Chenyu Gao

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Professional Skills

- Areas of Expertise: Computer Vision, Generative Models, Natural Language Processing, Medical Image Analysis
- Languages: Python, Bash
- Frameworks & Libraries: PyTorch, TensorFlow, pandas/polars, multiprocessing
- Developer Tools: Singularity, Git, HPC/Slurm

Intellectual Property

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

Experience

Data Science and Machine Learning Intern June 2025 – Aug 2025
insitro *South San Francisco, CA*

- Designed a framework for multimodal self-supervised representation learning to enable the discovery of novel gene targets. First-authored a technical paper (pending internal review).

Multi-Modality Representation Learning and Uncertainty Inference July 2022 – Present
Vanderbilt University, Research Assistant *Nashville, TN*

- Designed a brain age estimation system which enables early detection of neurodegenerative diseases. [GitHub]
- Developed conditional generative adversarial network (cGAN) for field-of-view extension of diffusion MRI.
- Designed a red team model to simulate privacy attacks on defaced MRI images: reconstructing 3D high-resolution MRI images with high-fidelity human faces with cascaded diffusion models. [Blog]
- Characterized the heteroscedasticity of uncertainty in diffusion tensor imaging (DTI) of aging brains.

Building the World's Largest Diffusion and Structural MRI Database July 2022 – Present
Vanderbilt University, Research Assistant *Nashville, TN*

- Coordinated the collection and processing of 40+ MRI datasets, encompassing 30,000+ participants.
- Cleaned, organized, and harmonized tabular data from 100,000+ scans using pandas.
- Implemented containerization of pipelines with Singularity to ensure reproducibility and scalability.
- Utilized local and high-performance computing (HPC) resources for high-throughput parallel processing.
- Developed strategies for quality assurance of over 1M of image samples in real-time collaboration.

Medical Image Analysis and MRI Defacing Dec 2020 – May 2022
Johns Hopkins University, Research Assistant *Baltimore, MD*

- Implemented classical image processing algorithms and deep learning-based methods for registration, segmentation, and synthesis of MR images.
- Evaluated the effects of defacing whole-head MRI on segmentation reproducibility.

ProgLearn: Omnidirectional Transfer for Quasilinear Lifelong Learning Aug 2020 – May 2021
Johns Hopkins University, Research Assistant *Baltimore, MD*

- Extended the application of a lifelong learning algorithm (ProgLearn) from vision to speech. Validated and benchmarked the backward and forward knowledge transfer against transfer learning. [GitHub]

Education

Vanderbilt University — July 2022 – Nov 2026 (expected)
Doctor of Philosophy in Electrical & Computer Engineering — *Nashville, TN*

- Honors: Graduate School Travel Grant (2023), ECE Day best poster (2025)

Johns Hopkins University — Aug 2020 – May 2022
Master of Science in Biomedical Engineering — *Baltimore, MD*

Sun Yat-sen University — Aug 2016 – June 2020
Bachelor of Science in Biomedical Engineering — *Guangzhou, China*

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-TI 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-ε4 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 Aβ 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.