

Heqin Zhu

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RESEARCH INTERESTS

My research centers on AI for Science (AI4S), with a specific focus on fundamental challenges in **computational biology**, from sequence understanding, structure and function prediction to drug discovery and other applications, including:

- RNA secondary structure [I6] and tertiary structure prediction.
- Structure-guided RNA foundation model (LLM) for sequence understanding, structure and function prediction [I8].
- Functional applications such as identification of IRES [I7], exploration of functional RNA motifs within non-coding genomic regions, and AI-driven drug discovery.

Previously, I worked on medical imaging computing, where I developed universal models [I1, I2] and few-shot learning methods [I5] for localizing anatomical landmarks.

EDUCATION

- **University of Science and Technology of China (USTC)** Sept. 2023 - 2026 (expected)
Ph.D. student, Biomedical Engineering
Suzhou, China
 - Advisor: S. Kevin Zhou (Fellow of IEEE, AIMBE, NAI)
- **Institute of Computing Technology (ICT), Chinese Academy of Sciences (CAS) & University of Chinese Academy of Sciences (UCAS)** Sept. 2020 - Jun. 2023
M.S., Computer Applications
Beijing, China
 - Advisor: S. Kevin Zhou (Fellow of IEEE, AIMBE, NAI)
 - Thesis: Landmark Detection from X-ray Images with Anatomical Universality
- **University of Science and Technology of China (USTC)** Sept. 2016 - Jun. 2020
B.S., Computer Science and Technology
Hefei, China
 - Hua Xia Talent Program in Computer Science and Technology
 - Thesis: Enhancement and Analysis of CBCT images

HONORS AND AWARDS

- Suzhou Industrial Park Scholarship, USTC 2025
- First Class Scholarship, USTC 2024-2025
- First Class Scholarship, UCAS & ICT 2020-2023
- Merit Student Award, UCAS & ICT 2023
- Outstanding Student Award, USTC 2018-2019
- Institute of Chemistry Excellence Scholarship, USTC 2017

PROFESSIONAL EXPERIENCE

- **Tencent, JAVIS Lab** Jul. 2021 - Nov. 2021
Research Intern
Shenzhen, China
 - Depth-supervised salient object detection.

PROFESSIONAL SERVICES

- Conference reviewer: MICCAI
- Journal reviewer: TCSVT

TEACHING & VOLUNTEER EXPERIENCES

- Volunteer: Medical Augmented Reality Summer School, Suzhou 2024
- TA: Electronic information openness practices, USTC Fall 2023
- Volunteer: Dushu Lake Forum Dushu Lake Symposium on Medical Image Computing, Suzhou 2023

Selected publications, # denotes co-first author and * denotes co-corresponding author. For full list, please refer to [Google Scholar](#).

Representative Papers

- [I8] **Heqin Zhu**, Ruifeng Li, Peng Xiong*, and S. Kevin Zhou*. "Structure-guided pretraining of RNA foundation model for RNA sequence understanding and structural prediction." ([In preparation, 2025](#)).
- [I7] Feng Zhang#, **Heqin Zhu**#, Jie Hu, Jiayin Gao, Ke Chen, S. Kevin Zhou*, and Peng Xiong*. "IRESeek: Structure-informed deep learning method for accurate identification of internal ribosome entry sites in circular RNAs." ([Submitted to Briefings in Bioinformatics, 2025](#)).
- [I6] **Heqin Zhu**, Fenghe Tang, Quan Quan, Ke Chen, Peng Xiong*, and S. Kevin Zhou*. "Deep generalizable prediction of RNA secondary structure via base pair motif energy." *Nature Communications* 16, (2025): 5856. ([Nat. Commun., 2025](#)). [[Paper](#); [Code](#)]
- [I5] **Heqin Zhu**, Quan Quan, Qingsong Yao, Zaiyi Liu, and S. Kevin Zhou. "Uod: Universal one-shot detection of anatomical landmarks." In *International Conference on Medical Image Computing and Computer-Assisted Intervention*, pp. 24-34. Cham: Springer Nature Switzerland, 2023. ([MICCAI 2023](#)). [[Paper](#); [Code](#)]
- [I4] **Heqin Zhu**, Qingsong Yao, and S. Kevin Zhou. "Datr: Domain-adaptive transformer for multi-domain landmark detection." *arxiv preprint arxiv:2203.06433* (2022). [[Paper](#); [Code](#)]
- [I3] **Heqin Zhu**, Xu Sun, Yuexiang Li, Kai Ma, S. Kevin Zhou*, and Yefeng Zheng*. "DFTR: Depth-supervised fusion transformer for salient object detection." *arxiv preprint arxiv:2203.06429* (2022). [[Paper](#); [Code](#)]
- [I2] **Heqin Zhu**, Qingsong Yao, Li Xiao, and S. Kevin Zhou. "Learning to Localize Cross-Anatomy Landmarks in X-Ray Images with a Universal Model." *BME Frontiers* 2022 (2022): 9765095. ([BMEF 2022](#)). [[Paper](#); [Code](#)]
- [I1] **Heqin Zhu**, Qingsong Yao, Li xiao, and S. Kevin Zhou. "You only learn once: Universal anatomical landmark detection." In *Medical Image Computing and Computer Assisted Intervention*, pp. 85-95. Springer International Publishing, 2021. ([MICCAI 2021](#)). [[Paper](#); [Code](#)]

Journal Papers

- [J4] Quan Quan#, Qingsong Yao#, **Heqin Zhu**, and S. Kevin Zhou. "IGU-Aug: Information-guided unsupervised augmentation and pixel-wise contrastive learning for medical image analysis." *IEEE Transactions on Medical Imaging* (2024). ([TMI 2024](#)).
- [J3] Quan Quan#, Qingsong Yao#, **Heqin Zhu**, Qiyuan Wang, and S. Kevin Zhou. "Which images to label for few-shot medical image analysis?." *Medical Image Analysis* 96 (2024): 103200. ([MIA 2024](#)).
- [J2] Huang Zhen#, Han Li#, Shitong Shao, **Heqin Zhu**, Huijie Hu, Zhiwei Cheng, Jianji Wang, and S. Kevin Zhou. "PELE scores: pelvic X-ray landmark detection with pelvis extraction and enhancement." *International Journal of Computer Assisted Radiology and Surgery* 19, no. 5 (2024): 939-950. ([IJCARS 2024](#)).
- [J1] Pengbo Liu, Hu Han, Yuanqi Du, **Heqin Zhu**, Yinhao Li, Feng Gu et al. "Deep learning to segment pelvic bones: large-scale CT datasets and baseline models." *International Journal of Computer Assisted Radiology and Surgery* 16 (2021): 749-756. ([IJCARS 2021](#)).

Conference Papers

- [C4] Xinyi Wang, Zikang Xu, **Heqin Zhu**, Qingsong Yao, Yiyong Sun, and S. Kevin Zhou. "SIX-Net: Spatial-Context Information miX-up for Electrode Landmark Detection." In *International Conference on Medical Image Computing and Computer-Assisted Intervention*, pp. 338-348. Cham: Springer Nature Switzerland, 2024. ([MICCAI 2024](#)).
- [C3] Fenghe Tang, Ronghao Xu, Qingsong Yao, Xueming Fu, Quan Quan, **Heqin Zhu**, Zaiyi Liu, and S. Kevin Zhou. "Hyspark: Hybrid sparse masking for large scale medical image pre-training." In *International Conference on Medical Image Computing and Computer-Assisted Intervention*, pp. 330-340. Cham: Springer Nature Switzerland, 2024. ([MICCAI 2024](#)).
- [C2] Quan Quan, Fenghe Tang, Zikang Xu, **Heqin Zhu**, and S. Kevin Zhou. "Slide-SAM: Medical SAM Meets Sliding Window." In *Medical Imaging with Deep Learning*, pp. 1179-1195. PMLR, 2024. ([MIDL 2024](#)).
- [C1] Yuanyuan Lyu, Haofu Liao, **Heqin Zhu**, and S. Kevin Zhou. "A 3 DSegNet: anatomy-aware artifact disentanglement and segmentation network for unpaired segmentation, artifact reduction, and modality translation." In *International Conference on Information Processing in Medical Imaging*, pp. 360-372. Cham: Springer International Publishing, 2021. ([IPMI 2021](#)).