Chin-Cheng Chan

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RESEARCH SUMMARY

My research applies signal processing theory and mathematics to **develop rigorous, high-quality, efficient, and trustworthy image reconstruction algorithms** for ill-posed inverse problems in computational imaging. Representative works of mine include a novel, computationally efficient image model that addresses a long-standing computational challenge in non-Cartesian Fourier imaging, as well as a novel framework for designing reconstruction methods that balance quality, efficiency, and transparency. Many of the algorithms I developed have **a broad impact on both classical and modern machine-learning reconstruction methods** and are **applicable across multiple imaging modalities**.

EDUCATION

University of Southern California, Los Angeles, CA — Aug. 2019 — Present

- Ph.D. in Electrical and Computer Engineering, expected May 2026.
- Research areas: image reconstruction, computational imaging, and MRI.

National Taiwan University, Taipei, Taiwan — Sep. 2014 — Jun. 2018

- B.Sc. in Electrical Engineering.
- Research areas: image processing for camera systems and computer vision.

RESEARCH EXPERIENCE

Biomedical Imaging Group, University of Southern California — Los Angeles, CA

Graduate Research Assistant (Advisor: Prof. Justin P. Haldar) — Aug. 2019 — Present

- A Novel Hilbert-Space Reconstruction Framework for Computational Imaging
  - Developed a novel framework for designing high-quality, efficient, and trustworthy image reconstruction methods using reproducing-kernel Hilbert space theory.
  - Addressed a long-standing trade-off between accuracy, computational efficiency, and transparency.
  - Achieved 6× speedup in MRI reconstruction without loss of image quality.
- Computationally Efficient Image Model for Non-Cartesian Fourier Imaging
  - Proposed a novel image model for non-Cartesian Fourier imaging.
  - Addressed a long-standing computational efficiency challenge in the conventional model used over the past 25 years.
  - Achieved 2×–4× faster reconstruction compared to the conventional model.
- Resolution Analysis Framework for Modern Reconstruction Algorithms
  - Developed a general resolution analysis framework applicable to arbitrary image reconstruction algorithms.
  - Tackled the emerging challenge of evaluating resolution in reconstructions generated by data-driven and advanced nonlinear methods.
  - Showed that commonly used image-quality metrics may not reliably reflect image resolution.
- Novel Beamforming Technique for Cartesian MRI
  - Proposed an enhanced beamforming technique tailored for Cartesian MRI acquisitions.
  - Mitigated the fundamental trade-off between scan time and reconstruction time in MRI.
  - Enabled 50× faster image reconstruction for highly accelerated real-time MRI compared to conventional methods.

Multimedia Processing and Communications Lab, National Taiwan University — Taipei, Taiwan

Undergraduate Research Assistant (Advisor: Homer Chen) — Aug. 2015 — Jun. 2019

- Deep Learning for Optical Coherence Tomography (OCT) Image Analysis
  - Developed a deep learning method for delineating the dermis-epidermis junction and reduced segmentation error by 40%.
- Improving the Reliability of Phase-Detection Autofocus
  - Proposed autofocus techniques using statistics, reinforcement learning, and deep learning, achieving 1.7× speedup.

- Blood Vessel Detection for Optical Coherence Tomography
  - Proposed a short-time robust PCA algorithm that improved the classification performance by 20%.

PEER-REVIEWED PUBLICATIONS

Preprint/Under Review

1. **C.-C. Chan**, J. P. Haldar, "Constrained MRI using weighted Hilbert spaces: Fast scan-specific reconstruction with transparent assumptions", 2025. (Conference abstract under review). [Link]
2. **C.-C. Chan**, J. P. Haldar, "A new k-space model for non-Cartesian Fourier imaging", *arXiv:2505.05647*, 2025. (Under review). [Link]

Journal publications

1. R. Lobos, **C.-C. Chan**, J. P. Haldar, "New theory and faster computations for subspace-based sensitivity map estimation in multichannel MRI", *IEEE Trans. Med. Imag.*, vol. 43, pp. 1–10, 2023. [Link]
2. S.-T. Tsai, C.-H. Liu, **C.-C. Chan**, Y.-H. Li, S.-L. Huang, H. H. Chen, "H&E-like staining of OCT images of human skin via generative adversarial network", *Appl. Phys. Lett.*, vol. 121, pp. 134102, 2022. [Link]
3. **C.-C. Chan**, J. P. Haldar, "Local perturbation responses and checkerboard test: A tool for characterizing advanced nonlinear algorithms for inverse problems in MR", *Magn. Reson. Med.*, vol. 86, pp. 1873–1887, 2021. [Link]
4. C.-J. Ho, M. Calderon-Delgado, **C.-C. Chan**, M.-Y. Lin, J.-W. Tjiu, S.-L. Huang, H. H. Chen, "Detecting mouse squamous cell carcinoma from submicron full-field optical coherence tomography images by deep learning", *J. Biophotonics*, vol. 14, 2021. [Link]
5. C.-J. Ho, **C.-C. Chan**, H. H. Chen, "AF-Net: A convolutional neural network approach to phase detection autofocus", *IEEE Trans. Image Process.*, vol. 29, pp. 6386–6395, 2020. [Link]
6. **C.-C. Chan**, H. H. Chen, "Modeling phase shift data of phase-detection autofocus by skew-normal distribution", *J. Electron. Imaging*, vol. 28, 2019. [Link]
7. P.-H. Lee, **C.-C. Chan**, S.-L. Huang, A. Chen, H. H. Chen, "Extracting blood vessels from full-field OCT data of human skin by short-time RPCA", *IEEE Trans. Med. Imag.*, vol. 37, pp. 1899-1909, 2018. [Link]

Conference publications

1. **C.-C. Chan**, J. P. Haldar, "A novel k-space model for non-Cartesian reconstruction", in *Proc. Int. Soc. Magn. Reson. Med.*, 2025, p. 1366. **(Magna Cum Laude Award)**. [Link]
2. **C.-C. Chan**, D. Kara, D. Kwon, E. Roselli, C. Nguyen, J. P. Haldar, "ROVir enables substantially easier real-time imaging of small regions of interest", in *Proc. Int. Soc. Magn. Reson. Med.*, 2025, p. 2622. [Link]
3. **C.-C. Chan**, J. P. Haldar, "Rethinking model-based non-Cartesian Fourier imaging: A new k-space model", in *Proc. IEEE Int. Symp. Biomed. Imag.*, 2025. [Link]
4. **C.-C. Chan**, C. Nguyen, J. P. Haldar, "Improved region-optimized virtual coils for Cartesian acquisition geometries", in *Proc. Int. Soc. Magn. Reson. Med.*, 2024, p. 1905. [Link]
5. **C.-C. Chan**, J. P. Haldar, "Measuring spatiotemporal resolution in real-time MRI", in *Proc. Int. Soc. Magn. Reson. Med.*, 2024, p. 1875. [Link]
6. **C.-C. Chan**, J. Wang, T. Nadeem, J. P. Haldar, "On reference-based image quality assessment in medical image reconstruction: Potential pitfalls and possible solutions", in *Proc. Asilomar*, 2023, pp. 36–39. (Invited paper). [Link]
7. R. Lobos, **C.-C. Chan**, J. P. Haldar, "New theory and faster computations for subspace-based sensitivity map estimation", in *Proc. Int. Soc. Magn. Reson. Med.*, 2023, p. 4625. [Link]
8. **C.-C. Chan**, J. P. Haldar, "Local perturbation responses: A tool for understanding the characteristics of advanced nonlinear MR reconstruction algorithms", in *Proc. Int. Soc. Magn. Reson. Med.*, 2020, p. 684. **(Power pitch presentation)**. [Link]
9. **C.-C. Chan**, H. H. Chen, "Autofocus by deep reinforcement learning", in *Proc. Electron. Imaging*, 2019, pp. 577-581. [Link]
10. **C.-C. Chan**, H. H. Chen, "Improving the reliability of phase detection autofocus", in *Proc. Electron. Imaging*, 2018, pp. 1-5. [Link]
11. **C.-C. Chan**, S.-K. Huang, H. H. Chen, "Enhancement of phase detection for autofocus", in *Proc. IEEE Int. Conf. Image Process.*, 2017, pp. 41-45. [Link]
12. P.-H. Lee, **C.-C. Chan**, S.-L. Huang, A. Chen, H. H. Chen, "Blood vessel extraction from OCT data by short-time RPCA", in *Proc. IEEE Int. Conf. Image Process.*, 2016, pp. 394-398. [Link]

AWARDS

- Ming Hsieh Institute Scholar — Oct. 2025
- Magna Cum Laude Award at ISMRM 2025. — May 2025
- Educational stipends for ISMRM 2024 and 2025. — Jan. 2024 and Jan. 2025

TEACHING AND MENTORING EXPERIENCE

Peer Mentor, University of Southern California — Los Angeles, CA

- Mentored a junior PhD lab member on research projects. — Jul. 2025 — Present

Teaching Assistant, University of Southern California — Los Angeles, CA

- EE-483: Graduate-level Digital Signal Processing. — Fall 2022, Fall 2023
- EE-503: Graduate-level Engineering Probability. — Fall 2021, Spring 2022, Spring 2024
- PHYS-152L: Lab section for Physics II. — Fall 2024