**Simulation Analytics for Cyber Physical Systems**

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**Abstract**

We propose to organize a special session on Simulation Analytics in the upcoming CASE2020. Simulation analytics is an umbrella to cover the following research topics for dealing with new challenges for integrating simulation, data, and decision making. First, data-driven simulation modeling: how to extend the data-driven ideas to complex stochastic models that provide causal representations for real data-generating processes. In machine learning, the data-driven concept is limited to relatively simple black-box models that fit the data well statistically but offer no causal presentation. Second, simulation input uncertainty: how to quantify input uncertainty in analyzing the performance of simulation models. In data-driven stochastic modeling, input uncertainty is inevitable. Third, simulation-based learning: how to efficiently learn an optimal decision surface for a simulation model under all possible scenarios of the environment. Previous

performance analysis has been based on point estimates by simulating the model under given scenarios, but these scenarios may not accurately reflect the real environment due to input uncertainty. Last, simulation-assisted prognostics: how to use a simulation model driven by currently observed data to generate future and hidden data, so that prognostic decisions can be made using the simulated data.