Bo Shen

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EDUCATION

Ph.D. Candidate in Industrial and Systems Engineering 2017 – 2022 (Expected)
Virginia Polytechnic Institute and State University

– *Dissertation:* Advanced Machine Learning for Quality Assurance of Smart Additive Manufacturing, advised by Dr. Zhenyu (James) Kong

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

RESEARCH INTERESTS

- **Methodology:** *High dimensional streaming 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).*

HONORS AND AWARDS

- 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)
- 2nd place, INFORMS & HFES Student Poster Competition, ISE, Virginia Tech (2019, 2020)
- Fellowship, Grado Department of Industrial & Systems Engineering, Virginia Tech (2017)

PUBLICATIONS

Journal Publications (Published/Accepted)

1. **Shen, B.**, Wang, R., Law, A. C. C., Kamath, R., Choo, H., & Kong, Z. J. (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*, 1-16. DOI: 10.1080/00401706.2021.1905074

   – Finalist for INFORMS QSR Best Refereed Paper Competition

2. **Shen, B.**, Xie, W., & Kong, Z. J. (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

3. **Shen, B.**, Gnanasambandam, R., Wang, R., & Kong, Z. J. (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

4. **Shen, B.**, Kamath, R., Choo, H., & Kong, Z. J. (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: 10.36227/techrxiv.14561775.v2

Journal Publications (Under Review/Revision)

5. **Shen, B.**, Kong, Z. J. (2022). A Novel Active Anomaly Discovery Method and Its Applications in Additive Manufacturing. *IISE Transactions.* Under revision. DOI: 10.36227/techrxiv.16674412.v1
   - Finalist for INFORMS Data Mining Section Best Paper Award (Student Track)
6. Wang, R., Garcia, D., **Shen, B.**, Ma, X., Kamath, R., Choo, H., Fezzaa, K., & Kong, Z. J. (2022). In-process Multi-physical Melt Pool Characteristics Sensing and Data Correlation in Laser Powder Bed Fusion. *Additive Manufacturing.* Under review.
7. Maftouni, M., **Shen, B.**, Law, A. C. C., & Kong, Z. J. (2022). A Mask-guided Attention Deep Learning Model for COVID-19 Diagnosis based on an Integrated CT Scan Images Database. *IISE Transactions on Healthcare Systems Engineering.* Under review. DOI: 10.36227/techrxiv.18166667.v1
   - Runner-up for INFORMS QSR Industry Data Challenge
8. Chung, J., **Shen, B.**, Law, A. C. C., & Kong, Z. J. (2022). Reinforcement Learning-based Defect Mitigation for Quality Assurance of Additive Manufacturing. *Journal of Manufacturing Systems.* Under review.

Working Journal Papers (Draft Accomplished)

9. **Shen, B.**, Xie, W., & Kong, Z. J. (2022). Robust Tensor Principal Component Analysis: Formulation, Algorithm, and Applications. To be submitted to *Journal of Machine Learning Research.*
10. Chung, J., **Shen, B.**, & Kong, Z. J. (2022). Sparse Bayesian Learning with Prior Knowledge and Temporally Correlated Solution Vectors with Application to Fault Diagnosis in Multi station Assembly Systems. To be submitted to *Journal of Manufacturing Systems.*
11. Chung, J., **Shen, B.**, and Kong, Z. J. (2022). Imbalanced Data Classification via Generative Adversarial Network with Applications in Cyber-Physical Attack Detection in Additive Manufacturing Processes. To be submitted to *ASME Trans. Journal of Manufacturing Science and Engineering.*
12. Maftouni, M., **Shen, B.**, Law, A. C. C., & Kong, Z. J. (2022). Automatic Melt Pool Segmentation and Tracking in the X-ray Image Sequence. To be submitted to *IISE Transactions.*
13. Gnanasambandam, R., **Shen, B.**, Law, A. C. C., & Kong, Z. J. (2022). Deep Gaussian Process Upper Confidence Bound for Optimizing Non-Stationary Functions and its Application in Additive Manufacturing. To be submitted to *ASME Trans. Journal of Manufacturing Science and Engineering.*
14. Law, A. C. C., Maftouni, M., **Shen, B.**, and Kong, Z. J. (2022). Forward Prediction of Residual Stress Formation in Laser Powder Bed Fusion using Deep Neural Network. To be submitted to *Manufacturing Letters.*

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)