ELLIE RAHM KIM

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RESEARCH INTERESTS

My research interest focuses on integrating computing/engineering methodologies to solve problems in biomedical sciences. I am driven to contribute to the advancement of precision medicine in cancer through the development of novel computational tools that unravel the complexities of the cancer genome.

EDUCATION

The University of Texas at Austin **GPA:** 3.97 | May 2025

B.S. in Neuroscience, B.A. in Government

- Minor in Computer Science
- Minor in Computational Engineering
- Minor in Scientific Computation and Data Sciences
- Minor in Applied Statistical Modeling
- Minor in Philosophy of Law
- Minor in Social and Behavioral Sciences

Relevant Coursework: Genetics, Neural Computation, Quantitative Neuroscience, Programming, Software Design, Scientific Computing, Data Science, Multivariable Calculus, Differential Equations, Linear Algebra, Probability, Statistics

RESEARCH EXPERIENCE

Harvard Medical School Jun 2024 - Present
Summer Research Intern, Advisor: Dr. Rameen Beroukhim

Dell Medical School of The University of Texas at Austin Jan 2024 - Present
Research Assistant, Advisor: Dr. Stephen Yi

- Employ single-cell RNA sequencing data to detect somatic mutations in tumor samples
- Independently operate GATK data processing pipeline that executes mapping, indexing, and variant calling
- Investigate patterns of tumor evolution and metastasis through phylogenetic tree construction
- Contributed to a lab-wide initiative of developing an antigen-antibody database, curating 500+ literatures

The University of Texas at Austin Oct 2022 - Dec 2023
Research Assistant, Advisor: Dr. Michael Mauk

- Conducted research on neural computation using a conductance-based spiking network model
- Managed a project analyzing the efficacy of synaptic plasticity models for network performance
- Led a comparative project on cerebellar cell learning rates in a computational simulation
- Developed Python scripts to visualize neuron spike activity in raster plots and PSTHs

MD Anderson Cancer Center | link Jun 2023 - Aug 2023
Summer Research Intern, Advisor: Dr. Kadir Akdemir

- Utilized computational tools to analyze 3D chromatin conformation data from tumor samples
- Developed an algorithm and identified recurrent cancer genes from chromatin loop dataset
- Investigated a hypothesis on whether 3D chromosomal rearrangements alter gene expression levels

- Proficiently handled 80+ patient genome sequencing data on high-performance computing environment
- Actively contributed to lab activities through journal club presentations and mentorship

Dell Medical School of The University of Texas at Austin Aug 2022 - Oct 2022
Research Assistant, Advisor: Dr. Joseph Dunsmoor
- Conducted MRI scans on patients with PTSD while adhering to established safety protocols
- Efficiently analyzed psychophysics data using Python's pandas and NumPy libraries

The University of Texas at Austin Nov 2021 - Oct 2022
Research Assistant, Advisor: Dr. Alissa Mrazek
- Developed a web scraping technique and prospected 500+ potential clients
- Designed a data collection strategy that significantly enhanced the lab's workflow productivity
- Created geographical visualizations using Python scripts to effectively present findings and insights
- Presented a comprehensive overview of web scraping and HTML parsing during lab meeting

MD Anderson Cancer Center | link May 2022 - Jul 2022
Summer Research Intern, Advisor: Dr. Kadir Akdemir
- Developed genomic analysis scripts using deconstructSigs to study mutational patterns in cancer
- Built an efficient pipeline with software tools including Picard, MuTect2, and Funcotator to identify significant variants in genome sequencing data
- Leveraged advanced computational tools to visualize and quantify tumor progression
- Utilized public databases, including COSMIC, to accurately detect and compare mutations in tumor samples

INDEPENDENT PROJECTS

Perceptual Bistability Modeling | link Apr 2024 - May 2024
"Modeling Perceptual Bistability: Impact of Neuronal Adaptation and Noise on Alternation Dynamics"
- Numerically simulated a circuit of neurons using differential equations and the Euler method
- Critically analyzed model equations from primary literature, adapting an optimized version for the project
- Systematically investigated the impact of varying model parameters on behavioral dynamics
- Honed scientific writing skills by creating a comprehensive report article, integrating results and literature review

Synaptic Plasticity Algorithm | link Aug 2023 - Dec 2023
"Investigating the Efficacy of the Cascade Model of Synaptic Plasticity in a Biologically Constrained Simulation"
- Programmed in C++ to integrate 3 synaptic plasticity algorithms into a large-scale brain network simulation
- Developed scientific metrics to methodically assess learning performance across various models of plasticity
- Innovated a new visualization method tailored for datasets displaying synaptic weight changes over time
- Authored a thesis on project outcomes, fulfilling requirements for a minor in scientific computing

Cell Differentiation Modeling | link Feb 2023 - Apr 2023
"Investigating Cell Differentiation in the Brain with a Computational Model of Delta-Notch Signaling and Dynamical System Analysis"
- Conducted extensive literature review to inform the development of the computational model
- Developed a agent-based mathematical model to simulate neural development process over time
- Designed an algorithm inspired by the random walk process to generate a cell network that simulates the interactions between neighboring embryonic stem cells in the brain
- Analyzed protein concentration rate changes over time and integrated the findings into a comprehensive report

Patient Genome Analysis | link Feb 2023 - Mar 2023

"Comparative Analysis of Single Nucleotide Polymorphism (SNP) Genomic Data in Patients with Anxiety Disorder (AD) and Major Depressive Disorder (MDD)"

- Acquired genomic data from publicly available sources and curated the datasets for analysis
- Conducted exploratory data analysis using dplyr, tidyr, and ggplot packages in R
- Studied differences in single nucleotide mutation profiles between anxiety and depressive disorder patients
- Created visualizations of allelic variations and presented research findings to classmates

Neural Activity Simulation Study | link Nov 2022 - Dec 2022

"Simulation Analysis of Neuron Firing Activity in Cerebellar Cells for Learning and Extinction Evaluation"

- Skillfully operated a computer simulation of neural networks to generate a spike train dataset
- Performed regression analysis of neuron firing activity to investigate learning and extinction rates
- Detected significant change in neural behavior correlated with temporal intervals between stimuli
- Delivered a presentation on results to classmates and lab members

TEACHING EXPERIENCE

College of Natural Sciences, The University of Texas at Austin Jan 2024 - Present

Peer STEM Tutor

- Provide clear, digestible guidance that simplifies complex concepts in Biology, Chemistry, and Neuroscience for struggling students

BIO 325 Genetics, The University of Texas at Austin Aug 2023 - Present

Teaching Assistant

- Design lesson plans and led weekly discussion sessions for 30+ students
- Experiment with various teaching strategies to identify effective approaches, ensuring classes are both comprehensible and engaging
- Organize and share easy-to-understand figures and summarized resources to aid the learning process
- Provide additional after-hours support during exam review sessions for 200+ students

NEU 340 Quantitative Neuroscience, The University of Texas at Austin Aug 2023 - Dec 2023

Teaching Assistant

- Provided tailored support for 200+ students learning coding for scientific research purposes
- Effectively managed course-related responsibilities, including a substantial grading workload

Private Tutor Jul 2019 - Sep 2020

- Personalized lesson plans targeted at individual students' challenges in High School Mathematics

Patrick Language Institute Jun 2019 - Dec 2019

Academic Instructor

- Instructed 50+ students in preparing for the Test of English as a Foreign Language (TOEFL)
- Proofread essays and improved students' scores by up to 50% in writing section of test

WORK EXPERIENCE

College of Natural Sciences, The University of Texas at Austin May 2024 - Present

College Readiness Mentor

- Oversaw communication and mentorship for 300+ freshmen, delivering support through email updates and individual guidance
- Conducted orientation and tutoring sessions in Calculus and Chemistry to enhance student academic readiness

International Student and Scholar Services, The University of Texas at Austin Aug 2021 - Dec 2022
Customer Service Associate

- Managed and addressed inquiries from prospective and current international students
- Implemented proactive approaches to resolve complex immigration-related issues for students
- Provided administrative support to 30+ office personnel, ensuring efficient workflow

VOLUNTEER WORK

Matriculate Dec 2023 - Present
Advising Fellow

- Lead mentorship and advising sessions for high school students from underprivileged backgrounds, guiding them through college admissions process
- Engage in thorough training, workshops, and skill evaluations to enhance advising proficiency

Department of Neuroscience, The University of Texas at Austin Feb 2024 - Apr 2024
Neuroscience First-Year Interest Group Mentor

- Facilitated mentorship events for 50+ first-year Neuroscience majors, providing extensive support in navigating college life, exploring research opportunities, and professional development

International Student and Scholar Services, The University of Texas at Austin Apr 2022 - Aug 2023
International Orientation Volunteer

- Served as a mentor and student panelist at the orientation for incoming international students
- Delivered engaging virtual information sessions, presenting insights on student life and answering questions from 300+ audience

PRESENTATIONS

Poster Presentation

- **Kim ER**, Akdemir KC. (2024). Structural Disruptions of the 3D Genome Architecture in Human Brain Cancer. Poster presented at: Technology & Science Undergraduate Research Forum, Austin, TX.
- **Kim ER**, Akdemir KC. (2024). Structural Disruptions of the 3D Genome Architecture in Human Brain Cancer. Poster presented at: Longhorn Research Poster Session, Austin, TX.
- **Kim ER**, Akdemir KC. (2023). Structural Disruptions of the 3D Genome Architecture in Human Brain Cancer. Poster presented at: MD Anderson Cancer Center Summer Research Poster Session, Houston, TX.
- **Kim ER**, Akdemir KC. (2023). Computational Investigation of Single Nucleotide Driver Mutations and Tumor Evolution Using Chromatin Conformation Data. Poster presented at: College of Natural Sciences Undergraduate Research Forum, Austin, TX.
- **Kim ER**, Akdemir KC. (2023). Computational Investigation of Single Nucleotide Driver Mutations and Tumor Evolution Using Chromatin Conformation Data. Poster presented at: Longhorn Research Poster Session, Austin, TX.

Oral Presentation

- **Kim ER**, Akdemir KC. (2023). Structural Disruptions of the 3D Genome Architecture in Human Brain Cancer. Talk given at: Fall Undergraduate Research Symposium, Austin, TX.

HONORS & AWARDS

- **Research or Conference Travel Scholarship**, The University of Texas at Austin Apr 2024
- **Competitive Scholarship**, College of Liberal Arts, The University of Texas at Austin Apr 2024
- **College Scholar**, University Honors Day, The University of Texas at Austin Apr 2023 - Apr 2024
- **Pediatric Oncology Student Training (POST) Grant**, Alex's Lemonade Stand Foundation Mar 2024
- **Dean's Honor List**, College of Liberal Arts, The University of Texas at Austin Feb 2023 - Feb 2024
- **University Honors**, The University of Texas at Austin Dec 2021 - Dec 2023
- **Central Texas Mensa Scholarship**, Mensa Education & Research Foundation Sep 2023
- **Winner**, Summer Research Poster Competition, MD Anderson Cancer Center Aug 2023
- **Government Department Scholarship**, College of Liberal Arts, The University of Texas at Austin Jun 2023
- **Mensa Foundation Scholarship**, Mensa Education & Research Foundation Jun 2023
- **CPRIT Research Training Award**, Cancer Prevention & Research Institute of Texas (CPRIT) May 2023
- **International Education Fee (IEF) Scholarship**, The University of Texas at Austin May 2023
- **Second Year Excellence Award**, College of Natural Sciences, The University of Texas at Austin Apr 2023
- **International Education Fee (IEF) Scholarship**, The University of Texas at Austin May 2022
- **Research or Conference Travel Scholarship**, The University of Texas at Austin Mar 2022
- **Alpha Lambda Delta Honor Society**, The University of Texas at Austin Jan 2022

SKILLS

Programming Languages: Python, MATLAB, R, Bash, HTML, C++
Technical Skills: Genome Analysis Toolkit (GATK), Samtools, VCFtools, High Performance Computing (HPC), NumPy, SciPy, SymPy, pandas, Matplotlib, MRI scan
Languages: Fluent in Korean