

# JIAN JIN

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## EDUCATION

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**Beijing Jiaotong University**, Beijing, China

Ph.D. Degree in Signal Processing (Major: Signal and Information Processing)

*Sep. 2014 – Jun. 2019*

**Simon Frazer University**, Vancouver, Canada

Joint Ph.D. Degree in Engineering Science (Major: Computer Vision)

*Sep. 2016 – Sep. 2018*

## WORK EXPERIENCE

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Research Fellow, Co-PI, Project Manager

*Jun. 2021 – Present*

*Nanyang Technological University, School of Computer Science and Engineering, Singapore*

- Experienced in **computer vision** tasks related to camera, mobile, and autopilot, specializing in image, video enhancement, super-resolution, JND prediction, as well as image, video, AIGC, 3D point cloud quality assessment, image edition, creation, classification, and data augmentation. **Investigated cutting-edge technologies** to stay at the forefront of the field. **Identified promising research directions**, and drafted detailed **research plans and proposals**. Drafted 5 proposals (including Tier 2 MOE Singapore, Alibaba AIR projects, etc.), **80% granted**, more than 5 million SGD. **Hosted 3 projects as Co-PI/manager**.
- **Led a team** of 12 students (1 Ph.D., 10 Masters, 1 Undergraduate). **Conducted research projects**, including key algorithms, software, experiments reproduction, designation, optimization, validation, demonstration, and delivery; key datasets designation, building, and promotion. Patent, TD, standardization, and papers draft, revision, rebuttal. **Interviewed** team members. Submitted **13 papers, 2 standards, 3TD, and 3 patents**.
- **Attended** important academic, standardization conferences (CVPR, ICCV, AVS, MPEG, etc.) and **communicated with collaborators** in both academia and industry. **Insightfully understood the industrial requirements** and the **potential commercial value** as well as **technology development trends**, and adjusted/optimized our techniques accordingly based on the products' requirements.

Research Fellow

*Nov. 2019 – May 2021*

*Alibaba-NTU Singapore Joint Research Institute, Singapore*

- Focused on **image processing**, including image compression; 3D/VR video compression and rendering; and perceptual modeling. **Developed a new paradigm** of image compression for human and machine uses, which achieved the SOTA results. **Filed 1 TD 1 patent and 2 standards**. **Built a 3D video dataset** and **developed an end-to-end quality estimator** for optimized 3D video coding algorithms, published by TMM2022. **First demonstrated that the deep machine vision did have JND and modeled it successfully**, published in TCSVT2021. **Designed** all the datasets, algorithms, and experiments, and **wrote** the related source codes in Python, C, and C++.
- Helped Prof. Lin **supervise/co-supervise** 4 master and 2 undergraduate students. Helped to **draft research 2 proposal** and 50% of them was approved. Helped students to **design** datasets, experiments, and algorithms. **Revised** their papers and thesis. **led** them to attend the first artificial intelligence competition in China and **won the finalist prize**. Helped collaborators **develop i) a VR rendering algorithm**, published in ICSP2020, and **ii) a deep image super-resolution algorithm** for view rendering, published in ICIG2020.
- **Communicated** with Alibaba groups and understood their concerns and requirements, especially for their products. Integrated the computing power (GPU servers) and manpower (dataset annotation) in NTU. Discussed the details of **dataset building and algorithm designation** with PIs from Alibaba and NTU. Responsible for the work conflicts coordination between different groups, report to PIs on time issues which need coordination, and the progress of coordination. Helped Alibaba to **test our techniques on their new products**.

Research Engineer

*Oct. 2016 – Sep. 2018*

*Altumview Systems Inc., BC, Canada*

- **Reproduced and implemented SOTA algorithms** on image processing and computer visions, including depth image super-resolution, virtual view video rendering, image classification, object detection, end-to-end image compression, etc. in C, C++, and Python.

## PROJECT EXPERIENCE

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*End-to-End Deep Visual Feature Compression*

*2023 – 2026*

*Tier 2 MOE, Singapore*

Manager and mainly participate. **Developing end-to-end feature compression paradigms**, including i) designing the whole structure of feature codec, ii) optimizing the rate-distortion-optimization module, iii) developing feature quality assessment techniques based on our previous JND techniques, and iv) proposing compressed features enhancement, and restoration module. All the research in this project is towards submitting **patents** and delivering **proposals** to the **standardization poor**.

Mainly participate. **Developing end-to-end techniques for video super-resolution**, including i) designing temporal-spatial models for features extraction, alignment, and aggregation, ii) integrating the SOTA generation models, including Diffusion, GAN, VAE, etc., for super-resolution video generation, and iii) developing efficient video quality metrics for supervising during training video generation. All these researches are desired to **provide technique support** for our collaborator **in their products**.

*Quality Assessment for 3D Digital Asset and CG*

2023 – 2025

XXX, Singapore

Manager at NTU, mainly participates. **Exploring quality metrics for 3D point cloud and computer generation content**, including i) building quality datasets, ii) designing a more efficient data representation format for efficiently conducting 3D content quality assessment, and iii) developing end-to-end metrics by considering extending 2D metrics to the 3D space. The purpose of this project is to **develop key metrics to supervise the 3D coding optimization and computer generation algorithm design**, and further **deliver proposals into the standardization poor**.

*User-Generated Video Quality Assessment*

2021 – 2023

Alibaba AIR, Singapore

Co-PI. **Developed quality assessment metrics for the images/videos generated by the users**, including i) developed an efficient IQA for the devices with limited computational ability by integrating the important information from both deep features and handcrafted ones into account, ii) developed a high accuracy IQA for server uses by integrating features generated from different spatial ranges and achieve the best results in PLCC and SRCC, iii) proposed an efficient while accurate VQA via our proposed video sampling and masking techniques. All these metrics were **tested and utilized** in the **quality enhancement services in Alibaba Cloud**. On the one hand, they are used to **assess video quality** and then designed as losses to **optimize quality enhancement algorithms**.

*Adversarial faces generation for privacy-preserving*

2021 – 2022

Tier 2 MOE, Singapore

Mainly participate. **Developed 3 adversarial face generation algorithms**, including i) developed a minimum noticeable difference based adversarial privacy preserving image generation with a learnable convolutional auto-encoder, ii) proposed an HVS-inspired adversarial image generation with high perceptual quality, and iii) developed a face makeup image generation method with the adversarial diffusion model. All these methods tried to make **efficient dense predictions** of adversarial face images by **editing personal ID** information without being detected by the human eyes or just via simple **makeup edition** so that they can be used in **social media apps** for **privacy-preserving** purposes.

*Image Compression for Machine Vision*

2020 - 2022

Alibaba AIR, Singapore

Co-PI. **Proposed a novel paradigm of image compression for human and machine uses**, including i) developed a high-level semantic information extractor and associated low-level signal information extractor to extract information, ii) developed a GAN-like module to reconstruct images with low/high-level information, iii) proposed a 16-bit gray-scale profile to compress the segmentation images for high-level information compression, and iv) proposed paradigm achieved good results in both machine and human metrics, especially for object detection and instance segmentation tasks. All the developed techniques were **filed as TD, patents**, and the related **technical proposals** were submitted to **AVS and DCM standardization organizations**.

*Perceptual Modeling for Human and Machine*

2019 – 2021

Alibaba AIR, Singapore

Mainly participate. **Developed 3 JND models**, including i) conducted the first work on exploring the JND for deep machine vision and first demonstrated that deep machine vision had JND as well as successfully modeled it, ii) proposed an RGB-JND, which is the first work trying to predict the JND by taking the stimuli among RGB full channels via a learnable generation network and significantly improve the accuracy of JND modeling, and iii) by taking the signal degradation that existed in the human visual system into account, proposed an HVS-SD-JND model, which further improve the JND accuracy. This project was **fundamental research**. We developed useful redundancy estimation models to **provide significant technical support for image and video processing and vision understanding** fields.

*3D video coding*

2017 – 2019

Google Chrome, Canada

Mainly participate. **Developed two view synthesis distortion estimation algorithms for optimizing 3D video coding**, including i) proposed pixel-level VSDE method for 3D video coding, where a backward prediction method was then developed, which started from the pixels of interest (POIs) in the virtual view and found their corresponding pixels in the reference view via a coarse-to-fine approach and **achieved at the pixel level**. ii) developed an auto-weighted layer representation based VSDE method and built an associated database, where the level of depth changes and their associated texture degeneration were used to predict view synthesis distortion by learning their relationship from the well-build database. Experimental results show that the proposed method **outperformed the relevant state-of-the-art methods in both accuracy and efficiency**. These two algorithms were used in 3D video **codec optimization**, especially for the **RDO process**.

*Free-view video coding and rendering*

2014 – 2018

NSFC (Major), China

Mainly participate. **Developed an efficient virtual view video rendering algorithm** via a region-aware 3D warping method, which was **4 times faster** than the **3D-HEVC standards**, without sacrificing the quality of rendering. **Developed an efficient deep image quantizer**, which was able to represent deep information with 6 bits without causing any view synthesis distortion. Compared to the 8-bit cost in 3D-HEVC standards, our approach achieved **25% bit savings**. Also, **developed a depth-bin-based graphical model for fast view synthesis distortion estimation**, which models the complicated view synthesis processes at the depth-value level, Experimental results verify that our proposed method is **8~32 times faster** and requires **17%-60% less memory** than the existing SOTA method, **with the same accuracy**.

## PROFESSIONAL SKILLS

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C, C++, MATLAB, Python, Tensorflow, Pytorch, LaTeX

## PUBLICATION LIST

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Already Published: (\* Equal contribution, # Corresponding author)

- [1] Yuan Xue, Jian Jin#, Weisi Lin, Wen Sun, “HVS-Inspired Adversarial Image Generation with High Perceptual Quality”, *Journal of Cloud Computing (JCC)*, 2023.
- [2] Yaxuan Liu\*, Jian Jin\*#, Member, IEEE, Yuan Xue, Weisi Lin, “The First Comprehensive Dataset with Multiple Distortion Types for Visual Just-Noticeable Differences”, *IEEE International Conference on Image Processing (ICIP)*, 2023.
- [3] Fanxin, Xia, Jian Jin#, Lili Meng, Feng Ding, Huaxiang Zhang, “GAN-based Image Compression with Improved RDO Process”, *International Conference on Image and Graphics (ICIG)*, 2023.
- [4] Jiangzhong Cao, Ximei Yao Yao, Huan Zhang, Jian Jin, Yun Zhang, Bingo Wing-Kuen Ling, “Slimmable Multi-task Image Compression for Human and Machine Vision”, *IEEE Access*, 2023.
- [5] Xingxing Zhang, Shupeng Gui, Jian Jin, Zhenfeng Zhu, Yao Zhao, Ji Liu, “Atzsl: Defensive zero-shot recognition in the presence of adversaries”, *IEEE Transactions on Multimedia (TMM)*, 2023.
- [6] Jian Jin, Xingxing Zhang, Lili Meng, Weisi Lin, Jie Liang, Yao Zhao, “Auto-Weighted Layer Representation Based View Synthesis Distortion Estimation for 3-D Video Coding”, *IEEE Transactions on Multimedia (TMM)*, 2022.
- [7] Wen Sun\*, Jian Jin\*, Weisi Lin, “Minimum Noticeable Difference based Adversarial Privacy Preserving Image Generation”, *IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)*, 2022. (\* Equal contribution)
- [8] Jian Jin, Xingxing Zhang, Xin Fu, Huan Zhang, Weisi Lin, Jian Lou, Yao Zhao, “Just Noticeable Difference for Deep Machine Vision”, *IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)*, 2021.
- [9] Geyang Wang, Yao Zhao, Chunyu Lin, Meiqin Liu, and Jian Jin, “Dually Octagonal Projection for 360 Video with Less-Distortion Introduced”, *International Conference on Signal Processing (ICSP)*, vol. 1, pp. 246-251. IEEE, 2020.
- [10] Chao Yao, Jimin Xiao, Jian Jin, Xiaojuan Ban, “Edge Orientation Driven Depth Super-Resolution for View Synthesis”, *International Conference on Image and Graphics (ICIG)*, 2020.
- [11] Jian Jin, Jie Liang, Yao Zhao, Chunyu Lin, Chao Yao, Lili Meng, “Pixel-level View Synthesis Distortion Estimation for 3-D Video Coding”, *IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)*, 2019.
- [12] Jian Jin, Jie Liang, Yao Zhao, Chunyu Lin, Chao Yao, Anhong Wang, “A Depth-Bin-Based Graphical Model for Fast View Synthesis Distortion Estimation”, *IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)*, 2019.
- [13] Jian Jin, Anhong Wang, Yao Zhao, Chunyu Lin, and Bing Zeng, “Region-aware 3D-warping for DIBR,” *IEEE Transactions on Multimedia (TMM)*, 2016, 18(6): 953-966.
- [14] Jian Jin, Yao Zhao, Chunyu Lin, and Anhong Wang, “An Accurate and Efficient Nonlinear Depth Quantization Scheme,” *Pacific Rim Conference on Multimedia (PCM 2015)*, Korea, pp. 390-399, Aug. 2015.
- [15] Jian Jin, Anhong Wang, Yao Zhao, and Chunyu Lin, “A fast region-level 3D-warping method for depth-image-based rendering”, *IEEE International Workshop on Multimedia Signal Processing (MMSP 2015)*, Xiamen, pp. 1-6, Oct. 2015.
- [16] Lijun Zhao, Anhong Wang, Bing Zeng, Jian Jin, “Scalable Coding of Depth Images with Synthesis-Guided Edge Detection,” *KSII Transactions on Internet and Information Systems*, 2015, 9(10): 4108-4125.
- [17] Zhiwei Xing, Anhong Wang, Jian Jin, Yingchun Wu, “Synthesis-Aware Region-Based 3D Video Coding,” *Pacific Rim Conference on Multimedia (PCM 2015)*, Korea, pp. 400-409, Aug. 2015.

Under Review:

- [1] Jian Jin, Yuan Xue, Xingxing Zhang, Lili Meng, Yao Zhao, Weisi Lin, “HVS-Inspired Signal Degradation Network for Just Noticeable Difference Estimation”, *IEEE Transactions on Multimedia (TMM)*, 2023.
- [2] Jian Jin, Dong Yu, Weisi Lin, Lili Meng, Hao Wang, Huaxiang Zhang, “Full RGB Just Noticeable Difference (JND) Modelling”, *IEEE Transactions on Image Processing (TIP)*, 2023.
- [3] Lili Meng, Sien Chen, Jian Jin#, Weisi Lin, Zhuo Chen, Tsui-Shan Chang, Zhengguang Li, “A New Image Codec Paradigm for Human and Machine Uses”, *IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)*, 2023.
- [4] Wen Sun, Jian Jin, Weisi Lin, “Privacy Preserving Face Makeup Image Generation with Adversarial Diffusion Model,” *IEEE Transactions on Multimedia (TMM)*, 2023.

## PROFESSIONAL ACTIVITIES

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- **Members:** i) IEEE, ii) CIE, and iii) CSIG
- **Technical Program/Review Committee Member:** i) National Conference on Image and Graphics, ii) IEEE International Conference on Visual Communications and Image Processing, iii) Asia Pacific Signal and Information Processing Association Annual Summit and Conference, etc.
- **Reviewer:** IEEE TIP, TCSVT, TMM, TNNLS, IEEE Intelligent Transport System, Signal Processing: Image Communication, Neurocomputing, CVPR, ICCV, ECCV, ACM MM, ICLR, AAAI, etc.