Isha Arora

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EDUCATION

B.S. Biomedical Engineering **2020-2024**
Cornell University, Ithaca, NY, USA
Concentration: Molecular, Cellular, and Systems Engineering (MCSE)
Minor: Computer Science
GPA: 3.846
Honors Thesis Title: Development of a Therapeutic Cancer Vaccine for 4T1 Breast Cancer Model in Mice
Thesis Advisor: Dr. Shaoyi Jiang

Relevant Courses: Large Scale Machine Learning, Computational Genetics and Genomics, Cellular Systems Biology, Physiology of Human Health & Disease, Molecular Principles of BME, Biological Statistics, Machine Learning, Object-Oriented Programming & Data Structures, Computer Vision, Foundations of Robotics

SCHOLARSHIPS & AWARDS

Engineering Learning Initiatives Grant **Summers 2021 & 2023**
Cornell University
- Wrote proposals for and received $7500 in funding to support biomechanics and immunology research in the Lammerding and Jiang Labs respectively
- Authored reports and gave presentations describing the research conducted in both labs

Michael J. Miller Scholarship **2020**
Association for the Advancement of Medical Instrumentation Foundation
- Received $3000 award for academic excellence and a commitment to healthcare technology

PUBLICATIONS

- **Isha Arora**, Arkadij Kummer, Hao Zhou, Mihaela Gadjeva, Eric Ma, Gwo-Yu Chuang, Edison Ong. mtx-COBRA: Subcellular localization prediction for bacterial proteins. *bioRxiv*. 2023.

CONFERENCES & PRESENTATIONS

- **ISCB RSGDREAM 2022 Poster Presentation & CUPP Poster Symposium** **Nov 2022**
  Joy Linyue Fan, **Isha Arora**, Alexander Preau, Nicolas Beltran-Velez, Elham Azizi. ECHIDNA – Mapping Genotype to Phenotype through Joint Probabilistic Modeling of Single-Cell Gene Expression and Chromosomal Copy Number Variation.
- **BMES 2023 Poster Presentation** **Oct 2023**
  Ronit Kumar*, **Isha Arora***, Amy Laflin, Estefani Quinones, Shaoyi Jiang. Novel Therapeutic Vaccine for the Treatment of Pancreatic Cancer.

RESEARCH EXPERIENCE

Berger Lab, Massachusetts Institute of Technology **Feb 2023 – Present**
*Undergraduate Researcher supervised by **Dr. Bonnie Berger, Dr. Rohit Singh***
- Developed a transformer and trained it on codon and amino acid alphabets to study differences between synonymous and non-synonymous mutations from an evolutionary viewpoint
- Constructed a codon-codon substitution matrix (similar to a BLOSUM matrix)

Jiang Lab, Cornell University **Sep 2021 – Present**
*Undergraduate Researcher supervised by **Dr. Shaoyi Jiang***
- Collaborated on two projects – testing of a compound as an agent to induce trained immunity (alone and in conjunction with anti-PD1 immunotherapy) and development of generalized neoantigen-based vaccines for cancer
- Identified neoantigens, after literature search, for testing in B6F10, Pan02, and 4T1 cancer models

- Created mRNA from plasmids and helped inject mRNA-LNP constructs in mice
- Wrote the ELISPOT protocol for lab and implemented it to test the immunogenicity of the identified neoantigens in the 4T1 triple negative breast cancer model
- Conducted immunofluorescence on tumor samples to study the T-cell response within the tumors

Azizi Lab, Columbia University **May 2022 – Jan 2023**

*Columbia IICD Summer Research Program Intern supervised by **Dr. Elham Azizi***

- Built a novel probabilistic graphical machine learning model, ECHIDNA, that incorporates whole genome and single cell RNA sequencing data to study the effect of the copy number variation on the response of melanoma cancer to anti-PD1 immunotherapy
- Used scRNA-seq data to deconvolve whole genome sequencing data into tumor clones
- Coded the model in Stan, fitted the model, and ran posterior predictive checks in Python
- Performed gene set enrichment analysis (GSEA) to identify the over-expressed genes and study the dynamics between phenotypic and genotypic changes over time

Lammerding Lab, Cornell University **Jan 2021 – Aug 2021**

*Undergraduate Researcher supervised by **Dr. Jan Lammerding***

- Investigated the role of Nuclear Actin in DNA Damage Signaling during Confined Migration
- Developed PDMS microfluidic devices to mimic confined migration of cells in body
- Conducted immunofluorescence to detect localization of DNA damage markers and nuclear actin structures for two conditions – a wild type actin & a mutant actin that abrogates actin polymerization
- Confirmed the temporal effect of DNA Damage Marker on cells using Western Blots
- Automated image and statistical analyses by creating macros in ImageJ and Excel

PROFESSIONAL EXPERIENCE

Moderna Therapeutics, Boston, United States **Jan 2023 – Jun 2023**

Co-op in Antigen Design & Selection Team (Bioinformatics Sub-team, Infectious Diseases)

- Developed an improved computational pipeline for prediction of the subcellular localization of proteins in bacteria, resulting in a first-author publication
- Designed antigens for various pathogens using bioinformatics techniques including sequence conservation analysis, T-cell immunogenicity assessment, and structural modeling
- Combined existing bioinformatics software to develop a structural antigen design workflow

Practee, Delhi, India **Dec 2020 – Jan 2021**

Intern

- Leveraged Natural Language Processing and Speech Recognition technologies in AWS and Azure to develop a Python script that determined a student's proficiency in conversational English

TEACHING EXPERIENCE

Biomedical Engineering Department, Cornell University **Jan 2022 – May 2022**

Teaching Assistant

- Physiology of Human Health & Disease (Spring 2022)
    - Held exam review sessions & discussion sections, assisted students through office hours, and graded exams & assignments

Computer Science Department, Cornell University **Jan 2021 – Dec 2021**

Teaching Assistant

- Intro to Computing in Python (Summer 2021)
- Object-Oriented Programming and Data Structures (Spring 2021, Fall 2021)
    - Held office hours and graded exams & assignments

LEADERSHIP, OUTREACH & EXTRACURRICULARS

Girls Who Code **Sept 2023 – Present**

Volunteer

- Taught introductory computer science concepts to high school students in weekly mentorship sessions and guided them through the development of text-based games

Cornell Hunger Relief **Nov 2020 – May 2021; Oct 2023 – Present**

Projects and Events Co-Chair; Secretary

- Helped organize and arrange various educational sessions to spread awareness about food insecurity in Ithaca amongst students and the greater community
- Reached out to and assisted various food pantries with re-stocking and distributing food to those in need, despite the COVID-19 pandemic

Cornell Biomedical Device **Nov 2020 – Present**

Product Development Subteam Member

- Actively contributed to the biomedical device ideation, prototyping, and app development for two projects – Exoguard and MyeMonitor
- Contributed to the biomedical device ideation of MelanOxi
- Designed circuits and programmed Arduinos

Cornell Anjali **Nov 2020 – Present**

Co-President (2023 – 2024), Co-Captain (2021 – 2022)

- Choreographed and taught various dances for on-campus performances and a 2-hour showcase.
- Organized the logistical aspects of team performances, coordinated timelines for competitions, and applied for funding.

COURSE PROJECTS

Diversifying and Purifying Selection in the Influenza Genotype **Fall 2022**

Computational Genetics and Genomics

- Implemented the Phylogeny Reconstruction, Ancestral Sequence Reconstruction using the Fitch algorithm, and dN/dS testing using the SLAC algorithm to identify whether changes in the influenza genome between different strains are attributed mainly to silent or adaptive mutations.

Camlgram – an Instant Messaging Service **Fall 2021**

Data Structures and Functional Programming

- Developed a fully functional instant messaging service on the Linux terminal in OCaml

TECHNICAL SKILLS

Dry Lab

- Programming Languages: Java, Python, MATLAB, ImageJ, R, OCaml
- Probabilistic Programming Languages: Stan
- Cloud Computing: AWS, Azure, Google Cloud
- Machine Learning: PyTorch, Common Machine Learning Models
- Database Management: MongoDB
- CAD

Wet Lab

- Experiments: Flow Cytometry, Western Blots, ELISA, ELISPOT, PCR, Immunofluorescence Microscopy, Live Cell Microscopy, Cell Culture, Bone Marrow Isolations, mRNA Synthesis, Protocol Development