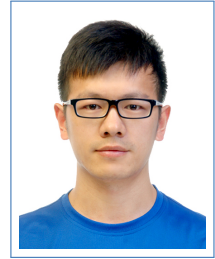# Youbao Tang

SENIOR RESEARCHER II

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Education

Sep. 2011–Dec. 2016	**Doctor of Computer Applied Technology**, *Harbin Institute of Technology (HIT)*, China, *Recommendation*.
	Supervisor: Professor Xiangqian Wu
	Thesis: Research on Visual Saliency Detection Method and Its Application
Sep. 2009–Jul. 2011	**Master of Computer Science and Technology**, *Harbin Institute of Technology (HIT)*, China, *Recommendation*.
	Supervisor: Professor Xiangqian Wu
	Thesis: Research on Encryption and Decryption Algorithm based on Noncontact Palmprint Feature
Sep. 2005–Jul. 2009	**Bachelor of Bioinformatics**, *Harbin Institute of Technology (HIT)*, China, *Top 20%*.

Research Interests

MEDICAL IMAGE ANALYSIS: Using Deep Learning for Medical Imaging and Clinical Informatics

PATTERN RECOGNITION: Writer Identification, Palmprint Recognition

COMPUTER VISION: Visual Saliency Detection, Scene Text Detection

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Publications

⋆ indicates equal contribution, <u>student</u> under my mentoring.

JOURNALS

2021	**Youbao Tang**, Yuxing Tang, Yingying Zhu, Jing Xiao, Ronald M. Summers, "A Disentangled Generative Model for Disease Decomposition in Chest X-rays via Normal Image Synthesis", *Medical Image Analysis*, 67:101839, 2021.
2020	Yuxing Tang, **Youbao Tang**, Yifan Peng, Ke Yan, Mohammadhadi Bagheri, Bernadette A. Redd, Catherine J. Brandon, Zhiyong Lu, Mei Han, Jing Xiao, Ronald M. Summers, "Automated Abnormality Classification of Chest Radiographs Using Deep Convolutional Neural Networks", *npj Digital Medicine*, 3(1):1-8, 2020.

2020 Ke Yan, Jinzheng Cai, Youjing Zheng, Adam P. Harrison, Dakai Jin, **Youbao Tang**, Yuxing 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.

2019 **Youbao Tang**, Xiangqian Wu, "Salient Object Detection Using Cascaded Convolutional Neural Networks and Adversarial Learning", *IEEE Transactions on Multimedia*, 21(9):2237-2247, 2019.

2018 **Youbao Tang**, Xiangqian Wu, "Scene Text Detection using Superpixel based Stroke Feature Transform and Deep Learning based Region Classification", *IEEE Transactions on Multimedia*, 20(9):2276-2288, 2018.

2018 Sicheng Zhao, Guiguang Ding, Yue Gao, Xin Zhao, **Youbao Tang**, Jungong Han, Qingming Huang, "Discrete Probability Distribution Prediction of Image Emotions With Shared Sparse Learning", *IEEE Transactions on Affective Computing*.

2017 **Youbao Tang**, Xiangqian Wu, "Scene Text Detection and Segmentation via Cascaded Convolution Neural Networks", *IEEE Transactions on Image Processing*, 26(3):1509-1520, 2017.

2016 **Youbao Tang**, Xiangqian Wu, Wei Bu, "Scene Text Detection Based on Multi-Level MSER", *Journal of Zhejiang University (Engineering Science)*, 50(6):1134-1140, 2016. (Chinese)

2015 **Youbao Tang**, Xiangqian Wu, Wei Bu, "Offline Signature Verification Based on ASIFT", *Journal of Beijing University of Aeronautics and Astronautics*, 41(1):110-116, 2015. (Chinese)

2014 Xiangqian Wu (Supervisor), **Youbao Tang**, Wei Bu, "Offline Text-Independent Writer Identification Based on Scale Invariant Feature Transform", *IEEE Transactions on Information Forensics and Security*, 9(3):526-536, 2014.

Conferences

2021 **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", *International Conference on Medical Image Computing & Computer Assisted Intervention (MICCAI)*. [**Early accepted**]

2021 **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", *International Conference on Medical Image Computing & Computer Assisted Intervention (MICCAI)*.

2021 Jieneng Chen, Ke Yan, Yu-Dong Zhang, **Youbao Tang**, Xun Xu, Shuwen Sun, Qiuping Liu, Lingyun Huang, Jing Xiao, Alan L Yuille, Ya Zhang, Le Lu, "Sequential Learning on Liver Tumor Boundary Semantics and Prognostic Biomarker Mining", *International Conference on Medical Image Computing & Computer Assisted Intervention (MICCAI)*.

2021 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", *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*.

2021 Ke Yan, **Youbao Tang**, Adam P Harrison, Jinzheng Cai, Le Lu, Jingjing Lu, "Interpretable Medical Image Classification with Self-Supervised Anatomical Embedding and Prior Knowledge", *International Conference on Medical Imaging with Deep Learning (MIDL)*.

2020 **Youbao Tang**, Yuxing Tang, Yingying Zhu, Jing Xiao, Ronald M. Summers, "E^{2}Net: An Edge Enhanced Network for Accurate Liver and Tumor Segmentation on CT Scans", *International Conference on Medical Image Computing & Computer Assisted Intervention (MICCAI)*. [**Early accepted**]

2020 **Youbao Tang**, Ke Yan, Jing Xiao, Ronald M. Summers, "One Click Lesion RECIST Measurement and Segmentation on CT Scans", *International Conference on Medical Image Computing & Computer Assisted Intervention (MICCAI)*. [**Early accepted**]

2020 Yingying Zhu, **Youbao Tang**, Yuxing Tang, Daniel Elton, Sungwon Lee, Perry Pickhardt, Ronald M. Summers, "Cross-Domain Image Translation by Shared Latent Gaussian Mixture Model", *International Conference on Medical Image Computing & Computer Assisted Intervention (MICCAI)*.

2020 Vatsal Agarwal*, **Youbao Tang***, Jing Xiao, Ronald M. Summers, "Weakly-Supervised Lesion Co-Segmentation on CT Scans", *IEEE International Symposium on Biomedical Imaging (ISBI)* [**Oral**].

2020 Vatsal Agarwal*, **Youbao Tang***, Jing Xiao, Ronald M. Summers, "Weakly-Supervised Lesion Segmentation on CT Scans Using Co-Segmentation", *SPIE Medical Imaging* [**Oral**].

2020 Jia Liang*, Yuxing Tang*, **Youbao Tang**, Jing Xiao, Ronald M. Summers, "Bone Suppression on Chest Radiographs with Adversarial Learning", *SPIE Medical Imaging* [**Oral**].

2019 Yuxing Tang, **Youbao Tang**, Veit Sanfort, Jing Xiao, Ronald M. Summers, "TUNA-Net: Task-oriented UNsupervised Adversarial Network for Disease Recognition in Cross-Domain Chest X-rays", *International Conference on Medical Image Computing & Computer Assisted Intervention (MICCAI)*.

2019 Ke Yan, **Youbao Tang**, Yifan Peng, Veit Sanfort, Mohammadhadi Bagheri, Zhiyong Lu, Ronald M. Summers, "MULAN: Multitask Universal Lesion Analysis Network for Joint Lesion Detection, Tagging, and Segmentation", *International Conference on Medical Image Computing & Computer Assisted Intervention (MICCAI)*.

2019 **Youbao Tang**⋆, Yuxing Tang⋆, Jing Xiao, Ronald M. Summers, "XLSor: A Robust and Accurate Lung Segmentor on Chest X-Rays Using Criss-Cross Attention and Customized Radiorealistic Abnormalities Generation", *International Conference on Medical Imaging with Deep Learning (MIDL)*.

2019 **Youbao 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", *IEEE International Symposium on Biomedical Imaging (ISBI)*.

2019 Yuxing Tang, **Youbao Tang**, Mei Han, Jing Xiao, Ronald M. Summers, "Abnormal Chest X-ray Identification with Generative Adversarial One-Class Classifier", *IEEE International Symposium on Biomedical Imaging (ISBI)* [**Oral & Travel Award**].

2019 **Youbao Tang**⋆, Sooyoun Oh⋆, Yuxing Tang, Jing Xiao, Ronald M. Summers, "CT-Realistic Data Augmentation Using Generative Adversarial Network for Robust Lymph Node Segmentation", *SPIE Medical Imaging*.

2019 Yuxing Tang, **Youbao Tang**, Mei Han, Jing Xiao, Ronald M. Summers, "Deep Adversarial One-class Learning for Normal and Abnormal Chest Radiograph Classification", *SPIE Medical Imaging* [**Oral**].

2018 **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", *International Conference on Machine Learning in Medical Imaging (MICCAI-MLMI)* [**Oral**].

2018 **Youbao Tang**, Adam P. Harrison, Mohammadhadi Bagheri, Jing Xiao, Ronald M. Summers, "Semi-Automatic RECIST Labeling on CT Scans with Cascaded Convolutional Neural Networks", *International Conference on Medical Image Computing & Computer Assisted Intervention (MICCAI)*.

2018 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 Dakai Jin, Ziyue Xu, **Youbao Tang**, Adam P. Harrison, Daniel Mollura, "CT-Realistic Lung Nodule Simulation from 3D Conditional Generative Adversarial Networks for Robust Lung Segmentation", *MICCAI*.

2017 **Youbao Tang**, Xiangqian Wu, "Salient Object Detection with Chained Multi-scale Fully Convolutional Network", *ACM Multimedia Conference (ACMMM)*.

2016 **Youbao Tang**, Xiangqian Wu, "Saliency Detection via Combining Region-level and Pixel-level Predictions with CNNs", *European Conference on Computer Vision (ECCV)*.

2016 **Youbao Tang**, Xiangqian Wu, Wei Bu"Deeply-Supervised Recurrent Convolutional Neural Network for Saliency Detection", *ACM Multimedia Conference (ACMMM)*.

2016 **Youbao Tang**, Xiangqian Wu, "Scene Text Detection via Edge Cue and Multi-Features", *International Conference on Frontiers in Handwriting Recognition (ICFHR)*.

2016 **Youbao Tang**, Xiangqian Wu, "Text-independent Writer Identification via CNN Features and Joint Bayesian", *International Conference on Frontiers in Handwriting Recognition (ICFHR)* [**Oral**].

2015 **Youbao Tang**, Xiangqian Wu, Wei Bu, "Saliency Detection Based on Graph-Structural Agglomerative Clustering", *ACM Multimedia Conference (ACMMM)*.

2014 **Youbao Tang**, Xiangqian Wu, Wei Bu, "Text Line Segmentation Based on Matched Filtering and Top-down Grouping for Handwritten Documents", *International Workshop on Document Analysis Systems (DAS)*.

2014 **Youbao Tang**, Wei Bu, Xiangqian Wu, "Text-Independent Writer Identification Using Improved Structural Features", *Chinese Conference on Biometric Recognition (CCBR)*.

2013 **Youbao Tang**, Xiangqian Wu, Wei Bu, "Offline Text-independent Writer Identification Using Stroke Fragment and Contour Based Features", *International Conference on Biometrics (ICB)*.

2013 **Youbao Tang**, Xiangqian Wu, Wei Bu, Hongyang Wang, "Skew Estimation in Document Images Based on an Energy Minimization Framework", *International Conference on Image Processing, Computer Vision, and Pattern Recognition (IPCV)*.

2011 Wei Bu, Qiushi Zhao, Xiangqian Wu, **Youbao Tang**, "A Novel Contactless Multimodal Biometric System Based on Multiple Hand Features", *International Conference on Hand-Based Biometrics (ICHB)*.

2011 Xin Cui, Qiushi Zhao, Xiangqian Wu, **Youbao Tang**, "A Contactless Hand Shape Identification System", *International Conference on Advanced Computer Control (ICACC)*.

2010 Xiangqian Wu, Enying Gao, **Youbao Tang**, Kuanquan Wang, "A Novel Biometric System Based on Hand Vein", *International Conference on Frontier of Computer Science and Technology (FCST)*.

ABSTRACTS

2020 **Youbao Tang**, et al., "One Click Guided Automatic RECIST Lesion Measurement and Segmentation on CT Scans", *The Radiological Society of North America (RSNA)* [**Featured Paper & RSNA Trainee Research Prize**].

2020 **Youbao Tang**, et al., "Accurate Liver and Tumor Segmentation on CT Scans Using an Edge-enhanced Network", *The Radiological Society of North America (RSNA)*.

2020 **Youbao Tang**, et al., "Making RECIST Measurements Easy: A Semi-Automated Deep Learning System With Expert-Equivalent Accuracy and Better Consistency", *The Radiological Society of North America (RSNA)*.

2019 **Youbao Tang**, et al., "An Interpretable Generative Model for Chest X-ray Decomposition via Synthesizing Radio-realistic Normal Chest X-rays and Separating Abnormalities", *The Radiological Society of North America (RSNA)*.

2019 Yuxing Tang, **Youbao Tang**, et al., "Abnormal Chest X-ray Identification with Generative Adversarial One-Class Classifier", *The Radiological Society of North America (RSNA)* [**RSNA Trainee Research Prize**].

2019 Ke Yan, **Youbao Tang**, et al., "MULAN: Multitask Universal Lesion Analysis Network for Joint Lesion Detection, Tagging, and Segmentation", *The Radiological Society of North America (RSNA)*.

2018 **Youbao Tang**, et al., "Semi-Automatic RECIST Labeling on CT Scans with Cascaded Convolutional Neural Networks", *The Radiological Society of North America (RSNA)*.

2018 **Youbao Tang**⋆, Jinzheng Cai⋆, et al., "CT Image Enhancement Using Stacked Generative Adversarial Networks and Transfer Learning for Lesion Segmentation Improvement", *The Radiological Society of North America (RSNA)*.

PREPRINTS

2020 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 preprint, arXiv:2012.02383*.

2018 Jinzheng Cai⋆, **Youbao Tang**⋆, Le Lu, Adam P. Harrison, Ke Yan, Jing Xiao, Lin Yang, Ronald M. Summers, "Accurate Weakly Supervised Deep Lesion Segmentation on CT Scans: Self-Paced 3D Mask Generation from RECIST", *arXiv preprint, arXiv:1801.08614*.

PATENTS

2020 Xiangqian Wu, Wei Bu, **Youbao Tang**, "Visual Saliency Detection based on Deeply-supervised Recurrent Convolutional Neural Network", CN Patent, *ZL 2016 1 0604722. 7*. Granted in 2020/11/10.

2020 Xiangqian Wu, Wei Bu, **Youbao Tang**, "Salient Object Detection with Chained Multi-Scale Fully Convolutional Network", CN Patent, *ZL 2017 1 0930183. 0*. Granted in 2020/04/03.

2019 Xiangqian Wu, Wei Bu, **Youbao Tang**, "Saliency based Scene Text Detection", CN Patent, *ZL 2016 1 1137890. 6*. Granted in 2019/06/04.

2018   Xiangqian Wu, Wei Bu, **Youbao Tang**, "Saliency Detection via Combining Region-Level and Pixel-Level Predictions with CNNs", CN Patent, *ZL 2016 1 0604732. 0*. Granted in 2018/11/02.

2016   Xiangqian Wu, Wei Bu, **Youbao Tang**, "Skew Estimation and Correction in Document Images Based on an Energy Minimization Framework", CN Patent, *ZL 2013 1 0321375. 3*. Granted in 2016/07/20.

2016   Xiangqian Wu, Wei Bu, **Youbao Tang**, "Writer Identification Using Stroke Fragment and Contour based Features", CN Patent, *ZL 2013 1 0225735. X*. Granted in 2016/03/23.

2019   Xiangqian Wu, Wei Bu, **Youbao Tang**, "Salient Object Detection Using Cascaded Convolutional Neural Networks and Adversarial Learning", CN Patent Application, *201910024728.0*.

2018   Xiangqian Wu, Wei Bu, **Youbao Tang**, "Scene Text Detection Using Superpixel-based Stroke Feature Transform and Deep Learning based Region Classification", CN Patent Application, *201810103800.4*.

Research Experience

Jul. 2020–Present   **PAII Inc.**, Senior Research Scientist II, Bethesda, MD, USA.
Researching on using deep learning for medical imaging and clinical informatics.

Jul. 2017–Jun. 2020   **NIH-PingAn CRADA Project**, Postdoctoral research fellow, NIH, Bethesda, MD, USA.
Mentor: Dr. Ronald M. Summers and Dr. Le Lu.
Researching on large-scale medical imaging analysis using deep learning.

Mar. 2016–Dec. 2016   **Research on Signature Video Based Personal Recognition**, National Natural Science Foundation, China, Application Writer and Main Researcher.
I was in charge of hand detection and segmentation, and identity recognition via signature video sequences.

Jan. 2015–Dec. 2016   **Research on Automated Fundus Lesion Recogntion Based on Visual Attention Model**, National Natural Science Foundation, China, Main Researcher.
I was in charge of salient object detection, segmentation and classification.

Jan. 2014–Dec. 2014   **Research on Palmprint Recognition in Complex Environment**, National Natural Science Foundation, China, Main Researcher.
I was in charge of hand segmentation and palmprint image quality assessment.

Jan. 2011–Dec. 2013   **Research on Automatic Diagnosis Techniques of Diabetic Retinopathy Based on Image Recognition**, National Natural Science Foundation, China, Main Researcher.
I was in charge of the system implementation.

Feb. 2010–Jul. 2011	**Research on Data Encryption and Decryption Algorithm Based on Palmprint Features**, NATIONAL NATURAL SCIENCE FOUNDATION, China, Main Researcher.
	I was in charge of encryption and decryption algorithm research and system implementation.
Aug. 2009–Jan. 2010	**Research on Contactless Identity Recognition Techniques by Integrating Hand Vein, Handprint, and Handshape**, NATIONAL 863 HIGH-TECH PROGRAM, China, Main Researcher.
	I was in charge of the whole identification system development.

Awards

2020	RSNA 2020 Trainee Research Prize. (First author)
2019	RSNA 2019 Trainee Research Prize. (Second author)
2018	NIH Fellows Award of Research Excellence (FARE) 2019 competition.
2014	National Scholarship
2014	2nd Price of the Third CCF Youth Internet Entrepreneurship Competition

Skills

Languages	**Mandarin, English**
Programming	**Matlab, C/C++, Python, Java**
Interests	**Basketball (Frequent player), Swimming, Running, Cooking, Singing**

Professional Service

REVIEWER

IEEE Transactions on Pattern Analysis and Machine Intelligence

IEEE Transactions on Information Forensics and Security

IEEE Transactions on Neural Networks and Learning Systems

IEEE Transactions on Industrial Informatics

IEEE Transactions on Image Processing

IEEE Transactions on Medical Imaging

IEEE Transactions on Multimedia

IEEE Transactions on Circuits and Systems for Video Technology

IEEE Transactions on Very Large Scale Integration Systems

IEEE Transactions on Dependable and Secure Computing

IEEE Journal of Biomedical and Health Informatics

IEEE Access

Medical Image Analysis

Knowledge-Based Systems

Neurocomputing

Artificial Intelligence in Medicine

American Journal of Roentgenology

Journal of Experimental & Theoretical Artificial Intelligence

IET Image Processing

IET Biometrics

Journal of Electronic Imaging

Journal of Digital Imaging

International Journal of Distributed Sensor Networks

ICLR 2022, CVPR 2019/2020/2021, ICCV 2019, ECCV 2020, AAAI 2020/2021, IJCAI 2021, MICCAI 2018/2019, ICME 2019, ICHI 2019, PRCV 2019