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Friday, Jan 30, 2026

12:00-1:00 pm

Morgridge Hall Seminar Room 7560 or

Zoom:

<https://uwmadison.zoom.us/j/99879638765?pwd=wbtqxoucEFIIPVCVc9SFbvKB1Av7Xk.1>

Passcode: 343271

Open-World Long-Tailed Learning: Theories, Algorithms, and Deployment

Abstract: Artificial General Intelligence (AGI) represents the next generation of AI that can match or exceed the cognitive versatility and proficiency of human intelligence. While the advanced AI models (e.g., GPT-5, Gemini-3, Claude 4, and Qwen-3) excel at acquiring and applying general knowledge in data-rich, well-structured environments, they falter when confronted with rare and critical scenarios including safety-critical driving scenario understanding, scientific hypothesis generation, financial fraud detection, and rare disease diagnosis. A natural and fundamental research question largely remains nascent: How can we develop principled algorithms, theory, and system architectures to enable open-world long-tailed learning (OpenLT) that adapts to heterogeneous, evolving data and supports robust reasoning and long-tail generalization? In this talk, I will discuss our group's recent work on 1) OpenLT Theory – characterizing the task complexity and generalization performance of long-tailed learning, 2) OpenLT Algorithm – developing a generic computational framework for long-tailed learning with label scarcity and highly-skewed data distribution, and 3) OpenLT Deployment - hinging on the key application of scientific hypothesis generation to discuss our proposed techniques and theoretical results for open-world long-tailed learning. Finally, I will conclude this talk and share thoughts about my future research.

Bio: Dr. Dawei Zhou is an Assistant Professor at the Computer Science Department of Virginia Tech. Zhou's primary research focuses on Open-World Machine Learning and AI for Scientific Discovery. His group develops intelligent systems that can autonomously generate, validate, and refine scientific hypotheses—advancing discovery pipelines in metamaterial design, healthcare, financial forensics, autonomous driving, and physics-guided predictive maintenance. He obtained his Ph.D. degree from the Computer Science Department of the University of Illinois Urbana-Champaign (UIUC). He has authored more than 60 publications in premier academic venues across AI, data mining, and information retrieval (e.g., ICML, NeurIPS, KDD, WWW, TMLR) and has served as Vice Program Chair/Proceeding Chair/Student Travel Award Chair/Local Chair/ Session Chairs/(Senior) Program Committee Members in various top ML and AI conferences (e.g., KDD, WWW, ICDM, BigData, NeurIPS, ICML, SIGIR, ICLR, AAAI, IJCAI, etc.). VLOG lab has secured over \$10 million in total funding, including over \$3 million in personal share, with generous support from Virginia Tech, NSF, DARPA, DHS, the Commonwealth Cyber Initiative, 4-VA, Deloitte, Amazon, Google, and Cisco. His work has been recognized by the 24th CNSF Capitol Hill Science Exhibition, Cisco Faculty Research Award (2023), AAAI New Faculty Highlights Roster (2024), NSF Career Award (2024), National Distinction Program (2025), and Virginia Tech Outstanding Assistant Professor Award (2025).



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