

# Xuan Ouyang

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## Education

### University of Wisconsin–Madison

Graduation Date: 2026/08 (Expected)

Bachelor of Science in Computer Science (honor)

GPA: 3.87/4.00 (Good academic standing)

Course Work: Advanced Algebra, Mathematical Analysis, Deep Learning in Computer Vision, Data-Centric ML, Real Analysis, Probability Theory, Foundation Models(grad level), Machine Learning(grad level) Wisconsin, USA

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## Research Interests

I am broadly interested in Multimodal Large Language Models and Generative AI, with a focus on building systems that can perceive, reason, and generate across modalities. My recent research explores data-centric approaches to improve model robustness and efficiency, including dataset pruning(Meltrim), pretraining data selection and Novel method for multimodal generation tasks(MSSB). Currently, I am particularly interested in VLM reasoning and Multimodal LLMs as foundations for more capable and trustworthy intelligent agents. More information can be found on my website: <https://yancyou.github.io/>.

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## Research Experience

### University of Wisconsin–Madison NLP Lab

2025/07 - now

Research Assistant

Advised by: Prof. Junjie Hu

- Designed a contrastive objective on cross-speaker same-word pairs and cross-tone different-word pairs, using targeted augmentation to promote speaker invariance while preserving tone distinctions critical for word identity. Evaluated learned embeddings via cross-speaker/tone retrieval (Top-1/Top-5 accuracy) and downstream tasks.
- Developed cross-lingual audio representations for Hmong in a low-resource setting by fine-tuning XLS-R and experimenting with audio tokenizers. Proposed a knowledge distillation pipeline to stably train ASR models alongside bias-aware, transferable representations—preserving both tone sensitivity and gender invariance through a multitask learning setup. Applications include a pilot healthcare deployment to assess pronunciation accuracy for hearing-impaired Hmong speakers. (This work will be submitted to ACL 2026) Madison, US

### University of Wisconsin–Madison

2025/05 - 2025/09

Member of REU team (Research for Undergraduate students)

Advised by: Prof. Hanbaek Lyu

- Designed and implemented a multimodal Static Schrödinger Bridge (MSSB) framework for instruction-guided image editing and cross-domain generation, casting the problem as a multi-marginal optimal transport between heterogeneous modalities. Unlike traditional diffusion- or flow-based approaches that rely on forward-backward simulation or heuristic matching, our method constructs a latent transport plan that is both probabilistically grounded and structurally aligned with task constraints.
- The framework supports diverse generation tasks—from modifying semantic attributes under language guidance to transferring style across visual domains—while maintaining coherence in both content and geometry. This work demonstrates the potential of Schrödinger Bridges as a unifying foundation for controllable multimodal generation, offering theoretical rigor, scalability, and architectural modularity beyond conventional pipelines. Madison, US

### Shanghai Jiao Tong University Epic Lab

2025/01 - 2025/05

Research Intern

Advised by: Prof. Linfeng Zhang

- Designed and implemented a coarse-to-fine dataset-pruning framework for speech recognition (MelTrim), building compact, high-utility coresets via acoustic clustering and frame-level utility pruning; Showed consistent accuracy gains with less data and compute across emotion recognition and speaker identification benchmarks. Broadly advances data-centric SR by adapting principled pruning to acoustic sequences—making ASR pipelines more efficient and robust and providing a general recipe for large-scale speech datasets.
- Lead two closely connected projects on improving pretraining efficiency through data selection and mixture. For data selection, we proposed an online method that computes gradient-based importance scores on proxy validation data to dynamically filter streaming pretraining samples. We further extended this idea to optimizer-level gradients, enabling

importance-aware updates within optimizers like AdamW and Muon. Also, we empirically demonstrated that injecting stochasticity—via randomized greedy selection—outperforms purely greedy filtering by reducing overfitting and improving validation loss. In parallel, we designed a domain mixing algorithm that rebalances sampling across tasks using log-space updates and gradient-based utility estimates, stabilized with exponential moving averages. These strategies collectively enable scalable, adaptive pretraining pipelines that treat data not as a fixed asset, but as a dynamic lever for controlling model behavior. (These work will be submitted to ICML 2026)

Madison, US

University College London

2024/08 - 2024/12

Research Assistant

Advised by Dr. Yujian Gan

- Designed and evaluated Text-to-SQL systems that move beyond the single-query assumption by curating Spider-S, a benchmark with paired single- and multi-query solutions and a flexible execution-based evaluator; developed a lightweight router to decide between single vs. multiple SQL generation for greater robustness and accuracy. Try to address the mismatch between natural language descriptions and the corresponding SQL queries.

London, UK

Publications

- **OPUS: Towards Efficient and Principled Data Selection in Large Language Model Pre-training in Every Iteration.**  
*Shaobo Wang\*, Xuan Ouyang\*, Tianyi Xu\*, Guo Chen, Jialin Liu, Yuzheng Zhang, Junhao Zheng, Yubo Ma, Huiqiang Jiang, Fei Huang, Kexin Yang, Xingzhang Ren, Dayiheng Liu, Linfeng Zhang, Junyang Lin† Submitting to ICML2026.*
- **Multi-Marginal f-Divergence Schrödinger Bridges: Towards a Unifying Framework for Generation and Distillation.**  
*Xuan Ouyang\*, Ishaan Kharbanda\*, Yudi Li\*, Rahul Choudhary, Hanbaek Lyu† ICML Reviewing, 2026.*
- **MelTrim: Coarse-to-Fine Data Pruning for Speech Classification.**  
*Shaobo Wang\*, Xuan Ouyang\*, Tianle Niu\*, Xintong Li, Zhengkun Ge, Yue Min, Xiaoqian Liu, Hankun Wang, Linfeng Zhang†. ACL ARR October Reviewing, 2026.*
- **SITA: Learning Speaker-Invariant and Tone-Aware Speech Representations for Low-Resource Tonal Languages.**  
*Xuan Ouyang\*, Tianyi Xu\*, Binwei Yao, Shoua Xiong, Sara Misurelli, Maichou Lor, Junjie Hu† Submitting to ACL 2026.*
- **From Single-SQL to Multi-SQL: Bridging Real-World Needs with the SpiderS Benchmark.**  
*Xuan Ouyang\*, Yujian Gan\*, Yuxi Lin, Zhilin Zhang, Jinxia Xie, Vassilis Routsis†. Submitting to ACL 2026.*

Working Experience

Machine Learning Research Assistant of Marler Lab

2025/01 - 2025/05

University of Wisconsin–Madison

- Collaborated with graduate students and faculty to optimize machine learning models for processing and synchronizing complex behavioral data, including semantic and syntactic analyses of mouse vocalizations.
- Developed and maintained robust computational pipelines for analyzing rodent vocalizations and movements using cutting-edge tools such as DeepSqueak and Sleep.

Madison, US

Selected Awards

I have extensive experience in mathematical modeling and machine learning, having participated in numerous modeling competitions over the years. At UW–Madison, I am honored to have been named to the Dean’s List every semester, recognizing my continued academic excellence.

Dean's List in UW–Madison

- High-achieving students in UW–Madison.

MCM/ICM (3-people Group)

- Honorable Mention, Second Prize in World Class.

Technical Skills

- **Languages:** Python, C/C++, java, Shell, LaTeX, Julia
- **Frameworks and Tools:** Pytorch, Docker, Sklearn, Numpy, Pandas
- **AI:** Natural language Processing (llama-2, Qwen3-VL, GPT-2) | Computer Vision (OpenCV, Stable Diffusion, YOLO Series)