



On Securing the Next Generation of Critical Infrastructure Systems



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ABSTRACT

Cyber-Physical Systems (CPS) provide the foundation for our critical infrastructure systems, such as energy, transportation, and manufacturing, to name a few. Although CPS are already ubiquitous in our society, their security aspects were only recently incorporated into their design process, mainly in response to catastrophic incidents caused by cyber-attacks. One common class of attacks on CPS is called data-deception attacks, which involve an attacker hijacking the CPS sensors. In this talk, we focus on two questions: (1) How can we model and analyze CPS under data-deception attacks? (2) Can we automatically find vulnerabilities of a given CPS to data-deception attacks? We present a general control framework to help engineers detect and address data-deception vulnerabilities in CPS. This framework can answer the following types of questions: Does the attacker go undetected by an intrusion monitor? What is the likelihood of a safety violation? What information does the attacker need to be successful? We demonstrate that this control framework can analyze realistic case studies by detecting several vulnerabilities in a water treatment testbed and an aircraft power distribution testbed. We discuss how our formal approach can improve the security of the next generation of critical infrastructure systems by reducing vulnerabilities to data-deception of attacks.

BIOGRAPHY

Rômulo Meira-Góes is an Assistant Professor in the Department of Electrical Engineering at Penn State. Previously, he was a postdoctoral researcher working with Eunsuk Kang, Stavros Tripakis, and Stéphane Lafortune at Carnegie Mellon University and the University of Michigan. In 2022, he received the inaugural CPS rising stars award from UVA. He received his Ph.D. in Electrical and Computer Engineering from the University of Michigan in 2020, working with Stéphane Lafortune. Prior to the University of Michigan, he earned his B.S. degree in Electrical Engineering from the Universidade Tecnológica Federal do Paraná - Curitiba in 2015.