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Learning Augmented Algorithms for MDPs

Wednesday, June 19, 2024 9:30 AM (1 hour)

Abstract: Making use of modern black-box AI tools such as deep reinforcement learning is potentially transformational for sustainable systems such as data centers, electric vehicles, and the electricity grid. However, such machine-learned algorithms typically do not have formal guarantees on their worst-case performance, stability, or safety. So, while their performance may improve upon traditional approaches in "typical" cases, they may perform arbitrarily worse in scenarios where the training examples are not representative due to, e.g., distribution shift. Thus, a challenging open question emerges: Is it possible to provide guarantees that allow black-box AI tools to be used in safety-critical applications? In this talk, I will provide an overview of an emerging area studying learning-augmented algorithms that seeks to answer this question in the affirmative. I will survey recent results in the area, focusing on online optimization and MDPs, and then describe applications of these results to the design of sustainable data centers and electric vehicle charging.

Session Classification: Keynote: Adam Wierman (Caltech)