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VerifAI: A Toolkit for the Formal Design and Analysis of Artificial Intelligence-Based Systems

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Abstract

We present VerifAI, a software toolkit for the formal design and analysis of systems that include artificial intelligence (AI) and machine learning (ML) components. VerifAI particularly addresses challenges with applying formal methods to ML components such as perception systems based on deep neural networks, as well as systems containing them, and to model and analyze system behavior in the presence of environment uncertainty. We describe the initial version of VerifAI, which centers on simulation-based verification and synthesis, guided by formal models and specifications. We give examples of several use cases, including temporal-logic falsification, model-based systematic fuzz testing, parameter synthesis, counterexample analysis, and data set augmentation.

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    Daniel J. Fremont and
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}
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