IEEE BDA Tutorial Series: Big Data & Analytics for Power Systems

Power System Protection and Big Data - Challenges and Opportunities

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Abstract: Machine learning (ML) is a promising field that is predicted to improve and even revolutionize many engineering processes. Power systems literature contains a significant number of papers dedicated to furthering applications of ML to different analyses and practices, among them power system protection. After more than fifteen years of published papers, not a single commercial relay uses ML for either primary or backup protection. On the other hand, the quantity and quality of real-time data measured in transmission and distribution systems have increased and this trend is likely to continue. Legacy protection systems have come under scrutiny in recent times due to their uncertain and even unacceptable performance in presence of significant renewable resources. Real-time detection of relay misoperations that compromise the security aspect of protection has always remained elusive to protection engineers.

This presentation will first focus on hurdles that have prevented ML-based protection applications from becoming a commercial reality. Then areas where legacy protection has space for improvement will be highlighted. Finally results from presenter's NSF-funded project will be shared that illustrate both promises and challenges in developing an ML based application to detect relay misoperations.

Bio: Dr. Sukumar Brahma received his Bachelor of Engineering from Gujarat University, India, Master of Technology from the Indian Institute of Technology, Bombay, and Ph.D. in from Clemson University, USA; all in Electrical Engineering. He is Dominion Energy Distinguished Professor in Power Engineering and director of Clemson University Electric Power Research Association (CUEPRA) at Clemson university. Before joining Clemson he was William Kersting Endowed Chair Professor at New Mexico State University, USA. Dr. Brahma has chaired the IEEE Power and Energy Society's Education Committee, Distribution System Analysis Subcommittee, and is a member of the Power System Relaying and Control Committee (PSRCC). He has been an editor and guest EIC for IEEE Transactions on Power Delivery. His research interests span across diverse areas of electrical engineering and computer science to holistically approach the emerging problems in power system protection. Dr. Brahma is a Distinguished Lecturer and a Fellow of the IEEE.

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