Shuyue Guan

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Education

The George Washing University (GWU) Washington, DC USA
Ph.D. in Biomedical Engineering, Advisor: Murray H. Loew 2017–Current
M.S. in Computer Science, Advisor: Claire Monteleoni 2015–2017

Northeast Forestry University (NEFU) Harbin, China
M.S. in Biophysics, Advisor: Dawei Qi 2010–2013
B.S. in Physics 2006–2010

Research Overview

Recent Research Interests: Machine Learning, Deep Learning, Image Processing, Computer Vision, and their applications in Medical Imaging

Transparent Deep Learning 2018–Current

- Learnability of deep learning models
- Generalizability of neural networks
- Data separability measure
- Generative Adversarial Networks (GANs) performance evaluation

Deep Learning Applications on Medical Images 2017–Current

- Deep learning models for medical images segmentation
- GANs for cancer detection
- Transfer learning for cancer detection

Hyperspectral Images-based Cardiac Ablation Lesion Detection 2016–2018

- Optimization of wavelength selection for multispectral image acquisition
- Unsupervised learning for lesions detection on hyperspectral images

Climate (Frost Point) Data Collection and Analysis 2016
Department of Computer Science at GWU, Advisor: Claire Monteleoni

Scene Image Identification and Positioning 2014
Advisor: Dongjie Zhu at Harbin Institute of Technology

Non-destructive Testing for Wooden Materials 2010–2013

- Defects description in blockboard
- Multifractal analysis for the defects recognition
- Automatic fiberboard density testing based on CT

The Design and Production of Chinese Medicine Ultrasonic Extraction Machine 2009–2010
Adviser: Runzhou Su at NEFU

- Participated in the undergraduate innovative experimental project of NEFU

Publications

[1] A. Lou, **S. Guan**, and M. H. Loew, "DC-UNet: rethinking the U-Net architecture with dual channel efficient CNN for medical image segmentation", in *Medical Imaging 2021: Image Processing*, International Society for Optics and Photonics, vol. 11596, SPIE, 2021, pp. 749–759. DOI: 10.1117/12.2582338.

[2] **S. Guan** and M. Loew, "An internal cluster validity index using a distance-based separability measure", in *2020 IEEE 32nd International Conference on Tools with Artificial Intelligence (ICTAI)*, 2020, pp. 827–834. DOI: 10.1109/ICTAI50040.2020.00131.

[3] **S. Guan** and M. Loew, "Analysis of generalizability of deep neural networks based on the complexity of decision boundary", in *[In press] International Conference on Machine Learning and Applications (ICMLA)*, https://arxiv.org/abs/2009.07974, 2020.

[4] **S. Guan** and M. Loew, "Understanding the ability of deep neural networks to count connected components in images", in *[In press] IEEE Applied Imagery Pattern Recognition (AIPR)*, https://arxiv.org/abs/2101.01386, 2020.

[5] **S. Guan** and M. Loew, "Evaluation of generative adversarial network performance based on direct analysis of generated images", in *2019 IEEE Applied Imagery Pattern Recognition Workshop (AIPR)*, 2019, pp. 1–5. DOI: 10.1109/AIPR47015.2019.9174595.

[6] **S. Guan** and M. Loew, "Breast cancer detection using synthetic mammograms from generative adversarial networks in convolutional neural networks", *Journal of medical imaging*, vol. 6, no. 3, pp. 031 411–031 411, Jul. 2019, ISSN: 2329-4302. DOI: 10.1117/1.JMI.6.3.031411.

[7] **S. Guan** and M. Loew, "Using generative adversarial networks and transfer learning for breast cancer detection by convolutional neural networks", in *Medical Imaging 2019: Imaging Informatics for Healthcare, Research, and Applications*, International Society for Optics and Photonics, vol. 10954, SPIE, 2019, pp. 306–318. DOI: 10.1117/12.2512671.

[8] H. Asfour, **S. Guan**, N. Muselimyan, L. Swift, M. Loew, and N. Sarvazyan, "Optimization of wavelength selection for multispectral image acquisition: A case study of atrial ablation lesions", *Biomed. Opt. Express*, vol. 9, no. 5, pp. 2189–2204, May 2018. DOI: 10.1364/BOE.9.002189.

[9] **S. Guan**, N. Kamona, and M. Loew, "Segmentation of thermal breast images using convolutional and deconvolutional neural networks", in *2018 IEEE Applied Imagery Pattern Recognition Workshop (AIPR)*, 2018, pp. 1–7. DOI: 10.1109/AIPR.2018.8707379.

[10] **S. Guan**, H. Asfour, N. Sarvazyan, and M. Loew, "Application of unsupervised learning to hyperspectral imaging of cardiac ablation lesions", *Journal of medical imaging*, vol. 5, no. 4, pp. 046 003–046 003, Oct. 2018, ISSN: 2329-4302. DOI: 10.1117/1.JMI.5.4.046003.

[11] **S. Guan** and M. Loew, "Breast cancer detection using transfer learning in convolutional neural networks", in *2017 IEEE Applied Imagery Pattern Recognition Workshop (AIPR)*, 2017, pp. 1–8. DOI: 10.1109/AIPR.2017.8457948.

[12] H. Mu, M. Zhang, D. Qi, **S. Guan**, and H. Ni, "Wood Defects Recognition Based on Fuzzy BP Neural Network", *International Journal of Smart Home*, vol. 9, pp. 143–152, 5 2015.

[13] **S. Guan** and D. Qi, "Defect edge detection in blockboard x-ray images by shannon entropy", *International Journal on Advances in Information Sciences and Service Sciences*, vol. 5, pp. 988–996, 2013.

[14] **S. Guan** and D. Qi, "Defects description in blockboard by hough transform and minimum-perimeter polygons", *International Journal of Advancements in Computing Technology*, vol. 4, no. 23, pp. 365–375, 2012. DOI: 10.4156/ijact.vol4.issue23.43.

[15] **S. Guan** and D. Qi, "Multifractal analysis of blockboard x-ray images for the defect detection", *Advances in Information Sciences and Service Sciences*, vol. 4, no. 18, pp. 149–156, 2012. DOI: 10.4156/AISS.vol4.issue18.18.

[16] **S. Guan**, D. Qi, and Y. Han, "Automatic fiberboard density testing based on application of computed tomography", in *Information and Business Intelligence*, Springer Berlin Heidelberg, 2012, pp. 614–620, ISBN: 978-3-642-29084-8.

[17] Y. Han, D. Qi, and **S. Guan**, "Application of computed tomography in wood-polymer composites density detection", in *Materials Science and Engineering Technology (ISMSET)*, ser. Advanced Materials Research, vol. 428, Trans Tech Publications Ltd, Feb. 2012, pp. 57–60. DOI: 10.4028/www.scientific.net/AMR.428.57.

Manuscripts

[1] **S. Guan**, M. Loew, "The estimation of training accuracy for two-layer neural networks on random datasets without training", *[arXiv Preprint]*, arXiv: 2010.13380

[2] **S. Guan**, M. Loew, H. Ko, "Data Separability for Neural Network Classifiers and the Development of a Separability Index", *[arXiv Preprint]*, arXiv: 2005.13120

[3] **S. Guan**, M. Loew, "A Novel Measure to Evaluate Generative Adversarial Networks Based on Direct Analysis of Generated Images", *[arXiv Preprint]*, arXiv: 2002.12345

Academic Service

- **Journal Reviewer:** IEEE TPAMI, IEEE TNNLS, IEEE TEVC, IEEE TMI, IEEE TBD, IEEE Access, PR, ACM TKDD, Computational Intelligence, JAIHC, SPIE JMI, IJMI
- **Conference Reviewer:** AISTATS (2021), WACV (2021)

Awards and Honors

- Collins Distinguished Doctoral Award 2020
- Honorable Mention Poster Award, SPIE Medical Imaging Conference 2019
- Gail E. Boggs Graduate Engineering Endowment Scholarship 2019
- Tyler Wean Scholarship 2019
- 125th Anniversary Endowment Scholarship 2019
- Timothy Tong Endowment Fellowship 2019
- Harriet Green Tischler Endowment Scholarship 2019
- Provincial Excellent Graduate, Heilongjiang China 2013
- Excellent Graduate, NEFU 2013
- National Graduate Fellowship, China 2012
- Graduate Technology Innovation Project Fund, NEFU 2010
- Excellent Undergraduate Thesis, NEFU 2010
- Successful Participant, Mathematical Contest in Modeling 2010

Teaching Assistant

- Biomedical Engineering Capstone Project Lab — Spring 2021, Spring 2018
  BME 4925W, BME 3915W (all courses are in GWU)
- Computer Vision — Fall 2020, Spring 2018
  BME/ECE 6885
- Biomedical Engineering MATLAB Programming — Spring 2020, Fall 2019, Spring 2019
  BME 2820
- Biomedical Engineering C Programming — Fall 2019
  BME 2825
- Pattern Recognition — Fall 2018, Fall 2017
  BME/ECE 6850
- Digital Image Processing — Spring 2017
  BME/ECE 6840
- Design and Analysis of Algorithms — Fall 2016
  CSCI 6212
- Probability for Computer Science — Spring 2016
  CSCI 3362/6362

Volunteer

- IEEE Applied Imagery Pattern Recognition (AIPR) Workshop — 2019, 2018, 2017, 2016
- IEEE International Symposium on Biomedical Imaging (ISBI) Conference — 2018
- AIESEC — Winter 2013, Winter 2012
  "Green Power Now!"
- AIESEC — Summer 2013, Summer 2012
  "Dear to Dream"