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**Friday, April 17, 2026**

**12:00-1:00 pm**

**Morgridge Hall Seminar Room 7560**

**Zoom Meeting: 966 3372 9112**

<https://uwmadison.zoom.us/j/96633729112?pwd=tHFc9i1dAAqmXe05uWtw8wXBIQZxGB.1>

**Passcode: 621125**

## Foundation Models and Generative AI for Medical Imaging Segmentation in Ultra-Low Data Regimes

**Abstract:** Abstract: Semantic segmentation of medical images is pivotal in disease diagnosis and treatment planning. While deep learning has excelled in automating this task, a major hurdle is the need for numerous annotated masks, which are resource-intensive to produce due to the required expertise and time. This scenario often leads to ultra-low data regimes where annotated images are scarce, challenging the generalization of deep learning models on test images. To address this, we introduce two complementary approaches. One involves developing foundation models. The other involves generating high-fidelity training data consisting of paired segmentation masks and medical images. In the former, we develop a bi-level optimization based method which can effectively adapt the general-domain Segment Anything Model (SAM) to the medical domain with just a few medical images. In the latter, we propose a multi-level optimization based method which can perform end-to-end generation of high-quality training data from a minimal number of real images. On eight segmentation tasks involving various diseases, organs, and imaging modalities, our methods demonstrate strong generalization performance in both in-domain and out-of-domain settings. Our methods require 8-12 times less training data than baselines to achieve comparable performance.

**Bio:** Pengtao Xie is an Associate Professor in the Department of Electrical and Computer Engineering and Department of Medicine, at University of California San Diego. His research interest lies in AI for health and medicine. He was recognized with NSF Career Award, NIH MIRA Award, Global Top-100 Chinese Young Scholars in AI by Baidu, top-5 finalist for the AMIA Doctoral Dissertation Award, ICLR Notable-Top-5% paper, Amazon AWS Machine Learning Research Award, Tencent AI-Lab Faculty Award, Innovator Award by the Pittsburgh Business Times, among others. He serves as an associate editor for the ACM Transactions on Computing for Healthcare, senior area chairs for ICML and AAAI, area chair for NeurIPS, etc. He received his PhD from the Machine Learning Department at Carnegie Mellon University in 2018.



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