

KE YAN

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JOB AND EDUCATION

Alibaba DAMO Academy, Beijing, China

Staff Algorithm Engineer in the Medical AI Lab

Nov 2021 – now

PAII Inc., US

Senior Researcher in medical image analysis

May 2019 – Nov 2021

National Institutes of Health, US

Postdoc in Imaging Biomarkers and Computer-Aided Diagnosis Laboratory

Jan 2017 – May 2019

Advisor: Dr. Ronald M. Summers, Dr. Le Lu, *IEEE fellow*

Tsinghua University, Beijing, P.R. China

Ph.D. Electronic Engineering, advisor: Prof. David Zhang, *IEEE fellow*

– Jul 2016

B.Eng. Electronic Engineering

– Jul 2010

RESEARCH INTERESTS

Medical image analysis, deep learning, machine learning, computer vision.

EXPERIENCES

DAMO Academy

Nov 2021 -

- I continue to study AI algorithms in medical images, and help to build clinically useful products.

PAII Inc.

May 2019 - Nov 2021

- I study detection, classification, segmentation, and registration problems in medical images. My major research area is universal lesion analysis in CT images. I also work on algorithm development and deployment. I take the leading role in a group of 3 research scientists on the DeepLesion project. I also mentored or co-mentored 5 interns on CT image registration, CT lesion detection, liver ultrasound diagnosis, CT lymph node segmentation, and CT liver tumor characterization.

Postdoc in NIH

January 2017 - May 2019

- I mined CT images and lesion annotations from PACS to build a large-scale and diverse database - DeepLesion. I developed lesion detection, retrieval, classification, and body-part recognition algorithms on the dataset using deep learning approaches.

DeePhi Tech, China

August 2016 - November 2016

- I developed pedestrian detection algorithms with caffe using Faster RCNN and region-based fully convolutional networks.

Ph.D. in Tsinghua

September 2011 - June 2016

- An interdisciplinary topic: I designed and developed a sensor system (an electronic nose) to measure biomarkers in human breath, and then worked with hospitals to collect samples from patients. Finally, I proposed five machine learning (transfer learning, feature selection, classification, and regression) algorithms to analyze the signals for non-invasive disease diagnosis and monitoring.

Intern in IBM China Research Lab

July 2015 - August 2015

- I took part in developing a robot-based intelligent shopping assistant and wrote modules for speech recognition, text-to-speech, and robot movement using public software and the APIs of the robot.

Intern in Xingke Intelligent Tech, China

July 2013 - August 2013

- I developed a real-time gesture recognition system on Unity3D, which reads skeleton data from Microsoft Kinect, then recognizes gestures using rule-based algorithms.

Undergraduate Research

March 2010 - August 2011

- I developed a face recognition system including geometry and illumination normalization, feature extraction, and subspace learning. The OpenCV-based program received over 10k downloads until 2014.

MAJOR MEDICAL IMAGING PROJECTS

Summary

- I have collaborated with several doctors in the US and Mainland and Taiwan China. I have experience in leading a small group for research and product development. In research, my most experienced areas include detection, classification, and retrieval algorithms in medical images.

DeepLesion

- I collected and released the largest universal CT lesion dataset – DeepLesion. It was mined from NIH PACS and has benefited researchers world-wide. Based on it, I conducted researches on lesion detection, classification, mining, matching, and retrieval. I also collaborated with others on lesion segmentation and measurement. I received the RSNA Trainee Research Prize for the project. I am taking the leading role to deploy our lesion analysis system to two hospitals and some PACS companies. It can help radiologists on automatic lesion screening, tracking, and measurement.

Self-supervised Anatomical Learning

- I proposed algorithms to distinguish pixel-wise anatomical location on radiological images (CT, X-ray, MR, etc.). The algorithms do not need training labels. They can be used to improve registration algorithms, organize unlabeled image collections, do landmark detection and body part retrieval, etc.

Ultrasound Image Analysis

- I collaborated with colleagues on steatosis and fibrosis grading in liver ultrasound images.

PUBLICATIONS

[Google Scholar](#): 1,844 citations till 2022/1/31

Peer-Reviewed Journals

46. Veit Sandfort, [Ke Yan](#), Peter M. Graffy, Perry J. Pickhardt, Ronald M. Summers, “Use of Variational Autoencoders with Unsupervised Learning to Detect Incorrect Organ Segmentations on CT”, *Radiology: Artificial Intelligence*, 2021.
45. [Ke Yan](#), Jinzheng Cai, Youjing Zheng, Adam P. Harrison, Dakai Jin, You-Bao Tang, Yu-Xing Tang, Lingyun Huang, Jing Xiao, Le Lu, “Learning from Multiple Datasets with Heterogeneous and Partial Labels for Universal Lesion Detection in CT,” *IEEE Transactions on Medical Imaging*, 2020.
44. Jinzheng Cai, Adam P. Harrison, Youjing Zheng, [Ke Yan](#), Yuankai Huo, Jing Xiao, Lin Yang, Le Lu, “Lesion-Harvester: Iteratively Mining Unlabeled Lesions and Hard-Negative Examples at Scale,” *IEEE Transactions on Medical Imaging*, 2020.
43. Yu-Xing Tang, Youbao Tang, Yifan Peng, [Ke Yan](#), Mohammadhadi Bagheri, Bernadette Redd, Catherine Brandon, Zhiyong Lu, Mei Han, Jing Xiao, and Ronald Summers, “Automated abnormality classification of chest radiographs using deep convolutional neural networks,” *npj Digital Medicine (Nature Partner Journals)*, 2020.

42. Veit Sandfort, Ke Yan, Perry J. Pickhardt, Ronald M. Summers, “Data augmentation using generative adversarial networks (CycleGAN) to improve generalizability in CT segmentation tasks,” *Scientific Reports*, 2019.
41. Atsushi Teramoto, Hiroshi Fujita, Tetsuya Tsukamoto, Yuka Kiriya, Ke Yan, et al., “Automated classification of benign and malignant cells from lung cytological images using deep convolutional neural network,” *Informatcs in Medicine Unlocked*, 2019.
40. Ke Yan, Xiaosong Wang, Le Lu, Ronald M. Summers, “DeepLesion: Automated Mining of Large-Scale Lesion Annotations and Universal Lesion Detection with Deep Learning,” *J. Med. Imaging*, 2018.
39. Ke Yan, Lu Kou, and David Zhang, “Learning Domain-Invariant Subspace Using Domain Features and Independence Maximization,” *IEEE Trans. on Cybernetics* (IF=4.943), Jan. 2017.
38. Ke Yan, David Zhang, and Yong Xu, “Correcting Instrumental Variation and Time-Varying Drift Using Parallel and Serial Multitask Learning,” *IEEE Trans. on Instrumentation and Measurement (TIM)* (IF=2.456), Jun., 2017.
37. Ke Yan and David Zhang, “Correcting instrumental variation and time-varying drift: A transfer learning approach with autoencoders,” *IEEE Trans. on Instrumentation and Measurement (TIM)* (IF=1.808), Sep., 2016.
36. Ke Yan and David Zhang, “Calibration transfer and drift compensation of e-noses via coupled task learning,” *Sensors and Actuators B: Chemical* (IF=4.758), Mar., 2016.
35. Ke Yan and David Zhang, “Improving the transfer ability of prediction models for electronic noses,” *Sensors and Actuators B: Chemical* (IF=4.758), Dec., 2015.
34. Ke Yan and David Zhang, “Feature selection and analysis on correlated gas sensor data with recursive feature elimination,” *Sensors and Actuators B: Chemical* (IF=4.758), Jun., 2015.
33. Ke Yan, David Zhang, Darong Wu, Hua Wei, and Guangming Lu, “Design of a breath analysis system for diabetes screening and blood glucose level prediction,” *IEEE Trans. on Biomedical Engineering* (IF=2.347), Nov., 2014.

Peer-Reviewed Conference Proceedings

32. Ke Yan, Jinzheng Cai, Dakai Jin, Shun Miao, Adam P. Harrison, Dazhou Guo, Youbao Tang, Jing Xiao, Jingjing Lu, Le Lu, “Self-supervised Learning of Pixel-wise Anatomical Embeddings in Radiological Images,” arXiv. 2012.02383, *ICCV* (in submission), 2021.
31. Ke Yan, Youbao Tang, Adam Harrison, Jinzheng Cai, Le Lu, Jingjing Lu, “Interpretable Medical Image Classification with Self-Supervised Anatomical Embedding and Prior Knowledge,” *MIDL* (short paper), 2021.
30. Fengze Liu*, Ke Yan*, Adam Harrison, Dazhou Guo, Le Lu, Alan Yuille, Lingyun Huang, Guotong Xie, Jing Xiao, Xianghua Ye, Dakai Jin, “SAME: Deformable Image Registration based on Self-supervised Anatomical Embeddings,” *MICCAI*, 2021.
29. Youbao Tang, Ke Yan, Jinzheng Cai, Lingyun Huang, Guotong Xie, Jing Xiao, Jingjing Lu, Gigin Lin, Le Lu, “Lesion Segmentation and RECIST Diameter Prediction via Click-driven Attention and Dual-path Connection,” *MICCAI*, 2021.
28. Jie-Neng Chen, Ke Yan, Yudong Zhang, Youbao Tang, Xun Xu, Qiuping Liu, Shuwen Sun, Lingyun Huang, Jing Xiao, Alan Yuille, Ya Zhang, Le Lu, “Sequential Learning on Liver Tumor Boundary Semantics and Prognostic Biomarker Mining,” *MICCAI*, 2021.

27. Bowen Li, Xinping Ren, Ke Yan, Le Lu, Lingyun Huang, Guotong Xie, Jing Xiao, Dar-In Tai, Adam Harrison, "Learning from Subjective Ratings Using Auto-Decoded Deep Latent Embeddings," *MICCAI*, 2021.
26. Youbao Tang, Jinzheng Cai, Ke Yan, Lingyun Huang, Guotong Xie, Jing Xiao, Jingjing Lu, Gigin Lin, Le Lu, "Weakly-Supervised Universal Lesion Segmentation with Regional Level Set Loss," *MICCAI*, 2021.
25. Jinzheng Cai, Youbao Tang, Ke Yan, Adam P. Harrison, Jing Xiao, Gigin Lin, Le Lu, "Deep Lesion Tracker: Monitoring Lesions in 4D Longitudinal Imaging Studies," *CVPR*, 2021.
24. Bowen Li, Ke Yan, Dar-In Tai, Yuankai Huo, Le Lu, Jing Xiao, Adam Harrison, "Reliable Liver Fibrosis Assessment from Ultrasound using Global Hetero-Image Fusion and View-Specific Parameterization," *MICCAI*, 2020.
23. Jinzheng Cai, Ke Yan, Chi Tung Cheng, Jing Xiao, ChienHung Liao, Le Lu, Adam Harrison, "Deep Volumetric Universal Lesion Detection using Light-Weight Pseudo 3D Convolution and Surface Point Regression," *MICCAI*, 2020.
22. Youbao Tang, Ke Yan, Jing Xiao, Ronald M. Summers, "One Click Lesion RECIST Measurement and Segmentation on CT Scans," *MICCAI*, 2020.
21. Zhuotun Zhu, Dakai Jin, Ke Yan, Tsung-Ying Ho, Xianghua Ye, Dazhou Guo, Chun-Hung Chao, Jing Xiao, Alan Yuille, Le Lu, "Lymph Node Gross Tumor Volume Detection and Segmentation via Distance-based Gating using 3D CT/PET Imaging in Radiotherapy," *MICCAI*, 2020.
20. Chun-Hung Chao, Zhuotun Zhu, Ke Yan, Dazhou Guo, Tsung-Ying Ho, Jinzheng Cai, Adam Harrison, Xianghua Ye, Jing Xiao, Alan Yuille, Min Sun, Le Lu, "Lymph Node Gross Tumor Volume Detection in Oncology Imaging via Relationship Learning Using Graph Neural Network," *MICCAI*, 2020.
19. Ke Yan, Yifan Peng, Veit Sandfort, Mohammadhadi Bagheri, Zhiyong Lu, and Ronald M. Summers, "Holistic and Comprehensive Annotation of Clinically Significant Findings on Diverse CT Images: Learning from Radiology Reports and Label Ontology," *IEEE Conf. on Computer Vision and Pattern Recognition (CVPR)*, 2019, oral presentation.
18. Ke Yan, Youbao Tang, Yifan Peng, Veit Sandfort, Mohammadhadi Bagheri, Zhiyong Lu, Ronald M. Summers, "MULAN: Multitask Universal Lesion Analysis Network for Joint Lesion Detection, Tagging, and Segmentation," *MICCAI*, 2019.
17. Ke Yan, Yifan Peng, Zhiyong Lu, Ronald M. Summers, "Fine-Grained Lesion Annotation in CT Images with Knowledge Mined from Radiology Reports," *IEEE International Symposium on Biomedical Imaging (ISBI)*, 2019, oral presentation, best paper finalist.
16. You-bao Tang, Ke Yan, Yuxing Tang, Jiamin Liu, Jing Xiao, Ronald M. Summers, "ULDor: A Universal Lesion Detector for CT Scans with Pseudo Masks and Hard Negative Example Mining," *ISBI*, 2019.
15. Yifan Peng, Ke Yan, Veit Sandfort, Ronald M. Summers, Zhiyong Lu, "A self-attention based deep learning method for lesion attribute detection from CT reports," *IEEE International Conference on Healthcare Informatics (ICHI)*, 2019.
14. Ke Yan, X Wang, L Lu, L Zhang, A Harrison, M Bagheri, and R M Summers, "Deep Lesion Graphs in the Wild: Relationship Learning and Organization of Significant Radiology Image Findings in a Diverse Large-scale Lesion Database," *IEEE Conf. on Computer Vision and Pattern Recognition (CVPR)*, 2018.
14. Ke Yan, Mohammadhadi Bagheri, Ronald M. Summers, "3D Context Enhanced Region-based Convolutional Neural Network for End-to-End Lesion Detection," *Intl. Conf. on Medical Image*

Computing and Computer Assisted Intervention (MICCAI), Granada, Spain, 2018.

13. Ke Yan, Xiaosong Wang, Le Lu, Ling Zhang, Mohammadhadi Bagheri, Ronald M. Summers, “DeepLesion: a Diverse and Large-scale Database of Significant Radiology Image Findings,” *MICCAI workshop-Large-scale Annotation of Biomedical Data and Expert Label Synthesis (LABELS)*, spotlight, 2018.
12. Jinzheng Cai*, Youbao Tang*, Le Lu, Adam P. Harrison, Ke Yan, Jing Xiao, Lin Yang, Ronald M. Summers, “Accurate Weakly-Supervised Deep Lesion Segmentation using Large-Scale Clinical Annotations: Slice-Propagated 3D Mask Generation from 2D RECIST,” *MICCAI*, 2018.
11. Youbao Tang*, Jinzheng Cai*, Le Lu, Adam P. Harrison, Ke Yan, Jing Xiao, Lin Yang, Ronald M. Summers, “CT Image Enhancement Using Stacked Generative Adversarial Networks and Transfer Learning for Lesion Segmentation Improvement,” *MICCAI workshop-International Conference on Machine Learning in Medical Imaging (MLMI)*, oral, 2018.
10. Ke Yan, Le Lu, and Ronald M. Summers, “Unsupervised Body Part Regression via Spatially Self-ordering Convolutional Neural Networks,” *IEEE Intl. Symposium on Biomedical Imaging (ISBI)*, oral presentation, 2018.
9. Ke Yan and David Zhang, “Blood glucose prediction by breath analysis system with feature selection and model fusion,” in *36th Annual Intl. Conf. of the IEEE Engineering in Medicine and Biology Society (EMBC)*, oral presentation, Chicago, 2014.
8. Ke Yan and David Zhang, “Sensor evaluation in a breath analysis system,” in *Intl. Conf. on Medical Biometrics (ICMB)*, oral presentation, Shenzhen, 2014.
7. Yujing Ning, Guangming Lu, Ke Yan, and Xia Zhang, “Standardization of gas sensors in a breath analysis system,” in *9th Chinese Conf. on Biometric Recognition*, oral presentation, 2014.
6. Ke Yan and David Zhang, “A novel breath analysis system for diabetes diagnosis,” in *Intl. Conf. on Computerized Healthcare*, oral presentation, Hong Kong, China, 2012.
5. Ke Yan, Youbin Chen, and David Zhang, “Gabor surface feature for face recognition,” in *First Asian Conf. on Pattern Recognition (ACPR)*, oral presentation, Beijing, 2011.

Books

4. D Jin, AP Harrison, L Zhang, K Yan, Y Wang, J Cai, S Miao, L Lu. “Artificial intelligence in radiology”, book chapter of “Artificial Intelligence in Medicine”, Elsevier, 2020.
3. Ke Yan et al., “Deep Lesion Graph in the Wild: Relationship Learning and Organization of Significant Radiology Image Findings in a Diverse Large-Scale Lesion Database”, book chapter of “Deep Learning and Convolutional Neural Networks for Medical Imaging and Clinical Informatics”, Springer, 2019.
2. Ke Yan, “Research on Key Signal Analysis Algorithms for Electronic Noses”, Outstanding Doctoral Dissertation Series of Tsinghua University, Tsinghua University Press, 2019.
1. David Zhang, Dongmin Guo, and Ke Yan, “Breath Analysis for Medical Applications,” Springer, 2017.

Peer-reviewed Clinical Abstracts

19. L Xu et al., “Multi-organ Universal Lesion Detection In CT Scans: An Independent External Validation” (oral), *RSNA*, 2021.
18. Y Tang et al., “Automatic RECIST Measurement In Longitudinal CT Imaging Studies” (oral), *RSNA*, 2021.

17. Y Tang et al., “Accurate Weakly-supervised Volumetric Universal Lesion Segmentation Using Large-scale Clinical RECIST Diameter Annotations And Regional Level Set Loss” (oral), *RSNA*, 2021.
16. B Li et al., “Accurate And Reliable Liver Steatosis Assessment From Conventional Ultrasound Images Trained With Subjective Ratings” (oral), *RSNA*, 2021.
15. F Liu et al., “SAME: Fast And Accurate Algorithm For Deformable Image Registration On CT”, *RSNA*, 2021.
14. Y Tang et al., “Automatically, Precisely, And Comprehensively Measuring Tumor Sizes With Minimal Human Effort”, *RSNA*, 2021.
13. Z Zhu et al., “Deep Learning Based Lymph Node Gross Tumor Volume Detection via Distance-guided Gating using CT and 18F-FDG PET in Esophageal Cancer Radiotherapy”, *ASTRO*, 2020.
12. Y Tang et al., “One Click Guided Automatic RECIST Lesion Measurement and Segmentation on CT Scans” (Featured Papers), *RSNA*, 2020.
11. B Li et al., “Automatic Liver Fibrosis Assessment from Conventional Ultrasound Images Using Global Hetero Image Fusion”, *RSNA*, 2020.
10. J Cai et al., “Automatic Hepatocellular Carcinoma Detection in Patients with Chronic Liver Diseases Using Dynamic Contrast-enhanced CT and Light-Weight 3D Convolutional Neural Network”, *RSNA*, 2020.
9. Z Zhu et al., “Lymph Node Gross Tumor Volume Detection and Segmentation via Distance-based Gating Using CT/PET Imaging in Esophageal Cancer Radiotherapy”, *RSNA*, 2020.
8. Y Huo et al., “Identifying and Characterizing Indeterministic Liver Lesions via Deep Learning on Large-scale Dynamic Contrast Enhanced CT Imaging Data from Patients Receiving Invasive Procedures”, *RSNA*, 2020.
7. K Yan et al., “Comprehensive Lesion Tagging on Diverse CT Images: Learning from Radiology Reports and Label Ontology” (Scientific Paper), *RSNA*, 2019, Chicago.
6. K Yan et al., “MULAN: Multitask Universal Lesion Analysis Network for Joint Lesion Detection, Tagging, and Segmentation in CT Images” (Scientific Paper), *RSNA*, 2019, Chicago.
5. Veit Sandfort et al., “CT Organ Segmentation: Use of Variational Autoencoders to Detect Incorrect Segmentations in a Large Dataset (> 12,000 CT scans)” (Scientific Paper), *RSNA*, 2019, Chicago.
4. K Yan et al., “Relationship Learning and Organization of Significant Radiology Image Findings for Lesion Retrieval and Matching,” Scientific Paper, **Trainee Research Prize**, *RSNA*, 2018.
3. K Yan, Mohammadhadi Bagheri, Ronald M. Summers, “3D Context Enhanced Region-based Convolutional Neural Network for Universal Lesion Detection in a Large Database of 32,735 Manually Measured Lesions on Body CT,” *RSNA*, 2018.
2. Y Tang et al., “CT Image Enhancement for Lesion Segmentation Using Stacked Generative Adversarial Networks,” *RSNA*, 2018.
1. X Wang*, K Yan*, et al., “DeepLesion: Automated Deep Mining, Categorization and Detection of Significant Radiology Image Findings using Large-Scale Clinical Lesion Annotations,” scientific poster, *Annual Meeting of Radiology Society of North America (RSNA)*, Chicago, 2017.

Patents

9. “Learning from Subjective Ratings Using Auto-Decoded Deep Latent Embeddings,” USPTO Provisional Patent Application number US63/164,166, 03/22/2021.

8. “Method, Device, and Computer Program Product for Self-Supervised Learning of Pixel-Wise Anatomical Embeddings in Medical Images,” USPTO Regular Patent Application number US17/208,128, 03/22/2021, USPTO Provisional Patent Application number US63/120,776, 12/03/2020.
7. “Method, Device, and Computer Program Product for Deep Lesion Tracker for Monitoring Lesions in Four-Dimensional Longitudinal Imaging,” USPTO Regular Patent Application number US17/213,804, 03/26/2021; USPTO Provisional Patent Application number US63/120,780, 12/03/2020.
6. “Liver Fibrosis Recognition Method Based on Medical Images and Computing Device using Thereof,” USPTO Regular Patent Application number US17/198,674, 03/11/2021; USPTO Provisional Patent Application number US63/019,780, 05/04/2020.
5. “Harvesting, Detecting, and Characterizing Liver Lesions from Large-Scale Multi-Phase CT Data Using Spatially Adaptive Deep Texture Learning,” USPTO Regular Patent Application number US16/836,855, 03/31/2020.
4. “Device and Method for Detecting Clinically Important Objects in Medical Images with Distance-Based Decision Stratification,” Patent date Filed January 17, 2020, Provisional Patent Application number US62/962,281, USPTO Regular Patent Application number US17/094,984.
3. “Device and Method for Universal Lesion Detection in Medical Images,” Patent date Filed January 17, 2020, Provisional Patent Application number US62/962,271. US regular patent US16/983,373, 08/03/2020.
2. “Method and System for Harvesting Lesion Annotations,” Patent date Filed January 17, 2020, Provisional Patent Application number US62/962,268, US regular patent US16/984,727, 08/04/2020.
1. “Detection of Radiology Image Findings Using Large-Scale Clinical Lesion Annotations,” US Patent Application 62/514,223, 2017.

For more details of the papers, please visit <http://yanke23.com/research/>.

AWARDS

- Winner of 2018 Radiological Society of North America (RSNA) Trainee Research Prize.
- Winner of the 2016 Tsinghua University Excellent Doctoral Dissertation Award.
- CVPR 2021 and TMI Outstanding Reviewer;
- Top 10 Sharers/Speakers in Ping An Technology, 2021.
- First prize of Tsinghua Outstanding Scholarship, 2 times (school-level, 2014, 2015);
- First prize of Foxconn Scholarship, 2 times (college-level, 2012, 2013);
- Most Creative Award in the First Photo Contest of University Town of Shenzhen.
- Best Intern Demonstration Award in IBM China Research Lab.

ACTIVITIES

- Invited talks: MICCAI 2018 Workshop of Computational Precision Medicine; NIH Research Festival; CVPR 2018 and 2019 Medical Computer Vision and Health Informatics Workshop, 2020 VALSE online seminar, 2021 Synced and MICS seminars.
- My work of DeepLesion was reported by [NIH](#), [AuntMinnie](#), [SPIE](#), [American Association for Cancer Research](#), and many other news websites.

- My paper “Unsupervised Body Part Regression via Spatially Self-ordering Convolutional Neural Networks” was featured in the RSIP Vision and ISBI Daily in cooperation with Computer Vision News.
- Reviewer of IEEE TMI, TNNLS, TMM, MedIA, Magnetic Resonance in Medicine, CVIU, PR, SPL, JMI, JBHI, CVPR, ECCV, WACV, AAMI, MICCAI, etc.