

CHENYU GAO

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TECHNICAL SKILLS

Areas of Expertise	Multimodal Representation Learning, Generative Models, Medical Image Analysis, Computer Vision
Languages	Python, Bash
Frameworks	PyTorch, TensorFlow, Scikit-learn, Hugging Face, NumPy, Pandas, Polars
DevOps & Cloud	Git, Docker, Singularity, HPC/Slurm, AWS (S3, EC2), Weights & Biases

INTELLECTUAL PROPERTY

- IP1. **Chenyu Gao**, Bennett A. Landman, Michael E. Kim. System and Method of Brain Age Identification for Predicting Neuro-Degenerative Disease. U.S. Patent 63/701,861, filed on Oct 1, 2024. Provisional patent.

EXPERIENCE

Data Science and Machine Learning Intern

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South San Francisco, CA

June 2025 – Aug 2025

- Designed and implemented a framework for multimodal self-supervised representation learning to enable the discovery of novel gene targets. First-authored a technical paper, currently pending internal review for publication.

Graduate Research Assistant

Vanderbilt University

Nashville, TN

July 2022 – Present

- Engineered a cascaded diffusion model for a privacy red-team attack, reconstructing high-fidelity 3D facial geometry from defaced MRI data to quantify and expose critical re-identification risks. [Blog]
- Designed a first-of-its-kind system for brain age estimation from multi-modal MRI to enable early detection of neurodegenerative diseases, resulting in a provisional patent. [GitHub]
- Architected a scalable data processing pipeline using Singularity, local and HPC to ingest, harmonize, and quality-assure 100,000 MRI scans from 40+ datasets for the world's largest diffusion and structural MRI database.
- Implemented a conditional GAN in PyTorch to synthetically extend the MRI field-of-view, rescuing previously incomplete scans and increasing effective dataset size by an estimated 10-15%.

Graduate Research Assistant

Johns Hopkins University

Baltimore, MD

Dec 2020 – May 2022

- Extended the application of a lifelong learning algorithm from vision to speech tasks and validated its omnidirectional knowledge transfer on a spoken digit benchmark, contributing to a publication in the top-tier journal *IEEE TPAMI*. [GitHub]
- Developed and benchmarked a suite of deep learning and classical computer vision algorithms for MR image analysis, establishing performance baselines that guided subsequent research on MRI defacing.

EDUCATION

Vanderbilt University

Doctor of Philosophy in Electrical & Computer Engineering

Nashville, TN

July 2022 – Nov 2026 (expected)

- Research Focus:** Applying multimodal representation learning and generative models to solve challenges in medical image analysis and computer vision.
- Honors:** Graduate School Travel Grant (2023), ECE Day best poster (2025)

Johns Hopkins University

Master of Science in Biomedical Engineering

Baltimore, MD

Aug 2020 – May 2022

Sun Yat-sen University

Bachelor of Science in Biomedical Engineering

Guangzhou, China

Aug 2016 – June 2020

JOURNAL ARTICLES

- J1. **C Gao***, K Xu*, et al. "Pitfalls of defacing whole-head MRI: re-identification risk with diffusion models and compromised research potential." *Computers in Biology and Medicine*. 2025.
- J2. **C Gao**, et al. "Brain age identification from diffusion MRI synergistically predicts neurodegenerative disease." *Imaging Neuroscience*. 2025.
- J3. **C Gao**, et al. "Field-of-view extension for brain diffusion MRI via deep generative models." *Journal of Medical Imaging*. 2024.
- J4. **C Gao**, et al. "Characterizing patterns of diffusion tensor imaging variance in aging brains." *Journal of Medical Imaging*. 2024.
- J5. **C Gao**, BA Landman, JL Prince, A Carass. "Reproducibility evaluation of the effects of MRI defacing on brain segmentation." *Journal of Medical Imaging*. 2023.
- J6. JT Vogelstein, J Dey, ..., **C Gao**, et al. "Simple Lifelong Learning Machines." *IEEE Transactions on Pattern Analysis and Machine Intelligence*. 2025.
- J7. ME Kim, **C Gao**, et al. "Scalable quality control on processing of large diffusion-weighted and structural magnetic resonance imaging datasets." *PLoS One*. 2025.
- J8. C Peter, ..., **C Gao** (ADSP-PHC Analyst Team), et al. "White Matter Abnormalities and Cognition in Aging and Alzheimer Disease." *JAMA neurology*. 2025.
- J9. AM Saunders, ME Kim, **C Gao**, et al. "Comparison and calibration of MP2RAGE quantitative T1 values to multi-T1 inversion recovery T1 values." *Magnetic Resonance Imaging*. 2025.
- J10. A Lorenz, ..., **C Gao**, et al. "The effect of Alzheimer's disease genetic factors on limbic white matter microstructure." *Alzheimer's & Dementia*. 2025.
- J11. KG Schilling, ..., **C Gao**, et al. "Head Motion in Diffusion Magnetic Resonance Imaging: Quantification, Mitigation, and Structural Associations in Large, Cross-Sectional Datasets Across the Lifespan." *Human Brain Mapping*. 2025.
- J12. R Zhang, ..., **C Gao**, et al. "Enhancing Clinical Data Management through Barcode Integration and REDCap: Innovations in Scalability and Adaptability." *JMIR Formative Research*. 2025.
- J13. A Peterson, ..., **C Gao**, et al. "Sex and APOE- $\epsilon 4$ allele differences in longitudinal white matter microstructure in multiple cohorts of aging and Alzheimer's disease." *Alzheimer's & dementia*. 2024.
- J14. P Kanakaraj, ..., **C Gao**, et al. "Deepn4: learning N4ITK bias field correction for T1-weighted images." *Neuroinformatics*. 2024.
- J15. ME Kim, **C Gao**, et al. "Empirical assessment of the assumptions of ComBat with diffusion tensor imaging." *Journal of Medical Imaging*. 2024.

CONFERENCE PUBLICATIONS

- C1. **C Gao**, et al. "Predicting age from white matter diffusivity with residual learning." *Medical Imaging 2024: Image Processing*. 2024.
- C2. **C Gao**, L Jin, JL Prince, A Carass. "Effects of defacing whole head MRI on neuroanalysis." *Medical Imaging 2022: Image Processing*. 2022.
- C3. E Topolnjak*, **C Gao***, et al. "Assessment of subject head motion in diffusion MRI." *Medical Imaging 2024: Image Processing*. 2024.
- C4. E McMaster, L Puglisi, **C Gao**, et al. "A technical assessment of latent diffusion for Alzheimer's disease progression." *Medical Imaging 2025: Image Processing*. 2025.
- C5. ME Kim, K Ramadass, **C Gao**, et al. "Scalable, reproducible, and cost-effective processing of large-scale medical imaging datasets." *Medical Imaging 2025: Imaging Informatics*. 2025.
- C6. Y Chang, L Xu, **C Gao**, et al. "Bundle-wise functional connectivity density and fractional amplitude of low-frequency fluctuations decrease in white matter in preclinical Alzheimer's disease and are associated with A β levels and cognition." *Medical Imaging 2025: Clinical and Biomedical Imaging*. 2025.
- C7. K Ramadass, Y Liu, ME Kim, **C Gao**, et al. "Investigating effects of air quality and weather on human brain volumes." *Medical Imaging 2025: Clinical and Biomedical Imaging*. 2025.
- C8. Z Li, ..., **C Gao**, et al. "Approximate diffusion tractography from FLAIR MRI and anatomical context using recurrent neural networks." *Medical Imaging 2025: Image Processing*. 2025.
- C9. S Bao, ..., **C Gao**, et al. "Quantitative analysis of colonic epithelial cell aging in a cell-cycle-like model: changes in nucleus and cytoplasm along the crypt axis." *Medical Imaging 2025: Digital and Computational Pathology*. 2025.
- C10. AR Krishnan, K Xu, T Li, **C Gao**, et al. "Inter-vendor harmonization of CT reconstruction kernels using unpaired image translation." *Medical Imaging 2024: Image Processing*. 2024.

- C11. T Yu, Y Li, ME Kim, **C Gao**, et al. "Tractography with T1-weighted MRI and associated anatomical constraints on clinical quality diffusion MRI." *Medical Imaging 2024: Image Processing*. 2024.
- C12. H Xu, NR Newlin, ME Kim, **C Gao**, et al. "Evaluation of mean shift, ComBat, and CycleGAN for harmonizing brain connectivity matrices across sites." *Medical Imaging 2024: Image Processing*. 2024.
- C13. ME Kim, HH Lee, K Ramadass, **C Gao**, et al. "Characterizing low-cost registration for photographic images to computed tomography." *Medical Imaging 2024: Clinical and Biomedical Imaging*. 2024.