterman Algorithm, Rstudio, Biopython, Chromosome Analysis Suite (ChAS), OMIM, UCSC Genome Broswer, Ensembl, Illumina Connected Analytics, BaseSpace SequenceHub (DRAGEN)
Analytics Tools: Google Cloud (SDK, Analytics, BigQuery)
Developer Tools: Git, GitHub, GitLab, Docker, VirtualBox, Kernel-based Virtual Machines (KVMs), Digital Ocean Droplets, VSCode, IntelliJ
Programming Experience: Unix Command Line Interface, Bash shell scripting, C/C++, CUDA, Python MPI, R
Development 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
GNU/Linux: Debian, Fedora, CentOS 8.5, AlmaLinux 8.7, Arch Linux, Ubuntu Server 22.04, Manjaro, EndeavorOS