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TOPIC: Machine Learning Classifiers for Emergent Behavior in Complex Systems and System-of-Systems

ABSTRACT: With increasing system complexity, achieving confidence in systems becomes increasingly difficult. With the recent trend towards significant footprint of complex system's functionality being governed by machine learning based models and algorithms, there is a need to ensure that emergent behavior associated with such systems are well analyzed and understood. This presentation discusses an approach that involves developing machine learning classifier models that learns on potential negative and positive emergent behaviors. The machine learning model observes the various MOEs (Measures of Effectiveness) and MOPs (Measures of Performance) and learns the nature of emergent behavior. The approach is illustrated through two examples - one at system level for pitch control of an aircraft, and another at system-of-system level for a swarm of UAVs.

DATE & TIME: SATURDAY, JULY 31, 2021 at 3:30 PM IST

ABOUT THE SPEAKER: Dr. Ramakrishnan Raman received his B. Tech and MS degrees from IIT Madras, and Ph.D. from IIIT-Bangalore. He is a certified Six Sigma Black Belt and is INCOSE Certified Expert Systems Engineering Professional - ESEP. He has over 24 years of extensive systems and software engineering experience in the Building/Industrial Automation and Aerospace domains. He has to his credit several publications in refereed international conferences & journals of complex systems architecture design and Artificial Intelligence - Machine Learning. He is active in the professional societies, including IEEE, INCOSE and SAE. He has received many organizational awards including 2010 Honeywell Technology Solutions Annual Leadership Excellence Award. In the year 2016, he received the Outstanding Service Award from the International Council on Systems Engineering at Edinburgh, Scotland. He has also been the Technical Program Chair for international conferences including 2016 & 2019 Asia Oceania 31st Systems Engineering Conference, and the INCOSE International Symposium. He actively interacts with various academic institutions, and is currently Guest Faculty at IIT Bombay Aerospace Department, and Adjunct Faculty at Department of Instrumentation & Control Engineering at Manipal Institute of Technology. He is IEEE Senior Member and Chair-IEEE Bangalore Section Systems Council, Member -SAE India Aerospace forum.

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