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Automatic Control and Systems Engineering

The Department of Automatic Control & Systems Engineering
is pleased to announce the following seminar:

Information-Theoretic Data Injection Attacks on the Smart Grid

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Via Google Meet

Host Academic: Dr Inaki Esnaola, ACSE

Abstract

Data injection attacks (DIAs) are one of the principal cybersecurity threats that the smart grid faces. In this kind of data-integrity vulnerability, the attacker compromises the measurements gathered by sensors to disrupt the state estimation of the power system. This talk first introduces the power system state estimation and the DIA formulation within the deterministic framework and the Bayesian framework. Then information-theoretic measures are introduced to evaluate the quantification of the disruption induced by the DIAs and of the resulting probability of detection. We discuss the case in which the attacker aims to maximize the information loss induced by the attack and to minimize the probability of detection simultaneously, for which a tradeoff strategy is introduced to balance the opposing objectives. Since information-theoretic attacks require the second order statistics of the state variables, accessing imperfect second-order statistics in a practical setting leads to degradation in the attack performance, which is analysed using random matrix theory tools for both the nonasymptotic scenario and the asymptotic scenario.

Biography

Dr. Ke Sun received the B.Eng. degree in Automation from the Shandong University of Science and Technology, Qingdao, China, in 2012, the first M.Sc. degree in Control Theory and Control Engineering from Tongji University, Shanghai, China, in 2015, the second M.Sc. degree in Automation Engineering from the University of Bologna, Bologna, Italy, in 2015, and the Ph.D degree in Automatic Control and Systems Engineering from University of Sheffield, Sheffield, UK, in 2020. He is currently a Postdoctoral Research Associate in the Department of Automatic Control and Systems Engineering (ACSE), University of Sheffield.
Recognition of his work includes the 2020 ACSE prize and the Honorable Mention Award within the Engineering Science Category in the 2020 Doctoral Research Award. His research interests include security of cyber-physical systems, information theory, and random matrix theory. He also serves as a reviewer for several journals and conferences, including IET Smart Grid Journal, IEEE Internet of Things Journal, and IEEE Transactions on Industrial Informatics.