Lichen **Wang**

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Education

Sep. 2016 - Apr. 2021	**Northeastern University, Boston, USA** Doctors of Philosophy Major : Electrical & Computer Engineering *Advisor : Prof. Yun Raymond Fu* Thesis : Correlation Discovery for Multi-view and Multi-label Learning [PDF]
Sep. 2013 - Jul. 2016	**Xi'an Jiaotong University, Xi'an, China** Master of Science in Engineering Major : Electronic & Information Engineering *Advisor : Prof. Aimin Zhang* Thesis : Vision based PCB Defects Detection Algorithms and System Implementation [PDF]
Sep. 2009 - Jul. 2013	**Harbin Institute of Technology, Harbin, China** Bachelor of Engineering Major : Electrical Engineering *Advisor : Prof. Zhenshen Qu* Thesis : Vision based Intravenous Bottle Foreign Matter Inspection [PDF]

Field of Interests

Computer Vision, Machine Learning, Multi-modal (Vision-Language) Learning, Large-Language Model, Transfer Learning Reinforcement Learning, NLP

Skills

Programming Skills :	Python, C/C++, MATLAB.
Operation System :	Linux (Ubuntu), MacOS, Windows.
Software :	PyTorch, TensorFlow, OpenCV, Point Cloud Library, MATLAB/Simulink, Tableau.

Experiences

- **Zillow, Seattle, WA** Department of AI, Rich Media Experience team & AI Media Insights team.

Sr. App. Scientist
01/2024-Present

Open-set Home Image Understanding, Python

Developed vision-language models for open-set image classification, object detection, and semantic segmentation tasks. Our model improves flexibility and compatibility for Zillow applications.

Open-set Semantic Segmentation | Vision-Language Models | Foundational models | CLIP | Multi-modal learning

Large-scale Indoor Dataset Collection, Python StreamLit Label Studio

Designed and created a large-scale indoor semantic segmentation dataset. Developed an advanced annotation tool that integrates foundational vision models (e.g., Segment Anything) to reduce mask annotation workload and enhance annotation efficiency and accuracy.

Indoor Image Dataset | Segment Anything Model | Mask Annotation | UI Design

Researh Intern Supervisor : LLM & Open-Vocabulary Detection, Python GPT3/4

Recruited and supervised 2 interns. (1) Developed a large-scale indoor description dataset using GPT4 and CV models with human-in-the-loop supervision. Designed and trained a generative AI model which achieves home-level description generation capacity. (2) Introduced an enhanced open-set object detection model that balances task-specific detection performance while maintaining open-set capacity for handling unexpected input. This model enhances the robustness of Zillow's real-world applications.

Indoor Description Dataset | Description Generation | Generative AI | GPT3/4 | Connectivity Analysis

Applied Scientist
06/2021-01/2024

Home 2D & 3D Feature Extraction, Python

Developed CV/ML models which explores 2D & 3D home data in both visual and language modalities. The learned home features and insights improves the performances of various Zillow applications.

Computer Vision | Multi-modal | Foundational models | Large Language Model | Zillow Indoor Dataset

Research Intern Supervisor, Python

Recruited and supervised 1 research intern. Proposed a domain adaptation-based computer vision model for the Home Layout Estimation task. Enhanced the robustness and precision of Zillow's products.

Layout estimation | Adaptive fine-tuning | Transfer Learning | Few-shot Learning

- **Northeastern University, Boston, MA** Department of Electrical & Computer Engineering.

Research Assistant
09/2016-04/2021

Multi-modal Learning, Python MATLAB

(1) Led a team in collecting a large-scale multi-modal (RGB-D, EMG, Skeleton) action dataset; (2) Proposed various multi-modal methods that fully explore latent correlations across modalities; (3) Developed generative strategies to address multi-modal challenges (e.g., modality missing and corruption).

Multi-modal | Generative Model | RGB-D | Transfer Learning | Action Recognition | Electromyography (EMG)

Transfer Learning & Domain Adaptation, Python MATLAB

(1) Designed novel training strategies that adapt large models to fit specific tasks with limited data, either in a supervised or unsupervised manner; (2) Various modules are designed for different data types (e.g., images, depth, 3D point cloud, multi-modal) and different settings (e.g., co-training, self-supervised, generative, adversarial).

Domain Adaptation | Transfer Learning | Co-training | 3D | Image Generation | Incremental Learning | Life-long Learning

Multi-label Learning, Python MATLAB

Proposed methods which predict multiple labels from a single instance. Modules are designed for tackling challenges such as complex label correlations and long-tail label distributions. Models are evaluated in various applications such as image classification, annotation, and retrieval.

Multi-label | Label Correlation | Generative | Manifold Learning | Active Learning | Transfer Learning | Domain Adaptation

Teaching Assistant
09/2016-04/2021

Data Visualization (EECE5642), Python Tableau MATLAB

Introduced diverse visualization strategies in various scenarios, including presentations, reports, and research papers. Tools such as MATLAB and Tableau are introduced in assignments.

Unsupervised Machine Learning (DS5230), Python MATLAB

Introduced various traditional and SOTA unsupervised learning strategies such as clustering, dimension reduction, auto-encoder, deep learning, self-supervised learning, etc.

Computer Vision (EECE 5639), Python MATLAB C/C++

Introduced conventional and advanced computer vision algorithms including image processing, 3D reconstruction, deep learning, classification, detection, segmentation, etc.

- **Samsung Research America, Mountain View, CA** Group of Artificial Intelligence.

Research Intern
05/2020-09/2021

Multi-modal (RGB-D) visual saliency detection, Python

Explored a multi-modal (RGB-D) saliency detection framework. A Knowledge-Distillation strategy is implemented to reduce the network's complexity and enhance inference efficiency on mobile platforms.

Multi-Modal Learning | RGB-D | Saliency Detection | Model Compression

- **NEC Labs America, Princeton, NY** Department of Data Science and System Security.

Research Intern
05/2019-01/2020

Reinforced Sentiment Classification, Python

Proposed a reinforcement learning-based NLP model which predicts sentimental polarities of a given text. It disregards task-irrelevant text and instead prioritizes identifying the most effective clues. It considerably reduces the computational resource requirements.

Sentiment Classification | NLP | Reinforcement Learning

Graph Data Representation Learning, Python

Developed a novel mechanism for learning graph data representations. Graph structured data retains valuable connectivity information among instances (e.g., social networks and advertising). The model allows for inductive and unsupervised learning in a highly efficient and effective manner.

Graph Isomorphism | Graph Similarity | Representation Learning | Auto-encoder | Random Walk

- **Zebra Technology, Lincolnshire, IL** Chief Technology Office, Computer Vision Algorithm.

CV Engineer Intern
05/2018-09/2018

Robust 3D Objects Detection & Localization, C/C++ Python

Developed computer vision system with the capability to capture 3D containers, classify container types, and accurately measure the dimensions/locations. The system is able to perform high-precision localization in high-level noise and low computational cost (e.g., embedded platform)

RGB-D | Point Cloud | 3D Deep Learning | Object Detection

05/2017-09/2017

Vision-based Human & Pose Detection, C/C++ Python

Deployed human/face detection and pose estimation algorithms in a warehouse environment. It effectively tackles challenges such as low illumination, occlusion, and various interruptions.

Computer Vision | Pose detection | Faster-RCNN | YOLO | QR Code

Publications

- **Conferences & Journals**
  - Tonmoay Deb, **Lichen Wang**, Zachary Bessinger, Naji Khosravan, Eric Penner, Sing Bing Kang, "ZInD-Tell : Towards Translating Indoor Panoramas into Descriptions," *IEEE Conference on Computer Vision and Pattern Recognition(CVPR) Workshop*, 2024 [PDF][Supplement]
  - Taotao Jing, **Lichen Wang**, Naji Khosravan, Zhiqiang Wan, Zachary Bessinger, Zhengming Ding, Sing Bing Kang, "iBARLE : imBalance-Aware Room Layout Estimation," *IEEE Winter Conference on Applications of Computer Vision (WACV)*, 2024 [PDF]
  - Chang Liu, **Lichen Wang**, Yun Fu, "Rethinking Neighborhood Consistency Learning on Unsupervised Domain Adaptation," *ACM International Conference on Multimedia (MM)*, 2023 [PDF]
  - Yue Bai, **Lichen Wang**, Yunyu Liu, Yu Yin, Hang Di, Yun Fu, "Semi-supervised Domain Adaptive Structure Learning," *IEEE Transactions on Image Processing (TIP)* [PDF]

- Can Qin, **Lichen Wang**, Qianqian Ma, Yu Yin, Huan Wang, Yun Fu, "Semi-supervised Domain Adaptive Structure Learning," *IEEE Transactions on Image Processing (TIP)* [PDF]
- **Lichen Wang**, Zhengming Ding, Kasey Lee, Seungju Han, Jae-Joon Han, Changkyu Choi, Yun Fu, "Generative Multi-Label Correlation Learning," *ACM Transactions on Knowledge Discovery from Data (TKDD)* [PDF]
- Yi Xu, **Lichen Wang**, Yizhou Wang, Can Qin, Yulun Zhang, Yun Fu, "MemREIN : Rein the Domain Shift for Cross-Domain Few-Shot Learning," *International Joint Conference on Artificial Intelligence (IJCAI)*, 2022 [PDF]
- Yi Xu, **Lichen Wang**, Yizhou Wang, Yun Fu, "Adaptive Trajectory Prediction via Transferable GNN," *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022 [PDF]
- Chang Liu, **Lichen Wang**, Yun Fu, "Meta Adversarial Weight for Unsupervised Domain Adaptation," *SIAM International Conference on Data Mining (SDM)*, 2022 [PDF]
- Yue Bai, Zhiqiang Tao, **Lichen Wang**, Sheng Li, Yu Yin, Yun Fu, "Collaborative Attention Mechanism for Multi-Modal Time Series Classification," *SIAM International Conference on Data Mining (SDM)*, 2022 [PDF]
- **Lichen Wang**, Yunyu Liu, Hang Di, Can Qin, Gan Sun, Yun Fu, "Semi-supervised Dual Relation Learning for Multi-label Classification," *IEEE Transactions on Image Processing (TIP)* [PDF]
- Can Qin, Handong Zhao, **Lichen Wang**, Huan Wang, Yulun Zhang, Yun Fu, "Slow Learning and Fast Inference : Efficient Graph Similarity Computation via Knowledge Distillation," *Neural Information Processing Systems (NeurIPS)*, 2021 [PDF]
- **Lichen Wang**, Bo Zong, Yunyu Liu, Can Qin, Wei Cheng, Wenchao Yu, Xuchao Zhang, Haifeng Chen, Yun Fu, "Aspect-based Sentiment Classification via Reinforcement Learning," *IEEE International Conference on Data Mining (ICDM)*, 2021 [PDF]
- Chang Liu, **Lichen Wang**, Kai Li, Yun Fu, "Domain Generalization via Feature Variation Decorrelation," *ACM International Conference on Multimedia (MM)*, 2021 [PDF]
- Songyang Jiang, Bin Sun, **Lichen Wang**, Yue Bai, Kunpeng Li, Yun Fu, "Skeleton Aware Multi-modal Sign Language Recognition," *IEEE Conference on Computer Vision and Pattern Recognition (CVPR) Workshop*, 2021 [PDF]
- **Lichen Wang**, Zhengming Ding, Yun Fu, "Generic Multi-label Annotation via Adaptive Graph and Marginalized Augmentation," *ACM Transactions on Knowledge Discovery from Data (TKDD)* [PDF]
- Can Qin, **Lichen Wang**, Qianqian Ma, Yu Yin, Huan Wang, Yun Fu, "Contradictory Structure Learning for Semi-supervised Domain Adaptation," *SIAM International Conference on Data Mining (SDM)*, 2021 [PDF]
- Yue Bai, **Lichen Wang**, Zhiqiang Tao, Sheng Li, Yun Fu, "Correlative Channel-Aware Fusion for Multi-View Time Series Classification," *AAAI Conference on Artificial Intelligence (AAAI)*, 2021 [PDF]
- Jiahua Dong, Yang Cong, Gan Sun, Bingtao Ma, **Lichen Wang** "I3DOL : Incremental 3D Object Learning without Catastrophic Forgetting," *AAAI Conference on Artificial Intelligence (AAAI)*, 2021 [PDF]
- Yue Bai, **Lichen Wang**, Yunyu Liu, Yu Yin, Yun Fu, "Dual-Side Auto-Encoder for High-Dimensional Time Series Segmentation," *IEEE International Conference on Data Mining (ICDM)*, 2020 [PDF]
- Yunyu Liu, **Lichen Wang**, Yue Bai, Can Qin, Zhengming Ding, and Yun Fu, "Generative View-Correlation Adaptation for Semi-Supervised Multi-View Learning," *European Conference on Computer Vision (ECCV)*, 2020 [PDF]
- **Lichen Wang**, Bin Sun, Joseph Robinson, Taotao Jing, and Yun Fu, "EV-Action : Electromyography-Vision Multi-Modal Action Dataset," *IEEE International Conference on Automatic Face and Gesture Recognition (FG)*, 2020 [PDF]
- **Lichen Wang**, Bo Zong, Qianqian Ma, Wei Cheng, Jingchao Ni, Wenchao Yu, Yanchi Liu, Dongjing Song, Haifeng Chen, Yun Fu, "Inductive and Unsupervised Representation Learning on Graph Structured Objects," *International Conference on Learning Representations (ICLR)*, 2020 [PDF]
- **Lichen Wang**, Yunyu Liu, Can Qin, Gan Sun, Yun Fu, "Dual Relation Semi-supervised Multi-label Learning," *AAAI Conference on Artificial Intelligence (AAAI)*, 2020 [PDF]
- Can Qin, Haoxuan You, **Lichen Wang**, C.-C. Jay Kuo, Yun Fu, "PointDAN : A Multi-Scale 3D Domain Adaption Network for Point Cloud Representation," *Neural Information Processing Systems (NeurIPS)*, 2019 [PDF]
- **Lichen Wang**, Zhengming Ding, Seungju Han, Jae-Joon Han, Changkyu Choi, Yun Fu, "Generative Correlation Discovery Network for Multi-Label Learning," *IEEE International Conference on Data Mining (ICDM) (Long paper)*, 2019 [PDF]
- Denghui Zhang, Junming Liu, Hengshu Zhu, Yanchi Liu, **Lichen Wang**, Pengyang Wang, Hui Xiong, "Job2Vec : Job Title Benchmarking with Collective Multi-View Representation Learning," *ACM International Conference on Information and Knowledge Management (CIKM) (Long paper)*, 2019 [PDF]
- **Lichen Wang**, Zhengming Ding, Zhiqiang Tao, Yunyu Liu, Yun Fu, "Generative Multi-View Human Action Recognition," *International Conference on Computer Vision (ICCV) (Oral)*, 2019 [PDF]
- Can Qin, **Lichen Wang**, Yulun Zhang, Yun Fu, "Generatively Inferential Co-Training for Unsupervised Domain Adaptation," *International Conference on Computer Vision (ICCV) Workshop (Best paper award)*, 2019 [PDF]
- Gan Sun, Yang Cong, **Lichen Wang**, Zhengming Ding, Yun Fu, "Online Multi-task Clustering for Human Motion Segmentation," *International Conference on Computer Vision (ICCV) Workshop*, 2019 [PDF]
- **Lichen Wang**, Zhengming Ding, Yun Fu, "Low-Rank Transfer Human Motion Segmentation," *IEEE Transactions on Image Processing (TIP)* [PDF]
- Yulun Zhang, Kunpeng Li, Kai Li, **Lichen Wang**, Bineng Zhong, Yun Fu, "Image Super-Resolution Using Very Deep Residual Channel Attention Networks," *European Conference on Computer Vision (ECCV)*, 2019 [PDF]
- **Lichen Wang**, Zhengming Ding, Yun Fu, "Adaptive Graph Guided Embedding for Multi-label Annotation," *International Joint Conference on Artificial Intelligence (IJCAI)*, 2018 [PDF]
- **Lichen Wang**, Zhengming Ding, Yun Fu, "Learning Transferable Subspace for Human Motion Segmentation," *AAAI Conference on Artificial Intelligence (AAAI)*, 2018 [PDF]
- **Lichen Wang**, Aimin Zhang, Chujia Guo, Pervez Bhan, Tian Yan, "Modified Multi-target Recognition Based on CamCom," *Chi-*

nese Control Conference (CCC), 2015 [PDF]
  - **Lichen Wang**, Aimin Zhang, Chujia Guo, Songyun Zhao, Pervez Bhan, "3-D Reconstruction for SMT Solder Joint Based on Joint Shadow," *Chinese Control and Decision Conference (CCDC)*, 2015 [PDF]
- **Patents**
  - Naji Khosravan, **Lichen Wang**, Sing Bing Kang, "Automated Building Identification Using Floor Plans and Acquired Building Images," *granted U.S. Invention Patent No. 11830135B1* [PDF][Google Patent]
  - Eric M. Penner, Naji Khosravan, Sing Bing Kang, **Lichen Wang**, Zachary S. Bessinger, "Automated Generation and Use of Building Information from Analysis of Floor Plans and Acquired Building Images," *granted U.S. Invention Patent No. 2024/0096097A1* [PDF]
  - Bo Zong, Haifeng Chen, **Lichen Wang**, "Reinforced Text Representation Learning," *granted U.S. Invention Patent No. 20210248425* [PDF][Google Patent][Research Paper]
  - Bo Zong, Haifeng Chen, **Lichen Wang**, "Unsupervised Graph Similarity Learning Based on Stochastic Subgraph Learning," *granted U.S. Invention Patent No. 20210089652* [PDF][Google Patent][Research Paper]
  - **Lichen Wang**, Yan Zhang, Kevin O'Connell, "Three-Dimensional (3D) Depth Imaging Systems and Methods for Dynamic Container Auto-Configuration," *granted U.S. and International Invention Patent No. 11010915* [PDF_US][PDF_CN][Google Patent]
  - Yan Zhang, Kevin O'Connell, Jay Williams, **Lichen Wang**, "Systems and Methods for Automatic Camera Installation Guidance (CIG)," *granted U.S. and International Invention Patent No. 10820307* [PDF_US][PDF_CN][Google Patent]
  - **Lichen Wang**, Min Wu, Qinglin Liu, "Novel Methods and System for Evaporator Frosting Inspection," *granted China Invention Patent No. CN201511025257.3* [PDF_CN]
  - Zhenshen Qu, **Lichen Wang**, Wenhua Jiao, Changlun Gao, Pengshan Ren, Haisheng Wang, "Novel Methods and System of Foreign Matter Inspection in Infusion Bottle," *granted China Invention Patent No. CN2013102084539* [PDF_CN]