## "CYBER- RESILIENCE OF THE POWER GRID"

**The resilience and cybersecurity of the power grid are of paramount importance. Given the potential consequences of a successful cyberattack on the grid, proactive measures are essential to mitigate these risks effectively. Traditional cybersecurity methods such as firewalls, access controls, and antivirus software have limitations when applied to power systems. These approaches tend to be reactive, focusing on known threats and vulnerabilities. Furthermore, they often lack real-time insight into the dynamic behavior of the grid. This is where digital twins and machine learning can play a transformative role.**

Please mark your calendar for the 30th April 2024
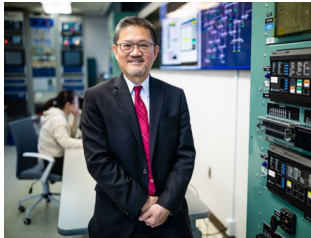
Time: 8:30 AM- 1:00 PM

Venue: Kelly Hall, Room 310

Registration is required for the workshop and lunch is served !!!
Registration Link

# Workshop Schedule

| Time | Name | Affiliation | Topic |
|------|------|-------------|-------|
| 08:30-09:00 | NETWORKING BREAKFAST | | |
| 09:00 – 09:10 | Gretchen Matthews | Professor and Director - CCI Southwest Virginia | Opening Remarks |

| Time | Speaker | Title | Topic |
|---|---|---|---|
| 09:10 – 09:15 | Chen-Ching Liu | Director - Power & Energy Center | Welcome Remarks |
| 09:15 – 09:40 | George Keller | SCADA Manager at AEP Transmission | SCADA/EMS, Communication Technologies, Field Devices, and NERC CIP Regulations |
| 09:40 – 10:05 | Madhav Marathe | Distinguished Professor and Executive Director of the Biocomplexity Institute. Professor in the Department of CS at University of Virginia (UVA) | Digital Twin of Integrated Energy Systems with Applications to Cascading Failure Analysis |
| 10:05 – 10:30 | Ali Mehrizi-Sani | Associate Professor, Bradley Department of Electrical and Computer Engineering at Virginia Tech | Renewables and Cybersecurity: Friends or Foes? |
| **10:30-10:45** | **BREAK** | | |
| 10:45 – 11:10 | Ming Jin | Assistant professor, Bradley Department of Electrical and Computer | Exploring "Antifragility": Concepts, Applications, and Open Problems |

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|---|---|---|---|
| |  | Engineering at Virginia Tech | |
| 11:10 – 11:35 | Chi Ta  | Assistant Professor, Agricultural & Applied Economics at Virginia Tech | Quantifying the Importance of Electricity Resilience: Leveraging Secondary and Primary Data |
| 11:35 – 12:00 | Chen-Ching Liu  | American Electric Power Professor and Director, Power and Energy Center at Virginia Tech | Digital Twins for Cyber-Resilience of the Power Grid |
| 12:00-1:00 | **LUNCH AND DISCUSSION** | | |

**George Keller** is a 42-year veteran of American Electric Power currently serving as SCADA Manager for AEP Transmission. George has over 35 years' experience with SCADA; from RTUs, protocols, control center systems, and designed and developed the current SCADA system used for the Eastern AEP Transmission System. George is currently on special assignment as technical lead for the integration of a new vendor supplied SCADA/EMS system for the entire AEP Transmission footprint. During his tenure he has seen the transition from serial RTU communications using analog modems to the now prevalent TCP/IP digital communications, cyber security controls grow from essentially nothing to the NERC CIP standards, great advances in SCADA/EMS/RTU related technologies, as well as the advent of State Estimation in Control Centers. George is a 1981 Electrical Engineering graduate of Virginia Tech, a licensed professional engineer, and a member of the IEEE.

**Madhav Marathe** is a Distinguished Professor in Biocomplexity, the Executive Director of the Biocomplexity Institute, and a Professor in the Department of Computer Science at the University of Virginia (UVA). His research interests are in network science, Sustainable habitats, AI, foundations of computing. During his 30-year professional career, he has established and led several transdisciplinary groups. In that period, he and his colleagues

have supported federal and state authorities in their effort to respond to several problems arising in the context of national security, sustainability, and pandemic science, including, the COVID-19 pandemic. Before joining UVA, he held positions at Virginia Tech and the Los Alamos National Laboratory. He is a Fellow of the IEEE, ACM, SIAM, AAIA and AAAS. He has published more than 500 articles in peer reviewed journals, conferences, and workshops. Mentoring and training next generation scientists has been his life-long passion.

Joint work with: Rounak Meyur, Anamitra Pal, Mina Youssef, Christopher L. Barrett, Achla Marathe, Stephen Eubank, Anil Vullikanti, Virgilio Centeno, Simon Levin, H. Vincent Poor, Arun Phadke, Swapna Thorve, Samarath Swarup, Henning Mortveit and late Jim Thorp.

**Ali Mehrizi-Sani** received the Ph.D. degree in electrical engineering from the University of Toronto in 2011. He is currently an Associate Professor with Virginia Tech. He is a Senior Editor for IEEE Transactions on Energy Conversion and is or has been on the editorial board of IEEE Transactions on Power Delivery, IEEE Transactions on Power Systems, IEEE Power Engineering Letters, and IET Generation, Transmission and Distribution. Among his recognitions are the 2018 IEEE PES Outstanding Young Engineer Award and the 2017 IEEE Mac E. Van Valkenburg Early Career Teaching Award.

**Ming Jin** is an assistant professor in the Bradley Department of Electrical and Computer Engineering at Virginia Tech. He was a postdoctoral researcher in the Department of Industrial Engineering and Operations Research at University of California, Berkeley. He received his doctoral degree from EECS department at University of California, Berkeley in 2017. Ming's expertise focuses on computational intelligence and trustworthy AI for engineering systems, emphasizing safety and alignment. He is particularly interested in developing technology to advance the cyber-resilience of power grids. Ming is the recipient of Virginia's Commonwealth Cyber Initiative Research Innovation Award, Siebel Scholarship, Amazon-VT Initiative Research Awards, and three Best Paper Awards. His group won first place in the 2021 CityLearn Challenge.

**Chi Ta** is an energy and environmental economist interested in policy evaluation, policy design, and incentive mechanisms to promote conservation and sustainability. She examines measures to reduce emissions, enhance energy efficiency, and promote renewable energy. Additionally, she studies policies aimed at enhancing the economic and environmental welfare of underserved communities and analyzes the effects of the energy transition on agriculture and rural areas. She combines different theoretical and empirical strategies in her research, such as general equilibrium modeling, optimal control theories, randomized control trials, and natural or policy experiments.

**Chen-Ching Liu** is American Electric Power Professor and Director, Power and Energy Center, at Virginia Tech. During 1983-2017, he was on the faculty of University of Washington, Iowa State University, University College Dublin (Ireland), and Washington State University. Professor Liu received an IEEE Third Millennium Medal in 2000 and the Power and Energy Society Outstanding Power Engineering Educator Award in 2004. He chaired the IEEE Power and Energy Society Fellow Committee, Technical Committee on Power System Analysis, Computing and Economics, and Outstanding Power Engineering Educator Award Committee. Professor Liu is the U.S. representative on the CIGRE Study Committee D2, Information Systems and Telecommunication. He is a Life Fellow of the IEEE, Member of Virginia Academy of Science, Engineering, and Medicine, and Member of the U.S. National Academy of Engineering.