Yu CAI

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EDUCATION

The Hong Kong University of Science and Technology (HKUST) 2022.08 - present
Ph.D. student in Electronic and Computer Engineering. CGA: 3.94/4.3
Advised by Prof. Kwang-Ting Cheng & Prof. Hao Chen (CSE)

Huazhong University of Science and Technology (HUST) 2018.09 - 2022.06
B.Eng. in Electronic and Information Engineering. (**Excellent Engineer Program**) GPA: 3.93/4.0
Outstanding Undergraduate Thesis: Research on Unsupervised Anomaly Detection in Chest X-Rays.
Advised by Prof. Xin Yang

RESEARCH INTEREST

Anomaly Detection in Medical Images, Computational Pathology.

PUBLICATION

Journal Papers

1. **Yu Cai**, Hao Chen, Xin Yang, Yu Zhou, Kwang-ting Cheng. "Dual-distribution discrepancy with self-supervised refinement for anomaly detection in medical images." *Medical Image Analysis*, 2023. (**MedIA, IF: 13.828**)

Conference Papers

1. **Yu Cai**, Hao Chen, Xin Yang, Yu Zhou, Kwang-ting Cheng. "Dual-Distribution Discrepancy for Anomaly Detection in Chest X-Rays." *The 25th International Conference on Medical Image Computing and Computer Assisted Intervention **(MICCAI)***, 2022. Early Accept (Acceptance rate: 13%).

COMPETITION

2021 APTOS Big Data Competition 2021.09 - 2021.12
- Designed a Multiple-Instance Learning (MIL) algorithm for Prediction on DME Patients' Response to Anti-VEGF Treatment.
- Ranked 12/10006.

PROJECTS

Anomaly Detection in Medical Images 2021.09 - present
- Prevailing methods train the model on merely normal data for anomaly detection, ignoring plenty of unlabeled images containing abnormal samples in clinical practice. To address this issue, I introduce the one-class semi-supervised learning paradigm, taking use of both normal and unlabeled images for training anomaly detection. Specifically, I proposed to utilize the ensembles of reconstruction networks to model the distribution of training data, and use the discrepancy between different ditribution to indicate anomalies. The paper was published in MICCAI 2022.
- Existing self-supervised anomaly detection methods train the model to detect synthetic abnormal regions, suffering from the overfitting. In contrast, I proposed to train an SSL Anomaly Score Refinement Net to map the orignial rough anomaly score map to the final accurate abnormal regions, mitigating the overfitting and achieving SOTA results on five medical benchmarks including chest X-rays, brain MRIs, and retinal fundus images. The paper was published in *Medical Image Analysis* (IF: 13.828).

Research on Visual Occlusion Instance Modeling and Extraction 2020.03 - 2021.03
- Proposed to extract and distinguish the occlusion boundary of each instance in the 2D images based on embedding

learning and k-means algorithm. Achieved an AP of 0.801 for occlusion boundary prediction and an AP of 0.736 for occlusion orientation prediction in PIOD dataset.

Content-Based Image Retrieval System 2020.12 - 2021.01

- Implemented a CBIR system utilizing Product Quantization and Inverted File System for image retrieval based on the pre-trained ResNet-101 features. Achieved an mAP of 0.843 on the Oxford5k dataset, with a speed of 0.14s per image on average on a single NVIDIA TITAN Xp GPU.

SELECTED AWARDS

2022-2026	HKUST Postgraduate Studentship
2022-present	HKUST RedBird PhD Award
2022.06	Honours Bachelor Degree (Top 2%)
2022.06	Outstanding Undergraduate Thesis (Top 2%)
2021.11	National Scholarship
2020.11	National Scholarship
2020.11	Outstanding Undergraduate in terms of Academic Performance (Top 1%)

TEACHING ASSISTANT

ELEC3120 Computer Communication Networks	Fall 2023
ELEC5680 Advanced Deep Learning Architectures	Spring 2023

SKILLS

Skills	Python, C, MATLAB, PyTorch, Caffe
Language	TOEFL 91 (R29+L18+S20+W24)