Varenya Jain

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Education

University of Illinois Urbana-Champaign 2020-2024

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

- *Dean's List (Spring 2024)*

Experience

Research Assistant February 2025 - Present

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

- Develop a genotype-phenotype database for the Fetal Sequencing Consortium to study Rare Mendelian diseases across Columbia University, The Broad Institute, and University of New South Wales
- Train large language models on Charité servers to extract Human Phenotype Ontology terms from prenatal ultrasound reports to construct Phenopacket records for individual patients
- Implement the GA4GH Beacon v2 protocol to establish federated databases of de-identified patient data

Contract Bioinformatician December 2022 - Present

Advanced Genomics Institute and Laboratory Medicine *Paramus, NJ*

- Optimize Illumina ICA and BaseSpace workflows, adding SFTP integration to streamline WGS/WES analyses
- Perform targeted enrichment, structural variant detection, and CNV calling to improve clinical interpretation of germline samples
- Leverage Franklin by Genoox to prioritize causal variants for clinical reporting

Student Researcher Aug 2023 - December 2024

Illinois Natural History Survey - Tan Lab of Biodiversity Genomics *Urbana, IL*

- **Morphological Diversity Project (2023):**
  - Researched adaptation in Sisoridae and Amphilidae catfishes within fast-water environments.
  - Presented findings showing significant shape disparity linked to adhesive organ presence, providing insights into evolutionary constraints on morphology.
- **Phylogenomics Project (2024):**
  - Investigated ultraconserved elements (UCEs) in zebrafish genomes using low-coverage whole-genome sequencing (lc-WGS) to study evolutionary relationships.
  - Built and optimized phylogenomic assembly workflows using QC utilities, De Novo Assembly, and the CAPTUS toolkit.

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.
- Supported for data processing on LC-MS Untargeted Metabolite Profiling.

SLC Conference Planning Committee | IEEE Jan 2022 - Jan 2023

The Institute of Electrical and Electronics Engineers *Chicago, IL*

- Managed conference logistics, scheduling, and coordinating with stakeholders.
- Worked with Midwest Region 4 Committee members to develop and implement strategies for a successful conference.

SPIN Research Intern | The NEAT Project v4.0 Aug. 2021 – Sep. 2022

National Center for Supercomputing Applications *Urbana, IL*

- Developed an NGS toolkit on the HAL cluster, improving parallel processing performance by 7%.
- Implemented alignment algorithms (Smith-Waterman, BLAST, localized string alignment) to enhance mutation and sequencing model pipelines.
- Presented research at the NCSA Exhibition, Engineering Open House, and FoDOMMaT/SPIN Showcase.

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.

University 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

Leadership and Involvements

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), 2024
- ISPD 28th International Conference on Prenatal Diagnosis and Therapy (Westin Copley Place, Boston), 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)

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

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, AlmaLinux, Arch Linux, Ubuntu Server, EndeavorOS