Yuxing **Tang**

SENIOR RESEARCH SCIENTIST @ PAII INC.

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Education Background

École Centrale de Lyon   *Lyon, France*
PH.D. IN COMPUTER SCIENCE   *2011-2016*

- Thesis: Weakly supervised learning of deformable part models and convolutional neural networks for object detection
- Advisor: Prof. Liming Chen and Dr. Emmanuel Dellandréa

Beijing Jiaotong University   *Beijing, China*
B.SC. AND M.SC. IN ELECTRICAL AND COMMUNICATION ENGINEERING   *2005-2009, 2009-2011*

Research Interests

My research focuses on computer vision, machine learning, in particular deep learning techniques for visual category recognition, object detection, natural language processing, and their applications in medical imaging, computer-aided diagnosis and computer-aided detection.

Work & Research Experience

PAII Inc.   *Palo Alto, CA & Bethesda, MD, USA*
SENIOR RESEARCH SCIENTIST   *July 2020 - Present*

- Working on BI-RADS classification, weakly supervised mass detection, and malignancy classification in mammograms.
- Working with NLP team to extract labels in radiology reports.
- Developing CAD algorithms on mammography and launching product prototypes in hospitals.
- Collaborating with radiologists to conduct clinical research.

National Institutes of Health (NIH)   *Bethesda, MD, USA*
POSTDOCTORAL RESEARCH FELLOW   *April 2017 - June 2020*

- Imaging Biomarkers and Computer-Aided Diagnosis Laboratory @ NIH Clinical Center
- Mentor: Dr. Ronald M. Summers and Dr. Le Lu (2017)
- Developed supervised and unsupervised abnormality classification and detection in chest radiographs.
- Developed generative adversarial networks for anomaly detection that can automatically identify abnormal chest radiographs (e.g., COVID-19 pneumonia) by learning only from normal radiographs.
- Worked with NIH Clinical Center radiologists to solve clinical-relevant problems.
- Constructed a large database of 21,761 MRI scans and annotations from NIH Clinical Center PACS for future machine learning endeavours.
- Supervised students/interns.

École Centrale de Lyon
RESEARCH ASSISTANT

Lyon, France
Sept. 2013 - Dec. 2016

- Computer Science Laboratory for Image Processing and Information Systems (LIRIS) @ CNRS
- VisualSense Project: Tagging visual data with semantic descriptions (EU CHIST-ERA D2K, The French National Research Agency: ANR-12-CHRI-0002-04)
- Accomplished collaborative research with three other leading academic institutions in Europe in the domain of visual and text data analysis.
- Worked on weakly and semi supervised object detection using transfer learning methods, natural language processing.
- Developed learning algorithms that exploit multi-modal data to discover mappings between visual and textual content.
- Gained expertise in deep learning for computer vision problems, especially about large scale image classification and object detection using very deep convolutional neural networks.

École Centrale de Lyon
RESEARCH ASSISTANT

Lyon, France
Sept. 2011 - Sept. 2013

- Computer Science Laboratory for Image Processing and Information Systems (LIRIS) @ CNRS
- VideoSense Project: Rich concepts recognition in multilingual videos through pivot languages (The French National Research Agency: ANR-2009 CORD 026 02)
- Worked on visual descriptors for supervised image and video content description.
- Gained expertise in machine learning for computer vision problems.
- Participated in PASCAL VOC 2011 classification and detection challenges.
- Co-participated in TRECVID 2012 semantic indexing and instance search tasks.

Beijing Jiaotong University
GRADUATE RESEARCH ASSISTANT

Beijing, China
Sept. 2010 - June 2011

- Beijing Key Laboratory of Communication and Information Systems
- Project: Fusion of Multiple Features for Image Forensics Analysis (National Natural Science Foundation of China: Project No. 60972151)
- Analysis of different visual features for image manipulation classification and detection.

Tsinghua University
R&D INTERN

Beijing, China
May 2010 - Aug. 2010

- Research Institute of Information Technology @ Tsinghua University
- Mentor: Prof. Jun Li
- Project: Cooperatively Overlay Routing Service (CORS) TV, a P2P real-time media streaming service prototype system (Supported by NEC labs China)
- Implemented network coding algorithms to reduce the packet redundancy rate of a P2P TV system.

Publications

JOURNALS

1. Chunyan Yi*, <u>Yuxing Tang</u>*, Rushan Ouyang, Yanbo Zhang, Zhenjie Cao, Zhicheng Yang, Shibin Wu, Mei Han, Jing Xiao, Peng Chang, Jie Ma. The added value of an artificial intelligence system in assisting radiologists on indeterminate BI-RADS 0 mammograms. To appear in *European Radiology (**ER**), 2021.* ***(Impact factor: 5.315)*** (* Contributed equally)

2. Zhicheng Yang, Zhenjie Cao, Yanbo Zhang, <u>Yuxing Tang</u>, Xiaohui Lin, Rushan Ouyang, Mingxiang Wu, Mei Han, Jing Xiao, Lingyun Huang, Shibin Wu, Peng Chang, Jie Ma. MommiNet-v2: Mammographic Multi-View Mass Identification Networks. To appear in *Medical Image Analysis (**MedIA**), 2021.* ***(Impact factor: 11.148)***

3. Yuxing Tang, Youbao Tang, Yifan Peng, Ke Yan, Mohammadhadi Bagheri, Bernadette Redd, Catherine Brandon, Zhiyong Lu, Mei Han, Jing Xiao, Ronald M. Summers. Automated Abnormality Classification of Chest Radiographs Using Deep Convolutional Neural Networks. *npj Digital Medicine, vol. 3 (70), 2020.* **(Impact factor: 11.665)**

4. 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 (**MedIA**), 2020.* **(Impact factor: 11.148)**

5. Angshuman Paul, Yuxing Tang, Thomas C. Shen, Ronald M. Summers. Discriminative Ensemble Learning for Few-Shot Chest X-ray Diagnosis. *Medical Image Analysis (**MedIA**), 2020.* **(Impact factor: 11.148)**

6. Yifan Peng, Yuxing Tang, Sungwon Lee, Yingying Zhu, Ronald M. Summers, Zhiyong Lu. COVID-19-CT-CXR: a freely accessible and weakly labeled chest X-ray and CT image collection on COVID-19 from biomedical literature. *IEEE Transactions on Big Data (**TBD**), 2020.* **(Impact factor: 5.670)**

7. 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 (**TMI**), 2020.* **(Impact factor: 10.048)**

8. Yuxing Tang, Josiah Wang, Xiaofang Wang, Boyang Gao, Emmanuel Dellandréa, Robert Gaizauskas, Liming Chen. Visual and Semantic Knowledge Transfer for Large Scale Semi-supervised Object Detection. *IEEE Transactions on Pattern Analysis and Machine Intelligence (**TPAMI**), vol. 40(12), pp. 3045-3058, 2018.* **(Impact factor: 17.861)**

9. Yuxing Tang, Xiaofang Wang, Emmanuel Dellandréa, Liming Chen. Weakly Supervised Learning of Deformable Part-Based Models for Object Detection via Region Proposals. *IEEE Transactions on Multimedia (**TMM**), vol. 19(2), pp. 393-407, 2017.* **(Impact factor: 6.513)**

10. Xiaofang Wang, Yuxing Tang, Simon Masnou, Liming Chen. A Global/Local Affinity Graph for Image Segmentation. *IEEE Transactions on Image Processing (**TIP**), vol. 24(4), pp. 1399-1411, 2015.* **(Impact factor: 10.856)**

Peer-reviewed Conferences and Workshops

11. Yuxing Tang, Zhenjie Cao, Yanbo Zhang, Zhicheng Yang, Zongcheng Ji, Yiwei Wang, Mei Han, Jie Ma, Jing Xiao, Peng Chang. Leveraging Large-Scale Weakly Labeled Data for Semi-Supervised Mass Detection in Mammograms. *IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), Virtual, 2021.* **(Acceptance rate: <25%)**

12. Yanbo Zhang, Yuxing Tang, Zhenjie Cao, Mei Han, Jing Xiao, Jie Ma, Peng Chang. BI-RADS Classification of Calcification on Mammograms. *International Conference on Medical Image Computing and Computer Assisted Intervention (**MICCAI**), Virtual, 2021.*

13. Zhenjie Cao, Zhicheng Yang, Yuxing Tang, Yanbo Zhang, Mei Han, Jing Xiao, Jie Ma, Peng Chang. Supervised Contrastive Pre-Training for Mammographic Triage Screening Models. *International Conference on Medical Image Computing and Computer Assisted Intervention (**MICCAI**), Virtual, 2021.*

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

15. 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 and Computer Assisted Intervention (**MICCAI**), Virtual, 2020.*

16. Angshuman Paul, Thomas Shen, Niranjan Balachandar, Yuxing Tang, Yifan Peng, Zhiyong Lu, Ronald M. Summers. COMe-SEE: Cross-Modality Semantic Embedding Ensemble for Generalized Zero-Shot

Diagnosis of Chest Radiographs. *Workshop on Medical Image Learning with Less Labels and Imperfect Data in conjunction with* **MICCAI**, *Virtual, 2020*

17. Jia Liang*, Yuxing Tang*, Youbao Tang, Jing Xiao, Ronald M. Summers. Bone Suppression on Chest Radiographs With Adversarial Learning. *SPIE* **Medical Imaging**: *Computer-Aided Diagnosis, Houston, TX, United States, 2020.* **(Oral)** (* Contributed equally)

18. Angshuman Paul, Yuxing Tang, Ronald M. Summers. Fast Few-Shot Transfer Learning for Disease Identification from Chest X-ray images Using Autoencoder Ensemble. *SPIE* **Medical Imaging**: *Computer-Aided Diagnosis, Houston, TX, United States, 2020.* **(Oral)**

19. Yifan Peng, Sungwon Lee, Daniel Elton, Tommy Shen, Yu-xing Tang, Qingyu Chen, Shuai Wang, Yingying Zhu, Ronald M. Summers, Zhiyong Lu. Automatic recognition of abdominal lymph nodes from clinical text. *The 3rd Clinical Natural Language Processing Workshop in conjunction with* **EMNLP**, *2020*

20. Yuxing Tang, Youbao Tang, Veit Sandfort, 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 and Computer Assisted Intervention (***MICCAI***), Shenzhen, China, 2019.*

21. 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***), Venice, Italy, 2019.* **(Oral)**

22. Youbao Tang, Ke Yan, Yuxing Tang, Jiamin Liu, Jing Xiao, Ronald Summers. ULDor: A Universal Lesion Detector for CT Scans with Pseudo Masks and Hard Negative Example Mining. *IEEE International Symposium on Biomedical Imaging (***ISBI***), Venice, Italy, 2019.*

23. 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***), London, United Kingdom, 2019.* (* Contributed equally)

24. 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**: *Computer-Aided Diagnosis, San Diego, CA, United States, 2019.* **(Oral)**

25. 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**: *Computer-Aided Diagnosis, San Diego, CA, United States, 2019.*

26. Yuxing Tang*, Xiaosong Wang*, Adam P. Harrison, Le Lu, Jing Xiao, Ronald M. Summers. Attention-Guided Curriculum Learning for Weakly Supervised Classification and Localization of Thoracic Diseases on Chest Radiographs. *9th International Conference on Machine Learning in Medical Imaging (***MLMI***) in conjunction with* **MICCAI**, *Granada, Spain, 2018.* **(Oral, 18% acceptance rate)** (* Contributed equally)

27. Yuxing Tang, Josiah Wang, Boyang Gao, Emmanuel Dellandrea, Robert Gaizauskas, Liming Chen. Large Scale Semi-supervised Object Detection using Visual and Semantic Knowledge Transfer. *IEEE Conference on Computer Vision and Pattern Recognition (***CVPR***), Las Vegas, NV, United States, 2016.* **(Acceptance rate: <30%)**

28. Yuxing Tang, Xiaofang Wang, Emmanuel Dellandréa, Simon Masnou, Liming Chen. Fusing Generic Objectness and Deformable Part-based Models for Weakly Supervised Object Detection. *IEEE International Conference on Image Processing (***ICIP***), Paris, France, 2014.* **(Oral, Top 10% award)**

29. Yuxing Tang, Charles-Edmond and Chao Zhu. Fan-shaped Patch Local Binary Patterns for Texture Classification. *11th International Workshop on Content-Based Multimedia Indexing (***CBMI***), Veszprém, Hungary, 2013.* **(Oral)**

Clinical Abstracts

30. Yuxing Tang et al. Leveraging Large-scale Weakly Labeled Data For Semi-supervised Mammogram Mass Detection. *Radiological Society of North America (**RSNA**) Scientific Paper, Chicago, USA, 2021.* **(Oral)**

31. Chunyan Yi, Yuxing Tang et al. Analysis Of The Added Value Of An Artificial Intelligence System In Assisting Radiologists On Indeterminate BI-RADS 0 Mammograms. *Radiological Society of North America (**RSNA**) Scientific Paper, Chicago, USA, 2021.* **(Oral)**

32. Xiaohui Lin et al. Automated classification of benign and malignant breast mass in digital mammograms with deep multi-task learning. *European Congress of Radiology (**ECR**), Virtual, 2021.* **(Oral)**

33. Rushan Ouyang et al. Automated classification of breast calcification malignancy in mammograms with deep-learning. *European Congress of Radiology (**ECR**), Virtual, 2021.* **(Oral)**

34. Jie Ma et al. A deep-learning classification model for mammogram screening. *European Congress of Radiology (**ECR**), Virtual, 2021.* **(Oral)**

35. Youbao Tang, Yuxing Tang, Yingying Zhu, Jing Xiao, Ronald M. Summers. Accurate Liver and Tumor Segmentation on CT Scans Using an Edge-enhanced Network. *Radiological Society of North America (**RSNA**) Scientific Paper, Virtual, 2020.* **(Oral)**

36. Yuxing Tang, Youbao Tang, Mei Han, Jing Xiao, Ronald M. Summers. Abnormal Chest X-Ray Identification with Generative Adversarial One-Class Classifier. *Radiological Society of North America (**RSNA**) Scientific Paper, Chicago, USA, 2019.* **(Trainee Research Prize, Oral)**

37. Youbao Tang, Yuxing Tang, Jing Xiao, Ronald M. Summers. An Interpretable Generative Model for Chest X-ray Decomposition via Synthesizing Radio-realistic Normal Chest X-rays and Separating Abnormalities. *Radiological Society of North America (**RSNA**), Chicago, USA, 2019.*

Pre-prints and Workshops

38. Yuxing Tang, Youbao Tang, Yifan Peng, Yingying Zhu, Sungwon Lee, Zhiyong Lu, Mei Han, Jing Xiao, Ronald M. Summers. Anomaly Detection in Chest Radiographs With A deep Generative Adversarial One-Class Classifier. *Under major revision: IEEE Transactions on Medical Imaging*

39. Xiaohui Lin, Shibing Wu, Jie Ma, Fei Xie, Yunshu Zhou, Rushan Ouyang, Mingxiang Wu, Yuxing Tang. Automatic Mammographic breast density classification in Chinese women: Development and clinical validation of a deep learning model. *Submitted to XXX Journal*

40. YingYing Zhu, Shuai Wang, Sungwon Lee, Qingyu Chen, Daniel C. Elton, Thomas Shen, Yuxing Tang, Zhiyong Lu, Ronald M. Summers. Learning Structured Graphs from Visual/Semantic Feature and Radiology Knowledge Graph for Multi-Class/Multi-Label Classification of Medical Images. *Submitted to XXX Conference*

41. Lingkun Luo, Xiaofang Wang, Shiqiang Hu, Chao Wang, Yuxing Tang, Liming Chen. Close Yet Distinctive Domain Adaptation. *arXiv:1704.04235, 2017*

42. Hervé Le Borgne, ... Yuxing Tang, Emmanuel Dellandréa, Charles-Edmond Bichot, Liming Chen et al. IRIM at TRECVID 2015: Semantic indexing and instance search. *TRECVID - TREC Video Retrieval Evaluation workshop, Gaithersburg, MD, United States, 2015*

43. Nicolas Ballas, ... Yuxing Tang, Emmanuel Dellandréa, Charles-Edmond Bichot, Liming Chen et al. IRIM at TRECVID 2014: Semantic indexing and instance search. *TRECVID - TREC Video Retrieval Evaluation workshop, Orlando, FL, United States, 2014*

44. Nicolas Ballas, ... Yuxing Tang, Emmanuel Dellandréa, Charles-Edmond Bichot, Liming Chen et al. IRIM at TRECVID 2013: Semantic indexing and instance search. *TRECVID - TREC Video Retrieval Evaluation workshop, Gaithersburg, MD, United States, 2013*

45. Nicolas Ballas, ... Yuxing Tang, Emmanuel Dellandréa, Charles-Edmond Bichot, Liming Chen et al. IRIM at TRECVID 2012: Semantic indexing and instance search. *TRECVID - TREC Video Retrieval Evaluation workshop, Gaithersburg, MD, United States, 2012*

Training

July 2012   INRIA Visual Recognition and Machine Learning Summer School   *Grenoble, France*

Honors & Awards

2020	Outstanding Reviewer Award, IEEE Conference on Computer Vision and Patter Recognition (CVPR)
2019	Trainee Research Prize, Radiological Society of North America (RSNA)
2019	Travel Award, IEEE International Symposium on Biomedical Imaging (ISBI)
2018	Outstanding Reviewer Award, International Association of Pattern Recognition (IAPR)
2016	Doctoral Consortium Travel Grant, IEEE Conference on Computer Vision and Patter Recognition (CVPR)
2014	Top 10% Paper Award, IEEE International Conference on Image Processing (ICIP)
2011	Outstanding Graduate Student Leaders, Beijing Jiaotong University
2009-10	Scholarship for Excellent Graduate Students, Beijing Jiaotong University
2007-08	Scholarship for Excellent Students, Beijing Jiaotong University
2006-07	Outstanding Student Leaders, Beijing Jiaotong University

Talks

Feb. 2020	Bone Suppression on Chest Radiographs With Adversarial Learning. *SPIE Medical Imaging Conference, Houston, United States*
April. 2019	Abnormal Chest X-Ray Identification with Generative Adversarial One-Class Classifier. *International Symposium on Biomedical Imaging, Venice, Italy*
Mar. 2019	Machine Learning and Artificial Intelligence in Radiology: Use Cases in NIH. *Frederick National Laboratory for Cancer Research, Frederick, United States*
Feb. 2019	Deep Adversarial One-Class Learning for Normal and Abnormal Chest Radiograph Classification. *SPIE Medical Imaging Conference, San Diego, United States*
Feb. 2019	Deep Learning in Radiology: Applications in Lesion and Organ Segmentation. *NIH AI Workshop on Image Segmentation, Bethesda, United States*
Dec. 2016	Weakly Supervised Learning of Deformable Part Models and Convolutional Neural Networks for Object Detection. *Ecole Centrale de Lyon, France*
Dec. 2015	Semi-Supervised Object Detection with Visual and Semantic Knowledge Transfer. *Imperial College London, United Kingdom*
Oct. 2014	Fusing Generic Objectness and Deformable Part-based Models for Weakly Supervised Object Detection. *International Conference on Image Processing, Paris, France*

Professional Service

Journal

Associate Editor* / Reviewer

- Medical Physics*
- IEEE Transactions on Neural Networks and Learning Systems (**TNNLS**)
- IEEE Transactions on Image Processing (**TIP**) • IEEE Transactions on Multimedia (**TMM**)
- IEEE Transactions on Circuits and Systems for Video Technology (**TCSVT**)
- IEEE Journal of Biomedical and Health Informatics (**JBHI**)
- IEEE Transactions on Medical Imaging (**TMI**) • IEEE Transactions on Big Data (**TBD**) • IEEE Access
- Pattern Recognition (**PR**) • Pattern Recognition Letters (**PRL**) • Neurocomputing
- IET Computer Vision • IET Signal Processing • IET Image Processing • IET Electronics Letters
- Medical Image Analysis (**MedIA**) • Medical Physics • Computerized Medical Imaging and Graphics
- Scientific Reports - Nature • npj Digital Medicine - Nature • Artificial Intelligence in Medicine
- Radiology • Radiology: Artificial Intelligence • Radiology: Cardiothoracic Imaging
- PLOS ONE • Sensors • Remote Sensing • Applied Sciences • Algorithms
- Journal of Electronic Imaging (**JEI**)
- Concurrency and Computation: Practice and Experience • Complexity

Conference

Technical Program Committee / Program Committee Member / Reviewer

- IEEE International Conference on Computer Vision and Pattern Recognition (**CVPR**). 2018, 2019, 2020, 2021
- IEEE International Conference on Computer Vision (**ICCV**). 2019
- International Conference on Medical Image Computing and Computer Assisted Intervention (**MICCAI**). 2018, 2019
- AAAI Conference on Artificial Intelligence (**AAAI**). 2020
- European Conference on Computer Vision (**ECCV**). 2020
- Asian Conference on Computer Vision (**ACCV**). 2018
- The International Conference on Ambient Systems, Networks and Technologies (**ANT**). 2018, 2019
- IEEE International Conference on Healthcare Informatics (**ICHI**). 2019
- Chinese Conference on Pattern Recognition and Computer Vision (**PRCV**). 2019

Volunteer

- European Conference on Computer Vision (**ECCV**). 2016
- International Conference on Cloud Computing (**CloudCom**). 2009

Other activities

Academic Judge

- NIH Postbaccalaureate Poster Day. 2018