Zhuo He

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Education

Michigan Technological University (MTU) — Houghton, MI
Ph.D. in Computational Science & Engineering (GPA 3.8/4.0) — Aug. 2019 – Present 2022

University of Southern Mississippi (USM) — Hattiesburg, MS
Ph.D. in Computational Science (GPA 4.0/4.0) — Jan. 2018 – Aug. 2019

Central South University — Changsha, China
Ph.D in Control Science & Engineering (GPA 3.7/4.0) — Sept. 2015 – Dec. 2017

Central South University — Changsha, China
Bachelor of Engineering (GPA 83/100) — Sept. 2011 – June 2015

Experience

Research Assistant — Jan. 2018 – Present
MTU/USM, Medical Imaging and Informatics Lab — Houghton, MI

- Collaborated with a multicenter clinic trial and use statistics, data mining, machine learning and deep learning in nuclear image (SPECT) to improve the patient selection of cardiac resynchronization therapy (CRT) and guide the lead placement of pacemaker
- Extract 3D spatial information form electrocardiography (ECG) signals by spatial variation functions to guide the patient selection and lead placement of CRT
- Build a precision medicine model by inverse reinforcement learning to integrate ECG signal and nuclear image for CRT patient selection and guide pacemaker lead placement

R&D Intern — May. 2021 – Aug. 2021
Canon Medical Research USA, INC. — Vernon Hills, IL

- Explored methods to detect bio-landmarks in CT images and observed that existing dilation-based object segmentation and recognition frameworks, such as UNet, are not suitable for this task after experiments
- Proposed a convolutional neural network to detect the location of the bio-landmarks, which addressed target recognition from heavily unbalanced front/background images

Clinical Trial Research Visiting Scholar — Jan. 2019 – Feb. 2019
Emory University, Department of Radiology and Imaging Sciences — Atlanta, GA

- Learned the use of medical software, preprocessed clinic trails data including cleaning, transforming, integrating, and management
- Collaborated with doctors to explored significant features for improving CRT patient selection by statistic and machine learning techniques

Projects

Nuclear Cardiology Imaging Research | *Python, Pytorch, TensorFlow, R* — Feb. 2019 – Present

- Implemented and tested machine learning models such as logistic regression, SVM, random forest to diagnose coronary artery disease
- Developed a 3D segmentation V-Net CNN model to extract the left ventricular myocardial contour with a Dice score of 0.95
- Developed a deep learning model by linear/CNN autoencoder algorithm to extract features from nuclear images (SPECT), which improved the prediction performance from AUC 0.72 to AUC 0.81

Software development for ECG/VCG analysis | *Python, HTML* — Feb. 2021 – Present

- Developed a software to convert electrocardiography (ECG) to vectorcardiography (VCG) signal and extracts characteristic information to guide the patient selection and device implantation for CRT
- Released a software for doctors to use online and process data for subsequent clinical trials and data analysis

Breast Cancer Histopathological Image Classification | *Python, TensorFlow* — Sept. 2018 – Dec. 2018

- Used Inception ResNet V3 model to extract features from breast cancer histopathological images by transfer learning, and obtain a multi-class diagnostic accuracy of 92.07%
- Constructed an autoencoder network to transfer the features extracted by Inception V3 to a low-dimensional space to reduce the 1,536-dimension feature vector into 2D feature vector. Accuracy increased to 97.63%

Technical Skills

- **Languages**: Python, Matlab, R, C/C++, SQL, C#, HTML
- **Frameworks**: Pytorch, Keras, TensorFlow
- **Tools and MISC**: MySQL, SQL Sever, Linux, Git, Latex, SPSS, SAS, Weka, Tableau
- **Related Courses**: EKG Interpretation (anatomy, mechanisms, rhythms), Medical Informatics, Biostatistics, Data Mining, Machine Learning, Deep Learning, Computational Intelligence, Advanced artificial Intelligence

Publications

Journal Article Manuscripts Under Review

- **He Z**, Zhang X, Zhao C, Ling X, Qian Z, Wang Y, Hou X, Zou J, Zhou W. A new method to discover predictors from mechanical dyssynchrony on gated SPECT MPI to predict CRT response. arXiv:2106.01355. Submitted to *Journal of Nuclear Cardiology*. (in review) (IF 5.95)

Articles in Peer-Reviewed Journals

- **He Z**, Li D, Cui C, Qin H, Zhao Z, Hou X, Zou J, Chen M, Wang C, Zhou W. Predictive values of left ventricular mechanical dyssynchrony for CRT response in heart failure patients with different pathophysiology. *Journal of Nuclear Cardiology*. 2021 Sep 17. doi: 10.1007/s12350-021-02796-3. Epub ahead of print. (IF 5.95)
- **He Z**, Fernandes FA, Nascimenta EA, Garcia EV, Mesquita CT, Zhou W. Incremental value of left ventricular shape parameters measured by gated SPECT MPI in predicting CRT super-responders. *Journal of Nuclear Cardiology*. 2021 Jan 27. doi:10.1007/s12350-020-02469-7. (IF 5.95)
- Hung GU, Zou J, **He Z**, Zhang X, Tsai SC, Wang CY, Chiang KF, Tang H, Garcia EV, Zhou W, Huang JL. Left-ventricular dyssynchrony in viable myocardium by myocardial perfusion SPECT is predictive of mechanical response to CRT. *Annals of Nuclear Medicine*. 2021. doi:10.1007/s12149-021-01632-5 (IF 2.61)
- Wang CY, Hung GU, Zou J, **He Z**, Zhang X, Tsai SC, Tang H, Garcia EV, Zhou W*, Huang JL*. Changes of Scar on Gated Myocardial Perfusion SPECT after Cardiac Resynchronization Therapy in Heart Failure Patients. *Journal of Nuclear Cardiology*. 2021. (IF 5.95)
- Zhao C, Xu Y, **He Z**, Tang J, Zhang Y, Han J, Shi Y, Zhou W. A New Approach for Lung Segmentation and Automatic Detection of COVID-19 Using Radiomic Features from Chest CT Images. Pattern Recognition. 2021. GitHub (open-sourced): https://github.com/MIILab-MTU/KD4COVID19 (IF 7.20)
- Jiang W, Liu Y, **He Z**, Zhou Y, Wang C, Jiang Z, Zhou W. Prognostic value of left ventricular mechanical dyssynchrony in hypertrophic cardiomyopathy patients with low risk of sudden cardiac death. *Nuclear medicine communications*. 2021 Feb 1;42(2):182-189. doi: 10.1097/MNM.0000000000001322.
- Zhou Y, **He Z**, Liao S, Liu Y, Zhang L, Zhu X, Cheang I, Zhang H, Yao W, Li X, Zhou W. Prognostic value of integrative analysis of electrical and mechanical dyssynchrony in patients with acute heart failure. *Journal of Nuclear Cardiology*. 2020 Nov 4. doi:10.1007/s12350-020-02429-1.. (IF 5.95)
- Hua X, Han J, Zhao C, Tang H, **He Z**, Chen Q, Tang S, Tang J, Zhou W. A novel method for ECG signal classification via one-dimensional convolutional neural network. *Multimedia Systems*. 2020 Nov 11:1-3. doi: 10.1007/s00530-020-00713-1.
- Wang C, Shi J, Ge J, Tang H, **He Z**, Liu Y, Zhao Z, Li C, Gu K, Hou X, Chen M. Left ventricular systolic and diastolic dyssynchrony to improve cardiac resynchronization therapy response in heart failure patients with dilated cardiomyopathy. *Journal of nuclear cardiology: official publication of the American Society of Nuclear Cardiology*. 2020 May 13. doi: 10.1007/s12350-020-02132-1. (IF 5.95)
- Zhu F, Li X, Tang H, **He Z**, Zhang C, Hung G-U et al. Machine learning for the prelude diagnosis of dementia. *Int J Pharm Res* 2020; 12: 2329–2335.
- Zhu F, Xu D, Liu Y, Lou K, **He Z**, Zhang H, Sheng Y, Yang R, Li X, Kong X, Zhou W. Machine learning for the diagnosis of pulmonary hypertension. *Kardiologiia*. 2020 Jul 7;60(6):953-953.
- Zhang F, Wang J, Shao X, Yang M, Qian Y, Yang X, Wu Z, Li S, Xin W, Shi Y, Liu B, Yu W, **He Z**, Zhou W, Wang Y. Incremental value of myocardial wall motion and thickening to perfusion alone by gated SPECT myocardial perfusion imaging for viability assessment in patients with ischemic heart failure. Journal of Nuclear Cardiology. 2020 Feb 14:1-2. (IF 5.95)
- Zhu F, Li X, Mcgonigle D, Tang H, **He Z**, Zhang C, Hung GU, Chiu PY, Zhou W. Analyze informant-based questionnaire for the early diagnosis of senile dementia using deep learning. *IEEE Journal of Translational Engineering in Health and Medicine*. 2019 Dec 16;8:1-6. (IF 2.53)
- Wang T, Lei Y, Tang H, **He Z**, Castillo R, Wang C, Li D, Higgins K, Liu T, Curran WJ, Zhou W. A learning-based automatic segmentation and quantification method on left ventricle in gated myocardial perfusion SPECT imaging: A feasibility study. *Journal of Nuclear Cardiology*. 2019 Jan 28:1-2. (IF 5.95)

- Tang H, Bober R, Zhang C, **He Z**, Zou J, Zhou W. Scale ratio ICP for 3D registration of coronary venous anatomy with left ventricular epicardial surface to guide CRT lead placement. *InMedical Imaging 2019: Image-Guided Procedures, Robotic Interventions, and Modeling 2019 Mar 8 (Vol. 10951, p. 1095123). International Society for Optics and Photonics*.

Conference

- **He Z**, Tang H, McGonigle D, Zhang C, Jiang Z, Zhou W. A Deep-Learning-Based Segmentation Method for Left Ventricle on Gated SPECT Myocardial Perfusion Images. Conference of Midsouth Computational Biology Bioinformatics Society (MCBIOS' 2019). (Student travel stipend)
- McGonigle D, Zhao D, Tang H, Zhang C, **He Z**, Bober R, Zhou W. Deep Learning to Extract Coronary Arteries from Fluoroscopy Angiography. Conference of Midsouth Computational Biology Bioinformatics Society (MCBIOS '2019). (Student travel stipend)
- Jiang Z, **He Z**, Zhu F, Tang H, Li D, Zhang C, Zhou W. Machine learning to diagnose CAD from SPECT MPI: a preliminary study. ASNC Scientific Session 2018.

Book Chapter

- **He Z**, Garcia E V., Zhou W. Nuclear imaging guiding cardiac resynchronization therapy. In: Mesquita, C. T., Rezende, M. F. (Eds.), *Nuclear Cardiology: Basic and Advanced Concepts in Clinical Practice*. Switzerland: Springer-Nature. 2021. dio:10.1007/978-3-030-62195-7