

Juan Shan

Associate Professor of Computer Science
Seidenberg School of Computer Science and Information Systems
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EDUCATION

Ph.D. in Computer Science, Utah State University, Logan, UT, USA, 2011

B.S. in Computer Science, Harbin Institute of Technology, Harbin, China, 2004

RESEARCH INTERESTS

- Machine Learning
- Medical Image Processing
- Computer-aided Diagnosis
- Pattern Recognition

My research interests lie in the interdisciplinary area of biomedical imaging and machine learning. My primary focus is developing robust and efficient computer-aided diagnosis (CAD) algorithms to help doctors analyzing medical images, discovering distinguishing features, and classifying data utilizing machine learning methods. My on-going research projects include CAD systems for breast cancer, knee osteoarthritis, and hand osteoarthritis.

EMPLOYMENT

Associate Professor Aug 2019 – present
Department of Computer Science, Seidenberg School of CSIS, Pace University

Assistant Professor Aug 2013 – July 2019
Department of Computer Science, Seidenberg School of CSIS, Pace University

Assistant Professor Aug 2011 – July 2013
Department of Math and Computer Science, Benedictine College

TEACHING

Assistant Professor Aug 2013 – July 2019

Associate Professor Aug 2019 – present

Department of Computer Science, Pace University

- Computer Vision (CS671)
- Advanced Computer Vision (CS740/CS840)
- Computer Programming I (CS121)
- Computer Programming II (CS122)

- Introduction to Computing (CIS101)
- Mathematics Structures (CS113)
- Digital Image Processing (DCS861H)
- Research Seminar for PhD (CS702/CS802)

Assistant Professor

Aug 2011– Aug 2013

Department of Math and Computer Science, Benedictine College

- Computer Architecture (CS421)
- Introduction of Computer Science with Java (CS114)
- Computer Science Fundamentals (CS101)
- Applied Statistics (MA211)
- Operating Systems and Networking (CS440)

PUBLICATIONS

(* indicates student co-author)

Peer-reviewed Journal Papers

1. C. Guida*, M. Zhang, and **J. Shan**, “Improving knee osteoarthritis classification using multimodal intermediate fusion of X-ray, MRI, and clinical information”, *Neural Computing and Applications*, accepted, 2023. (*Impact Factor: 5.130*)
2. R. Almajalid*, Ming Zhang, **Juan Shan**, “Fully Automatic Knee Bone Detection and Segmentation on Three-Dimensional MRI”, *Diagnostics*, 12(1), 123, 2022. DOI: 10.3390/diagnostics12010123. (*Impact Factor: 3.992*)
3. C. Guida*, M. Zhang, and **J. Shan**, “Knee Osteoarthritis Classification Using 3D CNN and MRI”, *Applied Sciences*, 2021, 11, 5196. <https://doi.org/10.3390/app11115196> (*Impact Factor: 2.474*)
4. Z. Zhang, D. Citardi, D. Wang, Y. Genc, **J. Shan**, X. Fan, “Patients’ perceptions of using artificial intelligence (AI)-based technology to comprehend radiology imaging data”, *Health Informatics Journal*, 27(2), April 2021. <https://doi.org/10.1177/14604582211011215> (*Impact Factor: 2.932*)
5. J. Malmsten*, N. Zaninovic, Q. Zhan, Z. Rosenwaks, and **J. Shan**, “Automated cell division classification in early mouse and human embryos using convolutional neural networks”, *Neural Computing and Applications*, Vol. 33, pp. 2217-2228, 2020. DOI: 10.1007/s00521-020-05127-8 (*Impact Factor: 4.664*)
6. R. Almajalid*, **J. Shan**, Y. D. Du, and M. Zhang, “Identification of Knee Cartilage Changing Pattern”, *Applied Sciences*, 9(17), 3469, 2019. (*Impact Factor: 2.474*)
7. Y. D. Du*, R. Almajalid*, **J. Shan**, and M. Zhang, “A Novel Method to Predict Knee Osteoarthritis Progression on MRI Using Machine Learning Methods”, *IEEE Trans. on NanoBioscience*, Vol. 17, Issue 3, pp. 228-236, 2018. (*Impact Factor: 2.771*)
8. W. Cao*, N. Zarnek*, **J. Shan**, and L. Li, “Microaneurysm Detection Using Principal Component Analysis and Machine Learning Methods”, *IEEE Trans. on NanoBioscience*, Vol. 17, Issue 3, pp. 191-198, 2018. (*Impact Factor: 2.771*)
9. J. Malmsten*, N. Zaninovic, Q. Zhan, M. Toschi, Z. Rosenwaks, **J. Shan**, “Automatic Prediction of Embryo Cell Stages using Artificial Intelligence Convolutional Neural Network”, *Fertility and Sterility*, vol. 110, no. 4, p. e360, 2018.
10. K. Thakur*, **J. Shan**, and A. K. Pathan, “Innovations of Phishing Defense: The Mechanism, Measurement and Defense Strategies”, *International Journal of Communication Networks and Information Security*, Vol. 10, No. 1, 2018.

11. **J. Shan**, S.K. Alam, B. Garra, Y. Zhang and T. Ahmed, “Computer-aided Diagnosis for Breast Ultrasound Using Computerized BI-RADS Features and Machine Learning Methods”, *Ultrasound Med Biol.*, Vol. 42, Issue 4, pp. 980-988, Jan. 2016. (*Impact Factor: 2.494*)
12. Y. X. Wang, H. D. Cheng and **J. Shan**, “A Novel Multiplayer Tracking System for Short Track Speed Skating”, *IET Computer Vision*. Vol. 8, Issue 6, pp. 629-641, Dec. 2014.
13. **J. Shan**, H. D. Cheng and Y. X. Wang, “A Novel Segmentation Method for Breast Ultrasound Images Based on Neutrosophic L-Means Clustering”, *Medical Physics*. Vol. 39, Issue 9, pp. 5669-5682, Sep. 2012. (*5-Year Impact Factor: 3.095*)
14. **J. Shan**, H. D. Cheng and Y. X. Wang, “Completely Automated Segmentation Approach for Breast Ultrasound Images Using Multiple-Domain Features”, *Ultrasound Med Biol.*, Vol. 38, Issue 2, pp. 262-275, Feb. 2012. (*5-Year Impact Factor: 2.576*)
15. H. D. Cheng, **J. Shan**, W. Ju, Y. Guo and L. Zhang, “Automated Breast Cancer Detection and Classification Using Ultrasound Images: A Survey”, *Pattern Recognition*, Vol. 43, Issue 1, pp. 299-317, 2010. (*5-Year Impact Factor: 3.402*)
Ranked #4 of TOP25 Hottest Articles of Pattern Recognition July-September 2009
16. W. Ju, **J. Shan**, C. Yan and H. D. Cheng, “Discrimination of Disease-Related non-Synonymous Single Nucleotide Polymorphism using Multi-Scale RBF Kernel Fuzzy Support Vector Machine”, *Pattern Recognition Letters*, Vol. 30, Issue 4, pp. 391-396, March 2009.

Peer-reviewed Conference Papers

1. Zhiheng Chang, **Juan Shan**, Jeffrey Driban, Timothy McAlindon, Jeffrey Duryea, Lena Schaefer, Charles Eaton, Ming Zhang, “Automated Joint Space Width Measurement for Hand Osteoarthritis: A Deep Learning Approach”, American College of Rheumatology (ACR) Convergence, November 10-14, 2022.
2. Yue Wang, Ming Zhang, Tino Cheung, Carmine Guida, Raymond Ren, **Juan Shan**, “Finger Joint Segmentation Using Machine Learning and Minimized Training Set”, 2022 Osteoarthritis Research Society International (OARSI) World Congress, April 7-10, 2022.
3. C. Guida, M. Zhang, J. Blackadar, Z. Yang, J. Driban, J. Duryea, L. Schaefer, C. Eaton, T. McAlindon, **J. Shan**, “Automated Hand Osteoarthritis Classification Using Convolutional Neural Networks”, *IEEE 20th International Conference on Machine Learning and Applications (ICMLA 2021)*, December 12-16, 2021.
4. B. Michaely*, M. Zhang, **J. Shan**, “Bone Marrow Lesion Segmentation Using Synthetic Data and Deep Learning Models”, *Arthritis Rheumatol.* 2021; 73 (suppl 9).
5. Z. Yang*, **J. Shan**, C. Guida*, J. Blackadar*, T. Cheung*, J. Driban, T. McAlindon, M. Zhang, “Automatic Hand Segmentation from Hand X-rays Using Minimized Training Samples and Machine Learning Models”, *Arthritis Rheumatol.* 2021; 73 (suppl 9).
6. Y. D. Du*, M.L. Zhang, G. Stonis*, and J. Shan, “Topological Data Analysis on Magnetic Resonance Image Biomarkers”, *IEEE International Conference on Bioinformatics and Biomedicine (BIBM 2019)*, San Diego, CA, Nov. 18-21, 2019.
7. R. Almajalid*, **J. Shan**, M.L. Zhang, G. Stonis, and M. Zhang, “Knee Bone Segmentation on Three-Dimensional MRI”, *IEEE 18th International Conference on Machine Learning and Applications (ICMLA)*, Boca Raton, Florida, Dec. 16-19, 2019.
8. J. Malmsten*, N. Zaninovic, Q. Zhan, M. Toschi, Z. Rosenwaks, and **J. Shan**, “Automated Cell Stage Predictions in Early Mouse and Human Embryos Using Convolutional Neural Networks”, *IEEE International Conference on Biomedical and Health Informatics (BHI'19)*, Chicago, USA, May 19-22, 2019. (*Oral presentation acceptance rate 11%*)

9. T. Alon*, **J. Shan**, M. L. Zhang, J. Delvecchio, and M. Zhang, "Bone Segmentation in 3D Knee MRI Images Using U-Net", *IEEE International Conference on Biomedical and Health Informatics (BHI'19)*, Chicago, USA, May 19-22, 2019.
10. Y. B. Liang*, **J. Shan**, D. P. Benjamin, and R. Almajalid, "Convolutional Neural Networks for Breast Ultrasound Image Segmentation", *IEEE International Conference on Biomedical and Health Informatics (BHI'19)*, Chicago, USA, May 19-22, 2019.
11. R. Almajalid*, **J. Shan**, Y.D. Du*, and M. Zhang, "Development of a Deep-Learning-Based Method for Breast Ultrasound Image Segmentation", *IEEE 17th International Conference on Machine Learning and Applications (ICMLA 2018)*, Orlando, Florida, Dec. 17-20, 2018.
12. Y. D. Du*, **J. Shan**, R. Almajalid*, Tomer Alon*, and M. Zhang, "Using Whole Knee Cartilage Damage Index to Predict Knee Osteoarthritis: A Two-year Longitudinal Study", *IEEE International Conference on Bioinformatics and Biomedicine (BIBM 2018)*, Madrid, Spain, Dec. 3-6, 2018. (Acceptance rate 19.6%)
13. M. Zhang, **J. Shan**, Y.D. Du*, and R. Almajalid*, Iris Su*, and Joseph DelVecchio*, "Whole Knee Cartilage Quantification Based on Informative Locations", *IEEE International Conference on Bioinformatics and Biomedicine (BIBM 2018)*, Madrid, Spain, Dec. 3-6, 2018. (Acceptance rate 19.6%)
14. Y. D. Du*, **J. Shan**, R. Almajalid*, and M. Zhang, "Knee Osteoarthritis Severity Level Classification Using Whole Knee Cartilage Damage Index and ANN", *IEEE Conference on Connected Health: Applications, Systems and Engineering Technologies*, Washington DC, USA, Sep. 26-28, 2018.
15. Y. D. Du*, **J. Shan**, and M. Zhang, "Knee Osteoarthritis Prediction on MR Images Using Cartilage Damage Index and Machine Learning Methods", *IEEE International Conference on Bioinformatics and Biomedicine*, Kansas City, Nov., 2017, pp. 671-677. (Acceptance rate 19%)
16. L. Li and **J. Shan**, "Automated Microaneurysm Detection in Fundus Images through Region Growing", *17th IEEE International Conference on Bio-Informatics and Bio-Engineering (BIBE - 2017)*, Washington D.C., Nov., 2017.
17. W. Cao*, N. Zarnek*, **J. Shan**, and L. Li, "Microaneurysm Detection in Fundus Images by Small Image Patches and Machine Learning Methods", *IEEE International Conference on Bioinformatics and Biomedicine*, Kansas City, Nov., 2017, pp. 325-331. (Acceptance rate 19%)
18. Li, L. & **Shan, J.**, "Automated Microaneurysm Detection in Fundus Images by Region Growing", *2017 IEEE International Conference on Biomedical and Health Informatics*, Orlando, Florida, February, 2017.
19. R.A. Mukaddim*, **J. Shan**, I. E. Kabir¹, A. S. Ashik, R. Abid, Z. Yan, D. N. Metaxas, B. S. Garra, K. K. Islam and S. K. Alam, "A Novel and Robust Automatic Seed Point Selection Method for Breast Ultrasound Images", *The International Conference on Medical Engineering, Health Informatics and Technology (MediTec 2016)*, Dhaka, Bangladesh, Dec. 17-18, 2016.
20. N. Butt* and **J. Shan**, "CyberCare: A Novel Electronic Health Record Management System", *The First IEEE Conference on Connected health: Applications, Systems and Engineering Technologies*, Washington DC, USA, June 27-29, 2016.
21. **J. Shan** and L. Li, "A Deep Learning Method for Microaneurysm Detection in Fundus Images", *The First IEEE Conference on Connected health: Applications, Systems and Engineering Technologies*, Washington DC, USA, June 27-29, 2016.
22. **J. Shan** and L. Li, "A New Scheme to Evaluate the Accuracy of Knowledge Representation in Automated Breast Cancer Diagnosis", *The 2014 International Conference on Collaboration Technologies and Systems (CTS 2014)*, Minneapolis, Minnesota, 2014.

23. **J. Shan**, H. D. Cheng and Y. X. Wang, “Breast Ultrasound Image Segmentation Based on Neutrosophic L-means Clustering”, *Int. Conf. on Image Processing (ICIP2012)*, Orlando, Florida, 2012.
24. **J. Shan**, Y. X. Wang and H. D. Cheng, “Completely Automatic Segmentation for Breast Ultrasound Using Multiple-Domain Features”, *Int. Conf. on Image Processing (ICIP2010)*, Hong Kong, China, September 26-29, 2010. (Oral acceptance rate 480/2545 = 18.8%)
25. **J. Shan**, H. D. Cheng and Y.X. Wang, “A novel automatic seed point selection algorithm for breast ultrasound images”, *Proc. of the 19th International Conference on Pattern Recognition (ICPR 2008)*, Florida, USA, Dec 8-11, 2008. (Oral acceptance rate 295/1631 = 18.0%)
26. **J. Shan**, H. D. Cheng and Y.X. Wang, “A completely automatic segmentation method for breast ultrasound images using region growing”, *11th Joint Conference on Information Science*, Shenzhen, China, Dec 15-20, 2008.
27. Y.X. Wang, H. D. Cheng and **J. Shan**, “Detecting shadows of moving vehicles based on HMM”, *Proc. of the 19th International Conference on Pattern Recognition (ICPR 2008)*, Florida, USA, Dec 8-11, 2008. (Oral acceptance rate 295/1631 = 18.0%)
28. **J. Shan**, Y. Wang and C. Yan, “Toward the recognition code of protein-DNA recognition”, *Proc. of IEEE 7th International Symposium on BioInformatics and BioEngineering*, pp. 1290 – 1293, 2007. (Acceptance rate 13%)
29. **J. Shan**, W. Ju, C. Yan and H. D. Cheng, “Discrimination of Disease-Related Non-Synonymous Single Nucleotide Polymorphism Using Fuzzy Support Vector Machine”, *10th Joint Conference on Information Science*, Salt Lake City, UT, USA, 2007. (Oral presentation)
30. W. Ju, **J. Shan**, C. Yan and H. D. Cheng, “Discrimination of Outer Membrane Proteins using Fuzzy Support Vector Machines”, *10th Joint Conference on Information Science*, Salt Lake City, UT, USA, 2007.
31. M. Wacht, **J. Shan**, and X. J. Qi, “A Short-Term and Long-Term Learning Approach for Content-Based Image Retrieval”, *Int. Conf. on Acoustics, Speech, and Signal Processing*, pp. 389-392, Toulouse, France, May 14-19, 2006. (Acceptance rate 1465/3045=48%)

GRANTS

- SCH: EAGER: RUI: Collaborative Research: A Novel 3D Image Predictive Model for Knee Osteoarthritis Disease,
National Science Foundation, \$208,107.00, 09/15/2017-08/31/2021, Principal Investigator.
- DAISEC: Data Analytics in Cybersecurity,
National Security Agency, \$188,564.98, 09/2017-08/2018, Co-Principal Investigator.
- Distinguished Lecture Series Grant, **CRA-W**, \$750.00, February 2017
- Innovative Teaching Grant, **Pace University**, \$5000.00, November 2016
- Scholarly Research Committee Grant, **Pace University**, \$2971.00, November 2016
- Kenan Travel Grant, **Pace University**, \$1450.00, February 2016

SELECTED PRESENTATIONS

1. “Integrate Clinical Relevance to Multimodal Data Fusion”, lightning talk and poster presentation at Smart and Connected Health PI Meeting, National Science Foundation, January 6, 2020.

2. “Deep Learning Models for Medical Image Analysis”, Invited talk Machine Intelligence Day, Seidenberg School of Computer Science and Information Systems, Pace University, December 6, 2019.
3. “Convolutional Neural Networks for Breast Ultrasound Image Segmentation”, IEEE International Conference on Biomedical and Health Informatics (BHI'19), Chicago, USA, May 21, 2019.
4. “Knee Osteoarthritis Severity Level Classification Using Whole Knee Cartilage Damage Index and ANN”, poster presentation, *IEEE 3rd Conference on Connected Health: Applications, Systems and Engineering Technologies*, Washington D.C., USA, September 2018.
5. “A Novel 3D Image Predictive Model for Knee Osteoarthritis Disease”, lightning talk, *NSF Connections in Smart Health Workshop & NSF SCH PI Annual Meeting*, Washington DC, USA, September 2018.
6. “A Deep Learning Method for Microaneurysm Detection in Fundus Images”, poster presentation, *IEEE 1st Conference on Connected Health: Applications, Systems and Engineering Technologies*, Washington DC, USA, June 2016.
7. “Introduction to Basic Research Methodologies and Computer-aided Diagnosis for Breast Cancer”, invited talk, *Pace University Honor Research and Thesis Forum*, March 8, 2016.
8. “Automatic Computer-aided Diagnosis for Breast Cancer”, poster presentation, *Pace Research Seminar*, February, 2015.
9. “A Similarity Measurement of Clinical Trials Using SNOMED - A Preliminary Study”, oral presentation, *International Conference on Collaboration Technologies and Systems (CTS 2014)*, Minneapolis, MN, May 2014.
10. “A New Scheme to Evaluate the Accuracy of Knowledge Representation in Automated Breast Cancer Diagnosis”, oral presentation, *CTS 2014*, Minneapolis, MN, May 2014.
11. “Automatic Breast Cancer Diagnosis using Ultrasound Images”, invited talk, Pace University DPS seminar, 2013.
12. “An Automatic Segmentation Method for Breast Ultrasound Images”, oral presentation, *Intermountain Graduate Research Symposium 2011*, Logan, UT, March 2011.
13. “Completely Automatic Segmentation for Breast Ultrasound Using Multiple-Domain Features”, oral presentation, *Int. Conf. on Image Processing (ICIP2010)*, Hong Kong, China, September 2010.
14. “Completely Automatic Segmentation for Breast Ultrasound”, oral presentation, *Intermountain Graduate Research Symposium 2010*, Logan, UT, March 2010.
15. “Discrimination of Disease-Related Non-Synonymous Single Nucleotide Polymorphism Using Fuzzy Support Vector Machine”, oral presentation, *10th Joint Conference on Information Science*, Salt Lake City, UT, July 2007.

AWARDS AND HONORS

- **Research Day 2014 Awardee**, Pace University, 2014
- **First Place Research Paper**, Intermountain Graduate Research Symposium, 2011
- **Dissertation Fellowship**, Utah State University, 2010
- Listed on **Honor Roll of Graduate School**, Utah State University, 2006

SERVICE

Internal

- Tenure and Promotion Committee of Department of Computer Science, 2020-present
- Program committee of Machine Intelligence Day, Seidenberg, Pace University, 2019-2022
- Chair of Computer Science Curriculum Committee, 2019-2021, 2015-2016
- Course Coordinator Committee, Department of Computer Science, 2019-2020
- Faculty Search Committee, Department of Computer Science, 2014-2015, 2017-2018, 2019-2020
- Faculty Affairs and Scholarship Release Time Committee, Seidenberg School, 2018
- Pace University Faculty Satisfaction Survey Committee, 2018-2019
- Seidenberg School Technical Report Committee, 2016
- ABET Assessment Course coordinator for CS121 and CS122, 2015-present
- Honor Thesis Supervisor, 2015-2017
- Computer Science Curriculum Committee, 2014-2017
- CIS101 Review Committee, 2014-2015

External

- Technical Program Committee of the IEEE/ACM Conference on Connected Health Applications, Systems, and Engineering Technologies (CHASE) 2022
<https://conferences.computer.org/chase2022/>
- Poster & Demo Chair of IEEE/ACM Conference on Connected Health Applications, Systems, and Engineering Technologies (CHASE), 2021
- Technical Program Committee member for IEEE International Conference on Machine Learning and Applications (ICMLA), track Predictive Models in Engineering Applications, 2019
- Session Chair of 2014 International Conference on Collaboration Technologies and Systems, Minneapolis, MN, 2014
- Ad hoc reviewer for Nature Communications, IEEE Transactions on Medical Imaging, IEEE Journal of Biomedical and Health Informatics, Biomedical Signal Processing and Control, Computer Methods and Programs in Biomedicine, etc.

STUDENT ADVISING

Current Students

- Ph.D. student(s): Yue Wang, Raj Ponnusamy, Mohammad Chowdhury, Teresa Brooks

Graduated Students

- Ph.D. student(s): Carmine Guida (July 2022, Faculty at Pace University), Rania Almajalid (Dec 2021, Faculty at Saudi Electronic University, Saudi Arabian), Kutub Thakur (April 2018, Faculty at New Jersey City University)
- DPS student(s): Jonas Malmsten (Spring 2019, Weil Cornell Medicine), Ephraim Adeola (Dec 2020)
- Master student(s): Ian Carvalho (Dec 2019), Jesse Hill (May 2021)