

# HUMAYRA TASNIM

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## EDUCATION

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<b>PhD in Computer Science</b> (Expected graduation : Spring 2024)	<i>Fall 2016 - Present</i>
University of New Mexico, Albuquerque, NM	
<b>MS in Computer Science</b>	<i>Fall 2021</i>
University of New Mexico, Albuquerque, NM	
<b>MS in Computer Science &amp; Engineering</b>	<i>2014 - 2015</i>
University of Dhaka, Dhaka, Bangladesh	
<b>BS in Computer Science &amp; Engineering</b>	<i>2009 - 2013</i>
University of Dhaka, Dhaka, Bangladesh	

## RESEARCH EXPERIENCE

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**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

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

- 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

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- **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

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- **Tasnim, H.**, Dutta, S., Moses, M., 2023. Dynamic spatio-temporal summarization using information-based fusion. arXiv:2310.01617. submitted to Image and Vision Computing, Elsevier (under review)
- **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., Surdidijsa, 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

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- 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

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

## TEACHING EXPERIENCE

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<b>Teaching Assistant, Computer Science, UNM</b>	<i>Fall 2016 - Spring 2017</i>
<ul style="list-style-type: none"><li>• Data Structure and Algorithm I (CS 262)- Course Instructor: Dr. Shuang Luan. (Fall 2016)</li><li>• Data Structure and Algorithm II (CS 362)- Course Instructor: Dr. Thomas Hayes. (Spring 2017)</li><li>• Responsibilities: Grading homework and exam scripts, holding office hours to assist students with coursework, and proctoring exams.</li></ul>	
<b>Lecturer in Computer Science &amp; Engineering, Eastern University, Bangladesh</b>	<i>2014 - 2016</i>
<ul style="list-style-type: none"><li>• Courses: Structured and Object-Oriented Programming, Theory of Computation, Software Engineering</li></ul>	

## COURSE PROJECTS

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

## LEADERSHIP, AWARDS AND HONORS

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<b>Recipient</b> , UNM School of Engineering Outstanding Graduate Student Award from CS Department	<i>2023</i>
<b>Recipient</b> , Student Scholarship recipient to attend 2022 Grace Hopper Celebration	<i>2022</i>
<b>Recipient and Student Lead</b> , Google exploreCSR Award (2 consecutive Years)	<i>20-21, 21-22</i>
<b>Graduate Student Advisor</b> , UNM Chili House Team, NASA MINDS Challenge	<i>2021</i>
<b>Participant</b> , Team Swarmathon, NASA Space Robotics Challenge Phase Two	<i>2021</i>
<b>Recipient</b> , NSF scholarship recipient to attend 2020 ACM Richard Tapia Conference	<i>2020</i>
<b>Co-Organizer</b> , Student -Faculty Panel, 16th and 17th UNM CS Student Conference	<i>2021-2022</i>
<b>Recipient</b> , CRA-W Grad Cohort Workshop Participation Grant	<i>2019</i>
<b>Recipient</b> , UNM GPSA Professional Development Grant (Spring)	<i>2019</i>
<b>Mentor</b> , Summer intern project for a high school student.	<i>2019</i>
<b>President</b> , Computer Science Graduate Student Association at UNM	<i>2018-19</i>
<b>Lead Organizer</b> , 15th UNM CS Student Conference and effectively secured exemplary external funding	<i>2019</i>
<b>Representative</b> , Woman in Computing chapter at UNM in 2018 Grace Hopper Celebration	<i>2018</i>
<b>Recipient</b> , Student Conference Award Program to attend 2018 Grace Hopper Celebration	<i>2018</i>
<b>Organizer</b> , 14th UNM Computer Science Student Conference	<i>2018</i>
<b>General Secretary</b> , Computer Science Graduate Student Association at UNM	<i>2017-18</i>
<b>Treasurer</b> , Woman in Computing (WinC) Chapter at UNM	<i>2017-18</i>
<b>Reviewer</b> , IEEE Symposium on Artificial Life (ALIFE)	<i>2017</i>
<b>Volunteer</b> , 13th UNM Computer Science Student Conference	<i>2017</i>
<b>Ministry of ICT Fellowship</b> from Bangladesh Government for MS thesis	<i>2014-15</i>
<b>7th place</b> in National Collegiate Programming Contest (Women), Bangladesh	<i>2011</i>