

Sonal Kumar

PhD Candidate in Neuroscience at Tufts University and the Jackson Laboratory
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EDUCATION

Doctor of Philosophy in Neuroscience September 2022 – Present
Tufts University Graduate School of Biomedical Sciences (GSBS), Boston, MA, in collaboration with the Jackson Laboratory, Bar Harbor, ME, USA
GPA: 4.0/4.0

Master of Science in Biotechnology and Bioinformatics August 2020 – July 2022
Institute of Bioinformatics and Applied Biotechnology (IBAB), Bengaluru, India
GPA: 8.87/10, equivalent to 4.0/4.0

Bachelor of Science in Biotechnology June 2017 – September 2020
St. Xavier's College (Autonomous), Ahmedabad, India
GPA: 8.38/10, equivalent to 4.0/4.0

RESEARCH EXPERIENCE

Doctoral Research, the Jackson Laboratory June 2023 – Present
Advisor: Prof. Gregory W. Carter
Thesis Advisory Committee: Dr. Giuseppina Tesco (Chair), Dr. Mary Teena Joy, Dr. Vivek Kumar
Genetically dissecting the progression of Alzheimer's disease phenotypes in marmoset models

- Leveraging high-performance computing environments and statistical modeling to analyze data collected longitudinally across phenotypic modalities spanning multiomics, neuroimaging, biomarker measures, and a battery of behavioral and cognitive tests for a population of common marmosets.
- Utilizing both wild-type and genetically engineered animals modeling AD genetic variants for mining genome-wide associations driven by correlations between disease biomarkers in addition to gene expression at the transcript and protein levels.

Rotation Student, the Jackson Laboratory March 2023 – May 2023
Advisor: Dr. Mary Teena Joy
Analyzed mice microglial RNA sequencing data for differential gene expression and carried out differential splicing analysis for different cases and controls for models of ischemic stroke.

Rotation Student, the Jackson Laboratory January 2023 – March 2023
Advisor: Prof. Martin Pera
Managed and maintained various human iPSC lines. Investigated the commitment and differentiation to the RPE cell lineage for a hiPSC line expressing inducible *NGN-2*.

Graduate Thesis, Institute of Bioinformatics and Applied Biotechnology November 2021 – July 2022
Advisor: Prof. Bibha Choudhary
Analyzing the sex-dependent transcriptional landscape of the Alzheimer's disease brain

- Examined human RNA sequencing data for different brain regions in controls and AD patients to develop sex-dependent transcriptional profiles.
- Analyzed whole-genome sequencing (WGS) data to look at variants for heat shock proteins implicated in ESR2 signaling. Utilized homology modeling and molecular dynamics techniques to understand the effect of a potentially deleterious variant in HSPB7 leveraging high-performance computing environments.
- Established mouse primary neuron cultures and studied the relationship between *ESR* and *HSPB7* expression post estradiol valerate treatment using qPCR.

Undergraduate Thesis, St. Xavier's College

November 2019 – May 2020

Advisor: Dr. Shital Doshi

*Studying the effect of HSP16.2 overexpression on β -amyloid protein aggregation in transgenic *Caenorhabditis elegans* CL2006*

Maintained wild and transgenic *C. elegans* using *E. coli* OP50 as feed. Synthesized cDNA from total isolated RNA using custom primers for *HSP16.2*. Gene amplification and vector propagation were underway but interrupted by the COVID-19 pandemic. The hypothesis that *HSP16.2* overexpression would result in decreased muscle paralysis due to β -amyloid disaggregation when subjected to heat shock could not be validated due to a nationwide lockdown.

INTERNSHIPS

Laboratory Intern, Dept. of Microbiology, Civil Hospital, Ahmedabad, India

May 2018

Learned lab management and safety principles, undergoing rotations in Bacteriology, Serology, Virology, and HIV labs in one of the largest public hospitals in the country. Performed slide preparation, microscopic evaluation, plating and culturing, and learned about broader treatment implications of findings. Observed biochemical, ELISA and agglutination-based test procedures, as well as clinical protocols and patient counseling following HIV confirmation.

SKILLS

Programming languages and tools: R, Shell scripting, SLURM, Singularity, Git, LaTeX, HTML, Python, MySQL

Computational Biology and Bioinformatics: Transcriptomics (DESeq2, Seurat) and proteomics, pathway analysis (clusterProfiler), variant calling (GATK), genome-wide association studies (GWAS: GEMMA, permGWAS2), differential splicing analysis (IsoformSwitchAnalyzeR), sequence and phylogenetic analysis, molecular dynamics simulation (gromacs), homology modeling, docking

PUBLICATIONS

1. **Sonal Kumar**, Annat Haber, Catrina Spruce, Duc Duong, Nicholas T Seyfried, Lauren Bailey, Sang-Ho Choi, Julia Kofler, Stephanie Hachem, Yongshan Mou, Seung-Kwon Ha, Jung Eun Park, Gregg E Homanics, Stacey J Sukoff Rizzo, Afonso Silva, Gregory W Carter. (2026) PSEN1 mutant marmoset fibroblasts mimic multi-omic signatures of Alzheimer's disease. *[Submitted]*.
2. Prajna Hebbar *et al.* (2026) A Complete Genome for the Common Marmoset. *[Under review]*.

ORAL PRESENTATIONS

1. "Potentially heritable biomarkers of neurodegeneration in a marmoset model of Alzheimer's disease," IEEE Women in Bioinformatics Workshop (WIBI) 2025, New Haven, CT, USA. (February 2025)

POSTER PRESENTATIONS

1. "Genetic associations with plasma biomarkers measuring neurodegeneration in a population of laboratory marmosets," Tufts GSBS Neuroscience Program Retreat 2026, Beverly, MA, USA. (April 2026)
2. "Genetic associations with plasma biomarkers measuring neurodegeneration in a population of laboratory marmosets," the Maine Chapter for the Society for Neuroscience, Bar Harbor, ME, USA. (March 2026)
3. "Genetic associations with plasma biomarkers measuring neurodegeneration in a population of laboratory marmosets," the 2025 Joint JAX Scientific Symposium and Faculty Retreat in Bar Harbor, ME, USA. (October 2025)

4. “Genetic associations with plasma biomarkers measuring neurodegeneration in a population of laboratory marmosets,” the Simian Collective (SimCo) 2025, Durham, NC, USA. (August 2025)
5. “Genetic associations of plasma biomarkers of neurodegeneration in a population of laboratory marmosets,” Alzheimer’s Association International Conference (AAIC) 2025, Toronto, Canada. [Virtual presentation]. (July 2025)
6. “Genetic associations with plasma beta-amyloid peptides in a population of laboratory marmosets,” Alzheimer’s Disease Gordon Research Conference (GRC) 2025, Ventura, CA, USA. (June 2025)
7. “Identifying genetic contributors to Corpus Callosum Dysgenesis (CCD) in a population of laboratory marmosets,” Tufts GSBS Neuroscience Program Retreat 2025, Boston, MA, USA. (April 2025)
8. “Potentially heritable biomarkers of neurodegeneration in a marmoset model of Alzheimer’s disease,” Alzheimer’s Association International Conference (AAIC) 2024, Philadelphia, PA, USA. (July 2024)
9. “Investigating the role of the noncanonical human small heat shock protein HSPB7 in Alzheimer’s disease”, IBAB Graduate Research Poster Symposium, IBAB, Bengaluru, India. (July 2022)
10. “Studying the effect of HSP16.2 overexpression on β -amyloid protein aggregation in transgenic *Caenorhabditis elegans* CL2006”, Present-Day Biology: Impact of Research at Molecular and Cellular Level. National conference, Ahmedabad, India. Presented under the theme ‘Diseases and Health’. (January 2020)
11. “Biofortified Crops as a Possible Solution to Vitamin-A Deficiency in Developing Nations”, Present-Day Biology: A Bastion for Social and Sustainable Development. International conference, Ahmedabad, India. Presented under the theme ‘Interventions in Nutrition and Agriculture’. (January 2019)

FELLOWSHIPS, AWARDS, AND ACHIEVEMENTS

The Service to Neuroscience Award , Tufts GSBS, Boston, MA	2026
JAX Predoctoral Travel Award , The Jackson Laboratory, Bar Harbor, ME	2026
JAX Predoctoral Travel Award , The Jackson Laboratory, Bar Harbor, ME	2025
JAX Data Science Fellow , The Jackson Laboratory, Bar Harbor, ME	2025
The Chief Minister’s Scholarship for Best Female Student , M.Sc. Biotechnology and Bioinformatics Class of 2022, IBAB, Bengaluru (₹25,000)	2023
1st rank , M.Sc. Biotechnology and Bioinformatics Class of 2022, IBAB, Bengaluru	2022
National qualifier , Graduate Aptitude Test in Engineering (GATE), in Biotechnology and Life Sciences	2022
1st rank , B.Sc. Biotechnology Class of 2020, St. Xavier’s College, Ahmedabad	2020
All India rank 333 (top 5% nationwide) , IIT M.Sc. Joint Admission Test in Biotechnology	2020
National qualifier , Joint Graduate Entrance Examination in Biology and Interdisciplinary Life Sciences	2020
2nd place in state-level quiz competition, BioCalyx Science Meet	2020
2nd place statewide , Gujarat Science Academy Minaxi-Lalit Science Award in Biotechnology (₹500)	2019
1st place in state-level quiz competition, 30 th Gujarat Integrated Bio Network Science Meet (₹2,000)	2019

PROFESSIONAL DEVELOPMENT AND CONTINUING EDUCATION

Google Cloud Data Warehousing & Data Science Workshop , The Jackson Laboratory, Bar Harbor, ME	2025
Carpentries Instructor Certification , The Carpentries	2025
Gene Expression Quantitative Trait Locus (eQTL) Mapping , The Jackson Laboratory, Bar Harbor, ME	2024
Systems and Computational Neuroscience , Tufts University Graduate School of Biomedical Sciences (GSBS), virtual attendance	2024
Spatial Transcriptomics , The Jackson Laboratory, Bar Harbor, ME	2024
Computational Interspecies Translation of Omics Signatures in Alzheimer’s Disease , The Jackson Laboratory for Genomic Medicine, Farmington, CT	2023
Introduction to Single-Cell RNA-Seq Time Series and Trajectory Analysis , Tufts University Data Intensive Studies Center (DISC), virtual attendance	2023

TEACHING AND MENTORING

Introduction to GitHub, JAX Bioinformatics Data Science in Context (BDSiC) January 2026
Led a hands-on course on Git and GitHub for undergraduate students participating in a 2 week workshop on gaining data science skills for biomedical research.

Teaching Assistant, Intro to R II, The Jackson Laboratory, Bar Harbor, ME October 2025

Teaching Assistant, Intro to R I, The Jackson Laboratory, Bar Harbor, ME September 2025

JAX Summer Student Mentoring Program June 2025 – August 2025 (December 2025)
Mentored an undergraduate student (Adon Roy, William Paterson University) through a 10-week-long summer project. Guided the development of a research proposal, final report, and presentation, with a poster presented at a national conference (ABRCMS 2025). I continued mentoring after Adon returned as a lab intern.

Workshop Helper, Computational Techniques and Resources for Effective Translational Research in Alzheimer's Disease May 2025
5-day hands-on workshop held at the Jackson Laboratory (JAX), Bar Harbor, ME.

Workshop Facilitator, Computational Interspecies Translation of Omics Signatures in Alzheimer's Disease, Preconference workshop for the Alzheimer's Association International Conference (AAIC), 2024. 2024

LEADERSHIP AND SERVICE

Tufts Co-Chair, JAX Graduate Student Organization Executive Council September 2025 – Present
JAX Student Representative, Tufts Graduate Student Council September 2025 – Present
Represent Tufts students based on the JAX campus, plan and manage social events for the graduate student community, and assist with campus recruitment.

President, Tufts GSBS Computational Biology Club May 2025 – Present
Vice President February 2024 – April 2025
Manage club budget, organize workshops, and plan special events and talks with external speakers. Assist fellow graduate students with computational challenges through open-coding sessions.

Judge, Maine State Science Fair March 2025
Engaged in constructive discussions with high school students analyzing their science projects, and scored their poster presentations. The highest scoring projects would compete at the national level.

Student Representative, Neuroscience Program Retreat Planning Committee December 2024 – April 2025
Represented the interests of students based at JAX, and helped plan logistics and programming for the annual Tufts GSBS Neuroscience Departmental retreat held in April 2025.

Blog Editor, Social Media Team, Inst. of Bioinformatics and Applied Biotechnology August 2020 – July 2022
Managed "IBAB Insider", my graduate institute's public blog. Authored features, edited community-contributed content, designed layouts, and published posts.

Co-Lead, Departmental Movie Club, St. Xavier's College June 2019 – November 2019
Organized programming and coordinated logistics for biweekly screenings of scientific documentaries and movies. Facilitated peer discussions post-screening.

Logistics Team, International Biosciences Conference, St Xavier's College November 2018 – January 2019
Boosted participation by coordinating outreach to ~50 institutions. Led preparation of information packets for 250+ attendees. Managed student registration and backstage logistics.

PROFESSIONAL MEMBERSHIP

International Society to Advance Alzheimer's Research and Treatment (ISTAART)
Alzheimer's Association

2023 – Present