朱河勤

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核心研究：**AI FOR SCIENCE**

- 计算生物学：基于大模型的 RNA 结构与功能预测。主导开发结构引导的 RNA 基础语言模型 [I8]；提出碱基对基序能量模型，发表于 Nature Communications [I6]。
- 医学影像计算：跨域通用型解剖关键点检测。研发 GU2Net [I1, I2], DATR [I4], UOD [I5], 等模型，分别发表于 MICCAI 2021，BME Frontiers, MICCAI 2023。

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 AIMBE, IAMBE, IEEE, MICCAI, and 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（同上）

- 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

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*

项目实习

- 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，开发了 DFTR 多模态融合模型 [I3]

- 课程资源整理 · *2019-现在*
  GitHub 开源项目
  ○ 主导整理了计算机相关的学习资源，目前获得 15.7K 星标。https://github.com/USTC-Resource/USTC-Course

学术活动

- 学术审稿：MICCAI（医学影像顶会，CCF B 类）、TCSVT（IEEE 期刊，IF=5.1）：负责 AI 在医学影像，生物信息领域的论文评审。
- 志愿活动：医学影像计算独墅湖会议志愿者（2023），医学增强现实夏季学期（2024）：协助组织 AI 医学影像专题论坛，促进产学研合作。
- 助教：电子信息开放实践：中国科学技术大学 2023 年秋季学期。

技术技能

- 大模型与深度学习：PyTorch 框架, 语言模型，扩散模型，多模态融合, LoRA。
- 科学计算工具：生物计算（AlphaFold3, Protenix, PyMol）, Pandas, Numpy.
- 编程语言与工具：Python, C, C++, Git, bash, VIM。

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, Feng Zhang, Fenghe Tang, Tong Ye, Xin Li, Yunjie Gu, Peng Xiong*, and S. Kevin Zhou*. "A fully open structure-guided RNA foundation model for robust structural and functional inference." (Submitted). [bioRxiv; Code]

[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).

[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).