Ph.D. DISSERTATION DEFENSE

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Degree: Doctor of Philosophy
School/Department: Computer Science
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Title: Trust in the AI-R

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ABSTRACT

The call for trustworthy AI has been a long pursuit, yet still far to reach. My thesis joins the initiative that brings three trustworthiness aspects, Accuracy, Interpretability, and Resilience (AI-R), under one umbrella. Unlike conventional approaches striving to balance AI-R aspects by sacrificing model performance for interpretability or compromising transparency for resilience, we take a unique direction and show that model interpretation helps to improve prediction quality and model resilience. Our methods advance attention mechanisms, LIME, SHAP, self-learn post-hoc explainability models, and incorporate model-intrinsic techniques into a multi-agent reinforcement learning (MARL) framework. Extensive experiments demonstrate that our methods boost model AI-R over various tasks in computational linguistics, the Markov game, criminal analysis, and financial decisions, including (1) significant improvement in machine translation accuracy in large-scale; (2) speedup of the model adaptation time when new agents join in MARL competitive and collaborative games; (3) mitigating algorithmic bias in criminal charges and financial decision-making. This dissertation is among the works taking the first step in unifying previously unaligned AI-R perspectives into one goal for trustworthy AI.