

# YINWEI ZHANG

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## 👤 SUMMARY

Ph.D. candidate with 1.5 years of industrial experience in machine learning and 5 years Ph.D. research experience in statistical modeling with a variety of programming languages. Passionate in implementing/developing machine learning pipeline. Mission-oriented real-world problem solver.

## 🎓 EDUCATION

### University of Arizona, United States

*Ph.D.* Candidate in Systems and Industrial Engineering

2018-Present

*M.Sc.* in Statistics&Data Science

2020-Present

*M.Sc.* in Engineering Management

2016-2018

### Jingchu University of Technology, China

*B.S.* in Process Equipment and Control Engineering

2012 - 2016

## ⚙️ TECHNICAL PROFICIENCIES

- **Soft skills:** communication, writing, leadership
- **Platforms:** Windows, MacOS, Linux, Docker
- **Programming skills:** Python, R, Matlab, SAS, SQL
- **Software&Libraries:** TorchLua, TensorFlow/PyTorch, Sklearn, Numpy, Pandas Blender, ROS, CARLA, Autoware

## 👥 EXPERIENCES

### Research Intern, ABB, Raleigh, NC

Jan, 2020 - Aug, 2021

- Selected applicable neural networks for robots in **industrial applications** and **manufacturing processes** by literature review
- **Collaborated** with international groups to collect the data, and proposed a novel efficient **data collection** mechanism
- Trained and tested the networks **parallelly** for **regression** and/or **classification** tasks in a Linux based multi-GPU server based on **Tensorflow** and **PyTorch**
- Developed the pipeline for serving the trained neural networks by using **TensorFlow Serving** in **Docker**
- Improved the robustness of the neural network by designing a novel **data augmentation** algorithm in Python
- Evaluated the sensitivity of the NN to the image features by developing a mask-based method, improving the **interpretability** of the NN
- Created the synthetic industrial environments in **blender** to evaluate the performances of the NN under various conditions
- Cooperated with project managers to generate **intellectual properties** and write scientific reports

### President, INFORMS Student Chapter, University of Arizona

Sep, 2021 - Present

- Lead the chapter members to collaborate with the department for organizing social events
- Analyze students' demands and initiate a new series of workshop that is helpful to students

### Teaching Assistant, Quality Engineering, University of Arizona

Jan, 2021 - May, 2021

- Supported learning unsupervised anomaly detection based on statistical modeling
- Demonstrated supervised model selection/training for efficient anomaly detection with historical well-labeled data
- Illustrated model evaluation based on confusion matrix, i.e., true positive, true negative, false positive, and false negative

### Teaching Assistant, Fundamentals of Data Science for Engineers, University of Arizona

Aug, 2021 - Dec, 2021

- Supported learning principles of data pre-processing, e.g., data correcting, data completing, data creating, and data converting
- Assisted in understanding algorithms for supervise/unsupervise learning
- Displayed evaluation mechanisms, e.g., Precision, Recall, and F1-score
- Demonstrated Python and libraries, e.g., Sklearn, Numpy, and Pandas

## PROJECTS

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### Reliability Quantification of the Autonomous Vehicle, Tucson, AZ 2022

- Developed a physics-based simulation pipeline in **Docker** for quantifying the safety of the autonomous vehicle
- Designed **Python**-based modules for multi-sourced data fusion collected from different sensors, significantly improved the robustness of the decision-making of the autonomous vehicle
- Incorporated **deep learning** algorithm into the pipeline and studied its performance by injecting real-world based sensor errors
- **Predicted** the possible false positives and false negatives by proposing a statistical model based on the collected data

### Anomaly Detection via Statistical Learning, Tucson, AZ 2019

- Developed a **statistical machine learning** model based on the additive regularized regression model for **anomaly detection/classification** in high dimensional spatio-temporal data in **MATLAB**
- Regularized the model coefficients with different norms, i.e.,  $L_1$  and  $L_2$  regularization, according to their physical meaning
- Estimated the model parameters by **dimension reduction** and a gradient-based **optimization** algorithm
- The results show that it can reduce false-alarm rate from over 70% to sub 1%, and ensure detection rate at over 99%

### Coursework Project on Product Assessment, Tucson, AZ 2018

- Collected one batch of products and measured the weight for each product
- Estimated the **sample mean** and **sample variance** of the weight
- Built **hypothesis** to test the equality between the mean weight and the designated weight by **T-test**
- The **p-value** showed that the weight for this batch is significant

## PRESENTATION

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

## PUBLICATION

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- Pan, F., **Zhang, Y.**, Liu, J., Head, L., Elli, M., & Alvarez, I. (2022). Quantifying error propagation in multi-stage perception system of autonomous vehicles via physics-based Simulation. *Winter Simulation Conference*, Singapore.
- **Zhang, Y.**, Zhang, T., Liu, J., Kang, W., Liang, R., & Potter, B. (2022). Profile extraction for optical lens curing process with Image-based Regularized Tensor Decomposition. *Proceedings of the 2022 International Symposium on Flexible Automation*, Japan.
- Zhang, T., **Zhang, Y.**, & Liu, J., Smooth-sparse decomposition in the image based on alternative smooth direction Model, (on-going).
- Nikravesh, Y., **Zhang, Y.**, Liu, J., & Frantziskonis, G.N (2022). A partition and microstructure-based method for large-scale topology optimization. *Mechanics of Materials*, Volume 166.
- 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. (2021). Family caregiving context: a pilot study. *The Arizona Nurse*, April.
- **Zhang, Y.**, Lansey, K., & Liu, J. (2020). Detecting bursts in water distribution system via penalized functional decomposition. IEEM Conference (honorable mention award).
- Lee, S., Jain, S., **Zhang, Y.**, Liu, J., & Son, Y. (2020). A multi-paradigm simulation for the implementation of digital twins in surveillance application. IISE Conference.
- Lee, S., Jain, S., Yuan, Y., **Zhang, Y.**, Yang, H., Liu, J., & Son, Y. (2019). Design and development of a DDDAMS-based border surveillance system via UVs and hybrid simulations. *Expert Systems With Applications*, 109-123.

## PATENT

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- System and method to generate augmented training data for neural network, No. PCT/US21/37798

- Robotic systems and methods used with installation of component parts
- Robotic systems and methods used to update training of a neural network based upon neural networks outputs