# Heqin Zhu

Graduate Research Assistant ◇ University of Science and Technology of China

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## Research Interests

My research centers on AI for Science (AI4S), with specific focus on fundamental challenges in **computational biology**. I aim to integrate physical priors with deep learning [I.6] to address the scarcity of high-resolution structural data, thereby establishing robust **sequence-structure-function** mappings through **multimodal biological data fusion**. These approaches decipher RNA's dynamic structures and diverse functionalities, targeting:

- Systematic annotation of functional RNA motifs within non-coding genomic regions.
- AI-driven drug discovery via RNA-ligand interaction modeling.

Previously, I worked on medical imaging computing, where I developed universal models [I.1, I.2]] and few-shot learning methods [I.5] for localizing anatomical landmarks, aiming at bridging domain gaps and enhancing model adaptability for clinical diagnostics.

## Education

- **University of Science and Technology of China (USTC)** *Sept. 2023 - present*
  *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)** *Sept. 2020 - Jun. 2023*
  *M.S., Computer Applications* Beijing, China
  ◦ Advisor: S. Kevin Zhou(Fellow of IEEE, AIMBE, NAI)
- **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)
- **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

## 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 lmage Computing, Suzhou *2023*

## PUBLICATIONS

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

**Representative Papers**

**[I.6]** **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." bioRxiv (2024): 2024-10. [Paper; Code]

**[I.5]** **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. [Paper; Code]

**[I.4]** **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]

**[I.3]** **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]

**[I.2]** **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): 9765095-9765095. [Paper; Code]

**[I.1]** **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. [Paper; Code]

**Journal Papers**

**[J.4]** 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).

**[J.3]** 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.

**[J.2]** 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.

**[J.1]** 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.

**Conference Papers**

**[C.4]** 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.

**[C.3]** 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.

**[C.2]** 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.

**[C.1]** 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.