Gregory I. Holste

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Education

The University of Texas at Austin, Austin, TX
M.S.E, Ph.D. in Electrical Engineering **Aug. 2021-present**

- Ph.D. student in DICE track of ECE department
- Advisor: Zhangyang (Atlas) Wang

Kenyon College, Gambier, OH
B.A. in Mathematics & Statistics **Aug. 2016-May 2020**

- GPA: 3.91 / 4.00 (*summa cum laude*)
- Concentration in Scientific Computing; Minor in Biology

Research Experience

The University of Texas at Austin, Austin, TX
Visual Informatics @ UT Austin (VITA) **Jul. 2021-present**

- Developing novel self-supervised learning algorithms for data-efficient cardiac diagnosis from echocardiogram videos [p3, p4]
- Investigating long-tailed learning of thorax diseases on chest X-rays [2]
- Designed a radiomics-guided Transformer architecture for weakly supervised disease localization in chest X-rays [1]
- Advisor: Zhangyang (Atlas) Wang

Artera Inc, Mountain View, CA
Artificial Intelligence Team **May. 2022-Oct.2022**

- Implemented methods for multimodal fusion of histopathology images and clinical data for prostate cancer prediction [p1]
- Improved upon productionalized biomarker by 0.02 mean cross-validation AUROC
- Advisors: Akinori Mitani, Andre Esteva

Michigan State University, East Lansing, MI
Medical Imaging & Data Integration Lab **Aug. 2019-Jul. 2021**

- Developed and compared multimodal fusion models that learn jointly from breast MRI images and associated non-image clinical data [4]
- Applied novel ensemble methods to pediatric rib fracture detection in radiographs [3, p2]
- Submitted solutions to RSNA Pulmonary Embolism Detection Challenge and MICCAI 2020 RibFrac Challenge (top 8-performing solution)
- Advisor: Adam Alessio

Michigan State University, East Lansing, MI
ACRES Research Experience for Undergraduates (REU) **Summer 2019**

- Implemented methods to segment eight regions of the chest in pediatric radiographs
- Compared methods to improve anatomic segmentation with 10^5-fold imbalance between classes, including custom pixel weight maps and loss functions [1]
- Advisor: Adam Alessio

Publications

[1] Y. Han, **G. Holste**, Y. Ding, A. Tewfik, Y. Peng, Z. Wang. "Radiomics-Guided Global-Local Transformer for Weakly Supervised Pathology Localization in Chest X-Rays." *IEEE Transactions on Medical Imaging*. Forthcoming.

[2] **G. Holste**, S. Wang, Z. Jiang, T.C. Shen, G. Shih, R.M. Summers, Y. Peng, Z. Wang. "Long-Tailed Classification of Thorax Diseases on Chest X-Ray: A New Benchmark Study" in *Proc. MICCAI Workshop on Data Augmentation, Labelling, and Imperfections*. 16 September 2022.

[3] J. Burkow, **G. Holste**, J. Otjen, F. Perez, J. Junewick, A. Alessio. "Avalanche decision schemes to improve pediatric rib fracture detection" in *Proc. SPIE Medical Imaging 2022: Computer-Aided Diagnosis*. 4 April 2022.

[4] **G. Holste**, S. Partridge, H. Rahbar, D. Biswas, C. Lee, A. Alessio. "End-to-End Learning of Fused Image and Non-Image Features for Improved Breast Cancer Classification from MRI" in *Proc. International Conference on Computer Vision (ICCV) Workshops*. 31 October 2021.

[5] **G. Holste**, R. Sullivan, M. Bindschadler, N. Nagy, A. Alessio. "Multi-class semantic segmentation of pediatric chest radiographs" in *Proc. SPIE Medical Imaging 2020: Image Processing*. 10 March 2020.

[6] R. Sullivan, **G. Holste**, J. Burkow, A. Alessio. "Deep learning methods for segmentation of lines in pediatric chest radiographs" in *Proc. SPIE Medical Imaging 2020: Computer-Aided Diagnosis*. 16 March 2020.

Preprints/ Under review

[p1] **G. Holste**, A. Mitani, R. Yamashita, H. Pinckaers, D. van der Wal, A. Esteva. "Improved Multimodal Fusion for Small Datasets via Extra Supervision." Under review for the *IEEE International Symposium on Biomedical Imaging (ISBI)*. Submitted October 2022.

[p2] J. Burkow, **G. Holste**, J. Otjen, F. Perez, J. Junewick, A. Zbojniewicz, E. Romberg, S. Menashe, J. Frost, A. Alessio. "High Sensitivity Methods for Rib Fracture Detection in Pediatric Radiographs." Under review at *Nature Machine Intelligence*. Submitted 13 September 2022.

[p3] **G. Holste**, E.K. Oikonomou, B.J. Mortazavi, K.F. Faridi, E.J. Miller, J.K. Forrest, R.L. McNamara, H.M. Krumholz, Z. Wang, R. Khera. "Automated detection of severe aortic stenosis using single-view echocardiography: A self-supervised ensemble learning approach." *medRxiv preprint*. 31 August 2022.

[p4] **G. Holste**, E.K. Oikonomou, B. Mortazavi, Z. Wang, R. Khera. "Self-Supervised Learning of Echocardiogram Videos Enables Data-Efficient Clinical Diagnosis." *arXiv preprint*. 23 July 2022.

Honors/ Awards

Charles W. & Margaret A. Tolbert Endowed Scholarship **Aug.2021-present**
UT Austin Cockrell School of Engineering scholarship for top incoming engineering students

Phi Beta Kappa **May 2020-present**
Elected to Kenyon College's chapter of the national honor society

Sigma Xi **Feb. 2020-present**
Inducted into the Kenyon-Denison chapter of the national science research honor society

Pi Mu Epsilon **Apr. 2018-present**
Elected to the Ohio Pi chapter of the national mathematics society

Wendell D. Lindstrom Memorial Prize **Apr. 2018**
One of 12 students given prize for outstanding mathematics students at Kenyon College

Kenyon College Merit List (8x) **every semester**

Oral Presentations

Long-Tailed Classification of Thorax Diseases on Chest X-Ray: A New Benchmark Study
MICCAI Workshop on Data Augmentation, Labelling, & Imperfections, Singapore **Sep. 2022**

Multi-class semantic segmentation of pediatric radiographs
SPIE Medical Imaging: Image Processing, Houston, TX **Feb. 2020**

Scientific Abstracts

Long-Tailed Classification of Thorax Diseases on Chest X-Ray
G. Holste, S. Wang, Z. Jiang, T.C. Shen, G. Shih, R.M. Summers, Y. Peng, Z. Wang
Accepted to RSNA 2022, Chicago, IL **Nov. 2022**

Self-Supervised Learning of Echocardiogram Videos Enables Data-Efficient Clinical Diagnosis
G. Holste, E.K. Oikonomou, B. Mortazavi, Z. Wang, R. Khera
ICML Workshop on Interpretable Machine Learning in Healthcare, Baltimore, MD **Jul. 2022**

Rib fracture detection in pediatric radiographs via deep convolutional neural networks
J. Burkow, **G. Holste**, F. Perez, J. Junewick, A. Zbojniewicz, J. Frost, E. Romberg, S. Menashe, J. Otjen, A. Alessio
International Pediatric Radiology Congress, Milan, Italy **Oct. 2021**

Automatic segmentation of chest radiographs with deep learning
G. Holste, R. Sullivan, N. Nagy, M. Bindschadler, A. Alessio
Mid-SURE Symposium, East Lansing, MI **Jul. 2019**

Deep learning methods for automatic evaluation of lines in chest radiographs
R. Sullivan, **G. Holste**, A. Alessio
Mid-SURE Symposium, East Lansing, MI **Jul. 2019**

Invited Talks

Fusing imaging and clinical information for improved automatic breast cancer detection
MSU Virtual Imaging Research Symposium, East Lansing, MI **Feb. 2021**

Automatic segmentation of pediatric chest radiographs
Kenyon College Math Monday, Gambier, OH **Nov. 2019**