Yunhe GAO

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Research Interests

- **Medical foundation models** (e.g. universal medical image understanding)
- **Knowledge-driven models** (e.g. injecting human prior knowledge into models)
- **Model robustness** (e.g. domain adaptation, generalization)

Education

- **Rutgers, The State University of New Jersey** Sep. 2019 - Present
  - *Ph.D in Computer Science | GPA: 3.93/4.0*
  - *Advisor: Prof. Dimitris N. Metaxas (Distinguished Professor)*
- **The Chinese University of Hong Kong** Sep. 2017 - Nov. 2018
  - *M.Sc. in Electronic Engineering | GPA: 3.8/4.0,* **Rank: 1/34**
  - *Advisor: Prof. Hongsheng Li*
- **University of Science and Technology of China** Sep. 2013 - Jul. 2017
  - *B.Eng in Automation*
  - *WANG Daheng (The Father of China Optics) Elite Student's Class*

Experience

- **Cloud + AI, Microsoft** Remote
  Part-time Research Scientist Intern. Mentor: Dr. Dongdong Chen. Feb. 2024 - Present
  - Medical image segmentation foundation model with in-context learning and semi-supervised learning.
- **Deep Engine Science, Amazon Web Service** Santa Clara, CA, USA
  Applied Scientist Intern. Manager: Dr. Boran Han. Dr. Zhiqiang Tang. June 2023 - Sep. 2023
  - Scalable dataset distillation.
- **Deep Engine Science, Amazon Web Service** Santa Clara, CA, USA
  Applied Scientist Intern. Manager: Dr. Xingjian Shi. Mentor: Dr. Yi Zhu. June 2022 - Sep. 2022
  - Data-efficient test-time domain adaptation via visual prompt tuning.
- **Computer Science Department, Rutgers University** Piscataway, NJ, USA
  Research Assistant in CBIM. Supervised by Prof. Dimitris Metaxas. Sep. 2019 - Present
  - Improving model robustness against training and testing distribution shift. [ICCV'21]
  - Medical image segmentation via Vision Transformer. [MICCAI'21]
  - Data-efficient learning via automatic data augmentation for natural and medical images. [ECCV'20, IPMI'21]
  - Shape regularization in medical image segmentation. [MedIA'21]

  Teaching Assistant. Sep. 2019 - May. 2021
  - Systems Programming (198:214:F19)
  - Introduction to Artificial Intelligence (198:440:S20)
  - Systems Programming (198:214:F20)
  - Systems Programming (198:214:S21)
- **Medical Group, SenseTime Research** Shanghai, China
  Research Intern. Host: Dr. Liang Zhao. Sep. 2018 - Jun. 2019
  - Bone&Tumor segmentation in pelvic CT images.
  - Model design, model compression and whole workflow acceleration.

- Multi-modality registration on CT and MR images.
- Tooth root canal segmentation in CBCT.

Publications

[1] **Y. Gao**, D. Gu, M. Zhou, D. Metaxas. "Aligning Human Knowledge with Visual Concepts Towards Explainable Medical Image Classification" Under review.

[2] **Y. Gao**, Z. Li, D. Liu, M. Zhou, S. Zhang, D. Metaxas. "Training Like a Medical Resident: Context-Prior learning toward Universal Medical Image Segmentation" The IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2024

[3] D. Liu, A. Stathopoulos, Q. Zhangli, **Y. Gao**, D. Metaxas. "LEPARD: Learning Explicit Part Discovery for 3D Articulated Shape Reconstruction" Conference on Neural Information Processing Systems (NeurIPS), 2023

[4] **Y. Gao**, X. Shi, Y. Zhu, H. Wang, Z. Tang, X. Zhou, M. Li, D. Metaxas. "Visual Prompt Tuning for Test-time Domain Adaptation." arXiv preprint

[5] **Y. Gao**, M. Zhou, D. Liu, D. Metaxas. "A Data-scalable Transformer for Medical Image Segmentation: Architecture, Model Efficiency, and Benchmark." Under review at IEEE Transactions on Medical Imaging (TMI)

[6] C. Qi, H. Qu, Z. Yan, **Y. Gao**, L. Baskaran, D. Metaxas. "Modality Bank: Learn multi-modality images across data centers without sharing medical data." IEEE Engineering in Medicine and Biology Society (EMBC), 2022

[7] Q. Zhangli, J. Yi, D. Liu, **Y. Gao**, D. Metaxas, et al. "Region proposal rectification towards robust instance segmentation of biological images." International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI), 2022.

[8] D. Liu, **Y.Gao**, D. Metaxas, et al. "Transfusion: multi-view divergent fusion for medical image segmentation with transformers." International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI), 2022.

[9] **Y. Gao**, M. Zhou, D. Metaxas. "UTNet: a hybrid transformer architecture for medical image segmentation." International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI), 2021.

[10] **Y. Gao**, Z. Tang, M. Zhou, D. Metaxas. "Enabling Data Diversity: Efficient Automatic Augmentation via Regularized Adversarial Training." International Conference on Information Processing in Medical Imaging (IPMI), 2021.

[11] Z. Tang, **Y. Gao**, Y. Zhu, Z. Zhang, M. Li, D. Metaxas. "CrossNorm and SelfNorm for Generalization Under Distribution Shifts." Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV), 2021.

[12] **Y. Gao**, R. Huang, Y. Yang, J. Zhang, K. Shao, C. Tao, Y. Chen, D. Metaxas, H. Li, M. Chen. "FocusNetv2: Imbalanced large and small organ segmentation with adversarial shape constraint for head and neck CT images." Medical Image Analysis (MedIA), 2021.

[13] Z. Tang, **Y. Gao**, L. Karlinsky, P. Sattigeri, R. Feris, D. Metaxas. "OnlineAugment: Online data augmentation with less domain knowledge." European Conference on Computer Vision (ECCV), 2020.

[14] Y. Chen, **Y. Gao**, K. Li, L. Zhao, J. Zhao "Vertebrae Identification and Localization Utilizing Fully Convolutional Networks and a Hidden Markov Model." IEEE Transactions on Medical Imaging (TMI), 2019.

[15] **Y. Gao**, R. Huang, M. Chen, Z. Wang, J. Deng, Y. Chen, Y. Yang, J. Zhang, C. Tao, H. Li. "Focusnet: Imbalanced large and small organ segmentation with an end-to-end deep neural network for head and neck ct images." International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI), 2019.

[16] **Y. Gao**, C. Liu, L. Zhao. "Multi-resolution path cnn with deep supervision for intervertebral disc localization and segmentation." International Conference on Medical Image

Computing and Computer-Assisted Intervention (MICCAI), 2019.

[17] **Y. Gao**. "Deep Learning Framework for Fully Automated Intervertebral Disc Localization and Segmentation from Multi-modality MR Images." International Workshop and Challenge on Computational Methods and Clinical Applications for Spine Imaging, 2018.

Awards & Scholarships

- **Excellent Intern Award** 2019
  - Only two quota for interns in the SenseTime Medical group in 2019. (2/28)
- **Championship in IVDM3Seg Challenge** 2019
  - An international competition in conjunction with MICCAI 2019. (1/8)
- **Dr. Alan Lam Scholarship** 2018
  - In recognition of outstanding Dissertation in the EE Department of CUHK.
  - Only one student in the EE Department. (1/34)
- **Department Scholarship** 2018
  - For top 3 students in the Electronic Engineering Department of CUHK. (3/34)

Professional Activities

Conference Reviewer

- IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)
- European Conference on Computer Vision (ECCV)
- International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)
- AAAI Conference on Artificial Intelligence (AAAI)

Journal Reviewer

- IEEE Transactions on Pattern Analysis and Machine Intelligence
- IEEE Transactions on Medical Imaging, **Distinguished Reviewer**
- Radiology: Artificial Intelligence, **Editor Trainee**
- Medical Image Analysis
- Pattern Recognition
- Neurocomputing

Technical Skills

- **Programming Languages:** Python, C/C++, Matlab
- **Frameworks:** PyTorch
- **Tools and Platforms:** Linux/Unix, Git, Vim, LaTeX