YU ZHANG

PERSONAL INFORMATION

Ph.D. Candidate (ABD)
Department of Computer Science
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Google Scholar

EDUCATION

University of Kentucky *Aug. 2017 - Dec. 2022 (expected)*
Ph.D. in Computer Science
Advisor: Nathan Jacobs
Overall GPA: 3.9/4.0

Northeastern University (CN) *Sept. 2013 - June 2017*
School of Computer Science and Engineering
B.E. in Telecommunications

APPOINTMENTS

Siemens Healthineers *Malvern, PA*
-Image Analytics Intern *May 2022 - Aug. 2022*

- Developed a self-supervised learning method for locating the same lesion across varying images.

University of Kentucky *Lexington, KY*
-Research Assistant *May 2019 - May 2022*

- Multi-domain semantic segmentation and depth estimation for unmanned aerial systems.
- Classification, detection, segmentation, and calibration on 2D and 3D medical images.
- Explored deep learning on astrophysics using imbalanced multi-modal data.

-Teaching Assistant *Jan. 2018 - May 2021*

- CS215: Introduction to Program Design, Abstraction and Problem Solving ×2
- CS216: Introduction to Software Engineering Techniques ×2
- CS371: Introduction to Computer Networking ×1

SKILLS

Experience: Deep Learning, Computer Vision, Domain Adaptation, Multi-Modal Data Modeling
Programming: Python, PyTorch, MATLAB, C, C++

RESEARCH SUMMARY

(See references in Publications.)

Multi-Domain Classification, Semantic Segmentation, and Depth Estimation

- Designed a dynamic feature alignment framework the semi-supervised domain adaptation problem by minimizing divergence and pseudo-labeling [C.2].
- Proposed a unified model for semantic segmentation for aerial imagery by learning a universal representation shared across multiple datasets with different label-spaces.
- Addressed the problem of multi-target domain adaptation for depth estimation and improved the performance by using uncertainty estimation, self-reconstruction, and knowledge distillation.

Medical Imaging Understanding with Limited Datasets

- Addressed the inconsistent performance of deep learning models on mammogram classification [J.12]. Proposed a novel method for network calibration which addresses the problem of model overconfidence [C.5][W.15]. Bridged the domain gap by using a CycleGAN-based method [A.17].
- Adapted a self-training approach for the task of breast cancer localization using only image-level labels [C.6]. Improved the image interpretation performance by designing an image-text matching network using textual medical reports as a weakly-supervision signal [J.10].
- Made numerous improvements and our current architecture is now able to use the full 2D and 3D mammograms, significantly improving performance over the previous method which subsampled the 3D volume [A.18][C.8][C.7]. Applied both CNN-based [C.3] and transformer-based [C.1] architectures on multi-modal PET images for Alzheimer disease diagnosis.

Identifying Galaxy Clusters using Deep Learning

- Identified cool core, weak cool core, and noncool core clusters of galaxies that are defined by their central cooling times using CNNs [J.11], interpreted the results by using class activation maps, and further improved the performance by using a multi-branch attention network [C.4].
- Proposed a self-supervised approach for estimating galaxy cluster masses from multi-band optical images using transfer learning [W.14][J.9].

PUBLICATIONS

(See Google Scholar for the full list.)

Conference Publications

[C.1] X. Xing, G. Liang, **Yu Zhang**, S. Khanal, A. Lin, N. Jacobs. "ADVIT: Vision Transformer on Multi-modality PET Images for Alzheimer Disease Diagnosis". In *IEEE International Symposium on Biomedical Imaging (ISBI)*, 2022. [link]

[C.2] **Yu Zhang**, G. Liang, N. Jacobs. "Dynamic Feature Alignment for Semi-supervised Domain Adaptation". In *British Machine Vision Conference (BMVC)*, 2021. [link]

[C.3] G. Liang, X. Xing, L. Liu, **Yu Zhang**, Q. Ying, A. Lin, and N. Jacobs. "Alzheimer's Disease Classification Using 2D Convolutional Neural Networks". In *IEEE Engineering in Medicine & Biology Society (EMBC)*, 2021. [link]

[C.4] **Yu Zhang**, G. Liang, Y. Su, N. Jacobs. "Multi-Branch Attention Networks for Classifying Galaxy Clusters". In *International Conference on Pattern Recognition (ICPR)*, 2020. [link]

[C.5] G. Liang, **Yu Zhang**, X. Wang, N. Jacobs. "Improved Trainable Calibration Method for Neural Networks on Medical Imaging Classification". In to *British Machine Vision Conference (BMVC)*, 2020. [link]

[C.6] G. Liang, X. Wang, **Yu Zhang**, N. Jacobs. "Weakly-Supervised Self-Training for Breast Cancer Localization". In *IEEE Engineering in Medicine & Biology Society (EMBC)*, 2020. [link]

[C.7] **Yu Zhang**, X. Wang, H. Blanton, G. Liang, X. Xing, N. Jacobs. "2D Convolutional Neural Networks for 3D Digital Breast Tomosynthesis Classification". In *IEEE International Conference of Bioinformatics and Biomedicine (BIBM)*, 2019. [link]

[C.8] G. Liang, X. Wang, **Yu Zhang**, X. Xing, H. Blanton, T. Salem, N. Jacobs. "Joint 2D-3D Breast Cancer Classification". In *IEEE International Conference of Bioinformatics and Biomedicine (BIBM)*, 2019. [link]

Journal Publications

[J.9] S. Lin, Y. Su, G. Liang, Y. Zhang, N. Jacobs, **Yu Zhang**. "Estimating Cluster Masses from SDSS Multi-band Images with Transfer Learning". In *Monthly Notices of the Royal Astronomical Society (MNRAS)*, 2022. [link]

[J.10] G. Liang, C. Greenwell, **Yu Zhang**, X. Wang, R. Kavuluru, N. Jacobs. "Contrastive Cross-Modal Pre-Training: A General Strategy for Small Sample Medical Imaging". In *IEEE Journal of Biomedical and Health Informatics (JBHI)*, 2021. [link]

[J.11] Y. Su, **Yu Zhang**, G. Liang, J. A. ZuHone, D. J. Barnes, N. B. Jacobs, M. Ntampaka, W. R. Forman, R. P. Kraft, P. E. J. Nulsen, C. Jones, E. Roediger. "A deep learning view of the census of galaxy clusters in IllustrisTNG". In *Monthly Notices of the Royal Astronomical Society (MNRAS)*, 2020. [link]

[J.12] X. Wang, G. Liang, **Yu Zhang**, H. Blanton, Z. Bessinger, N. Jacobs. "Inconsistent Performance of Deep Learning Models on Mammogram Classification". In *Journal of the American College of Radiology (JACR)*, 2020. [link]

Workshop Publications

[W.13] U. Rafique, **Yu Zhang**, B. Brodie, N. Jacobs. "Unifying Guided and Unguided Outdoor Image Synthesis". In *CVPR Workshop*: NTIRE 2021. [link]

[W.14] G. Liang, S. Lin, **Yu Zhang**, Y. Su, Nathan Jacobs. "Optical Wavelength Guided Self-Supervised Feature Learning For Galaxy Cluster Richness Estimate". In *NeurIPS Workshop: Machine Learning and Physical Sciences*, 2020. [link]

[W.15] G. Liang, **Yu Zhang**, N. Jacobs. "Neural Network Calibration for Medical Imaging Classification Using DCA Regularization". In *ICML Workshop: Uncertainty and Robustness in Deep Learning*, 2020. [link]

[W.16] **Yu Zhang**, G. Liang, T. Salem, N. Jacobs. "Defense-PointNet: Protecting PointNet Against Adversarial Attacks". In *IEEE BigData Workshop: The Next Frontier of Big Data From LiDAR*, 2019. [link]

Abstracts

[A.17] **Yu Zhang**, G. Liang, N. Jacobs, X. Wang. "Unsupervised Domain Adaptation for Mammogram Image Classification: A Promising Tool for Model Generalization". In *Conference on Machine Intelligence in Medical Imaging*, 2019. [link]

[A.18] G. Liang, **Yu Zhang**, J. Liu, N. Jacobs, X. Wang. "Training Deep Learning Models as Radiologists: Breast Cancer Classification Using Combined Whole 2D Mammography and Full Volume Digital Breast Tomosynthesis". In *Radiological Society of North America 105th Scientific Assembly and Annual Meeting*, 2019. [link]

MEDIA COVERAGE

- HealthExec: Inconsistent AI for breast cancer fail to deliver after closer inspection. *Feb. 2020*
- UKNow: UK Physics, Engineering Team Uses AI to Study Galaxy Clusters. *Sep. 2020*

TALKS

- "Defense-PointNet: Protecting PointNet Against Adversarial Attacks", Dec. 2019, IEEE BigData LiDAR Workshop, Los Angeles, CA
- "Unsupervised Domain Adaptation for Mammogram Image Classification: A Promising Tool for Model Generalization", Sep. 2019, C-MIMI, Austin, TX

AWARDS

- Conference Travel Grant, University of Kentucky, 2019
- ATS Fellowship, University of Kentucky, 2017-2018

SERVICE

- Reviewer for IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
- Reviewer for IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)
- Reviewer for IEEE Winter Conference on Applications of Computer Vision 2020, 2022
- Reviewer for The British Machine Vision Conference 2020, 2021
- Reviewer for Imaging Science Journal 2022

MEMBERSHIPS

- Institute of Electrical and Electronics Engineers (IEEE), Student Member
- Society for Imaging Informatics in Medicine (SIIM), Student Member