# Bo Shen

**Address:** Mechanical Engineering Center, 200 Central Ave #313, Newark, NJ 07114
**Email:** bo.shen@njit.edu ◇ **Phone:** +1(540) 739-9938 ◇ **Website:** boshen0.github.io

## EMPLOYMENT

**Assistant Professor** 2022 – Now
*Department of Mechanical and Industrial Engineering*
*New Jersey Institute of Technology*

## EDUCATION

**Ph.D. in Industrial and Systems Engineering** 2017 – 2022
*Virginia Polytechnic Institute and State University*

– *Advisor:* Dr. Zhenyu (James) Kong

**Bachelor of Science in Statistics** 2013 – 2017
*University of Science and Technology of China*

## RESEARCH INTERESTS

- **Methodology:** *High dimensional streaming (Tensor) data analysis; Optimization for machine learning; Bayesian optimization; Federated learning; Physics-informed machine learning; Reinforcement learning.*
- **Application:** *Smart manufacturing; Additive manufacturing; Cybersecurity; Industrial Internet of Things (IIoT); Healthcare.*

## HONORS AND AWARDS

- Winner, IISE QCRE/ProcessMiner Data Challenge Competition (2022)
- Winner, IISE Manufacturing and Design (M&D) Division Best Paper Award (2022)
- Winner, IISE Manufacturing and Design (M&D) Division Best Student Paper Award (2022)
- Winner, IISE QCRE Division Best Student Paper Award (2022)
- Member of Graduate Academy for Teaching Excellence, Virginia Tech (2022)
- ISE Outstanding PhD Student of the Year, Virginia Tech (2022)
- Finalist, INFORMS Data Mining Section Best Paper Award (Student Track, 2021)
- Runner-up, INFORMS QSR Industry Data Challenge (2020)
- Finalist, INFORMS QSR Best Refereed Paper Competition (2020)
- $2^{\text{nd}}$ place, INFORMS & HFES Student Poster Competition, ISE, Virginia Tech (2019, 2020)
- ISE Graduate Student Travel Awards, Virginia Tech (2018 – 2022)
- Fellowship, Grado Department of Industrial & Systems Engineering, Virginia Tech (2017)
- Undergraduate Fellowship, USTC (2014 – 2017)

## PUBLICATIONS

### Journal Publications (published, in revision, or submitted)

1. **Bo Shen**, Weijun Xie, & Zhenyu (James) Kong (2022). Smooth Robust Tensor Completion for Background/Foreground Separation with Missing Pixels: Novel Algorithm with Convergence Guarantee. *Journal of Machine Learning Research.* https://jmlr.org/papers/v23/22-0369.html

2. **Bo Shen**, Raghav Gnanasambandam, Rongxuan Wang, & Zhenyu (James) Kong (2022). Multi-Task Gaussian Process Upper Confidence Bound for Hyperparameter Tuning and its Application for Simulation Studies of Additive Manufacturing. *IISE Transactions.* DOI: 10.1080/24725854.2022.2039813

3. **Bo Shen**, Rakesh Kamath, Hahn Choo, & Zhenyu (James) Kong (2022). Robust Tensor Decomposition based Background/Foreground Separation in Noisy Videos and Its Applications in Additive Manufacturing. *IEEE Transactions on Automation Science and Engineering.* DOI: 10.1109/TASE.2022.3163674

4. Rongxuan Wang, David Garcia, Rakesh Kamath, Chaoran Dou, Xiaohan Ma, **Bo Shen**, Hahn Choo, Kamel Fezzaa, Hang Yu, & Zhenyu (James) Kong (2022). In-process Multi-physics Melt Pool Measurement and Correlation Analysis in Laser Powder Bed Fusion. *Scientific Reports.* DOI: 10.1038/s41598-022-18096-w

   – Winner for IISE Manufacturing and Design (M&D) Division Best Paper Award, 2022

5. **Bo Shen**, Rongxuan Wang, Andrew Chung Chee Law, Rakesh Kamath, Hahn Choo, & Zhenyu (James) Kong (2021). Super Resolution for Multi-Sources Image Stream Data using Smooth and Sparse Tensor Completion and its Applications in Data Acquisition of Additive Manufacturing. *Technometrics.* DOI: 10.1080/00401706.2021.1905074

   – Finalist for INFORMS QSR Best Refereed Paper Competition, 2020

   – Second place of poster competition in INFORMS & HFES Student Poster Competition, ISE, Virginia Tech, 2019

6. **Bo Shen**, Weijun Xie, & Zhenyu (James) Kong (2020). Clustered Discriminant Regression for High Dimensional Data Feature Extraction and Its Applications in Healthcare and Additive Manufacturing. *IEEE Transactions on Automation Science and Engineering.* DOI: 10.1109/TASE.2020.3029028

7. **Bo Shen** & Zhenyu (James) Kong. A Novel Active Anomaly Discovery Method and Its Applications in Additive Manufacturing. Under revision at *IISE Transactions.* DOI: 10.36227/techrxiv.16674412.v1

   – Finalist for INFORMS Data Mining Section Best Paper Award (Student Track), 2021

8. Maede Maftouni, **Bo Shen**, Andrew Chung Chee Law, & Zhenyu (James) Kong. A Mask-guided Attention Deep Learning Model for COVID-19 Diagnosis based on an Integrated CT Scan Images Database. Under second round review at *IISE Transactions on Healthcare Systems Engineering.* DOI: 10.36227/techrxiv.18166667.v1

   – Runner-up for INFORMS QSR Industry Data Challenge, 2020

   – Second place of poster competition in INFORMS & HFES Student Poster Competition, ISE, Virginia Tech, 2020

9. Yi Chen, Jing Dong, Xin T. Tong, & **Bo Shen**. Can We Do Better than Random Start? The Power of Data Outsouring. Under second round review at *Transactions on Modeling and Computer Simulation.* DOI: 10.48550/arXiv.2205.08098

10. Jihoon Chung, **Bo Shen**, Andrew Chung Chee Law, & Zhenyu (James) Kong. Reinforcement Learning-based Defect Mitigation for Quality Assurance of Additive Manufacturing. Under review at *Journal of Manufacturing Systems.*

    – Winner for IISE QCRE Division Best Student Paper Award, 2022

11. Jihoon Chung, **Bo Shen**, & Zhenyu (James) Kong. A Novel Sparse Bayesian Learning and Its Application to Fault Diagnosis for Multi-station Assembly Systems. Under second round review at *IISE Transactions.*

12. Andrew Chung Chee Law, **Bo Shen**, Maede Maftouni, Benjamin Standfield, Xiaowei Yue, & Zhenyu (James) Kong. Residual Stress Prediction with Reheating Effects of Thermal Cycles in Laser Powder Bed Fusion using Deep Neural Network. Under review at *Manufacturing Letters.*

13. Jihoon Chung, **Bo Shen**, and Zhenyu (James) Kong. Imbalanced Data Classification via Generative Adversarial Network with Application to Anomaly Detection in Additive Manufacturing Processes. Under review at *IEEE Transactions on Automation Science and Engineering.*

14. Raghav Gnanasambandam, **Bo Shen**, Andrew Chung Chee Law, and Zhenyu (James) Kong. Deep Gaussian Process Upper Confidence Bound for Optimizing Non-Stationary Functions and its Application in Additive Manufacturing. Under review at *IISE Transactions.*

**Preprints and Working Journal Papers**

15. Maede Maftouni, **Bo Shen**, Andrew Chung Chee Law, Rongxuan Wang, & Zhenyu (James) Kong. Automatic Melt Pool Segmentation and Tracking in the X-ray Image Sequence. To be submitted to *IISE Transactions.*

    – Winner for IISE Manufacturing and Design (M&D) Division Best Student Paper Award, 2022

16. Raghav Gnanasambandam, **Bo Shen**, Jihoon Chung, Xubo Yue, & Zhenyu (James) Kong. Self-scalable Tanh (Stan): Faster Convergence and Better Generalization in Physics-informed Neural Networks. To be submitted to *IEEE Transactions on Pattern Analysis and Machine Intelligence.* DOI: 10.48550/arXiv.2204.12589

    – Winner for IISE QCRE/ProcessMiner Data Challenge Competition, 2022

17. Andrew Chung Chee Law, **Bo Shen**, & Zhenyu (James) Kong. Deep Ensemble with Active Learning for Inverse Process Parameter Design of Metal Additive Manufacturing. In preparation.

**Conference Papers (Published)**

1. Maftouni, M., Law, A. C. C., **Shen, B.**, Zhou, Y., Yazdi, N., & Kong, Z. J. (2021). A Robust Ensemble-Deep Learning Model for COVID-19 Diagnosis based on an Integrated CT Scan Images Database. *Proceedings of the 2021 IISE Annual Conference.* DOI: proquest/2560887697

## TEACHING EXPERIENCE

**Teaching Experience at Virginia Tech**

ISE 2214 Manufacturing Processes Lab (2017 Fall, 2019 Spring & Fall): *Lab Instructor*

ISE 2014 Engineering Economy (2018 Fall): *Graduate Teaching Assistant*

ISE 4404 Statistical Quality Control (2018 Spring): *Graduate Teaching Assistant*

## INVITED TALK

1. **A Novel Active Anomaly Discovery Method and Its Applications in Additive Manufacturing**
   - INFORMS Annual Meeting, Anaheim, CA, 2021
   - IISE Annual Conference, Seattle, WA, 2022
2. **Multi-Task Gaussian Process Upper Confidence Bound for Hyperparameter Tuning**
   - INFORMS Annual Meeting, Anaheim, CA, 2021
   - IISE Annual Conference 2020 (Virtual)
3. **Robust Tensor Decomposition based Background/Foreground Separation in Noisy Videos and Its Applications in Additive Manufacturing**
   - INFORMS Annual Meeting, Anaheim, CA, 2021
4. **Super Resolution for Multi-Sources Image Stream Data using Smooth and Sparse Tensor Completion and its Applications in Data Acquisition of Additive Manufacturing**
   - ICAM AI Symposium, Anaheim, CA, 2021
   - INFORMS Annual Conference 2020 (Virtual)
   - IISE Annual Conference 2020 (Virtual)
5. **Robust Tensor Principal Component Analysis: Formulation, Algorithm, and Applications**
   - INFORMS Annual Conference 2020 (Virtual)
   - INFORMS Annual Conference, Seattle, WA, 2019
6. **Clustered Discriminant Regression for High-Dimensional Data Feature Extraction and Its Applications in Healthcare and Additive Manufacturing**
   - IISE Annual Conference, Orlando, FL, 2019

## SERVICE AND LEADERSHIP

**Session Chair:** Physics Informed/Constrained Learning in Manufacturing and Healthcare Systems, IISE Annual Conference 2022

**Session Chair:** Data Mining and Machine Learning in Smart Manufacturing, INFORMS Annual Conference 2021

**Journal Referee:** IISE Transactions, IEEE Transactions on Automation Science and Engineering, Technometrics, Journal of Intelligent Manufacturing

**VP Finance:** The INFORMS Student Chapter at Virginia Tech (2021 – 2022)

**Professional Society Memberships:** Institute of Industrial and Systems Engineers (IISE), Institute for Operation Research and the Management Sciences (INFORMS), Institute of Electrical and Electronics Engineers (IEEE)