

Chang-Le (Charles) Chen

Doctoral Candidate, Department of Bioengineering, University of Pittsburgh, USA

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Summary

Chang-Le (Charles) is a PhD researcher in Bioengineering at the University of Pittsburgh with prior experience as a research engineer at National Taiwan University College of Medicine. His work combines quantitative neuroimaging and machine learning to develop image analytical tools (including image harmonization methods for multi-site data and diffusion-derived markers linked to brain waste clearance) and investigate brain aging and neurodegeneration. Charles has published 20 peer-reviewed papers (8 as first author) and has received ~480 citations since 2020. Currently, he is leveraging large-scale multimodal neuroimaging datasets to study spatiotemporal patterns of brain aging and to identify MRI- and PET-based imaging markers that reflect neurofluid physiology and clearance pathways, with an emphasis on state- and physiology-aware biomarkers that can translate to clinically relevant questions.

Education

Ph.D. in Bioengineering

United States

Swanson School of Engineering, University of Pittsburgh

08/2021-Present

- ♦ Developing MRI data harmonization and longitudinal statistical harmonization methods.
- ♦ Developing diffusion MRI-derived indices for periventricular diffusivity evaluation in dementia.
- ♦ Developing multimodal brain age prediction paradigm and normative models for risk evaluation of neurodegeneration.
- ♦ Performing multimodal neuroimaging research relevant to neuroinflammation and amyloid clearance.
- ♦ Providing lectures on neuroimaging analysis and statistics and assisting in supervising multiple undergrad students.
- ♦ Current cumulative GPA: 4.0/4.0.

MSc. in Brain & Mind Sciences

Taiwan

National Taiwan University College of Medicine

09/2015-06/2017

- ♦ Performed diffusion and structural MRI analyses for pattern recognition of brain aging.
- ♦ Conducted neuroimaging research for neurodegenerative diseases and psychiatric disorders.
- ♦ Overall GPA: 4.04/4.30.
- ♦ Thesis: "Prediction of brain age based on cerebral white matter microstructural properties and its potential clinical applications".

BSc. in Biomedical Imaging & Radiological Sciences

Taiwan

School of Biomedical Science and Engineering, National Yang-Ming University

09/2010-06/2014

*National Yang-Ming University was merged to National Yang Ming Chiao Tung University in 2021.

- ♦ Performed diffusion MRI analysis for encephalopathy.
- ♦ Performed radiation dosimetry for treatment planning.
- ♦ Overall GPA: 3.77/4.30.

Experience

University of Pittsburgh

United States

Position: Graduate Student Researcher

08/2021-Present

- ♦ Developing harmonization methods for T1-weighted MRI data and longitudinal analyses to ensure consistency across imaging datasets.
- ♦ Developing diffusion MRI-derived indices to evaluate perivascular diffusivity as a marker for dementia.
- ♦ Developing multimodal brain age prediction models and normative frameworks to assess neurodegeneration risk.
- ♦ Provided instruction on neuroimaging techniques and statistical analyses, and mentor undergraduate students in research methodologies.
- Supervisors: Prof. Howard J Aizenstein, M.D. Ph.D. and Prof. Dana L Tudorascu, Ph.D.

Molecular Imaging Center, National Taiwan University

Taiwan

Position: Research Engineer

07/2017-07/2021

- ♦ Conducted neuroimaging analyses for diffusion MRI, structural MRI, fMRI, etc.
- ♦ Developed analytic framework of imaging processing and automatic pipeline for brain age estimation.
- ♦ Performed statistical and data analyses, e.g. regression, multivariate analysis, machine learning, etc.
- ♦ Designed and executed clinical experiments, including 2 independent projects: research on multi-site image harmonization and brain age study for Parkinsonism.
- ♦ Gave lectures on neuroimaging analysis and assisted in supervising two graduate students.
- ♦ Main project: Brain age modeling and clinical applications.
- Supervisor: Prof. Wen-Yih Isaac Tseng, M.D. Ph.D.

Taiwan Artificial Intelligence Academy

Taiwan

Position: Trainee

01/2018-04/2018

- ♦ Learned the theory and implementation of modern machine learning and deep learning.
- ♦ Performed instance segmentation by using mask R-CNN for the preprocessing of individual cell tracing.
- ♦ Performed multivariate prediction of financial fraud by using XGBoost.
- ♦ Project: 3D cell segmentation using constrained V-net architecture.

Medical Affairs Bureau, Ministry of National Defense

Taiwan

Position: Second Lieutenant

08/2014-07/2015

- ♦ 11 months of active duty enlisted military service in the Army branch of the Taiwan Armed Forces.
- ♦ Performed and facilitated medical examinations in the Hualien Armed Forces General Hospital.

Teaching Experience

2023 Spring **Applied Biostatistics** University of Pittsburgh

2022 Fall **Introduction to Medical Imaging and Image Analysis** University of Pittsburgh

Mentorship:

Mentored Ms. Mary Pangburn, an undergraduate Neuroscience major at Boston College, in research development and poster preparation; her work was recognized with a Research Poster Award at the Annual Psychiatry Research Day 2025, University of Pittsburgh (competitive event with 200+ posters, 20 awarded).

Reviewer Experience

Invited reviewer for academic journals: (1) Neurobiology of Aging, (2) Brain Communications, (3) Brain Research Bulletin, (4) Frontiers in Neuroscience, (5) Journal of Machine Learning Research, (6) Neurocomputing, (7) Neuroimage: Clinical

Honors & Awards

- 08/2024 **Full Travel Funding for 2024 IMSI Workshop**
 Awarded by the **Institute for Mathematical and Statistical Innovation (IMSI), USA**
 In-person invitation to attend IMSI 5-day academic workshop “Challenges in Neuroimaging Data Analysis”.
- 06/2022 **Magna Cum Laude Award**
 Awarded by the **International Society for Magnetic Resonance in Medicine (ISMRM)**
 Virtual presentation at 2022 Joint Annual Meeting ISMRM-ESMRMB (London, UK)
 ♦ Topic: “Microstructural Deviation in Parkinson’s Disease and Multiple System Atrophy Detected by Spatial Normative Models”
- 2021-2022 **Study Abroad Scholarship**
 Awarded by the **Ministry of Education, Taiwan**
 Fund: (\$16,000/year)
- 08/2020 **Magna Cum Laude Award**
 Awarded by the **International Society for Magnetic Resonance in Medicine (ISMRM)**
 Oral presentation at 2020 ISMRM Annual Meeting (Virtual meeting)
 ♦ Topic: “Multiple Brain Age Metrics Reveal Premature Brain Aging Network and Association with Clinical Factors in Schizophrenia”
- 08/2020 **Best Paper Award**
 Awarded by the **ISMRM Psychiatric MR Spectroscopy & Imaging Study Group**
 Oral presentation at 2020 ISMRM Annual Meeting (Virtual meeting)
 ♦ Topic: “Multiple Brain Age Metrics Reveal Premature Brain Aging Network and Association with Clinical Factors in Schizophrenia”
- 10/2019 **Best Popularity Award**
 Awarded by the **Department of Commerce, Ministry of Economic Affairs, Taiwan**
 Prediction Competition of Object Detection in Retail
 ♦ Object detection implemented with mobile YOLOv3 architecture for real-scene detection
- 05/2019 **Summa Cum Laude Award**
 Awarded by the **International Society for Magnetic Resonance in Medicine (ISMRM)**
 Oral presentation at 2019 ISMRM Annual Meeting (Canada)
 ♦ Topic: “Advanced Brain Aging in Patients with Right Mesial Temporal Lobe Epilepsy: A Machine Learning Approach Based on White Matter Tract Integrity”

Certificates

03/2018 **Technical Professionals Program in Artificial Intelligence**

Certified by the Taiwan Artificial Intelligence Academy

- ♦ 3-month intensive program for training in the theory and implementation of modern machine learning and deep learning techniques.
- ♦ Particularly excelled at the deep learning methods specialized for medical image analysis and clinical applications.

12/2017 Statistics and Data Analysis**Certified by the Chinese Applied Statistic Association**

- ♦ Covering statistical design, hypothesis testing, regression, statistical implementation, etc.
- ♦ Achieved the level “Excellent” in the test of “Applied Statistics”.

07/2014 Clinical Radiologic Technologist**Certified by the Taiwan Society of Radiological Technologists**

- ♦ Covering radiation physics, radiobiology, medical sciences, clinical medicine, etc.
- ♦ Excelled at medical imaging (magnetic resonance imaging, computed tomography, etc.).

Professional Skills

Neuroscience

Neuroimaging Analysis (including voxel-based and surface-based morphometries for structural MRI data, tractography and tract-specific analysis for diffusion MRI data, fMRI connectivity analysis, etc.), Clinical Experiment Design and Execution (executed five independent research projects).

Data Science

Medical Image Analysis (tumor segmentation, diffusion MRI image denoising, head motion correction, etc.), Machine Learning (supervised classification and regression, unsupervised methods, optimization, etc.), Data Visualization (neuroimaging visualization, statistical visualization, and customized digital artworks).

Deep Learning

Computer Vision (CNN, GAN, VAE, ViT, self-supervised learning, etc.), Natural Language Processing (Embedding, attention-based model, LLM, etc.), Reinforcement Learning (deep q learning, etc.), Time Series Analysis (RNN, LSTM, transformer, etc.).

Statistics

Multivariate Analysis (principal component analysis, canonical correlation, multivariate regression, etc.), Structural Equation Modeling (factor analysis, path analysis, and model evaluation), Survival Analysis (Kaplan-Meier method and Cox proportional hazard regression), Longitudinal Analysis (linear mixed effect model, latent growth curve modeling etc.), Bayesian Statistics (empirical Bayes estimation, etc.).

Computer Programming

Matlab (statistics & machine learning, visualization, graphical user interface design, exploratory data analysis, etc.), Python (Numpy, Pandas, Scipy, SKlearn, Keras, Matplotlib, Tensorflow, PyTorch, etc.), R (lavaan, lme, ggplot2, etc.).

Professional Software/Tools

SPM, DSI-studio, Freesurfer, FSL, MRtrix, Keras, SKlearn, Tensorflow, Pytorch, etc.

Languages

Mandarin (native), English (fluent).

Publications & Presentations

Peer-reviewed Articles (Selected):

1. Yi-Ling Chien, Wan-Ling Tseng, Chang-Le Chen, et al., “*Longitudinal Changes of the White Matter Microstructural Properties of Autism Spectrum Disorder: A Normative Model Analysis*”, **Autism Research** (2026), (IF = 5.6).
2. Noah Schweitzer, ..., Chang-Le Chen, et al., “*Neurology and inflammatory-associated plasma protein biomarkers linked to dementia progression, brain aging pathology*”, **Alzheimer's & Dementia: Diagnosis, Assessment & Disease Monitoring** (2026), (IF = 4.4).
3. Chang-Le Chen, et al., “*Periventricular diffusivity reflects APOE ϵ 4-modulated amyloid accumulation and cognitive impairment in the Alzheimer's disease continuum*”, **Alzheimer's & Dementia** (2025), (IF = 11.1).
4. Mei-Jou Chen, Chang-Le Chen, et al., “*Influence of dehydroepiandrosterone sulphate levels on the slower age-related decline in grey matter in younger women with polycystic ovary syndrome*”, **Brain Communications** (2025), (IF = 4.1).
5. Chang-Le Chen, et al., “*Advanced brain aging in Parkinson's disease with cognitive impairment*”, **npj Parkinson's Disease** (2024), (IF = 9.5).
6. Chang-Le Chen, et al., “*Superpixel-ComBat Modeling: A Joint Approach for Harmonization and Characterization of Inter-Scanner Variability in T1-Weighted Images*”, **Imaging Neuroscience** (2024), (IF = not released yet).
7. Huey-Ling Chiang, Chi-Shin Wu, Chang-Le Chen, et al., “*Machine-learning-based feature selection to identify attention-deficit hyperactivity disorder using whole-brain white matter microstructure: A longitudinal study*”, **Asian Journal of Psychiatry** (2024), (IF = 4.5).
8. Noah Schweitzer, ..., Chang-Le Chen, et al., “*Sex-specific risk factors and clinical dementia outcomes for white matter hyperintensities in a large South Korean cohort*”, **Alzheimer's Research & Therapy** (2024), (IF = 7.9).
9. Huey-Ling Chiang, ..., Chang-Le Chen, et al., “*Atypical development in white matter microstructures in ADHD: a longitudinal diffusion imaging study*”, **Asian Journal of Psychiatry** (2023), (IF = 9.5).
10. Mahbaneh E. Torbati, ..., Chang-Le Chen, et al., “*MISPEL: A supervised deep learning harmonization method for multi-scanner neuroimaging data*”, **Medical Image Analysis** (2023), (IF = 10.9).
11. Chang-Le Chen, et al., “*Validation of Neuroimaging-based Brain Age Gap as a Mediator between Modifiable Risk Factors and Cognition*”, **Neurobiology of Aging** (2022), (IF = 5.1).
12. Chang-Le Chen, et al., “*Detection of advanced brain aging in schizophrenia and its structural underpinning by using normative brain age metrics*”, **NeuroImage: Clinical** (2022), (IF = 4.9).
13. Chang-Le Chen, et al., “*Advanced Brain Aging in Multiple System Atrophy compared to Parkinson's Disease*”, **NeuroImage: Clinical** (2022), (IF = 4.9).
14. Yi-Ling Chien, ..., Chang-Le Chen, et al., “*Neurodevelopmental model of schizophrenia revisited: similarity in individual deviation and idiosyncrasy from the normative model of whole-brain white matter tracts and shared brain-cognition covariation with ADHD and ASD*”, **Molecular Psychiatry** (2022), (IF = 13.4).
15. Yu-Hung Tung, ..., Chang-Le Chen, et al., “*Whole-brain white matter tracts deviation and idiosyncrasy from normative development in autism, ADHD and their unaffected siblings link with dimensions of*

- psychopathology and cognition*”, **American Journal of Psychiatry** (2021), (IF = 19.2).
16. Pin-Yu Chen, Chang-Le Chen, et al., “*Differential associations of white matter brain age with language-related mechanisms in word-finding ability across the adult lifespan*”, **Frontiers in Aging Neuroscience** (2021), (IF = 4.5).
 17. Chang-Le Chen, et al., “*Generalization of diffusion magnetic resonance imaging–based brain age prediction model through transfer learning*”, **NeuroImage** (2020), (IF = 6.6).
 18. Wen-Yih Isaac Tseng, ..., Chang-Le Chen, et al., “*Microstructural changes in white matter tracts across middle-to-late adulthood: A diffusion MRI study on 7167 UK Biobank participants*”, **Neurobiology of Aging** (2020), (IF = 4.7).
 19. Pin-Yu Chen, Chang-Le Chen, et al., “*Fluid intelligence is associated with cortical volume and white matter tract integrity within multiple-demand system across adult lifespan*”, **NeuroImage** (2020), (IF = 6.6).
 20. Chang-Le Chen, et al., “*Premature white matter aging in patients with right mesial temporal lobe epilepsy: A machine learning approach based on diffusion MRI data*”, **NeuroImage: Clinical** (2019), (IF = 4.4).

Preprint (Selected):

1. Chang-Le Chen, Yao-Chia Shih, et al., “*Sustained modulation of emotion-related fibers after 8 weeks of mindfulness-based stress reduction training*”, **bioRxiv** (2019), doi: <https://doi.org/10.1101/855551>

International Conference Presentations (Selected):

1. Chang-Le Chen, Minjie Wu, et al. (2026) “*Periventricular Diffusivity Moderates the Relationship Between Astrocyte Reactivity and Amyloid Deposition in Non-Demented Older Adults*” Human Amyloid Imaging Annual Meeting (Puerto Rico).
2. Chang-Le Chen, Yueyang Chi, et al. (2025) “*Differential White Matter Tracts in Generalized Anxiety Disorder using 7T Diffusion Tensor Imaging*” Organization for Human Brain Mapping Annual Meeting (Brisbane, Australia).
3. Chang-Le Chen, Sang Joon Son, et al. (2024) “*Augmented DTI-ALPS for Assessing Interstitial Fluid Dynamics Associated with Glymphatic Function*” Organization for Human Brain Mapping Annual Meeting (Seoul, South Korea).
4. Chang-Le Chen, Minjie Wu, et al. (2024) “*Altered Frontoparietal Structural Correspondence Relates to Slower Processing Speed in Combat Blast*” Organization for Human Brain Mapping Annual Meeting (Seoul, South Korea).
5. Chang-Le Chen, Hecheng Jin, et al. (2024) “*Distinct Structural Covariance in the Limbic Cortical Network between Women and Men along with Aging*” Organization for Human Brain Mapping Annual Meeting (Seoul, South Korea).
6. Chang-Le Chen, Hecheng Jin, et al. (2024) “*Markers of Interstitial Fluid Dynamics from Diffusion MRI Reveal Association with Amyloid Deposition in Cognitively Normal Older Adults*” Alzheimer's Association International Conference (Philadelphia, PA, USA).
7. Chang-Le Chen, Mahbaneh E. Torbati, et al. (2023) “*Estimate the Linear Effect of Inter-Scanner Variability: Insight from Paired Cross-Scanner T1-weighted Images*” ISMRM Annual Meeting (Toronto, Canada).
8. Chang-Le Chen, Jinghang Li, et al. (2023) “*Longitudinal change of white matter-specific brain age is*

- associated with Alzheimer's disease-related regional atrophy*" ISMRM Annual Meeting (Toronto, Canada).
9. Chang-Le Chen, Ming-Che Kuo, et al. (2022) "*Microstructural Deviation in Parkinson's Disease and Multiple System Atrophy Detected by Spatial Normative Models*" ISMRM-ESMRMB Joint Annual Meeting (London, UK) (**Magna Cum Laude Award**).
 10. Chang-Le Chen, Yu-Hung Tung, et al. (2020) "*Multiple Brain Age Metrics Reveal Premature Brain Aging Network and Association with Clinical Factors in Schizophrenia*" (**Oral presentation**) ISMRM 28th Annual Meeting (Virtual Online Meeting) (**Magna Cum Laude Award**).
 11. Chang-Le Chen, Yung-Chin Hsu, et al. (2019) "*Generalize Diffusion-MRI-Based Brain Age Predictive Model Using Transfer Learning*" (**Oral presentation**) ISMRM 27th Annual Meeting (Montreal, Canada).
 12. Chang-Le Chen, Yao-Chia Shih, et al. (2019) "*Advanced Brain Aging in Patients with Right Mesial Temporal Lobe Epilepsy: A Machine Learning Approach Based on White Matter Tract Integrity*" (**Oral presentation**) ISMRM 27th Annual Meeting (Montreal, Canada) (**Summa Cum Laude Award**).
 13. Chang-Le Chen, Yung-Chin Hsu, et al. (2018) "*Neural Network Classification of ADHD Based on White Matter Connectograms Derived from Diffusion Spectrum Imaging*" ISMRM-ESMRMB 2018 Joint Annual Meeting (Paris, France).
 14. Chang-Le Chen, Pin-Yu Chen, et al. (2017) "*Potential Clinical Applications of Brain-age Prediction Based on White Matter Microstructural Properties*" (**Oral presentation**) ESMRMB 34th Annual Scientific Meeting (Barcelona, Spain).
 15. Chang-Le Chen, Pin-Yu Chen, et al. (2017) "*Brain Age Prediction Based on Cerebral White Matter Microstructural Properties*" (**Oral presentation**) ESMRMB 34th Annual Scientific Meeting (Barcelona, Spain).
 16. Chang-Le Chen, Yao-Chia Shih, et al. (2017) "*Transient Effects of Short-term MBSR Training on White Matter Tract Integrity*" OHBM's 2017 Annual Meeting (Vancouver, Canada).
 17. Chang-Le Chen, Yao-Chia Shih, et al. (2017) "*Strengthening of Emotion- and Memory-associated Callosal Fibers Following Short-term MBSR Training*" OHBM's 2017 Annual Meeting (Vancouver, Canada).
 18. Chang-Le Chen, Yu-Jen Chen, et al. (2017) "*Correct Shaking Artifact in Diffusion Spectrum Imaging Using Estimated Maximum Likelihood*" ISMRM 25th Annual Meeting (Honolulu, HI, USA).
 19. Chang-Le Chen, Yao-Chia Shih, et al. (2016) "*Increased Anterior Commissure Integrity After MBSR Training Relates to Improved Describing Ability*" OHBM's 2016 Annual Meeting (Geneva, Switzerland).
 20. Chang-Le Chen, Yao-Chia Shih, et al. (2016) "*Short-term Mindfulness-based Stress Reduction Training Increases Tract Integrity in Right Auditory Radiation and Anterior and Posterior Commissures*" ISMRM 24th Annual Meeting (Singapore).