Mahmudul Hasan

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RESEARCH INTERESTS

My research focuses on probabilistic models and spatial statistics for medical images, emphasizing trustworthy AI, interpretable learning, and improved tools for spatial agent development.

EDUCATION

Stony Brook University, Stony Brook, NY, USA Feb. 2020 – August. 2025 (Expected)
PhD Candidate, Computer Science GPA: 4.00/4.00

Stony Brook University, Stony Brook, NY, USA Feb. 2020 – Dec. 2023
M.Sc. in Computer Science GPA: 4.00/4.00

Khulna University of Engineering and Technology (KUET), Khulna, Bangladesh Jan. 2013 – Jan. 2018
B.Sc. in Computer Science and Engineering GPA: 3.78/4.00

PROFESSIONAL EXPERIENCES

Stony Brook University Feb. 2021 – Present
Graduate Research Assistant | Advisors: Dr. Chao Chen and Dr. Joel Saltz NY, USA

- **Disentangled Representation Learning** - Isolating discriminative factors using a probabilistic Model for enhanced interpretability | Python, Pytorch
  - Designed and implemented a probabilistic and generative framework for disentangled representation learning in pathology data analysis, leading to an 18% improvement in silhouette score compared to baseline methods (***MICCAI, 2024***).
  - Currently exploring the use of disentangled latent spaces in multiple instance learning (MIL) and tissue segmentation (Ongoing).
- **Spatial Statistics Toolkit** - Developed an advanced toolkit for spatial statistics, enabling analysis of point cloud data and hypothesis testing. | Python, R, Spatstat, Dash, JavaScript, QuPath
  - Introduced a novel spatial phenotype, achieving statistically significant results across different races and cancer subtypes using a new spatial g-function implementation (***ACM BCB, 2024***)
  - Developed a spatial analysis tool for tumor microenvironment (TME) in pancreatic cancer, integrating a novel spatial analysis framework with deep learning models for Multiplex IHC data (***Journal of Translational Medicine, 2024; AACR, 2022***).

Genentech / Roche May. 2022 – August. 2022
Image Analysis Intern | Supervisors: Dr. Tyler Risom and Dr. Andries Zijlstra California, USA

- Developed an advanced morphological tool for the analysis of collagen fibers (curvilinear structure) in multiplex imaging | Python, OpenCV

Stony Brook University Feb. 2020 - Feb. 2021
Graduate Teaching Assistant NY, USA

- For the CSE214 course data structure, conducted office hours, curated questions, and graded homework | Java

Khulna University of Engineering and Technology Aug. 2018 – Jan. 2020
Lecturer Khulna, Bangladesh

- Recitation and conducted research resulting into multiple publications (***Internet of Things, 7, 2019, IEEE ACCESS 2020, JMIR 2021***).

SELECTED PUBLICATIONS

- **Mahmudul Hasan**, Xiaoling Hu, Shahira Abousamra, Prateek Prasanna, Joel Saltz, Chao Chen. "Semi-Supervised Contrastive VAE for Disentanglement of Digital Pathology Images." ***MICCAI***, 2024 (Acceptance Rate: 30%).
- **Mahmudul Hasan**, Ariadna Kim Silva, Shahira Abousamra, Shao-Jun Tang, Prateek Prasanna, Joel Saltz, Kevin L. Gardner, Chao Chen, Alisa Yurovsky. New Spatial Phenotypes from Imaging Uncover Survival Differences for Breast Cancer Patients. ***ACM BCB***, 2024 (Oral; Acceptance Rate: 29%).
- Delgado-Coka, Lyanne, Michael Horowitz, Mariana Torrente-Goncalves, Lucia Roa-Peña, Cindy V. Leiton, **Mahmudul Hasan**, Sruthi Babu et al. "Keratin 17 modulates the immune topography of pancreatic cancer." ***Journal of Translational Medicine***, 2024 (Impact Factor: 8.440).
- Lyanne Oblein, Michael Horowitz, **Mahmudul Hasan**, Sruthi Babu, et. al. "Keratin 17 excludes CD8-positive T cells and recruits CD163-positive macrophages in pancreatic ductal adenocarcinoma." ***AACR***, 2022
- **Mahmudul Hasan**, Jakub R Kaczmarzyk, David Paredes, Lyanne Oblein, Jaymie Oentoro, Shahira Abousamra, Michael Horowitz, Dimitris Samaras, Chao Chen, Tahsin Kurc, Kenneth R Shroyer, Joel Saltz. A Novel Framework for Characterization of Tumor-Immune Spatial Relationships in Tumor Microenvironment. ***ArXiv***, 2022.
- **Mahmudul Hasan**, Md Milon Islam, Md Ishrak Islam Zarif, MMA Hashem. Attack and anomaly detection in IoT sensors in IoT sites using machine learning approaches. ***Internet of Things, 7***, 2019 (Impact Factor: 6.0).

TECHNICAL SKILLS

Languages, Tools, Frameworks: Python, C, C++, Java, PyTorch, Keras, TensorFlow, OpenCV, MATLAB, R, HTML, CSS, Javascript, Git, LaTeX, Slurm, Wandb, Cloud, QuPath.

Domain Experiences: Computer Vision (CV), Artificial Intelligence (AI), Deep Learning (DL), Machine Learning (ML), Spatial Statistics, Medical Image Analysis (MI), LLM, Generative Models, Probabilistic Models.

Selected Awards

Dashboard for breast cancer subtype prediction - Star project in CSE 564 visualization 2022

Dean's Award, KUET, Bangladesh 2018

Selected in national collegiate programming contest (NCPC), Bangladesh 2017