

ZHIWEI GONG

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EDUCATION

University of Pittsburgh , Pittsburgh, PA <i>Ph.D.in Artificial Intelligence</i>	August 2024 - Present
Johns Hopkins University , Baltimore, MD <i>M.S.E.in Applied Mathematics and Statistics; GPA: 3.61/4.0</i>	August 2021 - May 2023
University of Reading , Reading, UK <i>B.S.in Mathematics and Applied Mathematics; GPA: 3.93/4.0</i>	September 2020 - July 2021
Nanjing University of Information Science & Technology , Nanjing, China <i>B.S.in Mathematics and Applied Mathematics; GPA: 3.80/4.0</i>	September 2017 - July 2021

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 <i>Research Assistant-supervised by Dr. Swaroop Vedula & Dr. Shameema Sikder</i>	Oct 2022 - May 2024 <i>Johns Hopkins University</i>
<ul style="list-style-type: none">• 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 intra-operative 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 <i>Research Assistant-supervised by Dr. Francis Creighton & Dr. Manish Sahu</i>	Oct 2022 - Apr 2024 <i>Johns Hopkins University</i>
<ul style="list-style-type: none">• 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 <i>Research Assistant-supervised by Dr. Russell Taylor & Dr. Manish Sahu</i>	May 2022 - Oct 2022 <i>Johns Hopkins University</i>
<ul style="list-style-type: none">• 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 Learning 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

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- 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)