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深圳大学

本科毕业论文(设计)任务书

(2026 届)

题目: 基于 Transformer-UNet 的直肠肿瘤辅助诊断系统

学 院: 计算机与软件学院 专 业: 计算机科学与技术

班 级: 1 班 学 号: 2022150048

学生姓名: 陈星 指导教师: 梁正平

本科生毕业论文（设计）须知

1. 认真学习理解《深圳大学本科生毕业论文（设计）工作规定》和《深圳大学本科生毕业论文(设计)撰写规范及要求》。
2. 努力学习、勤于实践、勇于创新，保质保量地完成任务书规定的内容。
3. 独立完成规定的工作任务，不弄虚作假，不抄袭别人的工作内容。
4. 实验时，爱护仪器设备，节约材料，严格遵守操作规程及实验室有关制度。
5. 毕业论文（设计）必须符合《深圳大学毕业论文（设计）撰写规范与要求》，否则不能取得考核成绩。
6. 毕业论文（设计）成果、资料应于答辩结束后及时交给学院收存，学生不得擅自带离学校。经指导教师推荐可作为论文发表。
7. 妥善保存《深圳大学毕业论文（设计）任务书》。

<div>题目名称：基于 Transformer-UNet 的直肠肿瘤辅助诊断系统</div> <div><div>一、毕业论文(设计)基本内容与要求：</div><div>背景：</div><p>随着深度学习技术在医学影像分析中的广泛应用，人工智能辅助诊断系统成为提升医疗效率与诊断准确率的重要方向。直肠肿瘤是常见的消化系统恶性肿瘤，早期诊断对患者预后至关重要。传统影像诊断依赖医生人工判读，存在效率低、主观性强等问题。</p><p>基于上述背景，本课题旨在构建一个基于改进 U-Net 网络的直肠肿瘤辅助诊断系统。系统通过集成注意力门控机制对 MRI 或 CT 图像的自动分析，增强网络对肿瘤区域的聚焦能力，抑制背景噪声干扰；同时提取肿瘤的几何特征（面积、周长、形态学指标）与纹理特征（灰度共生矩阵特征），实现肿瘤区域的智能识别与可视化，为临床诊断提供技术支持。</p><div>基本内容与要求：</div><p>设计并开发一个基于 Transformer-UNet 混合架构的直肠肿瘤智能辅助诊断系统。系统将 Transformer 的全局上下文建模能力与 U-Net 的局部细节捕获优势相结合，通过自注意力机制增强肿瘤区域的特征表达，并融合注意力门控与深度监督策略，对 CT 医学影像实现高精度自动分割与多维特征提取。系统支持肿瘤几何特征（面积、周长、形态学指标）、灰度统计特征及纹理特征的量化计算，并通过可视化界面与历史数据对比分析，为临床医生提供客观、高效、可追溯的诊断依据，从而提升直肠肿瘤的早期筛查能力、疗效评估准确性与预后判断的可靠性。</p><div>功能：</div><div><div>1) 技术</div><ul style="list-style-type: none">● 深度学习框架：PyTorch、nnU-Net 框架、Transformer+U-Net● 前端框架：Vue + ElementUI● 后端框架：Flask● 图像处理库：OpenCV、SimpleITK● 数据管理：TensorRT 加速与 CT 影像数据归一化预处理<div>2) 系统功能：</div><div><div>1. 肿瘤 CT 图像上传与管理。</div><div>2. 模型推理与肿瘤分割结果生成。</div><div>3. 肿瘤区域特征计算与展示（面积、周长、强度等）。</div><div>4. 历史病例特征对比分析。</div><div>5. 医生登录、管理及病例记录查询功能。</div><div>6. 前端结果可视化展示与下载。</div></div></div></div>
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二、进度安排：

2025.10.25~2025.10.31	课题调研与需求分析
2025.11.01~2025.11.15	收集资料与系统总体设计
2025.11.16~2025.12.10	深度学习模型训练与验证
2025.12.11~2026.01.10	后端开发与 API 设计
2026.01.11~2026.02.10	前端开发与界面优化
2026.02.11~2026.03.10	系统集成与测试
2026.03.11~2026.03.31	撰写论文
2026.04.01~2026.04.20	修改论文与准备答辩

三、需收集的资料和指导性参考文献：

- [1] Rouet-Leduc, B., Hulbert, C. Automatic detection of methane emissions in multi spectral satellite imagery using a vision transformer. *Nat Commun* **15**, 3801 (2024). <https://doi.org/10.1038/s41467-024-47754-y>
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- [3] Mohammadi S, Livani M A. Enhanced breast mass segmentation in mammograms using a hybrid transformer UNet model[J]. *Computers in Biology and Medicine*, 2025, 184: 109432. Xiao Liu, Peng Gao, Tao Yu, Fei Wang, and Ru-Yue Yuan. 2025. CSWin-UNet: Transformer UNet with cross-shaped windows for medical image segmentation. *Inf. Fusion* 113, C (Jan 2025). <https://doi.org/10.1016/j.inffus.2024.102634>
- [4] Liu X, Gao P, Yu T, et al. CSWin-UNet: Transformer UNet with cross-shaped windows for medical image segmentation[J]. *Information Fusion*, 2025, 113: 102634. J. Chen et al., "TransUNet: Transformers Make Strong Encoders for Medical Image Segmentation," *IEEE Transactions on Medical Imaging*, vol. 43, no. 2, pp. 580-593, Feb. 2024, doi: 10.1109/TMI.2023.3309988.
- [5] Mohammadi S, Livani M A. Enhanced breast mass segmentation in mammograms using a hybrid transformer UNet model[J]. *Computers in Biology and Medicine*, 2025, 184: 109432. Y. Shi et al., "VmambaIR: Visual State Space Model for Image Restoration," in *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 35, no. 6, pp. 5560-5574, June 2025, doi: 10.1109/TCSVT.2025.3530090.
- [6] Zhang W, Chen S, Ma Y, et al. ETUNet: Exploring efficient transformer enhanced UNet for 3D brain tumor segmentation[J]. *Computers in Biology and Medicine*, 2024, 171: 108005.
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- [8] Li Z, Deng S, Xue Z, et al. TIA-UNet: transformer-enhanced deep learning for adolescent idiopathic scoliosis spinal x-ray image segmentation[J]. *Engineering Research Express*, 2024, 6(4): 045229.
- [9] Zhengshi Chen, Juanjuan He, Xiaoming Liu, Jinshan Tang, MDCT-Unet: A dual-encoder network combining multi-scale dilated convolutions with Transformer for medical image segmentation, *Biomedical Signal Processing and Control*, Volume 112, Part D, 2026, 108709, ISSN 1746-8094, <https://doi.org/10.1016/j.bspc.2025.108709>.
- [10] Meng, Wenjie, Shujun Liu, and Huajun Wang. "AFC-Unet: Attention-fused full-scale CNN-transformer unet for medical image segmentation." *Biomedical Signal Processing and Control* 99 (2025): 106839.
- [11] Mohammadi S, Livani M A. Enhanced breast mass segmentation in mammograms using a hybrid transformer UNet model[J]. *Computers in Biology and Medicine*, 2025, 184: 109432.

- [12] H. Wu, Z. Zhao and Z. Wang, "META-Unet: Multi-Scale Efficient Transformer Attention Unet for Fast and High-Accuracy Polyp Segmentation," in *IEEE Transactions on Automation Science and Engineering*, vol. 21, no. 3, pp. 4117-4128, July 2024, doi: 10.1109/TASE.2023.3292373.
- [13] T. P. T. Armand, S. Bhattacharjee, H. -K. Choi and H. -C. Kim, "Transformers Effectiveness in Medical Image Segmentation: A Comparative Analysis of UNet-Based Architectures," 2024 International Conference on Artificial Intelligence in Information and Communication (ICAIIIC), Osaka, Japan, 2024, pp. 238-242, doi: 10.1109/ICAIIIC60209.2024.10463435.
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- [15] M. Naderi, M. Givkashi, F. Piri, B. Mirmahboub, N. Karimi and S. Samavi, "Focal-Unet: Unet-like Focal Modulation for Medical Image Segmentation," in 2025 IEEE World AI IoT Congress(AIIoT),Seattle,WA,USA,2025,pp.0820-0825, doi: 10.1109/AIIoT65859.2025.11105308.
- [16] H. R. Kanan, A. Adelöw and M. Colarieti-Tosti, "Cross-Domain Reconstruction Network Incorporating Sinogram Sinusoidal-Structure Transformer Denoiser and UNet for Low-Dose/Low-Count Sinograms," in *IEEE Transactions on Radiation and Plasma Medical Sciences*, doi: 10.1109/TRPMS.2025.3571281.
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四、选题信息：

选题性质：设计■ 论文□

选题来源：科研项目 国家级□ 省部级□ 其他：_____

项目编号：_____

教师自拟□

学生自拟□

师生共拟■

指导教师签名：_____

院系领导意见：

签名：_____年__月__

日