

CIHAN RUAN

+1(408)-421-0868 | luciacihanruan@gmail.com | linkedin.com/in/cihanruan | Santa Clara, CA 95050

EDUCATION

Ph.D. in Computer Science and Engineering

Santa Clara, CA

Santa Clara University

Sept. 2016 – Jun. 2025

Advisor: Dr. Nam Ling, Multimedia Visual Processing Laboratory (MVP Lab)

- Honor: Dean's Excellent Research Awards (2017-2018)
- Relevant Courses: Advanced Techniques in Video Coding, Artificial Intelligence, Digital Signal Processing, Digital Image Processing
- Certification: DeepLearning.AI TensorFlow Developer, Deep Learning, UI/UX Design, CMU Natural Language Processing (NLP) Certificate, NVIDIA Certificate – Building LLM Applications With Prompt Engineering

Master in Science, Major in Computer Science and Engineering

Santa Clara, CA

Santa Clara University

Sept. 2014 – Jun. 2016

- Relevant Courses: Image and Video Compression, Big Data, Mobile Application Development, Web Programming

Bachelor of Engineering in Software Engineering

Tianjin, China

Nankai University

Sept. 2010 – Jun. 2014

- Award: Third Prize Scholarship 2012-2013

RESEARCH INTERESTS

- **Multimodal Data Compression and Storage** – Integrating video, tactile, and language signals with VVC/H.266, learned codecs, and DNA-based storage systems
- **3D Scene Representation and Neural Rendering** – Exploring Gaussian Splatting and neural graphics systems for high-fidelity, real-time 3D perception
- **Generative AI for Biomedical Applications** – Applying foundation models to medical image analysis, spatial transcriptomics, and biomarker discovery
- Side Project: cross-lingual semantic analysis and LLM evaluation for multimodal translation tasks

TECHNICAL STACK

Programming Languages and Tools: Python, C++, Java, Bash, Linux

ML & CV Frameworks: PyTorch, TensorFlow, OpenCV, Scikit-learn

Compression & Storage: VVC/H.266, HEVC, Fountain Codes, DNA-based Storage Systems

3D & Rendering: Gaussian Splatting, Neural Rendering

Scientific Computing & Data Processing: Pandas, NumPy, MySQL, Slurm

SELECTED RESEARCH PROJECTS

Efficient 3D Scene Representation with Gaussian Splatting Distillation

Research Lead | Apr. 2025 - Now

- Developed a novel 3D Gaussian Splatting (3DGS) distillation framework for fast, high-fidelity 3D scene reconstruction from limited viewpoints.
- Pioneered a Transformer-based distillation backbone to effectively transfer detailed geometric and appearance information from a teacher model to a compact student 3DGS model.
- Achieved a 95% reduction in model size and a $5\times$ increase in inference speed, while maintaining high visual quality.
- Designed and implemented a multi-stage training pipeline with novel loss functions to enforce multi-view consistency and preserve fine-grained scene details.

Multimodal Compression and Learned Codec Frameworks for Emerging Storage Systems

First Author, Project Lead & Research Coordinator | Dec. 2021 – Now

- Pioneered the introduction of modern deep learning compression methods into DNA-inspired storage systems, establishing new benchmarks for efficiency and robustness in large-scale archiving.
- Designed a progressive research pipeline:
 - * Phase I: Extended VVC/H.266 intra-frame compression to storage applications, achieving $3\times$ higher encoding capacity over conventional methods.
 - * Phase II: Integrated a Residual CNN error-correction network, improving recovery accuracy by 15% under noisy conditions.
 - * Phase III: Developed a dual-stream end-to-end compression framework leveraging Transformers, VAEs, and diffusion models, achieving more than 400 times improvement from the prior baseline.
 - * Phase IV: Extended framework to tactile data compression with VAEs, advancing toward multimodal storage and computation systems.
- Quantified impact: Achieved $400\times$ improvement in compression efficiency at ultra-low bitrates while ensuring robustness, enabling real-world scalability.
- Recognized as the first team to integrate state-of-the-art generative models (Transformer, VAE, Diffusion) into this field, shaping algorithmic directions for storage-based computing.

Real-time 3D Reconstruction for Biomedical Imaging

Co-first Author & Project Coordinator | Nov. 2023 - May. 2025

Collaboration with Stanford University (Michael Snyder Lab)

- Accelerated 3D reconstruction pipelines by $10\times$ through a novel alignment algorithm (Space-map), scaling to millions of sequential slices in massive datasets. Contributed to core algorithm design and validation, ensuring robustness and reproducibility across large-scale experiments.
- Engineered a multi-stage GPU pipeline combining SIFT/LoFTR feature extraction, RANSAC-based affine registration, and CUDA-accelerated diffeomorphic refinement (LDDMM), achieving $2\times$ higher accuracy while preserving fine-grained structural details.
- Reduced algorithmic complexity from $O(n^2) \rightarrow O(n)$ via density-field normalization, enabling real-time feasibility for workloads previously computationally intractable.
- Released as open-source software (GitHub), now adopted for large-scale 3D modeling and cross-domain reconstruction tasks. Research results submitted to Nature Methods (under review).

Large-scale Character Recognition System Development

Research Leadership | Oct. 2019 - May. 2020

Collaboration with Nankai University

- Built a data-efficient recognition pipeline using ResNet and semi-supervised learning with automatically generated paired samples. Processed 100k+ historical handwritten characters, achieving 87% recognition accuracy and setting new benchmarks for low-resource large-scale digitization.

WORK EXPERIENCE

Applied Research Scientist (Intern) | *Futurewei Inc., Santa Clara, CA* Feb - May. 2024, Feb - Aug. 2025

- Advanced extreme low-bitrate learned compression for images, video, and multimodal data, achieving 30–40% bitrate reduction at equal quality; led the development of a dual-stream codec (VQ-VAE + Transformer + Swin + U-Net) and contributed to multiple publications.
- Extended codecs to novel storage backends, boosting efficiency more than 400 times compared to the previous baseline, establishing the first applications of Transformers, VAEs, and Diffusion models in this field.
- Pioneered 3D Gaussian Splatting projects (optimization, pruning, stylization), delivering 95% model size reduction and $5\times$ inference speedup while preserving visual fidelity ($\text{PSNR} \geq 30$).

- Acted as technical lead & coordinator, mentoring junior researchers, initiating collaborations, and driving a pipeline of 5+ papers across conferences and journals.

Project Coordinator (Part-time) | *Stanford University, Palo Alto, CA*

Nov. 2023 - May. 2025

- Coordinated a cross-disciplinary team of 10+ researchers across CS and biomedical labs, aligning project deliverables and reducing turnaround time by 30%.
- Balanced project management with technical contributions, supporting algorithm design and validation that improved 3D data alignment accuracy by 2 \times .
- Streamlined collaboration workflows and publication pipelines, helping to deliver 1 under-review Nature Methods manuscript and multiple ongoing submissions.

PUBLICATIONS

Advanced Visual Compression Network Implementation

- L. Zhou, **C. Ruan**, W. Jiang, W. Wang, and N. Ling. *TVC: Tokenized Video Compression with Ultra-Low Bitrate*. Visual Intelligence –Special Collection on Controllable Artificial Intelligence Visual Content Generation, Springer, 2025. (*Under Review*)
- Y. Li, **C. Ruan**, W. Wang, W. Jiang, and N. Ling. *Tokenized Image Compression for both Human and Machine with Hierarchical Bounded Vector Quantization*. IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) 2026. (*Submitted*)

Multimodal Compression and Learned Codec Frameworks for Emerging Storage Systems

- **C. Ruan**, L. Lu, W. Jiang, W. Wang, H. Wu, and N. Ling. *HDCompression-DNA: Hybrid-Diffusion Neural Image Compression via DNA Storage*. IEEE International Conference on Multimedia & Expo (ICME) 2025.
- R. Han, **C. Ruan**, S. Tang, H. Wu, N. Ling and H. Zhang. *Tactile Information Coding for DNA Storage with Prospects for AI Applications*. IEEE International Conference on Multimedia & Expo (ICME) 2025.
- **C. Ruan**, R. Han, S. Gao, L. Lu, W. Jiang, W. Wang, H. Wu, and N. Ling. *HybridFlow-DNA: A Deep Generative Compression Framework for DNA Storage of Images*. IEEE International Symposium on Circuits and Systems (ISCAS) 2025.
- **C. Ruan**, L. Yang, R. Han, S. Gao, Q. Yuan, H. Wu, and N. Ling. *DSI-ResCNN: A Framework Enhancing the Error-tolerance Capacity of DNA Storage for Images*. IEEE Access, doi: 10.1109/ACCESS.2025.3549673
- **C. Ruan**, L. Yang, R. Han, and N. Ling. *Robust DNA Image Storage with Residual CNN*. IEEE International Symposium on Circuits and Systems (ISCAS), pp. 1-5, IEEE, 2024.
- **C. Ruan**, Y. Li, R. Han, S. Gao, H. Wu, and N. Ling. *Efficient DNA-Based Image Coding and Storage*. IEEE International Symposium on Circuits and Systems (ISCAS), pp. 1-5, IEEE, 2023.

Large-Scale 3D Data Alignment and Reconstruction

- R. Han*, C. Zhu*, **C. Ruan***, B. Zhao, B. Wei, J. Bi, Y. Tan, E. Monte, M. Wang, and M. Snyder. *Space-map: 3D single-cell atlas reconstruction from serial section*. Nature Methods. (*Under Review*)

Low-Resource Recognition and Computer Vision

- **C. Ruan**, R. Song, F. Guo, Y. Wang, H. Han, and J. Ruan. *ASAHmap: An Adaptive Chinese Handwritten Character Segmentation Algorithm for Large-Scale Ancient Handwritten Documents*. 2023 8th International Conference on Image, Vision, and Computing (ICIVC), Dalian, China, pp. 322-327, doi: 10.1109/ICIVC58118.2023.10269964.
- P. Wu, X. Yang, F. Guo, L. Wang, and **C. Ruan**. *ACCR: Auto-labeling for Ancient Chinese Handwritten Characters Recognition on CNN*. IEEE International Conference on Visual Communications and Image Processing (VCIP), Suzhou, China, 2022, pp. 1-5, doi: 10.1109/VCIP56404.2022.10008832.

Biological Data Processing System Design

- G. Duan, D. Wei, Y. Guo, **C. Ruan**, J. Chang, M. Zhou, J. Gao, H. Liu, X. Li, S. Gao. *Discovery of the first Tn630 member and the closest homolog of IS630 from viruses*. Scientific Reports, 14:27081, Nature Publishing Group, 2024.
- S. Chen, **C. Ruan**, Y. Guo, J. Chang, H. Yan, L. Chen, Y. Duan, G. Duan, J. Bei, X. Li, S. Gao. *Emergence of crucial evidence catalyzing the origin tracing of SARS-CoV-2*. PLOS ONE, 19(8), p.e0309557, 2024.
- J. Zhang, J. Shi, L. Wang, X. Liu, Z. Cao, **C. Ruan**, G. Ning, S. Feng, X. Yao, S. Gao. *Re-analysis of single-cell RNA-seq data reveals the origin and roles of cycling myeloid cells*. Stem Cells, sxae030, Oxford University Press, 2024.

REVIEW EXPERIENCE

Picture Coding Symposium (PCS) 2025
The Thirty-Ninth Annual Conference on Neural Information Processing Systems (NeurIPS) 2025
Computational and Structural Biotechnology Journal
Annual Meeting of the Cognitive Science Society (CogSci) 2025
The IEEE International Conference on Multimedia & Expo (ICME) 2025
The IEEE International Symposium on Circuits and Systems (ISCAS) 2025
The IEEE International Symposium on Circuits and Systems (ISCAS) 2024
Annual Meeting of the Cognitive Science Society (CogSci) 2024
8th Workshop on Eye Tracking and Visualization (ETVIS) 2024
Americas Conference on Information Systems (AMCIS) 2024
Pacific Asia Conference on Information Systems (PACIS) 2024
ACM Conference on Conversational User (CUI) 2024

TEACHING AND MENTORSHIP EXPERIENCE

- **Academic Support Experience**
 - Evaluated and graded assignments and exams for courses such as Artificial Intelligence, Machine Learning, Image Compression, and Pattern Recognition.
 - Provided detailed feedback to students, clarified key concepts, and helped them improve understanding and performance.
 - Assisted in developing grade rubrics and course materials to ensure consistency and fairness in assessment.
- **Mentorship**
 - Guided Fuhao Guo (Nankai University), Rongduo Han (Nankai University), and Yanting Guo (Yunnan University) in research projects, focusing on DNA storage and computer vision methodologies.
 - Supported students in preparing and submitting academic papers, leading to multiple publications in peer-reviewed journals.

INVITED TALK

Shandong University <i>Research Center for Mathematics and Interdisciplinary Sciences</i>	Dec. 2023
Fudan University <i>Intelligent Medicine Institute</i>	Dec. 2023
Nankai University <i>Bioinformatics Laboratory</i>	Dec. 2023

VOLUNTEER EXPERIENCE

- Translator, Audit** | *The Coursera Global Translator Community* Mar. 2020 - Dec. 2023
- Completed over 200,000 words of high-quality translation work, with responsibilities including organizing and producing high-quality English-to-Chinese subtitles for courses such as “Deep Learning,” “UI/UX Design,” and “Academic Writing.”
- Conference Committee and Volunteer** | *Multiple Conferences* Nov 2011-Now
- 2021-2024 Bay Area Biotech-pharma Statistical Workshop (BBSW) - Bay Area, CA
 - 2018 Nankai University Seminar on Information Theory and Data Science - Tianjin, China
 - 2017 Dahshu Advocacy Organization - Bay Area, CA
 - 2012 World Economic Forum Summer Davos - Tianjin, China

ADDITIONAL INFORMATION

Academic Award: WiCAS(Women in ISCAS) 2023 Runner-up Paper Award at IEEE ISCAS 2023
Extracurricular Experience: Editor-in-Chief, Journal of the College, Nankai University 2012-2014
Extracurricular Certifications: National Academy of Sports Medicine Certification Personal Trainer(NASM CPT), Adult Mental Health First Aid USA, The Fundamentals of Digital Marketing (Google Digital Garage), WHO Standard Operating Procedures for Emergencies (July 2022)
Hobbies: Volunteering, Writing, Photography, Graphic Design, Handicraft

REFERENCES

1. **Dr. Nam Ling**
Associate Dean for Research, Department of Computer Science and Engineering, Santa Clara University, Santa Clara, USA
Email: nling@scu.edu
2. **Dr. Michael Snyder**
Stanford W. Ascherman Professor of Genetics, Chair, Department of Genetics, Stanford University School of Medicine, CA, USA
Email: mpsnyder@stanford.edu
3. **Dr. Meng Wang**
Assistant Professor, Computational Medicine and Bioinformatics, University of Michigan, Ann Arbor, MI, USA
Email: mwmeng@umich.edu