HUMAYRA TASNIM

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EDUCATION

PhD in Computer Science (Expected graduation : Fall 2023) *Fall 2016 - Present*
University of New Mexico, Albuquerque, NM

MS in Computer Science *Fall 2021*
University of New Mexico, Albuquerque, NM

MS in Computer Science & Engineering *2014 - 2015*
University of Dhaka, Dhaka, Bangladesh

BS in Computer Science & Engineering *2009 - 2013*
University of Dhaka, Dhaka, Bangladesh

RESEARCH EXPERIENCE

Research Assistant, ***Moses Biological Computation Lab, CS, UNM*** *Summer 2017 - Present*

- Use computer modeling, statistical tools, and simulations to analyze and comprehend complex biological systems scenarios such as spatial association, cell motility, signaling, search behaviors, and localization.
- Develop information theory-based frameworks that enable the analysis and identification of spatial and temporal relationships within large-scale image datasets.

Selected Projects:

- **Quantitative Measurement of Spatial Association in Biological Systems**
  - Developed and applied **Normalized Mutual Information (NMI)** to quantitatively measure the spatial association of naive T cells with other cell types in lymph nodes.
  - This analysis is important for T cell activation and motility to understand the rapid response of the immune system to novel infections.
- **Information-Theoretic Feature Analysis in Multivariate Time-Varying Image Databases**
  - Developed an information-theoretic framework for automatic salient feature exploration in image databases.
  - Propose a feature-based temporal data summarizing technique for large-scale data reduction using information-based fusion.
- **Spatial Features Analysis of SARS-CoV-2 in Lung CT scans**
  - Propose a computational model to identify and track the progression of SARS-CoV-2 infection from Computed Tomography (CT) scans.
  - This model will be used to validate SimCoV (computer-simulated agent-based model) developed in the Moses lab to study SARS-CoV-2 infection by analyzing the spatial distribution of infected cells and immune response in patients.

INTERNSHIPS AND FELLOWSHIPS

Summer Research Intern, ***Lawrence Berkeley National Laboratory*** *June 2023 - August 2023*

- Onboarding intern at Computer Languages and Systems Software Group.
- Topic: Analyzing T-Cell Behavior for Immune Response in SARS-CoV-2 Patients using CT Scans and SIMCoV Model

Summer Research Intern, ***Lawrence Berkeley National Laboratory*** *June 2022 - August 2022*

- Research internship funded by Sustainable Research Pathways for High-Performance Computing (SRP-HPC) program.
- Topic: Analyzing Spatial Features of SARS-CoV-2 Infection Spread in Human Lung using CT Scans Compared to SIMCoV Model.

Summer Research Fellow, ***Los Alamos National Laboratory*** *June 2020 - August 2020*

- Research fellowship at Data Science at Scale Summer School Program.
- Developed an information-theoretic analysis framework that works on multivariate time-varying Cinema databases (image database developed at LANL) and performs automatic identification of salient regions.
- The technique serves as an interactive customized tool for the existing cinema viewer presenting pre-analyzed results for further research.

APPLICATION BASED PROJECTS

- **Technical Lead - Swarmathon : The Next Generation** *2020 - 2022*
  - Taught a course (Spring 2022) and organized a workshop (Spring 2021) sponsored by Google exploreCSR outreach program to encourage women undergrad students to pursue research careers, focusing on AI and machine learning. Link: `https://swarmathon-tng.cs.unm.edu/`
  - The Workshop provided basic ideas to use machine learning framework, TensorFlow, to train neural network models. As an application, I integrated object detection features into the swarm robots developed in the Moses lab for autonomous detection and collection of objects.
- **Graduate Student Advisor: UNM Chili House - NASA MINDS Challenge** *Spring 2021*
  - Part of the winning team *UNM Chili House* at NASA MINDS Challenge that proposed the use of robots to autonomously water and grow plants (New Mexico Chiles) on Mars and Moon to provide fresh food for astronauts. Link: `https://news.unm.edu/news/could-plants-control-robots-on-mars`
  - I worked on the approach to implementing the autonomous path-planning procedure of the robots and mentored undergraduate students.
- **Finalist: Team Swarmathon - NASA Space Robotics Challenge Phase 2** *Spring 2021*
  - Competition to develop software to increase the autonomy of mobile robots during space travel.
  - In the qualification round, as a part of the team, my work focused on resource detection and localization of the robots on the simulated environment.

SELECTED PUBLICATIONS

- **H. Tasnim**, S. Dutta, T. L. Turton, D. Rogers, and M. E. Moses, (2022) "Information-theoretic Exploration of Multivariate Time-Varying Image Databases", *Computing in Science & Engineering*
- Soumya Dutta, **Humayra Tasnim**, Terece L. Turton, and James Ahrens, "In Situ Adaptive Spatio-Temporal Data Summarization", IEEE International Conference on Big Data (IEEEBigdata) 2021, pp. 315-321.
- Moses, M.E., Hofmeyr, S., Cannon, J.L., Andrews, A., Gridley, R., Hinga, M., Leyba, K., Pribisova, A., Surdidijaja, V., **Tasnim, H**. and Forrest, S.,"Spatially distributed infection increases viral load in a computational model of SARS-CoV-2 lung infection", PLoS Computational Biology.2021;17(12):e1009735.
- Judy L Cannon, Melanie E Moses, Janie R Byrum, Paulus Mrass, G Matthew Fricke, **Humayra Tasnim**. "Modeling T Cell Motion in Tissues During Immune Responses." *Biophysical Journal 116 (3), 322a, Elsevier, 2019*
- **Humayra Tasnim**, G. Matthew Fricke, Janie R. Byrum, Justyna O. Tafoya, Judy L. Cannon, Melanie E. Moses. "Quantitative Measurement of Naive T cell Association with Dendritic Cells, FRC, and Blood Vessels in Lymph Nodes." *Frontiers in Immunology, section Microbial Immunology, 2018*, Front.Immunol.9:1571.doi: 10.3389/fimmu.2018.01571
- Sadia Nowrin, Lafifa Jamal, **Humayra Tasnim**, "An Efficient Approach To Design A Reversible Signed Multiplier," in *TENCON 2014 - 2014 IEEE Region 10 Conference*, vol., no., pp.1-6, 22-25 Oct. 2014

Google Scholar: `https://scholar.google.com/citations?hl=en&user=Q-vo1KQAAAAJ`

SELECTED POSTERS AND TALKS

- ECP Annual Meeting, 2023, Poster: "HPC Simulation of the Spatial Spread of SARS-CoV-2 in Lung CT Scans."
- 16th UNM CS Student Conference, Talk:"Information-theoretic Exploration of Multivariate Time-Varying Image Databases."
- CRA-W Grad Cohort Workshop 2019, Poster: "NMI: Quantitative Measurement of Spatial Association in Biological Systems."
- UNM STEM Research Symposium 2019, Talk: "Quantitative Measurement of Naive T cell Association with Dendritic Cells, FRC, and Blood Vessels in Lymph Nodes."
- UNM ESS–organized CS showcase event 2019, Poster: "Swarmathon: The Next Generation Workshop."

TECHNOLOGY SKILLS

Programming	Python, Matlab, C, Java, Haskell, HTML, CSS, PHP, Assembly, SQL, Shell Scripting
Tools/Software	TensorFlow, Keras, Git, Latex, ParaView, MySQL, Apache Tomcat server

TEACHING EXPERIENCE

Teaching Assistant, Computer Science, UNM *Fall 2016 - Spring 2017*

- Data Structure and Algorithm I (CS 262)- Course Instructor: Dr. Shuang Luan. (Fall 2016)
- Data Structure and Algorithm II (CS 362)- Course Instructor: Dr. Thomas Hayes. (Spring 2017)
- Responsibilities: Grading homework and exam scripts, holding office hours to assist students with coursework, and proctoring exams.

Lecturer in Computer Science & Engineering, Eastern University, Bangladesh *2014 - 2016*

- Courses: Structured and Object-Oriented Programming, Theory of Computation, Software Engineering

COURSE PROJECTS

Text Categorization using Naïve Bayes Classifier and Logistic Regression *Fall 2018*
Classification of DNA Sequence using Machine Learning Decision Tree Algorithm *Fall 2018*
Implement and Analyze Forest Fire Behavior as Cellular Automata Model *Spring 2017*
Evolving Core War Warriors Using a Genetic Algorithm *Spring 2017*
Discovering Structure and Behavior in Complex Adaptive Systems *Spring 2017*

LEADERSHIP, AWARDS AND HONORS

Recipient, Student Scholarship recipient to attend 2022 Grace Hopper Celebration *2022*
Recipient and Student Lead , Google exploreCSR Award (2 consecutive Years) *20-21, 21-22*
Graduate Student Advisor, UNM Chili House Team, NASA MINDS Challenge *2021*
Participant, Team Swarmathon, NASA Space Robotics Challenge Phase Two *2021*
Recipient, NSF scholarship recipient to attend 2020 ACM Richard Tapia Conference *2020*
Co-Organizer, Student -Faculty Panel, 16th and 17th UNM CS Student Conference *2021-2022*
Recipient, CRA-W Grad Cohort Workshop Participation Grant *2019*
Recipient, UNM GPSA Professional Development Grant (Spring) *2019*
Mentor, Summer intern project for a high school student. *2019*
President, Computer Science Graduate Student Association at UNM *2018-19*
Lead Organizer, 15th UNM CS Student Conference and effectively secured exemplary external funding *2019*
Representative, Woman in Computing chapter at UNM in 2018 Grace Hopper Celebration *2018*
Recipient, Student Conference Award Program to attend 2018 Grace Hopper Celebration *2018*
Organizer, 14th UNM Computer Science Student Conference *2018*
General Secretary, Computer Science Graduate Student Association at UNM *2017-18*
Treasurer, Woman in Computing (WinC) Chapter at UNM *2017-18*
Reviewer, IEEE Symposium on Artificial Life (ALIFE) *2017*
Volunteer, 13th UNM Computer Science Student Conference *2017*
Ministry of ICT Fellowship from Bangladesh Government for MS thesis *2014-15*
7th place in National Collegiate Programming Contest (Women), Bangladesh *2011*