

# Pingping Cai

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## RESEARCH INTERESTS

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Algorithm, Deep Learning, Computer Vision, 3D Point Cloud Processing, Image Processing

## EDUCATION

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University of South Carolina, Columbia, SC, USA	Jan 2021 — Present
Ph.D. in Computer Science	Cumulative GPA: 4.00/4.00
Huazhong University of Science and Technology, Wuhan, China	Sep 2015 — Mar 2018
M.Sc. in Software Engineering	Cumulative GPA: 3.50/4.00
Nantong University, Nantong, China	Sep 2011 — Jun 2015
B.Sc. in Applied Physics	Cumulative GPA: 3.85/4.00

## ACADEMIC EXPERIENCE

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### 3D Shape Completion

- Conduct a thorough investigation into the limitations of existing 3D shape completion algorithms.
- Introduce a novel shape completion algorithm that leverages a learnable shape dictionary, capable of acquiring prior knowledge from training samples and compensating for missing shape details during the inference stage.
- Independently design and implement the algorithm via Pytorch, compose the paper, and publish it in top-tier conferences as the first author. (**AAAI**)

### 3D Super Resolution

- Conduct an in-depth investigation into previous methods and analyze the reason of the presence of outlier points.
- Propose a novel solution by introducing an additional surface-level constraint in the upsampling process to mitigate the presence of outlier points.
- Independently design, implement the algorithm, author the paper, and publish it in top-tier conferences as the first contributor. (**AAAI**)

### Indoor 3D Environment Reconstruction

- Develop and implement an advanced millimeter-wave-based indoor 3D point cloud reconstruction algorithm utilizing a combination of traditional signal processing and deep learning techniques.
- Independently contribute to data collection, algorithm design, and experiment verification.
- Write the paper and publish it in top-tier conferences as the first author. (**UbiComp**)

### 2D Low-Light Image Enhancement

- Introduce a novel algorithm that utilizes an adversarial attack process to intentionally degrade the input image, creating a deliberately worse version that serves as an adversarial sample to the network, thereby enhancing the network's robustness and performance.
- Develop and implement the Adversarially Regularized Low-Light Image Enhancement network. Author the paper and publish it in reputable conferences as the supervisor. (**MMM**)

### 2D Image Super Resolution

- Conduct research and design innovative algorithms focused on restoring low-resolution face images to high-resolution counterparts, aiming for superior high-definition face reconstruction results.
- Design and implement the Gradient Constrained Sparse Representation algorithm using Matlab. Author the paper and publish it in a journal. (**ACCESS**)

## INDUSTRIAL EXPERIENCE

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University of South Carolina	Columbia, SC, USA
Graduate Research Assistant	Jan 2021 — Present

- Design and create an advanced Splice Detection Model using cutting-edge deep learning techniques such as YOLO and Fully Convolutional Networks, implemented with Python and PyTorch. Achieve a good performance with mAP@0.5 score of 0.94.
- Contribute proactively to the enhancement of the VirtBench Platform, leveraging QT and C++. Implement the functionality to load bounding boxes from XML files and accurately render them in the video.

- The official webpage of this project is <https://www.mirc-rc.uscreate.org>

**Baidu Inc.**

*Image Searching Algorithm Developer*

Beijing, China  
Jan 2018 — Jun 2019

- Contribute to offline text and image data mining. Extract more than **5 million** paired Query-Image Sets data.
- Develop ranking algorithms based on Query-Object Relevance and Image Quality, surpassing old rule-based ranking methods and achieving an improved average image click rate of **2%**.
- Maintain image searching algorithms, consistently optimizing their performance, leading to time improvement of **5%**.

**PUBLICATIONS**

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- **P. Cai**, D. Scott, X. Li, S. Wang. Orthogonal Dictionary Guided Shape Completion Network for Point Cloud, to appear in AAAI Conference on Artificial Intelligence (**AAAI**), Vancouver, Canada, 2024.
- **P. Cai**, Z. Wu, X. Wu, S. Wang. Parametric Surface Constrained Upsampler Network for Point Cloud, AAAI Conference on Artificial Intelligence (**AAAI**), 250–258, Washington, DC, 2023.
- **P. Cai** and S. Sur, “Millipcd: Beyond traditional vision indoor point cloud generation via handheld millimeter-wave devices,” Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (**UbiComp**), vol. 6, no. 4, Jan. 2023.
- **P. Cai** and S. Sur, “Deeppcd: Enabling autocompletion of indoor point clouds with deep learning,” Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (**UbiComp**), vol. 6, no. 2, Jul. 2022.
- L. Liu, W. Wang, and **P. Cai**, “Point cloud classification via learnable memory bank,” in International Conference on Multimedia Modeling (MMM), 2024.
- W. Wang, L. Liu, and **P. Cai**, “Adversarially regularized low-light image enhancement,” in International Conference on Multimedia Modeling (MMM), 2024.
- X. Pei, Y. Guan, **P. Cai**, and T. Dong, “Face hallucination via gradient constrained sparse representation,” IEEE Access, vol. 6, pp. 4577–4586, 2018.

**OTHER EXPERIENCES**

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- **Volunteer:** AAAI 2023
- **Research Mentor:** MMM 2024
- **Academic Reviewer:** CVPR, TPAMI, TMM, UbiComp, ICME, MMM . . .

**SKILLS**

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- **Programming:** Python (6 years), Matlab (3 years), C++ (2 years), Pytorch (3 years), Linux (6 years)
- **Personality:** Quick Learner, Hard-working, Self-Motivated, Easygoing