Nurali Virani, Ph.D. Lead Scientist, Machine Learning, GE Research

Role/Expertise: Co-Principal Investigator, ACAMS. Surrogate modeling, uncertainty quantification, continual learning, and model adaptation.

Citizenship: India

Clearances: None

Education:
The Pennsylvania State University, Ph.D. Mechanical Engineering, 2017
The Pennsylvania State University, M.S. Electrical Engineering, 2016
The Pennsylvania State University, M.S. Mechanical Engineering; 2015
Indian Institute of Technology (IIT) Kharagpur, M. Tech. Industrial Engineering, 2011
Indian Institute of Technology (IIT) Kharagpur, B. Tech. Manufacturing Science, 2011

Relevant Experience: Dr. Nurali Virani is a multidisciplinary researcher with a strong academic and research background in machine learning, statistical modeling, optimization theory, sensor fusion, signal processing, and mechatronics. He has worked on several projects including: 1) data-driven modeling and control of wind farms, 2) data-driven safe control of power generation gas turbine units, and 3) characterizing robustness of ML models. He was also a key researcher in the DARPA ASKE program to automatically create computational graphs from semantic knowledge graphs curated from code, documentation, and publications with human-in-the-loop. His current research interest is in making AI aware of its competence and to improve its competence and robustness via continuous learning (Humble AI) as well as making AI consistent with human knowledge. He was awarded GE Global Research CTO Technology Award (5 Under 5) for Outstanding Research in 2018 as well as 2019 Rudolph Kalman Best Paper Award by ASME. He was awarded a silver medal for academic excellence, when he graduated from Indian Institute of Technology in 2011. Dr. Virani has 35 peer-reviewed publications as well as 3 patents.

Relevant Publications and Patents:

[1] **Virani, N.**, Yang, Z., and Iyer, N., Justification-Based Reliability in Machine Learning. In AAAI Conference on Artificial Intelligence, 2020.

[2] **Virani, N.**, 2017. Learning Data-Driven Models for Decision-Making in Intelligent Physical Systems, Ph.D. dissertation.

[3] **Virani, N.** and Srivastav, A., General Electric Co, 2020. Method and system for competence monitoring and continuous learning for control. U.S. Patent Application 16/222,279.

[4] Crapo, A.W., **Virani, N.** and Mulwad, V., General Electric Co, 2020. Method and system for principled approach to scientific knowledge representation, extraction, curation, and utilization. U.S. Patent Application 16/791,617.

[5] **Virani, N.**, Lee, J.W., Phoha, S. and Ray, A., Learning Context-Aware Measurement Models, 2015 American Control Conference (ACC), pp. 4491–4496, IEEE, *Best Presentation in Session (Machine Learning) Award*, July 2015.

[6] **Virani, N.**, Lee, J.W., Phoha, S. and Ray, A., Information-Space Partitioning and Symbolization of Multi-Dimensional Time-Series Data using Density Estimation, 2016 American Control Conference (ACC), pp. 3328-3333, IEEE, 2016.

[7] **Virani, N.**, Phoha, S. and Ray, A., Learning from Multiple Imperfect Instructors in Sensor Networks, IEEE Transactions on Neural Networks and Learning Systems, 99, pp.1–7, 2018.

[8] Liu, G., Stephenson, H., Shahkarami, A., Murrell, G., Klenner, R., Iyer, N., Barr, B. and **Virani, N.,** 2019, April. Accelerated Completion Optimization with Uncertainty Reduction Through Coupled Data and Physics Based Hybrid Models. In *SPE Oklahoma City Oil and Gas Symposium*. Society of Petroleum Engineers.