Department of Computer Science
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**COMPUTER SCIENCE COLLOQUIUM**

# Secure and Resilient Smart Living CPS: A Unified Data Science Approach


SPEAKER **Dr. Sajal K. Das**

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VENUE CS Seminar Room, Y6405, Yellow Zone, Yeung Kin Man Academic Building, City University of Hong Kong, Kowloon Tong, Hong Kong

## ABSTRACT


Cyber-physical systems (CPS), such as smart grid, smart transportation, smart water distribution networks, smart manufacturing, smart healthcare, smart agriculture, and so on help improve human quality of life. However, these systems are vulnerable to a wide variety of attacks/threats (e.g., false data injection, data poisoning, evasion, deliberate data manipulation or perturbation) and extreme-weather events causing system malfunctions. Detecting and interpreting such threats in real time is vital to proactively respond to the underlying cause and prevent immediate impacts on civilians and the economy. Threats manifest themselves as anomalies in the sensing data and can be modeled as an anomaly detection problem, where we first learn the underlying structure of benign behavior and then detect anomalies as deviations from the learned structure. This talk will propose a unified theory for detecting anomalies (threats) in smart living CPS in a lightweight, timely, and unsupervised manner. The approach is based on computing new invariants and latent space using time series data analytics, machine learning, information theory, prospect theory, and reputation scoring models. The unified theory will be applied to real-world data collected from multiple CPS domains such as smart energy metering, smart transportation, and smart water metering. The talk will be concluded with future research directions.


## BIOGRAPHY

Dr. Sajal K. Das is a Curators' Distinguished Professor of Computer Science and Daniel St. Clair Endowed Chair at Missouri University of Science and Technology, Rolla where he was the Chair of Computer Science Department during 2013-2017. Previously, he served the NSF as a Program Director in the CISE directorate. His interdisciplinary research interests include cyber-physical systems, IoT, drones, cybersecurity, machine learning, data science, wireless and sensor networks, mobile and pervasive computing, smart environments, edge/cloud computing, and applied graph theory and game theory. He has contributed significantly to these areas and published extensively in high quality journals and peer-reviewed conference proceedings, numerous book chapters, 4 books, and 5 US patents. Dr. Das has directed funded projects totaling over $24 million. According to Google Scholar, his h-index is 99 with more than 41,500 citations. He is the founding Editor-in-Chief of Elsevier's Pervasive and Mobile Computing journal and serves as an Associate Editor of the IEEE Transactions on Dependable and Secure Computing, IEEE Transactions on Mobile Computing, IEEE Transactions on Sustainable Computing, ACM/IEEE Transactions on Networking, and ACM Transactions on Sensor Networks. A founder of the IEEE PerCom, IEEE WoWMoM, IEEE SMARTCOMP, and ACM ICDCN conferences, he served as the General and Technical Program Chair of numerous conferences. He is a recipient of 12 Best Paper Awards at prestigious conferences including ACM MobiCom and IEEE PerCom. He also received several awards for teaching, mentoring, research, and innovation including the IEEE Computer Society's Technical Achievement award and the University of Missouri System President's Award for Sustained Career Excellence. Dr. Das graduated 11 postdoctoral fellows, 51 PhD and 31 MS thesis students. He is a Distinguished Alumnus of the Indian Institute of Science, Bangalore, and a Fellow of the IEEE, National Academy of Inventors (NAI), and Asia-Pacific Artificial Intelligence Association (AAIA).

**All are welcome!**

*In case of questions, please contact Prof. LIANG Weifa at weifa.liang@cityu.edu.hk, or visit the CS Departmental Seminar Web at https://www.cs.cityu.edu.hk/events/cs-seminars/recent-cs-colloquiums.*