COURSE DETAIL

TOPICS IN APPLIED MATHEMATICS: REINFORCEMENT LEARNING, SEARCH, AND TEST-TIME SCALING OF LARGE LANGUAGE MODELS

Country
Korea, South

Host Institution
Seoul National University

Program(s)
Seoul National University

UCEAP Course Level
Upper Division

UCEAP Subject Area(s)
Mathematics Computer Science

UCEAP Course Number
154

UCEAP Course Suffix

UCEAP Official Title
TOPICS IN APPLIED MATHEMATICS: REINFORCEMENT LEARNING, SEARCH, AND TEST-TIME SCALING OF LARGE LANGUAGE MODELS

UCEAP Transcript Title
REINFORCEMENT LRNG

UCEAP Quarter Units
4.50

UCEAP Semester Units
3.00

Course Description

This advanced topics course covers reinforcement learning, search, and test-time scaling of large language models that are expected to drive the next generation of AI systems.

Topics include: Basics of RL (Markov Decision Process and Policy evaluation), Basics RL (Imitation learning, Deep policy gradient methods), Basics of RL (Deep Q-Learning, Rainbow DQN); Symmetric alternating Markov games, Monte Carlo tree search, expert iteration, and AlphaGo; Imperfect information games, Counerfactural regret minimization, and Pluribus; NLP basics (RNN, beam search, tokenizers); NLP basics (Transformers, encoder-decoder architectures); Instruction fine-tuning, Scaling laws of LLM pre-training; Reinforcement learning with human feedback, direct policy optimization, Group Relative Policy Optimization (GRPO); Chain of thought, Process reward models, Prover-verifier games; In-context learning, Scaling LLM Test-Time Compute; DeepSeek-R1.

Language(s) of Instruction
English

Host Institution Course Number
3341.751

Host Institution Course Title
TOPICS IN APPLIED MATHEMATICS: REINFORCEMENT LEARNING, SEARCH, AND TEST-TIME SCALING OF LARGE LANGUAGE MODELS

Host Institution Course Details

Host Institution Campus

Host Institution Faculty

Host Institution Degree
Host Institution Department
Course Last Reviewed 2024-2025

Print