(434) 243-0183

tanvir@virginia.edu
https://tanvir-ferdousi.github.io/

Tanvir Ferdousi

Biocomplexity Institute and Initiative
University of Virginia, Charlottesville, VA, USA

EDUCATION

Ph.D. *in* ***Electrical and Computer Engineering*** *[May 2021]*

Department of Electrical and Computer Engineering (ECE)
Kansas State University (K-State), Manhattan, KS

- Thesis: "Computational models and tools for analysis, prediction, and control of infectious diseases"
- Supervisor: Dr. Caterina Scoglio, ECE, K-State

B.Sc. *in* ***Electrical and Electronic Engineering*** *[Feb 2013]*

Department of Electrical and Electronic Engineering (EEE)
Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh

- Thesis: "Design of a honeycomb all solid photonic bandgap fiber for a wide visible region"
- Supervisor: Dr. Md. Shah Alam, EEE, BUET

RESEARCH INTERESTS

Data Analytics, Machine Learning / AI, High Performance Computing, Network Science, Software Systems

PUBLICATIONS

Google Scholar Profile: https://scholar.google.com/citations?user=tEofsW0AAAAJ

- **Ferdousi, Tanvir**, Liu Mingliang, Kirti Rajagopalan, Jennifer Adam, Abhijin Adiga, Mandy Wilson, S. S. Ravi, Anil Vullikanti, Madhav V. Marathe, and Samarth Swarup. 2023. "A Machine Learning Framework to Explain Complex Geospatial Simulations: A Climate Change Case Study." [Accepted, *2023 Winter Simulation Conference*, San Antonio, TX, December 2023, San Antonio, TX] [Paper]
- Yi, Chunlin, Aram Vajdi, **Tanvir Ferdousi**, Lee W. Cohnstaedt, and Caterina Scoglio. 2023. "PICTUREE—Aedes: A Web Application for Dengue Data Visualization and Case Prediction." *Pathogens* 12, no. 6: 771. [Paper]
- **Ferdousi, Tanvir,** Aparna Kishore, Lucas Machi, Dustin Machi, Chris J. Kuhlman, and S. S. Ravi. "A Web-Based System for Contagion Simulations on Networked Populations." In *2022 IEEE 18th International Conference on e-Science (e-Science)*, pp. 306-315. IEEE, 2022.
- **Ferdousi, Tanvir**, Lee W. Cohnstaedt, and Caterina M. Scoglio. "A windowed correlation-based feature selection method to improve time series prediction of dengue fever cases." *IEEE Access* 9 (2021): 141210-141222. [Paper]
- **Ferdousi, Tanvir**. "Computational models and tools for analysis, prediction, and control of infectious diseases." *PhD Dissertation* (2021), Kansas State University. [Dissertation]
- **Ferdousi, Tanvir**, Don Gruenbacher, and Caterina M. Scoglio. "A Permissioned Distributed Ledger for the US Beef Cattle Supply Chain." *IEEE Access* 8 (2020): 154833-154847. [Paper]
- **Ferdousi, Tanvir**, Sifat Afroj Moon, Adrian Self, and Caterina M. Scoglio. "Generation of swine movement network and analysis of efficient mitigation strategies for African swine fever virus." *PLOS ONE* 14, no. 12 (2019): e0225785. [Paper, Code]
- **Ferdousi, Tanvir**, Lee W. Cohnstaedt, D. Scott McVey, and Caterina M. Scoglio. "Understanding the survival of Zika virus in a vector interconnected sexual contact network." *Scientific Reports* 9, no. 1 (2019): 7253. [Paper, Code]
- Moon, Sifat A., **Tanvir Ferdousi**, Adrian Self, and Caterina M. Scoglio. "Estimation of swine movement network at farm level in the US from the Census of Agriculture data." *Scientific Reports* 9, no. 1 (2019): 6237.
- Shahtori, Narges Montazeri, **Tanvir Ferdousi**, Caterina M. Scoglio, and Faryad Darabi Sahneh. "Quantifying the impact of early-stage contact tracing on controlling Ebola diffusion." *Mathematical Biosciences & Engineering* 15, no. 5 (2018): 1165-1180.

POSTER

- Li, Harry and **Tanvir Ferdousi**. 2023. "Evaluating the Impact of Bailout Strategies on Financial Networks." Computing for Global Challenges (C4GC) Symposium, Biocomplexity Institute and Initiative, University of Virginia.

WORK EXPERIENCE

Postdoctoral Research Associate *at* ***University of Virginia (UVA)*** *[Aug 2021 – Current]*

- Developed graph analytics tools capable of large-scale computations (~10^6 nodes/edges) in a software as a service (SaaS) architecture using high performance computing (HPC). Three modules were completed and delivered, with 1 IEEE publication.
- Developed an explainable AI (XAI) framework for geospatial data using Shapley analysis in combination with supervised (random forest) and unsupervised (k-means clustering) learning.
- Deployed an Agro-hydrological simulation system (for VIC-CropSyst) with automated HPC parallelization, data preprocessing, and result aggregation to provide user-friendly interface for the task.
- Developed an integer linear programming (ILP) optimizer for water market allocation using Gurobi.
- Mentored an undergraduate student to model financial contagions using the Eisenberg-Noe framework to evaluate the impact of bailout strategies in reducing cascading failures in bank networks.
- Currently mentoring a graduate student to develop a bargaining simulation framework for allocation of the Colorado River's water usage reduction among the states of California, Arizona, and Nevada.

Graduate Research Assistant *at* ***Kansas State University (K-State)*** *[Aug 2016 – May 2021]*

- Developed network-based epidemic spreading models for Zika and African swine fever viruses to study the impacts of pathogen behavior, host movements, and disease control measures.
- Developed a feature selection method to improve the performance of recurrent neural networks (Long Short-Term Memory and Gated Recurrent Units) by about 33% in predicting weekly dengue fever cases.
- Designed and developed a web-based data analytics and epidemic forecasting dashboard to perform on-demand computations, visualize raster/vector datasets on maps, and plot time series data.
- Conceptualized and developed a blockchain-based data management framework for the US beef cattle industry using Ethereum smart contracts.
- Designed and developed models for graph generation from aggregate and incomplete data. The graphs were used to simulate virus spreading processes.

Senior Software Engineer *at* ***Samsung R&D Institute Bangladesh (SRBD)*** *[Apr 2013 - Jul 2016]*

- Managed a team of 5 in a project focused on network connectivity, data security, and IoT protocol compliance. Delivered iterative software quality assurance, including source code analysis, code review, and unit/integration tests in an Agile environment.
- Expanded the Java-based Constrained Application Protocol (CoAP) library with IoTivity framework specifications to build a protocol compliance test tool for IoTivity core libraries.
- Implemented and maintained a TURN-based NAT traversal solution to establish connections via relay servers. Worked at Samsung HQ in Suwon, South Korea, and collaborated with engineers from the HQ and Samsung R&D Institute India-Noida (2014).

Research Engineer *at* ***Institute of Information and Communication Technology (IICT)*** *[Feb 2013 - Mar 2013]*

- Conducted workshops on embedded systems as a teaching assistant. Prepared teaching materials on FPGA, Verilog, and Microcontrollers.

ACADEMIC EXPERIENCE

Relevant Courses	Machine Learning and Pattern Recognition, Network Theory, Mathematics of Data and Networks, Analysis of Algorithms, Agent-Based Game Theory, Multivariate Statistical Methods
Teaching Responsibilities	Introduction to Blockchain (Co-Taught), Applied Scientific Computing, Introduction to Computer Engineering, Linear Systems

TECHNICAL SKILLS

Areas of Expertise	Network Science, Data Analysis, Machine Learning / AI, Software Quality Engineering (SQE), Computational Models
Languages	C/C++, Python, R, Java, MATLAB, SQL, JavaScript

Environments	AWS, Azure, Linux, Mac OS, Windows
Libraries	TensorFlow, Torch, scikit-learn, Pandas, Numpy, PostGIS, Leaflet.js, Ethereum
Tools	Conda, Jupyter**,** Visual Studio, Eclipse, GNU Make, Bash Shell, Jira, Git

PEER REVIEW CONTRIBUTIONS

Reviewed multiple articles for the following journals / conferences,

- IEEE Access
- IEEE Networking Letters
- IEEE Transactions on Network Science and Engineering
- Elsevier Preventive Veterinary Medicine
- PeerJ
- The 2022 IEEE/ACM conference on Advances in Social Network Analysis and Mining (ASONAM)
- Winter Simulation Conference 2023

SELECTED PRESENTATIONS

- Using Net.Science to perform on-demand contagion simulations – June 2023
- NetSimS (Network Simulation as a Service) within the CINES ecosystem (Biocomplexity Institute Fall Research Meeting) – December 2022.
- A web-based system for contagion simulations on networked populations (IEEE eScience 2022, Salt Lake City, Utah) – October 2022
- A permissioned distributed ledger for farm animal supply chains (Beef Cattle Institute, K-State) – June 2019
- Understanding the role of sexual transmission in the spread of Zika virus (AMCA Annual Meeting, Kansas City, MO) – Feb 2018
- Developing applications using RFC 7252 - Constrained Application Protocol (CoAP) (Samsung, Dhaka, Bangladesh) – Jul 2015
- From schematics to PCB layouts in Proteus Design Suite (Eastern University, Dhaka, Bangladesh) – Dec 2014

AWARDS & HONORS

- “Grade 1” in annual performance evaluation at Samsung (2014).
- “Advanced Level” in the Software Certification Test at Samsung (2016).
- 1st place in the Solution Lab of Samsung R&D Institute Bangladesh in the Software Capability Test (2013).
- Dean’s List Award from Bangladesh University of Engineering and Technology (2010).
- Merit scholarships for being ranked 1st out of 84 enrolled students in the Cisco Networking Academy Program (CNAP) at BUET (2010-2011) in the CCNA Exploration 4.0 course.

ACTIVITIES & LEADERSHIP

- An alumnus of the Leadership Development Program at the Staley School of Leadership Studies, K-State.
- Served as the President of Bangladeshi Students’ Association (2019) at K-State.
- Served as a volunteer of the American Red Cross Club (ARCC) at K-State.