DEPARTMENT of ISE
UNIVERSITY of HOUSTON

ISE FRIDAY SEMINAR
BROADEN HORIZONS | EXTEND MINDS

Professor Chase Rainwater
Department Head of Industrial Engineering
University of Arkansas
Fayetteville, AR

Date: Friday, March 13, 2026

Time: 1 - 1:50 pm

Location: SW 101

Guided Reinforcement Learning for the Traveling Salesman Problem

Abstract: This work proposes a hybrid optimization framework that integrates Simulated Annealing(SA) with a Deep Reinforcement Learning (DRL) policy to enhance local search for the Traveling Salesman Problem (TSP). Instead of relying on random 2-opt moves, we train an LSTM-based policy network to learn a proposal distribution over better edge swaps using Proximal Policy Optimization (PPO). At each step of the SA rollout, the policy receives features derived from the current tour and outputs probability distributions over 2-opt start and end indices. The policy generates candidate 2-opt swaps from the current tour which are evaluated through SA's temperature-controlled Metropolis acceptance rule. This preserves SA's ability to explore globally and guides it toward consistently better moves learned through PPO. We hypothesize that the resulting DRL-guided SA system will reach near-optimal tours in fewer iterations, as the learned policy replaces random exploration with neural guidance.

Biography: Dr. Chase Rainwater is Professor and Department Head of Industrial Engineering at the University of Arkansas. Dr. Rainwater holds a Ph.D. in Industrial and Systems Engineering from the University of Florida and a B.S. in Industrial Engineering from the University of Arkansas. His research spans operations research, logistics, network optimization and machine learning applications. Dr. Rainwater has secured more than $20 million in research funding government agencies, industry and foundations. He was recognized as a Fellow of both the Institute of Industrial and Systems Engineers and the University of Arkansas Teaching Academy, and has received multiple awards for teaching, research, and service. Dr. Rainwater led the University of Arkansas' AI Task Force and currently serves as the University's Provost Fellow for AI. He is also a member of the Southeastern Conference's AI Consortium and the NWA AI Business Council.

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