Tanmoy Sarkar Pias

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Profile: Linkedin, Google Scholar, GitHub, Lab, Portfolio

Education

Ph.D. Student, Computer Science — Spring 2021-Summer 2025 (Expected)
Virginia Tech — Blacksburg, VA, US
CGPA: 4.00/4.00

Dissertation committee members:

- Professor Daphne Yao (chair) - Computer Science, Virginia Tech
- Professor T. M. Murali - Computer Science, Virginia Tech
- Professor Pearl Chiu - Fralin Biomedical Research Institute at VTC, Virginia Tech
- Dr. Ismini Lourentzou - Computer Science, University of Illinois at Urbana Champaign
- Dr. Shalmali Joshi - Biomedical Informatics, Columbia University

Masters of Science (MSc.), Computer Science — Spring 2021-Fall 2023
Virginia Tech — Blacksburg, VA, US
CGPA: 4.00/4.00

Bachelor of Science (BSc.), Computer Science and Engineering — Jul 2014 - Oct. 2018
Bangladesh University of Engineering and Technology (BUET)
CGPA: 3.78/4.00 (Final 4 Semesters)

Work Experience

Research Assistant [link] — May 2021-Present
Department of Computer Science, Virginia Tech — Blacksburg, VA, USA
My selected projects from the Human-centric Machine Intelligence Lab

- **ML Testing: Trustworthiness and Consistency of AI Prediction**
  - Designing a machine learning testing and validation framework before deployment
  - Synthetic dataset generation for testing and retraining
  - Testing LLMs and time-series models
- **Medical Knowledge Guided Machine Learning**
  - Designing custom loss functions for machine learning models to infuse domain knowledge
  - Enhance the explainability of the model to increase reliability

Researcher — January 2023 - Present
Sanghani Center for Artificial Intelligence and Data Analytics: Tanmoy Sarkar Pias — Virginia Tech

Research Intern (Machine Learning) — May 2023 - August 2023
ThinkSense Inc. — Arlington, VA

- Developed effective machine learning models for human activity recognition using for smart devices.

Teaching Assistant — Jan. 2021-Dec. 2023
Department of Computer Science, Virginia Tech — Blacksburg, VA, USA

- CS 5244: Web Application Development with Vue
  - Mentored professional students and supervised 40 students in projects.
- CS 3114: Data Structures and Algorithms
  - Mentored undergraduate students to understand, implement, and apply different data structures and algorithms
- CS 2505: Computer Organization
  - Mentored undergraduate students to understand coding problems and helped to debug using GDB.

Faculty (Lecturer) — Oct. 2018-Dec. 2020
University of Asia Pacific

- **Object-Oriented Programming II:** Python, OOP, Class, Object, Abstract Class, Interface, etc.
- **Visual and Web Programming:** Python, Django, back-end, front-end, HTML, CSS, JS, web development, and projects.
- **The theory and application of SVM, CNN, K-means, RNNs, LSTMs, and neural networks were taught in Pattern Recognition.**
- **Digital System Design**: Taught and demonstrated digital circuit designs and supervised hardware projects.
- **Supervising Thesis and Project groups**

Honors and Awards

Fellowship: Awarded with BitShare Fellowship from the Department of Computer Science, Virginia Tech. 2021

Best Conference Paper Award: IEEE ECICE conference, Yunlin, Taiwan. 2019

Dean's Award: Awarded for outstanding result in the 3rd year during undergraduate studies at BUET 2017

Publications (*corresponding author)

1. **Tanmoy Sarkar Pias**, Afrose, S., Tuli, M. D., Trisha, I. H., Deng, X., Nemeroff, C. B., & Yao, D. Low Responsiveness of Machine Learning Models to Critical or Deteriorating Health Conditions. Nature Communications Medicine. Accepted. 2025. (Available on medRxiv. DOI: 10.1101/2024.09.25.24314400)
2. Akter, Simon Bin, Sumya Akter, Moon Das Tuli, David Eisenberg, Aaron Lotvola, Humayera Islam, Jorge Fresneda Fernandez, Maik Hüttemann, and **Tanmoy Sarkar Pias***. "Fair and explainable Myocardial Infarction (MI) prediction: Novel strategies for feature selection and class imbalance correction." Computers in Biology and Medicine 184 (2025): 109413.
3. Akter, Simon Bin, Sumya Akter, Rakibul Hasan, Md Mahadi Hasan, AM Tayeful Islam, **Tanmoy Sarkar Pias**, Jorge Fresneda Fernandez, Md Golam Rabiul Alam, and David Eisenberg. "Early detection of subjective cognitive decline from self-reported symptoms: An interpretable attention-cost fusion approach." Journal of Biomedical Informatics (2025): 104770.
4. Frantz Miles, Ya Xiao, **Tanmoy Sarkar Pias**, Na Meng, and Danfeng Daphne Yao*. "Methods and Benchmark for Detecting Cryptographic API Misuses in Python." IEEE Transactions on Software Engineering (2024).
5. Bin Akter Simon, **Tanmoy Sarkar Pias**, Shohana Rahman Deeba, Jahangir Hossain, and Hafiz Abdur Rahman*. "Ensemble learning based transmission line fault classification using phasor measurement unit (PMU) data with explainable AI (XAI)." Plos one 19, no. 2 (2024): e0295144.
6. Mridula Danastan Tasaouf, Abu Ahmed Ferdaus, and **Tanmoy Sarkar Pias***. "Exploring Emotions in EEG: Deep Learning Approach with Feature Fusion." In 2023 26th International Conference on Computer and Information Technology (ICCIT), pp. 1-6. IEEE, 2023.
7. Akter Simon Bin, Sumya Akter, and **Tanmoy Sarkar Pias***. "Stroke Probability Prediction from Medical Survey Data: AI-Driven Analysis with Insightful Feature Importance using Explainable AI (XAI)." In 2023 26th International Conference on Computer and Information Technology (ICCIT), pp. 1-6. IEEE, 2023.
8. Akter Sumya, Rumman Ahmed Prodhan, **Tanmoy Sarkar Pias***, David Eisenberg, and Jorge Fresneda Fernandez. "M1M2: deep-learning-based real-time emotion recognition from neural activity." Sensors 22, no. 21 (2022): 8467.
9. **Tanmoy Sarkar Pias**, David Eisenberg, and Jorge Fresneda Fernandez. "Accuracy improvement of vehicle recognition by using smart device sensors." Sensors 22, no. 12 (2022): 4397.
10. S. Barman, M. Hasan, P. Arafin, T. Helaly and **Tanmoy Sarkar Pias***, "Deep Convolutional Neural Network Based Automatic COVID-19 Detection from Chest X-ray Images," 2022 4th International Conference on Electrical, Computer & Telecommunication Engineering (ICECTE), Rajshahi, Bangladesh, 2022, pp. 1-4, doi: 10.1109/ICECTE57896.2022.10114540.
11. Mazumder, Tanmoy, Shawan Das, Md Hasibur Rahman, Tanjina Helaly, and **Tanmoy Sarkar Pias***. "Performance Evaluation of Different Word Embedding Techniques Across Machine Learning and Deep Learning Models." In 2022 25th International Conference on Computer and Information Technology (ICCIT), pp. 932-937. IEEE, 2022.
12. Prodhan, Rumman Ahmed, Sumya Akter, Muhammad Bin Mujib, Md Akhtaruzzaman Adnan, and **Tanmoy Sarkar Pias***. "Emotion Recognition from Brain Wave Using Multitask Machine Learning Leveraging Residual Connections." In International Conference on Machine Intelligence and Emerging Technologies, pp. 121-136. Cham: Springer Nature Switzerland, 2022.
13. Prodhan, Rumman Ahmed, Sumya Akter, **Tanmoy Sarkar Pias***, and Md Akhtaruzzaman Adnan. "Optimal EEG Electrode Set for Emotion Recognition From Brain Signals: An Empirical Quest." arXiv preprint arXiv:2311.17204 (2023). (accepted in Springer)
14. Akter Sumya, Rumman Ahmed Prodhan, Muhammad Bin Mujib, Md Akhtaruzzaman Adnan, and **Tanmoy Sarkar Pias***. "Evaluating the Effectiveness of Classification Algorithms for EEG Sentiment Analysis." In Sentiment Analysis and Deep Learning: Proceedings of ICSADL 2022, pp. 195-212. Singapore: Springer Nature Singapore, 2023.
15. Shawon Md Shahedul Haque, Sagor Biswas, Nirob Arefin, **Tanmoy Sarkar Pias***, and Ashikur Rahman. "On age prediction from facial images in presence of facial expressions." International Journal of Applied Pattern Recognition 6, no. 4 (2021): 345-369.
16. Hasan Mahmudul, Samina Yasmin, and **Tanmoy Sarkar Pias***. "Fine-grained emotion recognition from eeg signal using fast fourier transformation and cnn." In 2021 Joint 10th International Conference on Informatics, Electronics & Vision (ICIEV) and 2021 5th International Conference on Imaging, Vision & Pattern Recognition (icIVPR), pp. 1-9. IEEE, 2021.
17. Islam Muhammad Aminul, Md Al-Amin Khan Riad, and **Tanmoy Sarkar Pias***. "Enhancing security of image steganography using visual cryptography." In 2021 2nd International Conference on Robotics, Electrical and Signal Processing Techniques (ICREST), pp. 694-698. IEEE, 2021.
18. Rahman Rashik, Abdul Fattah Rakib, Mariam Rahman, Tanjina Helaly, and **Tanmoy Sarkar Pias***. "A Real-time End-to-End Bangladeshi License Plate Detection and Recognition System for All Situations Including Challenging Environmental Scenarios." In 2021 5th International Conference on Electrical Engineering and Information Communication Technology (ICEEICT), pp. 1-6. IEEE, 2021.
19. Apu Md Remon Hasan, Fahmeda Akter, Mst Farzana Akhtar Lubna, Tanjina Helaly, and **Tanmoy Sarkar Pias***. "ECG Arrhythmia Classification Using 1-D Convolution Neural Network Leveraging the Resampling Technique and Gaussian Mixture Model, " In 2021 Joint 10th International Conference on Informatics, Electronics & Vision (ICIEV) and 2021 5th International Conference on Imaging, Vision & Pattern Recognition (icIVPR), pp. 1-8. IEEE, 2021.
20. Hassan Reshad, Sakib Hasan, Md Jubaer Hasan, Md Rafat Jamader, David Eisenberg, and **Tanmoy Sarkar Pias***. "Human attention recognition with machine learning from brain-EEG signals." In 2020 IEEE 2nd Eurasia Conference on Biomedical Engineering, Healthcare and Sustainability (ECBIOS), pp. 16-19. IEEE, 2020.

21. Sarif Md Mesbah, **Tanmoy Sarkar Pias***, Tanjina Helaly, Md Sohel Rana Tutul, and Md Nymur Rahman. "Deep learning-based Bangladeshi license plate recognition system." In 2020 4th International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT), pp. 1-6. IEEE, 2020.
22. Islam Muhammad Aminul, Md Al-Amin Khan Riad, and **Tanmoy Sarkar Pias***. "Performance Analysis of Steganography Tools." In 2020 2nd International Conference on Advanced Information and Communication Technology (ICAICT), pp. 428-433. IEEE, 2020.
23. Rahman, Rashik, **Tanmoy Sarkar Pias***, and Tanjina Helaly. "GGCS: A Greedy Graph-Based Character Segmentation System for Bangladeshi License Plate, " In 2020 4th International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT), pp. 1-7. IEEE, 2020.
24. **Tanmoy Sarkar Pias**, Raihan Kabir, David Eisenberg, Nadeem Ahmed, and Md Rashedul Islam. "Gender recognition by monitoring walking patterns via smartwatch sensors." In 2019 IEEE Eurasia Conference on IOT, Communication and Engineering (ECICE), pp. 220-223. IEEE, 2019.
25. **Tanmoy Sarkar Pias***, David Eisenberg, and Muhammad Aminul Islam. "Vehicle recognition via sensor data from smart devices." In 2019 IEEE Eurasia Conference on IOT, Communication and Engineering (ECICE), pp. 96-99. IEEE, 2019.
26. Bhattacharjee Ananya, **Tanmoy Sarkar Pias**, Mahathir Ahmad, and Ashikur Rahman*. "On the Performance Analysis of APIs Recognizing Emotions from Video Images of Facial Expressions." In 2018 17th IEEE International Conference on Machine Learning and Applications (ICMLA), pp. 223-230. IEEE, 2018.

Poster

- Frantz, Miles, Ya Xiao, **Tanmoy Sarkar Pias**, and Danfeng Daphne Yao*. "POSTER: Precise Detection of Unprecedented Python Cryptographic Misuses Using On-Demand Analysis." In The Network and Distributed System Security (NDSS) Symposium. 2022.
- "Reducing Data Imbalance Effect in Natural Language (NLP) Models", VTTI, 2022
- "Effect of Facial Expressions on Age Prediction: A view from online age detection APIs", NSysS, 2019

Reviewer

Nature-Scientific Reports, BMC Artificial Intelligence, Computers in Biology and Medicine, Frontiers - Digital Health, Expert Systems With Applications, Journal of Advanced Computational Intelligence and Intelligent Informatics, Discover Artificial Intelligence, Neural Networks, Knowledge and Information Systems, Biomedical Signal Processing and Control.

Key Skills

- 10+ years of experience in Python
- 6+ years of experience in ML/DL with Keras & PyTorch
- 4+ years of experience in R programming

Selected Class Projects

1. **Reducing the effect of Data Imbalance from NLP dataset** Graduate Spring 2022
   - Applied class weights, oversampling, and bias initialization techniques to mitigate the data imbalance.
   - Important tools: Python, Keras, Pandas, Numpy, and Matplotlib.
2. **Collaborative Learning Through Multiple Private Datasets Ensuring Data Privacy** Graduate Spring 2021
   - Protect private information from model inversion attacks and membership inference attacks.
   - Important tools: Python, Keras, Pandas, Numpy, and Matplotlib.
3. **Confused Student Recognition from EEG signal** Graduate Spring 2021
   - Used deep learning techniques to detect confused students from their brain activity.
   - Important tools: Python, Keras, Pandas, Numpy, and Matplotlib.
4. **Gender Recognition From Image (Deep Learning Project)** Undergraduate Fall 2017
   - Designed a deep learning model to recognize genders from face images.
   - Important tools: Python and Keras.
5. **Enterprise Resource Planning (Software)** Undergraduate Spring 2017
   - Created a complete GUI-based ERP system for both admin and employees.
   - Important tools: Java and JavaFX
6. **Space Fight Dual (Hardware project)** Undergraduate Fall 2016
   - Created and programmed a multiplayer game using low-level components.
   - Important Tools: Arduino, Sonar Sensor, LED matrix, Sound Sensor, Space Fight Dual
7. **Space Fight Game (Hardware project)** Undergraduate Spring 2016
   - Created and programmed a game using low-level components.
   - Important Tools: AtMega32, Sonar Sensor, LED matrix, Sound Sensor, Microcontroller Project: Space Fight
8. **Online Super Shop (Web Project)** Undergraduate Fall 2015
   - Implemented a complete (front-end, back-end, and database) web application for an online super shop.
   - Important Tools: Java, JSP, MySQL
9. **Bus ticket Management System (Software)** Undergraduate Spring 2015
   - Created desktop application for bus ticketing system.
   - Important Tools: Java (Framework: JavaFX)
10. **Tic Tac Toe (Game)** Undergraduate Fall 2014
    - Implemented an AI-based game using only C.
    - Important Tools: C, C++, iGraphics (Implementation of Min-Max algorithm)