Zeju Li

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Research Interests

Medical Image Computing, Neuroimaging and Machine Learning

Primary area   🔖 Semantic Segmentation, Brain MRI, Class Imbalance.

Secondary area 🔖 Meta-Learning, Federated Learning, 3D Vision, Image Restoration.

Research Experience

Jan. 23 – ⋯   🔖 **Post-Doctoral Researcher.** Nuffield Department of Clinical Neurosciences, University of Oxford, Oxford, United Kingdom.
Supervisor: Prof. Saad Jbabdi
He worked on advancing neuroimaging with machine learning algorithms.

Oct. 18 – Dec. 22   🔖 **Research Student.** Department of Computing, Imperial College London, London, United Kingdom.
Supervisor: Prof. Ben Glocker and Prof. Daniel Rueckert
He worked on improving the generalization capability of neural networks for medical imaging, especially under class imbalance.

Jul. 19 – Mar. 20   🔖 **Research Intern.** Noah's Ark Lab, Huawei, London, United Kingdom.
Supervisor: Prof. Greg Slabaugh and Dr. Liang Chen
He worked on exploring AutoML for computational photography.

Jul. 18 – Sep. 18   🔖 **Research Intern.** Institute of Computing Technology, Chinese Academy of Sciences, Beijing, China.
Supervisor: Prof. Shaohua Kevin Zhou and Prof. Hu Han
He worked on embedding CT prior knowledge in chest X-ray diagnosis.

Jun. 14 – Jun. 18   🔖 **Research Student.** Department of Electronic Engineering, Fudan University, Shanghai, China.
Supervisor: Prof. Yuanyuan Wang and Prof. Jinhua Yu
He worked on brain MR image analysis including tumor segmentation, image reconstruction and disease classification.
He also worked on compressing ultrasound signal.

Education

2018 – 2022   🔖 **PhD in Computing, Imperial College London, United Kingdom.**
Thesis title: *Learning strategies for improving neural networks for image segmentation under class imbalance.*

2015 – 2018   🔖 **MSc in Biomedical Engineering, Fudan University, China.**
Thesis title: *Deep learning based MR images analysis of glioma and its clinical applications.*

2011 – 2015   🔖 **BSc in Electronic Engineering, Fudan University, China.**
Thesis title: *Fourier domain ultrasound beamforming.*

Research Publications

Refereed Journal Articles

1. **Li, Z.**, Kamnitsas, K., Dou, Q., Qin, C., & Glocker, B. (2023). Joint optimization of class-specific training- and test-time data augmentation in segmentation. *IEEE Transactions on Medical Imaging*.

2. **Li, Z.**, Kamnitsas, K., Ouyang, C., Chen, C., & Glocker, B. (2023). Context label learning: improving background class representations in semantic segmentation. *IEEE Transactions on Medical Imaging*.

3. **Li, Z.**, Kamnitsas, K., & Glocker, B. (2020). Analyzing overfitting under class imbalance in neural networks for image segmentation. *IEEE Transactions on medical imaging*.

4. **Li, Z.**, Yu, J., Wang, Y., Zhou, H., Yang, H., & Qiao, Z. (2019). Deepvolume: brain structure and spatial connection-aware network for brain mri super-resolution. *IEEE Transactions on Cybernetics*.

5. **Li, Z.**, Wang, Y., Yu, J., Guo, Y., & Cao, W. (2017). Deep learning based radiomics (dlr) and its usage in noninvasive idh1 prediction for low grade glioma. *Scientific Reports*.

6. **Li, Z.**, Wang, Y., Yu, J., Shi, Z., Guo, Y., Chen, L., & Mao, Y. (2017). Low-grade glioma segmentation based on cnn with fully connected crf. *Journal of Healthcare Engineering*.

7. **Li, Z.**, Wang, Y., Yu, J., Guo, Y., & Zhang, Q. (2017). Age groups related glioblastoma study based on radiomics approach. *Computer Assisted Surgery*.

8. Chen, C., Ouyang, C., **Li, Z.**, Wang, S., Qiu, H., Chen, L., … Rueckert, D. (2022). Enhancing mr image segmentation with realistic adversarial data augmentation. *Medical Image Analysis*.

9. Ouyang, C., Chen, C., Li, S., **Li, Z.**, Qin, C., Bai, W., & Rueckert, D. (2022). Causality-inspired single-source domain generalization for medical image segmentation. *IEEE Transactions on Medical Imaging*.

10. Qiao, M., Liu, C., **Li, Z.**, Zhou, J., Xiao, Q., Zhou, S., … Wang, Y. (2022). Breast tumor classification based on mri-us images by disentangling modality features. *IEEE Journal of Biomedical and Health Informatics*.

11. Luo, H., Zhuang, Q., Wang, Y., Abudumijiti, A., Shi, K., Rominger, A., … Wu, G. et al. (2021). A novel image signature-based radiomics method to achieve precise diagnosis and prognostic stratification of gliomas. *Laboratory investigation*, *101*(4), 450–462.

12. Dou, Q., So, T. Y., Jiang, M., Liu, Q., Vardhanabhuti, V., Kaissis, G., … Yu, K. et al. (2021). Federated deep learning for detecting covid-19 lung abnormalities in ct: a privacy-preserving multinational validation study. *NPJ digital medicine*, *4*(1), 1–11.

13. Li, H., Han, H., **Li, Z.**, Wang, L., Wu, Z., Lu, J., & Zhou, S. K. (2020). High-resolution chest x-ray bone suppression using unpaired ct structural priors. *IEEE Transactions on Medical Imaging*.

14. Wu, G., Lin, J., Chen, X., **Li, Z.**, Wang, Y., Zhao, J., & Yu, J. (2019). Early identification of ischemic stroke in noncontrast computed tomography. *Biomedical Signal Processing and Control*.

15. Zhou, Z., Wang, Y., Yu, J., Guo, W., & **Li, Z.** (2019). Super-resolution reconstruction of plane-wave ultrasound image based on a multi-angle parallel u-net with maxout unit and novel loss function. *Journal of Medical Imaging and Health Informatics*.

16. Gu, J., **Li, Z.**, Wang, Y., Yang, H., Qiao, Z., & Yu, J. (2019). Deep generative adversarial networks for thinsection infant mr image reconstruction. *IEEE Access*.

17. Chen, Y., **Li, Z.**, Wu, G., Yu, J., Wang, Y., Lv, X., … Chen, Z. (2018). Primary central nervous system lymphoma and glioblastoma differentiation based on conventional magnetic resonance imaging by high-throughput sift features. *International Journal of Neuroscience*.

18. Yu, J., Shi, Z., Lian, Y., **Li, Z.**, Liu, T., Gao, Y., … Mao, Y. (2017). Noninvasive idh1 mutation estimation based on a quantitative radiomics approach for grade ii glioma. *European Radiology*.

19 Wu, G., **Li, Z.**, Wang, Y., Yu, J., Chen, Y., & Chen, Z. (2018). Primary central nervous system lymphoma and glioblastoma image differentiation based on sparse representation system. *Journal of Biomedical Engineering*.

Refereed Conference Proceedings

1 **Li, Z.**, Kamnitsas, K., Islam, M., Chen, C., & Glocker, B. (2022). Estimating model performance under domain shifts with class-specific confidence scores. In *International conference on medical image computing and computer-assisted intervention (miccai 2022)*.

2 **Li, Z.**, Kamnitsas, K., & Glocker, B. (2019). Overfitting of neural nets under class imbalance: analysis and improvements for segmentation. In *International conference on medical image computing and computer-assisted intervention (miccai 2019)*.

3 **Li, Z.**, Li, H., Han, H., Shi, G., Wang, J., & Zhou, S. K. (2019). Encoding ct anatomy knowledge for unpaired chest x-ray image decomposition. In *International conference on medical image computing and computer-assisted intervention (miccai 2019)*.

4 **Li, Z.**, Wang, Y., & Yu, J. (2017a). Brain tumor segmentation using an adversarial network. In *International miccai brainlesion workshop (miccai-brainlesion 2017)*.

5 **Li, Z.**, Wang, Y., & Yu, J. (2017b). Reconstruction of thin-slice medical images using generative adversarial network. In *International workshop on machine learning in medical imaging (miccai-mlmi 2017)*.

6 Wagner, F., **Li, Z.**, Saha, P., & Kamnitsas, K. (2023). Post-deployment adaptation with access to source data via federated learning and source-target remote gradient alignment. In *International workshop on machine learning in medical imaging (miccai-mlmi 2023)*.

7 Islam, M., **Li, Z.**, & Glocker, B. (2023). Robustness stress testing in medical image classification. In *Uncertainty for safe utilization of machine learning in medical imaging (miccai-unsure 2023)*.

8 Li, L., Ma, Q., Ouyang, C., **Li, Z.**, Meng, Q., Zhang, W., … Kainz, B. (2023). Robust segmentation via topology violation detection and feature synthesis. In *International conference on medical image computing and computer-assisted intervention (miccai 2023)*.

9 Chen, C., **Li, Z.**, Ouyang, C., Sinclair, M., Bai, W., & Rueckert, D. (2022). Maxstyle: adversarial style composition for robust medical image segmentation. In *International conference on medical image computing and computer-assisted intervention (miccai 2022)*.

10 Gu, X., Guo, Y., **Li, Z.**, Jianning, Q., Dou, Q., Liu, Y., … Yang, G.-Z. (2022). Tackling long-tailed category distribution under domain shifts. In *European conference on computer vision (eccv 2022)*.

11 Li, L., Ma, Q., **Li, Z.**, Ouyang, C., Zhang, W., Price, A., … Alansary, A. (2022). Fetal cortex segmentation with topology and thickness loss constraints. In *Topological data analysis and its applications for medical data (miccai-tda 2022)*.

12 Ouyang, C., Wang, S., Chen, C., **Li, Z.**, Bai, W., Kainz, B., & Rueckert, D. (2022). Improved post-hoc probability calibration for artifact-corrupted mri segmentation. In *Uncertainty for safe utilization of machine learning in medical imaging (miccai-unsure 2022)*.

13 Yan, W., Wang, Y., **Li, Z.**, van der Geest, R. J., & Tao, Q. (2018). Left ventricle segmentation via optical-flow-net from short-axis cine mri: preserving the temporal coherence of cardiac motion. In *International conference on medical image computing and computer-assisted intervention (miccai 2018)*.

14 Li, X., Wang, Y., Yan, W., Van der Geest, R. J., **Li, Z.**, & Tao, Q. (2018). A multi-scope convolutional neural network for automatic left ventricle segmentation from magnetic resonance

images: deep-learning at multiple scopes. In *International congress on image and signal processing, biomedical engineering and informatics (cisp-bmei 2018)*.

Under Review Articles

1. **Li, Z.**, Zheng, Y.-Q., & Jbabdi, S. (2023). Learning label refinement and thresholds for imbalanced semi-supervised learning.

Skills

Languages	🔖	English, Mandarin Chinese.
Coding	🔖	Python, Java, Matlab, R, C.
Machine Learning	🔖	Pytorch, Tensorflow, MatConvNet.

Miscellaneous Experiences

Awards and Achievements

2022	🔖	1st place of Fetal Tissue Annotation Challenge.
2021	🔖	2nd place of Learn2Reg-Challenge Task2.
2019	🔖	MICCAI 2019 Graduate Student Travel Award.
2018	🔖	Winner of Huawei UK AI chanllege.
	🔖	Outstanding Graduate of Shanghai.
	🔖	National Scholarship.
2016	🔖	Intel Fellowship.

Patents

- 🔖 Apparatus and method for image processing, CN114846506A, 2021.
- 🔖 Thin layer magnetic resonance image reconstruction method based on deep learning, CN108629816A, 2018.
- 🔖 Method and system for lossless prediction of low-grade intracranial gliomas isocitrate dehydrogenase based on deep learning, CN108109140A, 2018.
- 🔖 Identification method of primary central nervous system lymphoma and glioblastoma based on sparse representation system, CN107016395A, 2017.
- 🔖 Brain glioma molecular marker nondestructive prediction method and prediction system based on radiomics, CN106683081A, 2017.

Journal Reviewer

- 🔖 IEEE Transactions on Medical Imaging;
- 🔖 Medical Image Analysis;
- 🔖 Journal of Biomedical and Health Informatics;
- 🔖 Neurocomputing;
- 🔖 Computer Vision and Image Understanding;
- 🔖 IEEE Access;
- 🔖 Pattern Recognition;
- 🔖 Neural Networks;
- 🔖 Knowledge-Based Systems;

Miscellaneous Experiences (continued)

- Computer Methods and Programs in Biomedicine;
- Biomedical Signal Processing and Control;
- Academic Radiology;
- Biocybernetics and Biomedical Engineering;
- Frontiers in Medicine;
- Scientific Reports;
- Computers in Biology and Medicine;
- Artificial Intelligence In Medicine;
- Frontiers in Oncology;
- IEEE Transactions on Neural Networks and Learning Systems.

Conference Reviewer

- International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI);
- The IEEE / CVF Computer Vision and Pattern Recognition Conference (CVPR);
- The IEEE / CVF International Conference on Computer Vision (ICCV);
- The AAAI Conference on Artificial Intelligence (AAAI);
- European Conference on Computer Vision (ECCV);
- Domain Adaptation and Representation Transfer (MICCAI-DART).
- Data Augmentation, Labeling, and Imperfections (MICCAI-DALI).
- Advances in Simplifying Medical UltraSound (MICCAI-ASMUS).
- Computational Mathematics Modeling in Cancer Analysis (MICCAI-CMMCA).

Volunteer

- International Conference on Medical Imaging with Deep Learning (MIDL) 2019.

Teaching

Imperial
- 70014 Machine Learning for Imaging [Spring 2021];
- 70028 Reinforcement Learning [Autumn 2020];
- CS 496 Mathematics for Machine Learning [Autumn 2019];
- CS 316 Computer Vision [Autumn 2018, Spring 2020];
- CS 317 Graphics [Spring 2019].

Fudan
- Circuit Laboratory [Spring 2016];
- Signal Processing [Spring 2017].

References

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