Kevin Zhai

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Summary

- Ph.D. researcher in Computer Science at the University of Central Florida, advised by Dr. Mubarak Shah.
- Specialize in inference-time alignment, safety, and personalization for diffusion and diffusion-LLM models.
- Previous experience as a computer engineer building simulation systems; background in computer science, physics, and mathematics (triple major).

Research Interests

- Generative modeling: diffusion models, diffusion LLMs, flow matching.
- Inference-time alignment and test-time scaling.
- Safety, personalization, and unlearning in text-to-image models.

Research and Work Experience

Graduate Research Assistant Aug 2023 – Present
Institute of Artificial Intelligence (IAI), University of Central Florida Orlando, FL

- Research on generative models and alignment: inference-time algorithms for diffusion, safety and personalization in text-to-image models, and test-time scaling for diffusion LLMs.
- First author on *MIRA*, a training-free inference-time alignment method for text-to-image diffusion that adds an image-space, score-based KL regularizer to noise optimization to reduce reward hacking.
- First author on *COPE*, a two-stage "Consensus-to-Personal" framework for personalized text-to-image generation that uses a single safety-aligned backbone plus group-specific inference-time steering.
- Second author on *PURE*, a repair-aware unlearning framework for text-to-image diffusion based on a KL trust region and an alternating forget/repair schedule; contributed to theory, experiments, and evaluation.
- Third author on *HEX*, a test-time scaling method for diffusion LLMs that ensembles heterogeneous block schedules; contributed literature review, ablation design and analysis, and optimization of the decoding implementation.
- Build and maintain experimental pipelines in Python/PyTorch on SLURM GPU clusters: data preparation, job arrays, logging, and automated evaluation.

Computer Engineer Jul 2021 – Jun 2023
DCS Corp Alexandria, VA

- Developed algorithms to mimic human driving behavior in ground-vehicle simulations, combining physics-based models with behavior rules.
- Planned and built a testing environment in Unreal Engine 4 to approximate real-world driving conditions for evaluating autonomy stacks.

Undergraduate Researcher May 2020 – May 2021
Vanderbilt University Nashville, TN

- Developed network-simulation software to study fidelity under adversarial conditions.
- Explored approaches for mitigating network attacks using simulation-driven analysis.

Selected Manuscripts

1. **Zhai, K.**, Singh, U., et al. *Mitigating Reward Hacking in Inference-Time Alignment of T2I Diffusion Models via Distributional Regularization (MIRA)*. Submitted to ICLR 2026.
2. **Zhai, K.**, Singh, U., et al. *Consensus-to-Personal: Inference-Time Alignment for Text-to-Image Personalization (COPE)*. Submitted to CVPR 2026.
3. Ghosh, S., **Zhai, K.**, et al. *Repair-Aware Forgetting: An Iterative Approach to Unlearning in T2I Diffusion Models (PURE)*. Submitted to ICLR 2026.
4. Lee, J., Moon, H., **Zhai, K.**, et al. *Test-Time Scaling in Diffusion LLMs via Hidden Semi-Autoregressive Experts (HEX)*. Submitted to ICLR 2026.

Technical Skills

Languages:	Python, C++, JavaScript, Bash
ML / AI:	Diffusion models, diffusion LLMs, deep learning, RL, preference optimization
Tools:	PyTorch, Git, Docker, SLURM, Jupyter, Weights & Biases
Other:	High-performance computing, experiment design, data visualization

Education

Ph.D. in Computer Science Aug 2023 – Present
University of Central Florida, Center for Research in Computer Vision Orlando, FL

B.Sc. in Computer Science, Physics, and Mathematics (Triple Major) Aug 2017 – May 2021
Vanderbilt University Nashville, TN

Teaching and Mentoring

Graduate Teaching Assistant – Data Structures Fall 2024 – Spring 2025
University of Central Florida

- Helped students learn core data structures and debugging strategies through labs and office hours.
- Contributed to a course pass rate above 80% (historically around 50%) by providing targeted support on programming assignments.
- Gave individual feedback on code quality and problem-solving approaches.

Grants and Awards

- UCF ORCGS Doctoral Fellowship ($25,000 per year)