Yinwei Zhang

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👤 About Me

I am self-motivated, persevering and curious to the unknown knowledge. I was intern of robotics research group in ABB and the main task is to apply deep learning algorithms to robots and evaluate their performances under different environments. My research with my advisor Dr.Jian Liu in University of Arizona is related with spatial and temporal data analysis.

🎓 Education

University of Arizona, U.S   2018 - Present
4th-year Ph.D Candidate in Systems and Industrial Engineering

University of Arizona, U.S   2020 - Present
M.S. in Statistics

University of Arizona, U.S   2016 - 2018
M.S. in Engineering Management

Jingchu University of Technology, China   2012 - 2016
B.S. in Process Equipment and Control Engineering

👥 Experience

President, INFORMS Student Chapter, University of Arizona   Sep, 2021 - Present
- Lead the chapter members to setup social media accounts such as website, Twitter, and Facebook
- Collaborate with the department and improve the visibility of the chapter through social media
- Initiate a new series of workshop that invites students who have graduated to share the experience in industries and academics

Research Intern in Robotics, ABB, North Carolina   Jan, 2020 - Aug, 2021
- **Supervisor**: Jianjun Wang, Biao Zhang
- **Main tasks**
  - Take part in the development of algorithms for intelligent software agents to enable creation of future autonomous robotics.
  - Build modular software systems for image processing and machine learning.
  - Develop and integrate advanced perception technologies for robotic applications.
  - Improve robot performance using 3D vision technology, including algorithms to identify and classify meaningful structures around a robot.
  - Generate intellectual property and write scientific publications.

💼 Project

Anomaly Detection via Statistical Learning, University of Arizona   2019
- **Sponsor**: National Science Foundation
- **Procedures**: I developed a modified elastic-net based model with a fast-iterative algorithm to reduce the dimensions of high-volume spatio-temporal sensor data, with a reduction rate higher than 90%.

Sparse learning algorithms were also invented to accurately and precisely estimate true model coefficients. Parameters tuning were conducted based on statistical learning strategies. The proposed methodology has been applied in online burst detection in water distribution systems and high-speed video monitoring system for 3D-printing, reducing false-alarm rate from over 70% to sub 1%, and ensure detection rate at over 99%.

- **Methodological Strength**: Statistical Learning, Spatial and Temporal Data Fusion, Dimension Reduction, Large Scale Optimization

Moving Targets Detection and Tracking with Moving Camera, University of Arizona 2018

- **Sponsor**: Air Force Office of Scientific Research
- **Highlights**: Collaborative Surveillance System with UAVs and UGVs
    - **For UGVs**: I trained a deep learning neural network model by TensorFlow and ran it in a Linux platform installed on UGVs to detect moving targets from video streams efficiently and effectively recording with a moving camera.
    - **For UAVs**: I developed an optical flow and perspective transformation based algorithm by OpenCV to detect and track moving targets in videos captured by UAVs. Pyramidal Lucas-Kanade algorithm was used to estimate the speeds and directions of features in the video, improving the processing speed by more than 80%. Morphological operations and connected components analysis were used to enhance the performance by 33%.
- **Methodological Strength**: Computer Vision, Image Processing, Data Fusion.

🎤 PRESENTATION

- Shenghao Xia, **Y. Zhang**, Jian Liu, *Investigation of Curing Process Heterogeneity from Raman Spectrum via CP Decomposition*, INFORMS Annual Meeting, Virtual, Nov, 2020
- **Y. Zhang**, *Tutorial: Applications of Spatial-Temporal Data Analytics in Industry*, Grand Lab Slam Workshop, University of Arizona, Tucson, Oct, 2019
- **Y. Zhang**, J. Liu, K. Lansey, *Functional Data Analytics for Detecting Bursts in Water Distribution Systems*, INFORMS Annual Meeting, Seattle, Oct, 2019
- **Y. Zhang**, J. Liu, YJ Son, *Effective and Efficient Moving Object Detection by a Moving Camera*, INFORMS Annual Meeting, Phoenix, Nov, 2018

📖 PUBLICATION

- T.Zhang, **Y. Zhang**, J. Liu, Smooth-Sparse Decomposition in the image based on Alternative Smooth Direction Model, (on-going).
- Peterson, R. L., Shea, K. D., Liu, J., Luque, K., Powell, J., **Zhang, Y**., Williams, D. K., Martin-Plank, L., Heasley, B. J., Phillips, L. R., Crist, J. D., *Family Caregiving Context: A Pilot Study*, The Arizona Nurse, April (accepted).
- Nikravesh, **Y. Zhang**, J.Liu, Frantziskonis,G.N, 2021, *A Partition and Microstructure-based Method for Large-scale Topology Optimization*, Structural and Multidisciplinary Optimization, (submitted).
- **Y. Zhang**, K. Lansey, J. Liu, 2020, *Detecting Bursts in Water Distribution System via Penalized Functional Decomposition*, IEEM Conference (honorable mention award).
- S. Lee, S. Jain, **Y. Zhang**, J. Liu, YJ Son, 2020, *A Multi-Paradigm Simulation for the Implementation of Digital Twins in Surveillance Application*, IISE Conference.
- S. Lee, S. Jain, Y. Yuan, **Y. Zhang**, H. Yang, J. Liu, YJ Son, 2019, *Design and development of a DDDAMS-based border surveillance system via UVs and hybrid simulations*, Expert Systems With Applications, 109-123.

🎤 Patent

- Generative Adversarial Network-based Apparatus for Automatic Generation of Realistic Synthetic Image in industrial Computer Vision Systems (Pending)   June/17/2021
- Combining deep learning based moving object tracking with feature-based moving object tracking (Pending)   June/17/2021
- Random Visual Blocking-based Visualization and Interpretation Apparatus for Regression Neural Networks in Industrial Computer Vision Applications (Pending)   June/17/2021

⚙ Others

- Programming Skills: Python, C++, R, Matlab, SAS
- Software&Libraries: TensorFlow/PyTorch, OpenCV, Blender, ROS
- Coursework: Statistical Machine Learning, Fundamentals of Data Science for Engineers, Engineering Statistics, Fundamentals of Optimization, Large Scale Optimization, Theory of Statistics, Statistical Consulting