

# 朱河勤

中国科学技术大学

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## 研究兴趣

我的研究聚焦于用人工智能解决科学问题(AI4S)，特别关注计算生物学领域，从序列理解、结构和功能预测到药物发现等应用和挑战，具体包括：

- RNA 二级结构 [I6]与三级结构预测；
- 结构引导的RNA 基础语言模型（LLM）开发 [I8]，用于序列理解，结构和功能预测；
- 功能应用研究：如IRES 识别 [I7]、非编码基因组区域功能性RNA 基序探索，以及AI 驱动的药物发现。

在这之前，我研究过医学影像计算，开发了具有跨域适应能力的通用模型 [I1, I2] 及小样本学习算法[I5]，用于医学影像关键点的精准定位。

## 教育经历

- 中国科学技术大学 2023.09 - 2026（预计）  
博士研究生，生物医学工程 苏州  
◦ 导师: [周少华教授](#) (Fellow of IEEE, AIMBE, NAI)
- 中国科学院，计算技术研究所&中国科学院大学 2020.09 - 2023.06  
硕士，计算机应用技术 北京  
◦ 导师: [周少华教授](#) (Fellow of IEEE, AIMBE, NAI)  
◦ 学位论文:具有解剖结构通用性的X光影像关键点检测算法研究
- 中国科学技术大学 2016.09 - 2020.06  
本科，计算机科学与技术 合肥  
◦ 华夏计算机科学与技术英才班  
◦ 学位论文: C型臂CT图像的增强与分析

## 荣誉获奖

- 苏州工业园区奖学金，中国科学技术大学 2025
- 一等学业奖学金，中国科学技术大学 2024-2025
- 一等学业奖学金，计算所&国科大 2020-2023
- 三好学生，计算所&国科大 2023
- 优秀学生奖，中国科学技术大学 2018-2019
- 化研所英才奖, 中国科学技术大学 2017

## 实习经历

- 腾讯天衍实验室 2021.07 - 2021.11  
研究实习生 深圳  
◦ 使用深度图监督学习进行图像显著性检测

## 学术服务

- 会议审稿: MICCAI
- 期刊审稿: TCSVT

## 志愿活动

- 志愿者：医学增强现实夏季学期，苏州 2024
- 志愿者：医学影像计算独墅湖会议，苏州 2023
- 助教：电子信息开放实践，中国科学技术大学 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, Zaixi Zhang, Feng Zhang, Fenghe Tang, Tong Ye, Yunjie Gu, 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, 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](#)).