Dazhou Guo

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Profile

- Senior Algorithm Engineer, Alibaba DAMO Academy
- Former Senior Research Scientist, PAII Inc., Research Scientist Internship, Pactera Technology LLC
- PhD in Computer Vision, Computer Science and Engineering, University of South Carolina; Master in Computer Vision, Computer Science, Tianjin University; BSc, Dalian University of Technology; Google Scholar: 1680+ (link)

Selected Projects

Senior Algorithm Engineer, Alibaba DAMO Academy, USA

2024–Present **Lead the development of accurate pretreatment identification of extra-nodal extension (ENE) in laryngeal and hypopharyngeal cancers *(2 papers, 1 submitted, 2 filed patents)***

- Developed a size-independent and size-aware two-branch network architecture to simultaneously encode unaltered lymph node features and zoomed-in features that better account for localized subtle changes in textures and boundaries.
- Curated a dataset comprising 1,824 malignant lymph nodes from 248 patients across 4 centers with lymph nodes semi-automatically segmented, labeled, and subsequently confirmed by oncologists.
- Trained and delivered models that outperformed head and neck specialists (AUC, 0.96 vs [0.79, 0.92]) in prediction of ENE, especially in early-stage ENE detection (AUC, 0.87 vs [0.33, 0.69]).
- *Tech Stack*: ConvNets, 2.5D Classification, Monai, Transformer, Imbalanced Learning.

2023–2024 **Lead the development of the continual learning-driven framework for accurate and generalizable whole-body anatomies segmentation *(3 papers, 1 submitted, 2 filed patents)***

- Developed a single unified AI model capable of segmenting hundreds of anatomies across CT scans by leveraging multiple partially labeled datasets without catastrophic forgetting.
- Cleaned, standardized, and categorized 20 public and 18 private datasets, resulting in a comprehensive collection of over 14,000 high-quality CT images and more than 235 anatomical labels.
- Trained, delivered, and served online models that consistently improve DSC by an average of 5% relative to an ensemble of specialist nnUNets trained on a per-dataset basis, and surpass the segmentation accuracy of "Segment Anything"/SAM-style foundation models by over 9.9% DSC.
- Led initiatives to consolidate and analyze models by systematically collecting and categorizing corner cases, evaluating the impacts of different body parts, assessing self-supervised pre-training, implementing model pruning, and addressing additional optimization challenges.
- Authored over 90% of the production code and developed the complete deployment code.
- *Tech Stack*: Continual Learning, Partial Label Learning, Self-supervised Pretraining, ConvNets, 3D Segmentation, SAM, Transformers, Low-rank Adaptation, Model Pruning, Model Optimization.

2022–2023 **Lead the development of the thoracic lymph node segmentation framework in CT imaging via lymph node station stratification and size encoding *(1 paper, 1 filed patent)***

- Developed a 3D stratified segmentation framework that encodes both lymph node station and size variations by mapping thoracic lymph node stations into three super stations and subsequently learning station-specific size differences.
- Achieved the state-of-the-art performance with an average DSC of 74.2% (a 9.9% increase) and a detection recall of 72.0% (a 15.6% improvement), while reducing false positives to 4.0 per patient—a reduction of 1.9 FP per patient.
- Led the lymph node data collection and annotation pipeline, achieving a five times speedup compared to manual delineation.
- Authored the complete production code and developed the data curation code.
- *Tech stack*: ConvNets, PyTorch-lightning, Network Stratification, Network Architecture Search, etc.

Senior Research Scientist, PAII Inc., USA

2021–2022 **Lead the development of the thoracic lymph node station (LNS) parsing segmentation framework and lymph node detection framework in CT scans *(3 papers, 3 filed patents)***

- Developed an automated search module to identify key organs that optimize LNS parsing performance, achieving an average DSC of 81.1%—a 5.0% improvement over pure CT-based CNN models and a 19.2% increase compared to the previous representative approach.
- Co-developed a malignant lymph node detection model using distance-sensitive gating, achieving 65.7% and 70.1% recall at 4 and 8 FPs per patient (9.2% improvement).
- Co-developed the malignant lymph node segmentation model using distance-based GNN.
- Authored the complete LNS production and deployment code and co-developed the lymph node detection code.
- *Tech stack*: ConvNets, Network Architecture Search, Mask-RCNN, FCOS, GNN, etc.

2019–2021 **Co-Lead the development of organ at risk segmentation framework for head & neck cancer using stratified learning and neural architecture search *(2 papers, 1 filed patent)***

- Developed a comprehensive framework to stratify organs into anchor, mid-level, and small & hard OAR categories, with each category addressed by tailored segmentors optimized through neural architecture search.
- Cleaned, standardized, and categorized CT scans from six centers covering 42 head and neck OARs, yielding a comprehensive collection of over 1,600 high-quality CT images.
- Led initiatives to consolidate and analyze the model through multi-center retrospective studies, comprehensively evaluating performance and spearheading targeted revision efforts.
- Trained, delivered, and served online models that enhanced DSC by at least 3–5% relative to the nnUNet benchmark. Multi-user studies demonstrated that 98% of model predictions required only minor (<1 min) or no revisions to meet clinical acceptance, reducing workloads by 90%.
- Authored the complete production code and developed the full deployment code.
- Tech stack: Pytorch, 3D Segmentation, Organ Stratification, Small/Hard Organ Detection, Network Architecture Search, etc.

Research Intern at Pactrea LLC

2018-2019 **Developed the automatic segmentation and parsing models for esophageal gross tumor volume, clinical target volume *(3 papers, 2 filed patents)***

- Collected and cleaned a retrospective dataset of 606 esophageal cancer patients from four centers; among these, 354 underwent CT scans only, while 252 received additional diagnostic FDG-PET/CT scans.
- Trained, delivered, and served online models that achieved an average DSC of 81.0% when only using CT images. With additional PET scans, the CT+PET model significantly increased the performance to 83.1%. Multi-user studies demonstrated that 88% of model predictions required only minor (<1 min) or no revisions to meet clinical acceptance, reducing workloads and inter-user variation by 48% and 37.6%, respectively.
- Authored the complete production code and developed the full deployment code.
- Tech stack: DEEDS, ConvNets, 3D Segmentation, small/hard object segmentation, Imbalanced learning, etc.

Professional Activities & Awards

Papers Full list: `https://scholar.google.com/citations?user=GG4UXqsAAAAJ&hl`

Abstract >10 clinical abstracts in RSNA and ASTRO.

Patents >10 patents filed for projects in Alibaba DAMO Academy, PAII Inc and Pactrea LLC.

Reviewer CVPR, ICCV, AAAI, MICCAI, IEEE TPAMI, IEEE TIP, IEEE Multimedia, IEEE TMI, etc.

2020 MICCAI-2020 NIH Award (link)

2019 Medical Image Analysis MICCAI-2019 selected papers