

# JIN CAO

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## EDUCATION

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### Xi'an Jiaotong University (XJTU)

Sep 2022 - June 2026

Undergraduate in Artificial Intelligence (Advanced Class)

GPA: 4.13/4.3 (*Professional Courses*), 3.85/4.3 (*All Courses*)

Score: 94.71/100 (*Professional Courses*), 90.83/100 (*All Courses*)

*Related courses: Mathematical Analysis for Engineering, Probability Theory and Stochastic Process, Linear Algebra and Geometry ...*

### Xi'an Jiaotong University (XJTU)

Sep 2021 - June 2022

Special Class for the Gifted Young

*Related courses: High School Mathematics, High School English, High School Physics ...*

## RESEARCH EXPERIENCE

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My research interests currently lie mainly in 3D Vision. I'm now a research intern at Stanford Vision and Learning Lab, Stanford, working with Koven Yu and Prof. Jiajun Wu, focusing on infinite 3D scene generation. at ZJU3DV, Zhejiang University working with Prof. Sida Peng, focusing on Robust Radiance Field Reconstruction. Previously, I work in low-level image processing with Prof. Xiangyong Cao and Prof. Deyu Meng at Xi'an Jiaotong University.

## RESEARCH PROJECTS

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### UniVerse: Unleashing the Scene Prior of Video Diffusion Models for Robust Radiance Field Reconstruction

Dec 2024 - Mar 2025

*Supervisors: Prof. Sida Peng*

- We propose UniVerse, a video generative model for robust 3D reconstruction from inconsistent multi-view images. Specifically, given a set of unstructured multi-view images, we first sort them to obtain a camera trajectory and insert blank images along this trajectory to transform images into a video, finally restore the video and extract the corresponding frames for following reconstruction tasks
- This work highlight the potential of decoupling robust reconstruction into restoration & reconstruction, instead of directly performing reconstruction on inconsistent images, bringing new insights to the community.
- I'm responsible for most of the idea, code, experiments and writing of this work.
- **Submitted to ICCV 2025.**

### Chain-of-Restoration: Multi-Task Image Restoration Models are Zero-Shot Step-by-Step Universal Image Restorers [1] [Paper]

Aug 2024 - Oct 2024

*Supervisors: Prof. Xiangyong Cao and Prof. Deyu Meng.*

- We introduce a novel task setting for image restoration, *i.e.* Universal Image Restoration (UIR). Within this framework, models are restricted to training on a set of degradation bases and are challenged to handle both individual and composite degradations derived from these bases. Then we present the first dataset designed for UIR, *i.e.* Universal Image Restoration Dataset (UIRD-12).
- We introduce the first method for UIR, the Chain of Restoration (CoR). By incorporating a simple Degradation Discriminator, CoR transforms a multi-task model into a universal image restoration model in a zero-shot manner, requiring no additional training.
- I'm responsible for most of the idea, code, experiments and writing of this work.
- **Submitted to ICCV 2025.**

### HAIR: Hypernetworks-based All-in-One Image Restoration [2] [Paper] [Code]

Jul 2024 - Sep 2024

*Supervisors: Prof. Xiangyong Cao and Prof. Deyu Meng.*

- We propose HAIR, a novel Hypernetworks-based All-in-One image restoration method that is capable of dynamically generating parameters based on the degradation information of input image. Extensive experiments demonstrate that HAIR can significantly improve the performance of existing image restoration models in a plug-and-play manner, both in single-task and All-in-One settings.
- We theoretically prove that, for a given small enough error threshold  $\epsilon$  in image restoration tasks, HAIR requires fewer parameters compared to mainstream embedding-based All-in-One methods
- I'm responsible for most of the idea, code, experiments and writing of this work.
- **Submitted to *ICCV 2025*.**

## LatentHSI: Restore Hyperspectral Images in a Latent Space [3]

[Paper]

Feb 2024 - Apr 2024

*Supervisors: Dr. Xiangyu Rui and Prof. Xiangyong Cao.*

- We propose LatentHSI, an unsupervised method for HSI restoration that utilizes a VAE to construct a latent space for HSIs. Sampling within this latent space is enabled by a diffusion model and the guidance of the observed images.
- We have developed a unified approach applicable to HSI restoration tasks within this latent space, making it general for many HSI applications including pansharpening, denoising, super-resolution, etc.
- I'm responsible for most of the idea, code, experiments and writing of this work.
- **Accepted by *Information Fusion*. (IF 18.6)**

## PUBLICATIONS

\* stands for co-first author. I was responsible for the idea, code, experiments, and writing for [1]–[3].

- [1] **J. Cao**, D. Meng, and X. Cao, *Chain-of-restoration: Multi-task image restoration models are zero-shot step-by-step universal image restorers*, 2024. arXiv: 2410.08688 [cs.CV].
- [2] **J. Cao**, Y. Cao, L. Pang, D. Meng, and X. Cao, *Hair: Hypernetworks-based all-in-one image restoration*, 2024. arXiv: 2408.08091 [cs.CV].
- [3] **J. Cao\***, X. Rui\*, L. Pang, D. Meng, and X. Cao, “Latenthsi: Restore hyperspectral images in a latent space,” *Information Fusion*, vol. 117, p. 102 848, 2025.

## LANGUAGE

<b>English</b>	CET-6 (College English Test in China) 572, Preparing for TOFEL.
<b>Chinese</b>	Native Speaker.
<b>Japanese</b>	Beginner.

## ACHIEVEMENTS

<i>National Third Prize in the C++ A Group of the 15th Langiao Cup National Software and Information Technology Professional Talent Competition (top 6%)</i>	<i>June 2024</i>
<i>Provincial First Prize in the C++ A Group of the 15th Langiao Cup National Software and Information Technology Professional Talent Competition (rank 18<sup>th</sup> top 2.7%)</i>	<i>Apr 2024</i>
<i>Provincial Second Prize of China's 2024 National Mathematics Competition for College Students (top 9%)</i>	<i>Nov 2023</i>
<i>Provincial First Prize in the C++ A Group of the 14th Langiao Cup National Software and Information Technology Professional Talent Competition (rank 8<sup>th</sup> top 1.9%)</i>	<i>Apr 2023</i>

## SKILLS

<b>Programming Languages</b>	Python, C/C++, MATLAB, Latex
<b>Machine Learning Tools</b>	Pytorch, Sklearn, Matplotlib, Pandas, Numpy