

# Jianxin Xie

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## EDUCATION

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- 2023 **Ph.D.\* Industrial & Systems Engineering**  
The University of Tennessee at Knoxville, USA  
**Dissertation:** Physics-constrained modeling and optimization of complex systems with healthcare application  
**Advisor:** Dr. Bing Yao
- 2020 **M.S. Industrial & Manufacturing Engineering**, Florida State University, USA
- 2016 **B.S. Physics**, Southeast University, China

## RESEARCH INTERESTS

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Physics-augmented modeling and analysis of complex systems for process monitoring and control, system diagnostics and prognostics, quality and reliability improvement, and performance optimization, with applications in healthcare:

- Physics-constrained machine learning
- Big data analytics for spatiotemporal complex systems
- Prediction and decision-making
- Computer simulation and optimization
- Biomedical and health informatics

## TEACHING INTERESTS

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### Undergraduate Level

- Foundation of Data Science
- Programming for Data Science
- Foundation of Machine Learning
- Data Science Systems

### Graduate Level

- Statistical Learning
- Bayesian Machine Learning
- Deep Learning
- Machine Learning I & II

## AWARDS & HONORS:

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1. **Best Poster Award**, QCRE Best Student Poster Competition, IISE Annual Conference *May 2023*
2. **Travel Award**, Graduate Student Senate, University of Tennessee *Apr 2023*
3. **Volunteer of Distinction**, Office of Provost, University of Tennessee *Mar 2023*
4. **Outstanding Graduate Student Award**, ISE, University of Tennessee *Mar 2023*
5. **Gilbreth Memorial Fellowship**, IISE, 2022 *Aug 2022*
6. **Best Poster Award**, QCRE & DAIS Tracks Best Student Poster Competition, IISE Annual Conference *May 2021*
7. **Runner Up Best Paper Award** in the Operations Research Track, IISE Annual Conference *May 2021*
8. Excellent Academic Research Report for the 5th Academic Conference of Southeast University

\* 30 credit hours were completed at Oklahoma State University toward my Ph.D.

May 2015

9. **“Hongguang” Scholarship** (endowed by Mr. CAO Hongguang, an alumnus of Southeast University, to students with excellent academic performance) Apr 2015
10. **Second Prize** for the 11th Innovative Competition for Scientific and Technological Works of Physics and Experiment among University Students in Jiangsu Province, China Nov 2014
11. **Grand Prize** (for the team) for Social Practice on “Research for the New Rural Social Security in Huaibei, Anhui Province”, Southeast University Nov 2014
12. **Outstanding Individual Prize** for Social Practice on “Research for the New Rural Social Security in Huaibei, Anhui Province”, Southeast University Nov 2014
13. **Second Prize** (for the team) in English Drama Competition, Southeast University Jun 2014
14. **Outstanding Youth League Member**, Southeast University May 2014
15. **“Optics Course” Award**, Southeast University Dec 2013
16. **Merit Student**, Department of Physics, Southeast University Dec 2013

## PUBLICATIONS

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### *Journal Articles*

1. **J. Xie** and B. Yao, “Hierarchical Active Learning for Defect Localization in 3D Simulation”, *IISE Transaction on Healthcare Systems Engineering*, (Accepted). <https://doi.org/10.1080/24725579.2023.2233992>
2. **J. Xie** and B. Yao, “Physics-constrained Deep Active Learning for Spatiotemporal modeling of Cardiac Electrodynamics”, *Computers in Biology and Medicine*, vol. 146, p. 105586, 2022. <https://doi.org/10.1016/j.combiomed.2022.105586> (*Best poster award in QCRE best student poster competition*)
3. **J. Xie** and B. Yao, “Physics-constrained Deep Learning for Robust Inverse ECG Modeling”, *IEEE Transactions on Automation Science and Engineering*, vol. 20, pp. 151-166, 2022. <https://doi.org/10.1109/TASE.2022.3144347> (*Best poster award in QCRE & DAIS Tracks best student poster competition*)
4. C. Shen, **J. Xie**, M. Zhang, P. Andrei, M. A. Hendrickson, E. J. Plichta, and J. P. Zheng, "Self-Discharge Behavior of Lithium-Sulfur Batteries at Different Electrolyte/Sulfur Ratios," *Journal of The Electrochemical Society*, vol. 166 (3), pp. A5287-A5294, 2019. <https://doi.org/10.1149/2.0461903jes>
5. C. Shen, **J. Xie**, M. Zhang, P. Andrei, J. P. Zheng, M. A. Hendrickson, and E. J. Plichta, "A Li-Li<sub>2</sub>S<sub>4</sub> battery with improved discharge capacity and cycle life at low electrolyte/sulfur ratios," *Journal of Power Sources*, vol. 414, pp. 412-419, 2019. <https://doi.org/10.1016/j.jpowsour.2019.01.029>
6. C. Shen, **J. Xie**, T. Liu, M. Zhang, P. Andrei, L. Dong, M. Hendrickson, E. J. Plichta, and J. P. Zheng, "Influence of pore size on discharge capacity in Li-air batteries with hierarchically macroporous carbon nanotube foams as cathodes," *Journal of The Electrochemical Society*, vol. 165 (11), pp. A2833-A2839, 2018. <https://doi.org/10.1149/2.1141811jes>
7. C. Shen, **J. Xie**, M. Zhang, M. A. Hendrickson, E. J. Plichta, and J. P. Zheng, "Carbon nanotube (CNT) foams as sulfur hosts for high-performance lithium-sulfur battery," *ECS Transactions*, vol. 77(11), pp.457, 2017. <https://doi.org/10.1149/07711.0457ecst>
8. C. Shen, **J. Xie**, M. Zhang, J. P. Zheng, M. A. Hendrickson, and E. J. Plichta, "Communication—Effect of lithium polysulfide solubility on capacity of lithium-sulfur cells," *Journal of The Electrochemical Society*, vol. 164 (6), pp. A1220-A1222, 2017. <https://doi.org/10.1149/2.1381706jes>
9. C. Shen, **J. Xie**, M. Zhang, P. Andrei, M. A. Hendrickson, E. J. Plichta, and J. P. Zheng, "Understanding the role of lithium polysulfide solubility in limiting lithium-sulfur cell capacity," *Electrochimica Acta*, vol. 248, pp. 90-97, 2017. <https://doi.org/10.1016/j.electacta.2017.07.123>

## **Working Papers**

10. **J. Xie** and B. Yao, “Multi-Branching 2D CNN for Atrial Fibrillation Detection from Single-lead ECGs”, *Expert Systems with Applications*, Submitted, 2023.
11. **J. Xie**, Z. Jiang, and B. Yao, “The Effect of Different Optimization Strategies to Physics-Constrained Deep Learning for Soil Moisture Estimation”, *2023 IISE Annual Conference Proceeding*, Submitted, 2023.
12. **J. Xie**, Z. Jiang, and B. Yao, “Physics-constrained Deep Learning for Estimating Waterflow Dynamics in Soil Systems”, to be submitted to *Soil Science and Society of American Journal*.

## **PROCEEDINGS:**

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13. **J. Xie** and M. Zhang, “Laser Processing Technology for PAN Fiber Carbonization”, In the Composites and Advanced Materials Expo, CAMX Conference Proceedings, 2018. <https://par.nsf.gov/biblio/10087769>
14. J. P. Zheng, C. Shen, **J. Xie**, M. Zhang, P. Andrei, M. A. Hendrickson, & E. J. Plichta, “Energy Density Limitation of Lithium-Sulfur Battery by Lithium Polysulfide Solubility in Electrolyte”, In Meeting Abstracts (No. 5, pp. 473-473), The Electrochemical Society, 2017. <https://iopscience.iop.org/article/10.1149/MA2017-02/5/473/meta>
15. J. Li, **J. Xie**, & M. Zhang, “The Fabrication and Characterization of Nanocarbon Foam as Novel Wick Material for Thermal Management of Electronics”, In TechConnect World Innovation Conference (pp. 52-55), TechConnect, 2017. <https://bit.ly/3CisRZN>

## **REFERRED PRESENTATIONS:**

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1. **J. Xie**, Z. Jiang, B. Yao, “The Effect of Different Optimization Strategies to Physics-Augmented Deep Learning for Soil Moisture Estimation.” IISE Annual Conference, New Orleans, LA, May, 20-23, 2022.
2. **J. Xie**, S. Stavrakis, B. Yao, “Automated Identification of Atrial Fibrillation from Single-lead ECGs Using Multi-branching ResNet.” IISE Annual Conference, New Orleans, LA, May, 20-23, 2022.
3. **J. Xie**, B. Yao, “Physics-constrained Deep Active Learning for Spatiotemporal modeling of Cardiac Electrodynamics.” INFOMRS Annual Conference, Indianapolis, IN, Oct 14-19, 2022.
4. **J. Xie**, B. Yao, “Physics-constrained Deep Active Learning for Spatiotemporal modeling of Cardiac Electrodynamics.” IISE Annual Conference, Seattle, WA, May 21-24, 2022.
5. **J. Xie**, B. Yao, “Physics-constrained Deep Learning for High Dimensional Predictive Modeling.” OSU Cowboy Innovations Health and Life Science Technology showcase, Oklahoma State University, Apr 1<sup>st</sup>, 2022.
6. **J. Xie**, B. Yao, “Physics-constrained Deep Learning for Robust Inverse ECG Modeling.” INFORMS Annual Conference, Oct 24-27, 2021.
7. **J. Xie**, B. Yao, “Physics-constrained Deep Learning for High Dimensional Predictive Modeling.” IISE Annual Conference, May 22-25, 2021. (*Best poster award in QCRE & DAIS Tracks best student poster competition*)
8. **J. Xie**, M. Carles, M. Zhang, “Laser Processing Technology for PAN Fiber Carbonization and Graphitization.” The Composites and Advanced Materials Expo (CAMX), Dallas, TX, Oct 2018.
9. H. Van, **J. Xie**, M. Zhang, “Laser-Induced Graphitic Structure Change in Carbon Materials.” The 3rd Global Nanotechnology Congress and Expo, Scientific Federation, Aug 2017.
10. C. Shen, **J. Xie**, M. Zhang, J. P. Zheng, “Energy density limitation of lithium-sulfur battery.” The 48th Power Sources Conference, Electrochemical Society, Denver, CO, Jun 2018.

11. J. P. Zheng, C. Shen, **J. Xie**, M. Zhang, P. Andrei, M. A. Hendrickson, E. J. Plichta, “Energy Density Limitation of Lithium-Sulfur Battery by Lithium Polysulfide Solubility in Electrolyte.” The 232nd ECS (The Electrochemical Society) Meeting, Electrochemical Society, National Harbor, MD, Oct 2017.
12. C. Shen, **J. Xie**, M. Zhang, J. P. Zheng, M. A. Hendrickson, E. J. Plichta, “Carbon Nanotube (CNT) Foams as Sulfur Hosts for High-Performance Lithium-Sulfur Battery.” The 231st ECS (The Electrochemical Society) Meeting, Electrochemical Society, New Orleans, LA, May 2017.
13. C. Shen, **J. Xie**, M. Zhang, J. P. Zheng, M. A. Hendrickson, E. J. Plichta, “Macroporous Carbon Nanotube (CNT) Foams as Lithium Air Battery Cathodes.” The 231st ECS (The Electrochemical Society) Meeting, Electrochemical Society, New Orleans, LA, May 2017.

## TEACHING EXPERIENCE

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### OKLAHOMA STATE UNIVERSITY, USA

#### *Teaching Assistant*

- Material Science
- Manufacturing Process

*Fall 2021*  
*Spring 2021*

### FLORIDA STATE UNIVERSITY, USA

#### *Teaching Assistant*

- Principal Engineering Economy
- Manufacturing Processes and Materials Engineering I
- ISO9000

*Fall 2019, Spring 2019*  
*Fall 2018, Fall 2019*  
*Spring 2019*

## MENTORING

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### UNDERGRADUATE STUDENTS:

- Grace Hendrix
  - *Project:* Deep learning-enabled automatic detection of atrial fibrillation from ECG signals
  - *Current position:* Undergraduate student in Industrial Engineering and Management, Oklahoma State University
- Maria Eugenia Almanza
  - *Project:* The carbonization of polyacrylonitrile (PAN)-based fiber by CO<sub>2</sub> laser
  - *Current position:* Third Party Manufacturing Engineering at Abbott

## RESEARCH EXPERIENCE

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### THE UNIVERSITY OF TENNESSEE KNOXVILLE & OKLAHOMA STATE UNIVERSITY

#### *Research Assistant:*

- **Physics-constrained Machine Learning for Robust Inverse ECG Modeling**
  - Propose a novel physics-constrained deep learning (P-DL) scheme to accurately predict the heart-surface potentials based on noisy sensor measurements collected on the body surface.
  - Develop an active-learning strategy based on the Gaussian process upper-confidence-bound (GP-UCB) to search for the optimal value of the regularization parameter that controls the effect of physics laws.
- **Spatiotemporal Cardiac Modeling from Sparse Sensor Measurement**
  - Engage the P-DL method to reconstruct cardiac electrodynamics based on sparse sensor measurements on the heart surface.
  - Propose a novel active learning criterion that combines both geodesic distance-based space-filling design and uncertainty quantification to actively select the most informative sites to make sequential sensor observations.
- **Defect localization in 3D complex systems**
  - Develop a GP regression model on the 2D embedding of a 3D geometry to capture the 3D geometric information.



## EXTRACURRICULAR ACTIVITIES

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- **“To My Younger Self” Mentoring Program** *2022-2023*
  - An INFORMS DEI Ambassadors project to provide professional development to women-identifying doctoral students through a tiered set of activities that allows them to interact with more experienced women in the field.
- **“FutureBAProf” Workshop** *Aug 2022*
  - A one-and-half-day workshop sponsored by the University of Iowa for advanced Ph.D. students and postdocs to demystify academic careers in business analytics and help participants prepare for the job market and careers in this field.
- **IISE Future Faculty Fellows (3F) program** *2022-2023*
  - 3F program is a yearlong program designed to give Ph.D. students who major in Industrial & Systems Engineering the opportunity to explore and prepare for a faculty position in academia.

## REFERENCES

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