Chieh-Hsin (Jesse) Lai

Technical Lead / Staff Research Scientist @ Sony AI |
Visiting Assistant Professor @ National Yang Ming Chiao Tung University, Taiwan

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Research Interests

Deep learning, generative modeling, and representation learning for computer vision, audio, and language; AI for sciences and physics-informed machine learning.

Leadership Summary

- Led and co-authored the book **The Principles of Diffusion Models** with leading researchers in the area, providing a systematic handbook for diffusion models.
- Technical Lead in the Music Foundation Model Team at Sony AI, driving deep generative modeling across audio, vision, and language.
- Led cross-functional research-to-engineering execution for *SoundCTM* (sound generation) and *Gibbs-DDRM* (media restoration).
- People leadership: mentored 9 interns/PhD students since 2022; set research direction, milestones, and review cadence; collaborated hands-on with mentees to drive publications and open research artifacts adopted by the broader community (e.g., *Consistency Trajectory Models (CTM)*, *Manifold-Preserving Guided Diffusion (MPGD)*).
- External leadership: Area Chair (NeurIPS/ICLR/ICML); elected member of IEEE Machine Learning for Signal Processing Technical Committee; organizer and speaker for tutorials and invited talks; strengthens community visibility and collaboration opportunities.

Experience

Sony AI, Japan *Jan 2026 –*
Staff Research Scientist | Focus: Deep generative modeling

Sony AI, Japan *May 2022 – Dec 2025*
Senior Research Scientist | Focus: Deep generative modeling

National Yang Ming Chiao Tung University, Taiwan *Aug 2024 – Present*
Visiting Assistant Professor | Supervising AI for science research

Sony, USA *Oct 2021 – May 2022*
Senior Research Engineer | Focus: Deep generative modeling and robustness

Institute of Mathematics, Academia Sinica, Taiwan *Aug 2015 – July 2016*
Research Assistant | Focus: Harmonic analysis, Differential equations

Education

University of Minnesota – Twin Cities, USA *Ph.D. in Mathematics, 2016 - 2021*
Advisor: Gilad Lerman | Focus: ML theory, Anomaly detection, Generative models

National Tsinghua University, Taiwan *B.Sc. in Mathematics, 2012 - 2015*
Undergraduate Research: Harmonic analysis and Boltzmann equation

Selected Publications

(* *denotes equal contribution. Full list available on my Google Scholar.*)

Book / Monograph

1. **Lai, Chieh-Hsin**, Yang Song, Dongjun Kim, Yuki Mitsufuji, and Stefano Ermon. The principles of diffusion models. *arXiv preprint arXiv:2510.21890*, 2025

Selected Papers

1. Zheyuan Hu*, **Chieh-Hsin, Lai***, Yuki Mitsufuji, and Stefano Ermon. Cmt: Mid-training for efficient learning of consistency, mean flow, and flow map models. *arXiv preprint arXiv:2509.24526*, 2025

2. Kevin Rojas, Ye He, **Chieh-Hsin Lai**, Yuta Takida, Yuki Mitsufuji, and Molei Tao. Theory-informed improvements to classifier-free guidance for discrete diffusion models. *arXiv preprint arXiv:2507.08965*, 2025

3. Gianluigi Silvestri, Luca Ambrogioni, **Chieh-Hsin Lai**, Yuhta Takida, and Yuki Mitsufuji. VCT: Training consistency models with variational noise coupling. In *Forty-second International Conference on Machine Learning*, 2025

4. Ayano Hiranaka*, Shang-Fu Chen*, **Chieh-Hsin, Lai***, Dongjun Kim, Naoki Murata, Takashi Shibuya, Wei-Hsiang Liao, Shao-Hua Sun, and Yuki Mitsufuji. Hero: Human-feedback efficient reinforcement learning for online diffusion model finetuning. In *ICLR*, 2025

5. Yong-Hyun Park, **Chieh-Hsin, Lai**, Satoshi Hayakawa, Yuhta Takida, and Yuki Mitsufuji. Jump your steps: Optimizing sampling schedule of discrete diffusion models. In *ICLR*, 2024

6. Koichi Saito, Dongjun Kim, Takashi Shibuya, **Chieh-Hsin, Lai**, Zhi Zhong, Yuhta Takida, and Yuki Mitsufuji. Soundctm: Uniting score-based and consistency models for text-to-sound generation. 2025

7. Junyoung Seo, Kazumi Fukuda, Takashi Shibuya, Takuya Narihira, Naoki Murata, Shoukang Hu, **Chieh-Hsin, Lai**, Seungryong Kim, and Yuki Mitsufuji. Genwarp: Single image to novel views with semantic-preserving generative warping. In *NeurIPS*, 2024

8. Dongjun Kim*, **Chieh-Hsin, Lai***, Wei-Hsiang Liao, Yuhta Takida, Naoki Murata, Toshimitsu Uesaka, Yuki Mitsufuji, and Stefano Ermon. Pagoda: Progressive growing of a one-step generator from a low-resolution diffusion teacher. In *NeurIPS*, 2024

9. Dongjun Kim*, **Chieh-Hsin, Lai***, Wei-Hsiang Liao, Naoki Murata, Yuhta Takida, Toshimitsu Uesaka, Yutong He, Yuki Mitsufuji, and Stefano Ermon. Consistency trajectory models: Learning probability flow ode trajectory of diffusion. In *ICLR*, 2024

10. Yutong He, Naoki Murata, **Chieh-Hsin, Lai**, Yuhta Takida, Toshimitsu Uesaka, Dongjun Kim, Wei-Hsiang Liao, Yuki Mitsufuji, J Zico Kolter, Ruslan Salakhutdinov, et al. Manifold preserving guided diffusion. In *ICLR*, 2024

11. **Chieh-Hsin, Lai**, Yuhta Takida, Toshimitsu Uesaka, Naoki Murata, Yuki Mitsufuji, and Stefano Ermon. On the equivalence of consistency-type models: Consistency models, consistent diffusion models, and fokker-planck regularization. In *ICML Workshop*, 2023

12. **Chieh-Hsin, Lai**, Yuhta Takida, Naoki Murata, Toshimitsu Uesaka, Yuki Mitsufuji, and Stefano Ermon. Fp-diffusion: Improving score-based diffusion models by enforcing the underlying score fokker-planck equation. In *ICML*, 2023

13. Naoki Murata, Koichi Saito, **Chieh-Hsin, Lai**, Yuhta Takida, Toshimitsu Uesaka, Yuki Mitsufuji, and Stefano Ermon. Gibbsddrm: A partially collapsed gibbs sampler for solving blind inverse problems with denoising diffusion restoration. In *ICML*, 2023

14. **Chieh-Hsin, Lai***, Dongmian Zou*, and Gilad Lerman. Robust variational autoencoding with wasserstein penalty for novelty detection. In *AISTATS*, 2023

15. Yuhta Takida, Takashi Shibuya, Weihsiang Liao, **Chieh-Hsin, Lai**, Junki Ohmura, Toshimitsu Uesaka, Naoki Murata, Shusuke Takahashi, Toshiyuki Kumakura, and Yuki Mitsufuji. Sq-vae: Variational bayes on discrete representation with self-annealed stochastic quantization. In *ICML*, 2022

16. **Chieh-Hsin, Lai***, Dongmian Zou*, and Gilad Lerman. Robust subspace recovery layer for unsupervised anomaly detection. In *ICLR*, 2020

Patents

- Yuta Takida, Masaaki Imaizumi, Takashi Shibuya, **Chieh-Hsin Lai**, Toshimitsu Uesaka, Naoki Murata, and Yuhki Mitsufuji. Information processing device, information processing method, and non-transitory computer readable storage medium

My (Main) Mentee / Students

- Zheyuan Hu (May 2025 - Present): PhD at National University of Singapore
- Che-Chia Chang (August 2024 - Present): PhD at National Yang Ming Chiao Tung University
- Chen-Yang Dai (August 2024 - Present): PhD at National Yang Ming Chiao Tung University
- Yonghyun Kim (July 2024 - Present): PhD student at University of Pennsylvania
- Gianluigi Silvestri (July 2024 - May 2025): PhD at OnePlanet Research Center
- Yangming Li (June 2024 - Nov. 2024): PhD at University of Cambridge
- Ayano Hiranaka (Dec. 2023 - June 2024): PhD student at University of Southern California
- Shang-Fu Chen (Dec. 2023 - June 2024): PhD student at National Taiwan University
- Dongjun Kim (May 2023 - March 2024): Post-doc at Stanford University

Invited Talks / Events / Academic Services

- *IEEE Machine Learning for Signal Processing Technical Committee* (Elected Member) 2026-
- Area Chair of *NeurIPS 2025, ICLR 2026, ICML 2026*
- Reviewer for *NeurIPS, ICML, ICLR, CVPR, AAAI* (since 2022), *IEEE TPAMI*, and *ACM MM 2025*.
- Organizing and Delivering Tutorial on Diffusion Models, *IJCNN 2025, ICASSP 2025, ISMIR 2024*
- NeurIPS 2025, 2024 Expo Workshop on Generative Models
- Invited talks at *NVIDIA Taiwan, National Taiwan University, National Yang Ming Chiao Tung University, National Tsinghua University, Appier Taiwan, Brown University, Duke University, University of Minnesota, Tokyo University, Tohoku University, Korea Institute for Advanced Study, Sungkyunkwan University, Hanyang University* etc.