# UNIVERSITY OF SOUTH FLORIDA

## *Major Research Area Paper Presentation*

*Efficient Algorithms and Methods for Analyzing Probabilistic Models*
*by*
*Mohammad Ahmadi*

*For the Ph.D. degree in Computer Science and Engineering*

In order to model temporal stochastic behavior of systems, probabilistic formalisms such as Continuous Time Markov Chains (CTMCs) can be used. Model checking algorithms and probabilistic model checkers such as PRISM are developed to calculate the probability of well-defined properties on these models. Prominent probabilistic model checkers require the model's state-space to be finite and cannot be used to check infinite state models. Moreover, they don't produce a counterexample in case the property is refuted. This paper presents a Bounded Model Checking (BMC) framework that utilizes SMT-solving to analyze probabilistic models with infinite state-spaces. In case a property is refuted, this framework is able to return a relatively small counterexample, facilitating debugging of the model.
Statistical model checking can be used to analyze probabilistic models in cases where the model's state-space is too large for probabilistic model checkers. A comparison of weighted Stochastic Simulation Algorithms is also presented in this paper studying the viability of these algorithms for estimating the probability of rare events.

*Wednesday, November 30th, 2022*
*1:00 PM*
*ENB 313 and Microsoft Teams*

THE PUBLIC IS INVITED

*Examining Committee*
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