NJIT

Department of Computer Science

Neural Solvers for Fast, Accurate Probabilistic Inference

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Hosted by: Cristian Borcea

Date: Friday, January 24, 2025
Coffee: 11:15 AM – 11:30 AM
Time: 11:30 AM – 12:30 PM
Location: GITC 3600 (3rd floor Seminar Lecture Hall)

Zoom Link: https://njit-edu.zoom.us/j/96354041939?pwd=Ov5BacyCnwF4Xp1jERRb0cEgjVrOPq.1

Abstract:
Deep learning has revolutionized fields such as image recognition, robotics, and speech processing, but it continues to encounter major challenges in critical situations. Specifically, deep models often misinterpret occlusions, generate incorrect outputs in adversarial environments, or fail to generalize under distributional shifts. By integrating symbolic and probabilistic reasoning into deep learning, these limitations can be addressed, providing systems that are more interpretable, consistent, and capable of handling uncertainty. Neuro-symbolic-probabilistic models (NSPMs) merge deep learning's perceptual strengths with structured reasoning, making AI both more reliable and explainable. However, inference in these models remains a challenge—exact inference is NP-hard and generally intractable in practical applications

In this talk, I will present my ongoing research on "neural solvers" that enable scalable and accurate inference within NSPMs, making them viable tools for real-time systems. I will also showcase how these solvers improve efficiency, reducing inference times from seconds to microseconds. Through experimental results and practical use cases, I will demonstrate how these advancements pave the way for deploying NSPMs in time-sensitive applications, where rapid, accurate decision-making is crucial.

Bio:
Shivvrat Arya is a Ph.D. candidate in Computer Science at the University of Texas at Dallas, advised by Dr. Vibhav Gogate and Dr. Yu Xiang. His research lies at the intersection of machine learning, deep learning, and computer vision, specializing in tractable neurosymbolic AI for explainable and efficient inference. Shivvrat's work has earned Best Paper awards, spotlight, and oral presentations at prestigious AI/ML conferences such as NeurIPS and AAAI. Supported by DARPA, NSF, and AFOSR funding, his projects include neural solvers for NP-Hard constrained and unconstrained inference tasks in graphical models, explainable video activity recognition, AR-based predictive task guidance systems, and procedural video error detection datasets.