

# Chenyu Gao

444 Elmington Ave, Apt 716, Nashville, TN 37205

☎ +1 (667) 910-5300 | ✉ [chenyu.gao@vanderbilt.edu](mailto:chenyu.gao@vanderbilt.edu) | 🌐 [chenyugoal.github.io](https://chenyugoal.github.io)

## EDUCATION

---

### Vanderbilt University

*Doctor of Philosophy in Electrical & Computer Engineering*

July 2022 – May 2026 (expected)

*Nashville, TN*

### Johns Hopkins University

*Master of Science in Biomedical Engineering*

Aug 2020 – May 2022

*Baltimore, MD*

### Sun Yat-sen University

*Bachelor of Science in Biomedical Engineering*

Aug 2016 – June 2020

*Guangzhou, China*

## PROFESSIONAL SKILLS

---

- Areas of expertise: computer vision, generative models, machine learning, multi-modality, medical imaging
- Programming languages: Python, MATLAB, Bash, R
- Libraries: PyTorch, pandas, multiprocessing, NiBabel, TensorFlow, VTK

## RESEARCH EXPERIENCE

---

### Multi-Modality Representation Learning and Uncertainty Inference

July 2022 – Present

*Vanderbilt University (advisor: Bennett A. Landman), Research Assistant*

*Nashville, TN*

- Characterized the heteroscedasticity of uncertainty in diffusion tensor imaging (DTI) of aging brains.
- Designed brain age estimation models that focus on the microstructural information (“texture”) in the white matter regions, by deliberately destroying the macrostructural information (“shape”) through non-rigid transformations (“warping”). Enabled earlier biomarkers for predicting neurodegenerative diseases. [GitHub]
- Developed conditional generative adversarial network (cGAN) for field-of-view extension of diffusion MRI.
- Developed cascaded diffusion models to generate high-resolution 3D MR images with high-fidelity human faces from defaced MR images, demonstrating a potential malicious privacy attack.

### Building the World’s Largest Diffusion and Structural MRI Database

July 2022 – Present

*Vanderbilt University (advisor: Bennett A. Landman), Research Assistant*

*Nashville, TN*

- Coordinated the collection and processing of 20 large-scale MRI datasets from multiple sites, encompassing over 28,000 participants. Standardized data organization using the Brain Imaging Data Structure (BIDS).
- Cleaned and organized demographic and diagnostic data from over 48,000 sessions using pandas.
- Implemented containerization of pipelines with Docker and Singularity to ensure reproducibility and scalability.
- Utilized both local computation and high-performance computing (HPC) resources for cost-effective and high-throughput parallel processing.
- Developed strategies for efficient quality assurance of millions of image samples in real-time collaboration.

### Medical Image Analysis and MRI Defacing

Dec 2020 – May 2022

*Johns Hopkins University (advisor: Jerry L. Prince), 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 (advisor: Joshua T. Vogelstein), 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]

## REFEREED JOURNAL ARTICLES

---

- J1. **Chenyu Gao**, et al. “Field-of-view extension for brain diffusion MRI via deep generative models.” *Journal of Medical Imaging*. 2024.
- J2. **Chenyu Gao**, et al. “Characterizing patterns of diffusion tensor imaging variance in aging brains.” *Journal of Medical Imaging*. 2024.
- J3. **Chenyu Gao**, Bennett A. Landman, Jerry L. Prince, Aaron Carass. “Reproducibility evaluation of the effects of MRI defacing on brain segmentation.” *Journal of Medical Imaging*. 2023.
- J4. Adam M. Saunders, Michael E. Kim, **Chenyu Gao**, et al. “Comparison and calibration of MP2RAGE quantitative T1 values to multi-TI inversion recovery T1 values.” *Magnetic Resonance Imaging*. 2025
- J5. Amalia Peterson, Aditi Sathe, Dimitrios Zaras, Yisu Yang, Alaina Durant, Kacie D Deters, Niranjana Shashikumar, Kimberly R Pechman, Michael E Kim, **Chenyu 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.
- J6. Praitayini Kanakaraj, Tianyuan Yao, Leon Y Cai, Ho Hin Lee, Nancy R Newlin, Michael E Kim, **Chenyu Gao**, et al. “DeepN4: Learning N4ITK Bias Field Correction for T1-weighted Images.” *Neuroinformatics*. 2024.
- J7. Michael E Kim, **Chenyu Gao**, et al. “Empirical assessment of the assumptions of ComBat with diffusion tensor imaging.” *Journal of Medical Imaging*. 2024.

## REFEREED CONFERENCE PUBLICATIONS

---

- C1. **Chenyu Gao**, et al. “Predicting age from white matter diffusivity with residual learning.” *Medical Imaging 2024: Image Processing*. International Society for Optics and Photonics (SPIE). 2024.
- C2. **Chenyu Gao**, Linghao Jin, Jerry L Prince, Aaron Carass. “Effects of defacing whole head MRI on neuroanalysis.” *Medical Imaging 2022: Image Processing*. International Society for Optics and Photonics (SPIE). 2022.
- C3. Ema Topolnjak\*, **Chenyu Gao\***, et al. “Assessment of subject head motion in diffusion MRI.” *Medical Imaging 2024: Image Processing*. International Society for Optics and Photonics (SPIE). 2024.
- C4. Aravind R Krishnan, Kaiwen Xu, Thomas Li, **Chenyu Gao**, et al. “Inter-vendor harmonization of CT reconstruction kernels using unpaired image translation.” *Medical Imaging 2024: Image Processing*. International Society for Optics and Photonics (SPIE). 2024.
- C5. Tian Yu, Yunhe Li, Michael E Kim, **Chenyu Gao**, et al. “Tractography with T1-weighted MRI and associated anatomical constraints on clinical quality diffusion MRI.” *Medical Imaging 2024: Image Processing*. International Society for Optics and Photonics (SPIE). 2024.
- C6. Hanliang Xu, Nancy R Newlin, Michael E Kim, **Chenyu Gao**, et al. “Evaluation of mean shift, ComBat, and CycleGAN for harmonizing brain connectivity matrices across sites.” *Medical Imaging 2024: Image Processing*. International Society for Optics and Photonics (SPIE). 2024.
- C7. Michael E Kim, Ho Hin Lee, Karthik Ramadass, **Chenyu Gao**, et al. “Characterizing low-cost registration for photographic images to computed tomography.” *Medical Imaging 2024: Clinical and Biomedical Imaging*. International Society for Optics and Photonics (SPIE). 2024.

## MANUSCRIPTS UNDER REVIEW

---

- P1. **Chenyu Gao\***, Kaiwen Xu\*, et al. “Pitfalls of defacing whole-head MRI: re-identification risk with diffusion models and compromised research potential.” (submitted) [arXiv]
- P2. **Chenyu Gao**, et al. “Brain age identification from diffusion MRI synergistically predicts neurodegenerative disease.” (submitted) [arXiv]
- P3. Zhiyuan Li, Tianyuan Yao, Praitayini Kanakaraj, **Chenyu Gao**, et al. “Multi-Modality Conditioned Variational U-Net for Field-of-View Extension in Brain Diffusion MRI.” (submitted) [arXiv]
- P4. Michael E. Kim, **Chenyu Gao**, et al. “Scalable quality control on processing of large diffusion-weighted and structural magnetic resonance imaging datasets.” (submitted) [arXiv]
- P5. Joshua T. Vogelstein, Jayanta Dey, Hayden S. Helm, Will LeVine, Ronak D. Mehta, Tyler M. Tomita, Haoyin Xu, Ali Geisa, Qingyang Wang, Gido M. van de Ven, **Chenyu Gao**, et al. “A Simple Lifelong Learning Approach.” (submitted) [arXiv]

## 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.