ANIKA TABASSUM

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RESEARCH SUMMARY

My research interests broadly lie in *AI for Science.* I contribute to developing data-driven deep learning models to tackle *dynamic* and *noisy* scientific data to aid expensive high-fidelity scientific simulators. I specialize in *domain generalization* and *deep multimodal learning* mainly revolves around image, time-series/sequential, and spatial data. All my works are interdisciplinary collaborations with domain experts from material science, fusion science, neuroscience, and power systems.

KEYWORDS

Programming: Python, Matlab, Pytorch, C++

Deep Learning: CNN, ResNet, UNet, variants of LSTM, Transformer, Vision Transformer, Image segmentation (SAM, UNeT, Mask-RCNN), NBeats, GAN, GNN, VAE.

Machine Learning: Optimization, Clustering, Classification, Boosting, Scikit-Learn, SVM **Multithread:** Multiprocessing, PyPy, Pytorch DDP

Database: PostgreSQL, SqLite, Pandas.

Softwares: VSCode, Jupyter Notebook, GitHub

Cloud: ORNL Summit, CADES

EDUCATION

Doctor of Philosophy in Computer Science   *October 2021*
Virginia Tech   Advisor: Prof. B. Aditya Prakash

Professional Certificate in Urban Computing   *May 2020*
Virginia Tech

Bachelor of Science in Computer Science and Engineering   *March 2016*
Bangladesh University of Engineering and Technology, Bangladesg

SELECTED PROJECTS

LLM Influenced Knowledge Graph Neural Network *(Sep 2023- present)*

- Develop a graph neural network variants incorporating LLMs and knowledge graphs.
- *Collaborator: National Center for Computational Sciences (NCCS), ORNL*
- *Techniques: LLM (GPT-3), Open Graph Benchmark Models.*

Foundational Image Segmentation for Material Microscopy *(July 2023- present)*

- Develop a foundational image segmentation model to generalize for material microscopy images.
- *Collaborator: Material Science Division, ORNL*
- *Techniques: Foundational models, e.g., Meta SAM, NVIDIA MONAI, Physics-based GAN*

Li-ion battery Temperature Modeling. *(October 2022- August 2023)*

- Develop a deep-learning sequential model to predict a temperature sequence under various conditions of Li-ion battery.
- *Collaborator: Stevens Institute of Technology*
- *Techniques: LSTM, Transformer, Meta-learning*

ReducedOrder Representation for Neuromorphic Chip Simulator. *(April 2023 - September 2023)*

- Design a machine-learning-based surrogate model for brain neural simulator STACS.
- *Collaborator: Sandia National Lab*
- *Techniques: GNN, Transformer*

Data Reduction for Fusion Plasma Simulator. *(June 2022 - December 2022)*

- Develop a data reduction technique for identifying plasma particle distributions fusing XGC gyrokinetic simulation data.
- *Collaborator: Princeton Plasma Physics Lab*
- *Techniques: ResNet, Hypernetworks, Vision Transformer*

CDC Covid-19 Forecasting Challenge. *(March 2020 - September 2021)*

- Predict hospitalizations and mortality for Covid-19 with a data-driven deep-learning model (Placed 1st in Facebook COVID-19 Symptom Data Challenge).
- *Collaborator: Georgia Institute of Technology (Team: DEEP-COVID)*
- *Techniques: Time-series sequential models, Explainable AI*

EXPERIENCE

Postdoctoral Research Associate at Oak Ridge National Lab *(October 2021- Present)*

- Discrete Algorithms, Computations Science & Mathematics Division (CSMD)
- Supervisor: Dr. Ramakrishnan Kannan

Research Internship at Oak Ridge National Laboratory *(May 2019-August 2019)*

- **Smart Neigborhood**: Build a machine learning framework to understand and leverage optimization algorithms for modeling energy usage in smart electric meters.

Teaching Assistant at Virginia Tech *(August 2018-May 2019)*

- CS 2114: Software Design & Data Structure

Teaching Assistant at Virginia Tech *(August 2017-May 2018)*

- CS 1114: Introduction to Software Design

AWARDS

- Rising Stars in Computational & Data Sciences, University of Texas Austin, 2023.
- Outstanding Postdoc researcher award in Computer Science and Mathematics Division (CSMD), 2022.
- Facebook COVID-19 Symptom Data Challenge, 1st prize (Team *DEEP OUTBREAK*), 2020.
- NSF Fellowship, 2019-21.
- Travel award SIGKDD, 2019 & 2020.

INVITED TALKS

- Success and Failure Analysis of Foundational and Few-shot Image Segmentation Models as a Case Study on Microstructure Characterization at Monterey Data Conference 2023, ORNL AI Expo 2023.
- Temperature Modeling through Invariance Learning Representation for ensuring Li-ion Battery Safety at ORNL AI Expo 2023.
- Data-driven and Knowledge-driven Deep learning Models for battery Safety Modeling at Mathematics in Computer Science seminar, ORNL, 2023.
- Deep Curriculum Learning for Multi-scale Battery Reconstruction at ORNL Postdoc Research Symposium (ORPA), 2022.
- Machine Learning Models for Critical Infrastructures at Women in Data Science (wIDS), Blacksburg, 2021.
- Connecting Critical Infrastructures through Explainable and Network-based Models at UrbComp Seminar, Virginia Tech, 2020.
- Urban-Net: A System to Understand and Analyze Critical Infrastructure Networks for Emergency Management at KDD 2019.

SELECTED PUBLICATIONS

DISSERTATION

- Explainable and Network-based Approaches for Decision-making in Emergency Management. Anika Tabassum. PhD Dissertation, Virginia Tech 2021.

UNDER REVIEW

- Reinforcement Learning Prediction Cascades: A Case Study for Image Segmentation. Bharat Srikishan, **Anika Tabassum**, Ramakrishnan Kannan, Srikanth Allu, Nikhil Muralidhar.
- Modeling Thermal Runaway Countering Data Paucity through Adversarial Invariant Encoding. **Anika Tabassum**, Srikanth Allu, Ramakrishnan Kannan, Nikhil Muralidhar.

PEER REVIEWED JOURNAL & CONFERENCES

- **Anika Tabassum**, Nikhil Muralidhar, Ramakrishna Kannan, Srikanth Allu. MatPhase: Material Phase Prediction for Li-ion Battery Reconstruction using Curriculum Learning. IEEE BigData 2022 (to appear).
- **Anika Tabassum**, Supriya Chinthavali, Sangkeun Lee, Bill Kay, Nils Stenvig, and B. Aditya Prakash. Efficient Contingency Analysis in Power Systems via Network Trigger Nodes. IEEE BigData 2021.
- **Anika Tabassum**, Supriya Chinthavali, Varisara Tansakul, and B. Aditya Prakash. Actionable Insights in Urban Multivariate Time-series. ACM CIKM 2021.
- Alexander Rodriguez, **Anika Tabassum**, Jiaming Cui, Jiajia Xie, Javen Ho, Pulak Agarwal, Bijaya Adhikary, and B. Aditya Prakash. DeepCOVID: An Operational DL-driven Framework for Explainable Real-time COVID-19 Forecasting. Annual Conference on Innovative Applications of Artificial Intelligence (IAAI) 2021.
- Alexander Rodriguez, Nikhil Muralidhar, Bijaya Adhikary, **Anika Tabassum**, Naren Ramakrishnan, B. Aditya Prakash. CALINET: Steering a Historical Disease Forecasting Model Under a Pandemic. AAAI 2021.
- Nikhil Muralidhar, **Anika Tabassum**, Liangzhe Chen, Supriya Chinthavali, Naren Ramakrishnan, and B. Aditya Prakash. Cut-n-Reveal: Timeseries segmentations with explanations. ACM Transactions on Intelligent Systems and Technology (TIST) May 2020.

- Sorour E. Amiri, **Anika Tabassum**, E. Thomas Ewing, and B. Aditya Prakash. Tracking and analyzing dynamics of news-cycles during global pandemics: a historical perspective. ACM SIGKDD Explorations Vol. 21 Issue 2 December 2019.

- **Anika Tabassum**, Supriya Chinthavali, Sangkeun Lee, Liangzhe Chen, B. Aditya Prakash. Urban-Net: A System to Understand and Analyze Critical Infrastructure Networks for Emergency Management. ACM SIGKDD 2019.

- **Anika Tabassum**, Sukarna Barua, Tanzima Hashem and Tasmin Chowdhury. Dynamic Group Trip Planning Queries in Spatial Databases. SSDMB 2017.

PEER REVIEWED WORKSHOPS

- **Anika Tabassum**, Nikhil Muralidhar, Ramakrishnan Kannan, and Srikanth Allu. Li-ion Battery Material phase prediction through Hierarchical Curriculum Learning. AI for Science Workshop, NeuRIPS 2022.

- Bill Kay, Hao Lu, Pravallika Devineni, **Anika Tabassum**, Supriya Chintavali, and Sangkeun Lee.Identification of Critical Infrastructure via PageRank. IEEE BigData (BTSD). 2021.

- Alexander Rodriguez, Nikhil Muralidhar, Bijaya Adhikary, **Anika Tabassum**, Naren Ramakrishnan, and B. Aditya Prakash. Steering a Historical Disease Forecasting Model Under a Pandemic: Case of Flu and COVID-19. NeuRIPS Workshop on Machine Learning in Public Health (MLPH), 2020.

- Pravallika Devineni, Bill Kay, Hao Lu, **Anika Tabassum**, Supriya Chintavali, and Sangkeun Lee. Towards Quantifying Vulnerabilities in Critical Infrastructure Systems. IEEE BigData Workshop on Big Data Tools, Methods, and Use Cases for Innovative Scientific Discovery (BTSD), 2020.

- Supriya Chinthavali, Varisara Tansakul, Sangkeun Lee, **Anika Tabassum**, JeffMunk, Jan Jakowski, Michael Starke, Teja Kuruganti, Heather Buckberry, JimLeverette. Quantification of Energy Cost Savings through Optimization and Control of Appliances within Smart Neighborhood Homes. ACM International Workshop on Urban Building Energy Sensing, (UrbSys), 2019

SURVEY ARTICLE

- Supriya Chinthavali, Varisara Tansakul, Sangkeun Lee, Matthew Whitehead, **Anika Tabassum**, and others. COVID-19 Pandemic Ramifications on Residential Smart Homes Energy Use Load Profiles. In Proc. of Energy and Buildings, Volume 259, pp 111847, (Elsevier) 2022. .

- Cramer, Estee Y., et al. Evaluation of individual and ensemble probabilistic forecasts of COVID-19 mortality in the US. In Proc. of the National Academy of Sciences of U.S.A. (PNAS) 2022.

- **Anika Tabassum**, Supriya Chinthavali, Liangzhe Chen, and B. Aditya Prakash. Data Mining Critical Infrastructure Systems: Models and Tools. IEEE Intelligent Informatics Bulletin, 2018.

SERVICES

Program Committee *(2017-2023)*

- AAAI 2024
- NeurIPS 2023, ,
- ICML Synergy of Scientific ML and Modeling 2023
- ECML PKDD 2022, 2023
- IEEE Big Data 2022.

Workshop Organizer *(2022)*

- IEEE BigData Tools, Methods, and Use-cases for Innovative Scientific Discovery (BTSD) Workshop 2022.

Professional Society *(2023)*

- ACM, SIAM

Session Chair *(2021)*

- ECML PKDD

Reviewer *(2017-present)*

- ACM, SIAMICDM, KDD, WWW, SDM, TKDD, IEEE BigData, ECML PKDD, IEEE TPAMI.