ZHIWEI GONG

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Github: https://github.com/zhiweigong75

EDUCATION

University of Pittsburgh, Pittsburgh, PA — *August 2024 - Present*
Ph.D.in Artificial Intelligence

Johns Hopkins University, Baltimore, MD — *August 2021 - May 2023*
M.S.E.in Applied Mathematics and Statistics; GPA: 3.61/4.0

University of Reading, Reading, UK — *September 2020 - July 2021*
B.S.in Mathematics and Applied Mathematics; GPA: 3.93/4.0

Nanjing University of Information Science & Technology, Nanjing, China — *September 2017 - July 2021*
B.S.in Mathematics and Applied Mathematics; GPA: 3.80/4.0

CONFERENCES & ABSTRACTS

- **Gong, Z.**, Amanian, A., Xiao, Y., Jain, A., Sahu, M., Creighton, F. (2023). Statistical Shape Model of the Eustachian Tube for Understanding and Managing Eustachian Tube Dysfunction. *Combined Otolaryngology Spring Meetings. May 3-7, 2023.*
- Amanian, A., Xiao, Y., **Gong, Z.**, Sahu, M., Ding, A., Taylor, R., Unberath, M., Galaiya, D., Ward, B.k., Creighton, F. (2022). Automated Segmentation of the Eustachian Tube for Applications in the Management of Eustachian Tube Dysfunction – A Deep Learning Framework. *Conference on Machine Intelligence in Medical Imaging. October 2-3, 2022. Virtual Conference.*

PUBLICATIONS

- **Gong, Z.**, Wan, B., Paranjape, J. N., Sikder, S., Patel, V. M., & Vedula, S. S. (2024). Evaluating the Generalizability of Video-Based Assessment of Intraoperative Surgical Skill. *International Journal of Computer Assisted Radiology and Surgery.* [To Be Submitted]
- **Gong, Z.**, Sahu, M., Xiao, Y., Amanian, A., Jain, A., Taylor, R., Ishii, M., Creighton, F. (2024). Statistical Shape Model of the Eustachian Tube for Understanding and Managing Eustachian Tube Dysfunction. *Otolaryngology–Head and Neck Surgery.* [To Be Submitted]

RESEARCH EXPERIENCE

Video-Based Assessment Of Intraoperative Surgical Skill — *Oct 2022 - May 2024*
Research Assistant-supervised by Dr. Swaroop Vedula & Dr. Shameema Sikder — *Johns Hopkins University*

- Established the state-of-the-art performance of semi-supervised domain adaptation (SSDA) and unsupervised domain adaptation (UDA) methods for generalizability of algorithms for video-based assessment (VBA) of intraoperative skill in a critical step in cataract surgery.
- Evaluated the utility of UDA with maximum mean discrepancy (MMD) for prediction tasks that use temporal models.
- De-identified and processed cataract surgical videos.

Statistical Shape Modeling of the Eustachian Tube — *Oct 2022 - Apr 2024*
Research Assistant-supervised by Dr. Francis Creighton & Dr. Manish Sahu — *Johns Hopkins University*

- Developed an automated pipeline to build Statistical Shape Models (SSMs) from a pool of CT scans of patients to facilitate quantitative analysis and visual exploration of anatomical variations of eustachian tube (ET).
- Constructed anatomical ET shapes using Point Distribution Model, and captured principal modes of shape variability by Principal Component Analysis (PCA).

Deep Learning Platform for Automated Segmentation of the Eustachian Tube — *May 2022 - Oct 2022*
Research Assistant-supervised by Dr. Russell Taylor & Dr. Manish Sahu — *Johns Hopkins University*

- Applied Semi-Supervised VoxelMorph framework on the CT scans of ET to do automated registration and segmentation.

- Build a completed pipeline to evaluate the performance of deep learning models from the clinical views

PRESENTATIONS & PROJECTS

Cardiac Ultrasound Image Segmentation and Stroke Volume Estimation *Feb 2023 - May 2023*
Medical Image Analysis course project-supervised by Dr. Jerry Prince *Johns Hopkins University*

- Employed an UNet-based network to segment the left ventricle endocardium of the cardiac ultrasound sequence.
- Performed the cubic spline approach to reconstruct 3D shape of the left ventricle endocardium and estimate the stroke volume.
- Achieved 80.0657% accuracy for segmentation task, 0.74% and 2.3487% relative error for stroke volume and ejection fraction estimation task.
- Ranked 1st out of 8 teams and won the best presentation award.

Neuroimage Registration and Synthesis *Feb 2023 - May 2023*
Medical Image Analysis course project-supervised by Dr. Jerry Prince *Johns Hopkins University*

- Performed Inter-modality registration to align T2w, fractional anisotropy (FA) and apparent diffusion coefficient (ADC) to T1w space using ANTs-SyN.
- Synthesized diffusion tensor imaging (DTI) related images, FA and ADC, utilizing the provided structural images (T1w and T2w).
- Achieved 0.0058, 0.0185, 0.0794 MAE values of T2w, FA, ADC for registration task, and 0.0293, 0.1804 MAE values of FA, ADC for synthesis task.
- Ranked 3rd out of 8 teams and won the best presentation award.

dMRI Distortion Correction: A Deep Learning-based Registration Approach *March 2022 - May 2022*
Deep Learning course project-supervised by Dr. Vishal Patel *Johns Hopkins University*

- Performed MRI image preprocessing such as affine spatial normalization and brain extraction using FreeSurfer to obtain the segmentation for various structure.
- Run traditional registration method, SyN as baseline for comparison with deep learning-based algorithm.
- Applied VoxelMorph on HCP and Buckner40 brain datasets to perform subject-to-atlas registration tasks.

Image Reconstruction via Bayesian Inference *April 2022 - May 2022*
Mathematical Image Analysis course project-supervised by Dr. Mario Micheli *Johns Hopkins University*

- Applied a generalized approach of sparse bayesian learning using the bayesian coordinate descent algorithm to image reconstruction on image domain and frequency domain with different additive noise
- Compared the effects of gaussian low-pass and high-pass filter to the task of image reconstruction on frequency domain.

SKILLS

- **Programming Languages** Python, R, MATLAB
- **Frameworks & Tools** PyTorch, TensorFlow, Keras, Git, Linux, OpenCV, VoxelMorph, ANTsPy
- **Deep Leaning Techniques** CNNs, GANs, RNNs, Transformers
- **Statistical & Database software** SPSS, MySQL

SELECTED COURSEWORK

Medical Image Analysis, Deep Learning; Machine Perception; Statistical Data Science and Machine Learning; Mathematical Image Analysis; Computational Molecular Medicine; Bayesian Statistics; Stochastic Processes; Differential Equations; Multivariate Data Analysis

HONORS & AWARDS

- SCI Fellowship in University of Pittsburgh
- First-class Academic Scholarship, three times (Top 5%, one of the highest honors in our university)
- Merit Student, three times (Top 5%, one of the highest honors in our university)