Kuan Heng (Jordan) Lin

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Education

Computer Science B.S., minor in Mathematics *September 2021–Present*
University of California, Los Angeles (GPA: 3.981)
Coursework: Computer Vision, Deep Learning, Graphics, Algorithms & Data Structures, Imaging, Programming Languages, Software Construction, OS, Quantum Computing, Systems, Architecture, Theory, Digital Design, Linear Algebra, Analysis, Probability, Statistics

Publications

[1] Kuan Heng Lin*, Sicheng Mo*, Ben Klingher, Fangzhou Mu, Bolei Zhou. "Ctrl-X: Controlling Structure and Appearance for Text-To-Image Generation Without Guidance". In: *Neural Information Processing Systems (NeurIPS)*. 2024.

[2] Sicheng Mo*, Fangzhou Mu*, Kuan Heng Lin, Yanli Liu, Bochen Guan, Yin Li, and Bolei Zhou. "FreeControl: Training-Free Spatial Control of Any Text-to-Image Diffusion Model with Any Condition". In: *Computer Vision and Pattern Recognition (CVPR)*. 2024.

Research

Undergraduate Researcher | Zhou Lab at UCLA *March 2023–Present*

- Design fast training-free and guidance-free structure and appearance control for arbitrary text-to-image and text-to-video models.
- Propose novel training-free controllable and image-to-image generation for any text-to-image model via principal component extraction of seed images and diffusion guidance optimization with arbitrary condition images (e.g., depth maps, line art, mesh previews).
- Port and combine large research and benchmark `Python` + `PyTorch` repositories as research baseline, cross-referencing papers and different repository APIs to develop general-purpose grounded & interactive generation modules based on `Diffusers`.
- Inject temporal and instance consistency to Stable Diffusion and ControlNet with inter-frame attention and simulation-in-the-loop conditioning for video generation and realistic rendering of autonomous driving simulations to bridge the Sim2Real gap.
- Develop novel methods for semantic latent space manipulation of diffusion models with deterministic and stochastic sampling, leveraging inversion to perform direct real-image editing and visualize diffusion latent guidance to measure dataset and model bias.

URC-Sciences Summer Program Scholarship Researcher | Zhou Lab at UCLA *June 2023–September 2023*

- Design a human-in-the-loop video generator by extending Stable Diffusion with video guidance and interactive grounded generation.

Undergraduate Researcher | The Ozcan Research Group (HHMI Program) *October 2022–June 2023*

- Design Fourier residual and attention blocks for diffusion autoencoders and generative adversarial networks for accurate and disentangled hologram reconstruction, super-resolution, and axial distance prediction at reduced network sizes.
- Adapt existing ResNet and ResNeXt architectures with Fourier residual networks to learn image features in both the discrete and frequency domain, achieving state-of-the-art accuracy with fewer parameters.
- Design and optimize novel Fourier-based models for biomedical imaging, image classification, and generative vision.

Student Researcher | The Bouchard Lab at UCLA *April 2022–January 2023*

- Design and implement novel Levenberg–Marquardt optimizer for via Hessian-free and Accelerated methods (e.g., Gauss–Newton, Approximate Gradient Descent, Hessian-free, Curveball) in both `TensorFlow` and `PyTorch` with `CUDA` on distributive networks.
- Develop multi-stage training methods that incorporate optimization and regularization techniques for image classification with distributed and parallel computing to achieve state-of-the-art accuracies at reduced computational costs.

Work Experiences

Research Intern | Snap Inc. *June 2024–September 2024*

- Work in the Creative Vision team to optimize training and inference of large-scale video generation with `PyTorch` profiling and parallelism.
- Implement pipeline-wide intra-batch variable sequence length training for arbitrary datasets, modalities, and conditioning for flexible, efficient multimodal training while maintaining parallelisms, performance, and memory usage of non-variable-length training.
- Build Snap's first distributed 2D parallel (Data + Model Parallel) training framework for scaling video Diffusion Transformers with `torch.distributed`, designing custom Tensor Parallel & Sequence Parallel strategies and wrappers for video DiTs and convolutional autoencoders, significantly scaling up model size and number of tokens while minimizing VRAM usage and GPU communication overhead.

Program Development Team | UCLA CS, UCLA CAE, Learning Assistant Program *June 2023–Present*

- Optimize & automate LA application and review with Airtable `JavaScript` and Gmail scripting for 900+ applicants supporting 14000+ students in UCLA STEM courses, streamlining applicant review and communication for a downsized (33%) PDT team.
- Advertise the LA program to increase applicants for key CS courses by 300% and communicate with professors & administrators for high-demand courses (e.g., CS 111, 118, 131) to be supported, empowering more students through collaborative and inclusive teaching.

Head Learning Assistant | UCLA Computer Science, Learning Assistant Program *March 2022–June 2023*

- Lead weekly discussions and bi-weekly workshops for CS 33: Computer Organization to review material and lead worksheets for 400+ students. Reviewed very positively, notably my willingness to help, clarity of explanations, and passion for teaching.
- Organize meetings, plan pedagogy activities and workshops, and host content meetings to facilitate and mentor CS 33 LAs.

Interests & Skills

Research: Generative AI, computer vision, machine learning, optimization, explainability, image processing, natural language processing
Programming: `Python` (`PyTorch`, `TensorFlow`, `JAX`), `CUDA`, `C++`, `C`, `Assembly`, `Verilog`, `R`, `Haskell`, `React`, `Flask`, `JavaScript`, `HTML/CSS`
Miscellaneous: Pedagogy, science communication, filmmaking, photography, video editing, content creation, music composition
Languages: English (fluent), Chinese (native)

Projects & Experiences

Advisor ← Co-President ← Workshops Officer | ACM Student Chapter at UCLA, AI Committee *May 2022–Present*

- Founded weekly reading groups & seminars discussing recent ML advances such as generative vision, reinforcement learning, and LLMs with student & industry speakers, culminating in projects and events for general members such as the adversarial AI competition.
- Spearhead general member programs (e.g., special topics discussions) and bold initiatives (e.g., AI hackathons, research team, shared compute, inter-comittee collaborations) which drastically improved member retention, officer burnout, and club exposure.
- Revamp and teach workshops on deep learning topics such as gradient descent, backpropagation, neural networks, CNNs, RNNs, Transformers, generative vision, `Python` package management, and hands-on notebooks, improving retention by 100%.

Machine Learning Engineer | people2vec, LA Hacks 2023: Overall Third Place *April 2023*

- Created the social media platform, people2vec, powered by large language models and vision models and YouTube watch histories that matches people with others near them of similar media interests to form genuine, authentic connections.
- Integrated Co:here sentence embeddings and pretrained `Inception V3` feature maps to perform distribution analysis inspired by Frechét Inception Distance to compute similarity scores between YouTube titles and thumbnails using `PyTorch`.
- Visualize matched user data with principal component analysis to convey interest information while preserving privacy.

Full-stack Developer | Wikisafe, HackMIT 2022: Blockchain for Society Second Prize *October 2022*

- Created a crowd-sourced knowledge database powered by machine learning and blockchain for secure version management.
- Integrated fine-tuned text summarization, caption generation, and generative imagery `PyTorch` models and `Solidity` smart contracts on the Ethereum blockchain with `Web3.js` in a full-stack web application with an intuitive user interface.

Full-stack Developer | T-Eggletop Map Creator *January 2022–February 2023*

- Created an online homebrew tabletop RPG map designer that makes campaign design easier, faster, and more accessible for game master of all levels, collaborating in a team of five with `Git` and handled operations & version control.
- Implemented and built efficient full-stack APIs (`MongoDB`, `Express.js`, `React.js`, `Node.js`), user authentication and profile modifications, map structures, `MongoDB` database communication, frontend interfaces, map builder, and deployment.

Assistant Managing Editor of Review | UCLA Undergraduate Science Journal *January 2022–Present*

- Draft and polish letters to authors which succinctly culminate and summarize all reviewer reviews, provide constructive and detailed feedback for authors, and prepare comprehensive reports for the editorial board for further communication.
- Lead small teams of reviewers to set rigorous benchmarks and helpful guidelines for reviewing papers.

Cinematographer, Editor, Composer | UCLA Film & Photography Society Production *September 2021–September 2023*

- *Manic Pixie Vending Machine* (cinematographer, colorist, assistant editor), *Fear No Evil* (cinematographer, colorist, assistant editor), *On Her Time* (cinematographer, colorist, assistant editor, composer), *Doldrums* (behind-the-scenes cinematographer).
- Lead large camera & lighting teams to set up lighting, camera equipment, and sets to create stunning visuals from little budget.
- Used professional cameras, gimbals, and sliders, colorgraded and edited Adobe Premiere projects with sound mixing and composition.

Research & Project Lead | Data Science Union at UCLA *October 2021–March 2023*

- Lead passionate student to conduct independent research and experimentation on generative models, including generative adversarial networks, diffusion models, and autoencoders, with a focus on exploring the explainability of latent spaces.

Student Researcher | DataRes at UCLA, Research Team *March 2022–December 2022*

- Designed and fine-tuned BERT-based transformer models for adaptive and controllable natural language and music generation.
- Implemented graph convolutional networks (GCN) with `PyTorch DGL` and `Neo4j DBMS` for semi-supervised node classification and regression, predicting affiliation with social networks and city GPS coordinates with *Wikipedia* page hyperlinks via embeddings.

Physics Engine Developer | Lofi Beats to Scale and Rotate to *April–June 2022*

- Developed and maintained a physics engine from scratch, complete with linear and angular collision detection and resolution, with `JavaScript`, `tiny-graphics.js`, and `OpenGL` to create a robust sandbox with user interaction.
- Implemented real-time shadowing with `OpenGL` from scratch via light-view texture maps.

Awards & Honors

Undergraduate Research Scholars Program *September 2024–June 2025*
UCLA Dean's Honor List *Fall 2021–Winter 2024*
URC-Sciences Summer Program Scholarship *June–September 2023*
LA Hacks Overall Third Place *April 2023*
Upsilon Pi Epsilon Honor Society *November 2022*
HackMIT Blockchain for Society Second Place *October 2022*
QWER Hacks Community & Connection First Place *January 2022*