

SHIXIANG (WOODY) ZHU

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EDUCATION

Georgia Institute of Technology

Ph.D. in Machine Learning
H. Milton Stewart School of Industrial and Systems Engineering
Advisors: Prof. Yao Xie

2017 ~ 2022 (*Expected*)

Beijing University of Posts and Telecommunications

B.S. & M.S. in Computer Science
School of Computer Science & Institute of Network Technology

2010 ~ 2017

RESEARCH INTERESTS

My research lies in the broad area of machine learning and data science, with a particular interest in *developing models for dynamic networks and spatio-temporal data* and *decision making under uncertainty*. The goal of my research is to develop new methodologies for *Social Good* and address high-impact problems in a wide array of applications, such as police operation, power grid and renewable energy, transportation, financial security, and public health.

PUBLICATIONS

Journal Articles (published, in revision, or submitted)

1. Early detection of COVID-19 hotspots using spatio-temporal data.

S. Zhu, A. Bukharin, L. Xie, S. Yang, P. Keskinocak, and Y. Xie.

IEEE Journal of Selected Topics in Signal Processing, 2021. Accepted.

* Finalist of Best Applied Paper Competition at 2021 INFORMS Workshop on Data Mining and Decision Analytics.

* Best Paper Award (Honorable Mention) at ICML Time Series Workshop 2021.

* A short version is accepted for oral presentation and highlighted as contributed talk by ICML Time Series Workshop 2021.

* Excellent Poster Award at Georgia Statistics Day 2021.

2. Spatio-temporal-textual point processes for crime linkage detection.

S. Zhu and Y. Xie.

Annals of Applied Statistics, 2021. Accepted.

* Selected to be presented in The Best of AOAS Session at JSM 2022 (Only 3 out of all papers).

* Best Poster Presentation Award at 2018 Forecasting from Complexity Workshop.

* Best Student Poster Award at Georgia Statistics Day 2018.

* The project won the 2018 Smart 50 Award at the Smart Cities Connect Conference & Expo.

3. Data-driven optimization for police zone design.

S. Zhu, H. Wang, and Y. Xie.

INFORMS Journal on Applied Analytics, 2021. Accepted.

* Finalist of 2021 INFORMS Wagner Prize.

* 2nd place in 2019 INFORMS Doing Good with Good OR Best Paper Competition.

4. Signal processing challenges and examples for *in-situ* transmission electron microscopy.

J. Kacher, Y. Xie, S. P. Voigt, **S. Zhu**, H. Yuchi, J. Key, and S. R. Kalidindi.

IEEE Signal Processing Magazine (Survey paper), 2021. Accepted.

5. Spatio-temporal point processes with attention for traffic congestion event modeling.

S. Zhu, R. Ding, M. Zhang, P. Van Hentenryck, and Y. Xie.

IEEE Transactions on Intelligent Transportation Systems, 2021. To appear.

6. Imitation learning of neural spatio-temporal point processes.

S. Zhu, S. Li, and Y. Xie.

IEEE Transactions on Knowledge and Data Engineering, 2021. To appear.

* A short version is accepted for oral presentation by NeurIPS AI for Earth Sciences Workshop 2020.

7. High-resolution spatio-temporal model for county-level COVID-19 activity in the U.S.
S. Zhu, *A. Bukharin, L. Xie, M. Santillana, S. Yang, and Y. Xie.*
ACM Transactions on Management Information Systems. Vol. 12, Issue 4, Article 33, December 2021.
8. Investigating local oxidation processes in Fe thin films in a water vapor environment by in situ liquid cell TEM.
J. Key, S. Zhu, C. M. Rouleauc, R. R. Unocic, Y. Xie, and J. Kacher.
Ultramicroscopy. Vol. 209, February 2020.
9. Sequential adversarial anomaly detection for one-class event data.
S. Zhu, *H. Yuchi, M. Zhang, and Y. Xie.*
INFORMS Journal on Data Science. In Major Revision.
* Runner up, Best Paper Competition for 2020 INFORMS Workshop on Data Mining and Decision Analytics.
* A short version is accepted for oral presentation by ICASSP 2021.
10. Multi-resolution spatio-temporal prediction with application to wind power generation.
S. Zhu, *H. Zhang, Y. Xie, and P. Van Hentenryck.*
Submitted to IEEE Transactions on Power Systems.
11. Non-stationary spatio-temporal point process modeling for high-resolution COVID-19 data.
Z. Dong, S. Zhu, Y. Xie, J. Mateu, and F. J. Rodríguez-Cortés.
Submitted to Journal of the Royal Statistical Society: Series C.
12. Balanced districting with provable compactness and contiguity.
C. Hettle, S. Zhu, Y. Xie, and S. Gupta.
Submitted to Mathematical Programming, Special Issue on Mathematical Optimization and Fair Social Decisions 2021.
* A short version is accepted for oral presentation by FORC 2021, non-archival track.

Refereed Conference Proceedings

1. Sequential adversarial anomaly detection with deep Fourier kernel.
S. Zhu, *H. Yuchi, M. Zhang, and Y. Xie.*
2021 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).
2. Deep Fourier kernel for self-attentive point processes.
S. Zhu, *M. Zhang, R. Ding, and Y. Xie.*
2021 International Conference on Artificial Intelligence and Statistics (AISTATS).
* Oral presentation, acceptance rate: $48/1527 = 3.1\%$.
3. Goodness-of-fit test for self-exciting processes.
S. Wei, S. Zhu, M. Zhang, and Y. Xie.
2021 International Conference on Artificial Intelligence and Statistics (AISTATS).
4. Adversarial anomaly detection for marked spatio-temporal streaming data.
S. Zhu, *H. Yuchi, and Y. Xie.*
2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).
5. Crime event embedding with unsupervised feature selection.
S. Zhu and *Y. Xie.*
2019 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).
6. Learning temporal point processes via reinforcement learning.
S. Li, S. Xiao, S. Zhu, N. Du, Y. Xie, and L. Song.
2018 Neural Information Processing Systems (NeurIPS).
* Spotlight, acceptance rate: $168/4856 = 3.5\%$
7. Crime incidents embedding using restricted Boltzmann machines.
S. Zhu and *Y. Xie.*
2018 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).
8. Sequential adaptive detection for in-situ transmission electron microscopy (TEM).
Y. Cao, S. Zhu, Y. Xie, J. Key, J. Kacher, R. R. Unocic, and C. M. Rouleau.
2018 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).

9. Data-driven optimization for police beat design in South Fulton, Georgia.
S. Zhu, A. Bukharin, L. Lu, H. Wang, and Y. Xie.
KDD Workshop on Data Science for Social Good 2021.

Preprints and Working Papers

1. Distributionally robust weighted k -nearest neighbors.
S. Zhu, L. Xie, M. Zhang, R. Gao, and Y. Xie.
2. Neural spectral marked point processes.
S. Zhu, H. Wang, X. Cheng, and Y. Xie.
3. A spatio-temporal analysis for power grid resilience to extreme weather.
S. Zhu, R. Yao, Y. Xie, F. Qiu, and X. Wu.
To be submitted to Nature Energy.

PATENTS

1. *Y. Xie and S. Zhu.* Methods and systems for data analysis by text embeddings.
U.S. Patent Application No. 16/383,563. Awarded 2020.

HONOR & AWARDS

Finalist of <i>2021 INFORMS Wagner Prize</i>	<i>Fall 2021</i>
Selected to participate in <i>Cornell ORIE Young Researchers Workshop</i>	<i>Fall 2021</i>
Excellent Poster Award, <i>Georgia Statistics Day</i>	<i>Fall 2021</i>
Finalist of Best Applied Paper Competition, <i>2021 INFORMS Workshop on DMDA</i>	<i>Fall 2021</i>
<i>George Leadership Development Fellows</i>	<i>Summer 2021</i>
Best Paper Award (Honorable Mention), <i>ICML Time Series Workshop 2021</i>	<i>Summer 2021</i>
<i>ML@GT Fellows</i>	<i>Spring 2021</i>
Runner-up, <i>Best Applied Paper Competition at 2020 INFORMS Workshop on DMDA</i>	<i>Fall 2020</i>
Second Place, <i>Doing Good with Good OR Student Paper Competition</i> , INFORMS	<i>Fall 2019</i>
Best Student Poster Award (Honorable Mention), <i>Georgia Statistics Day</i>	<i>Fall 2019</i>
Travel Award, <i>Deep Learning SAMSI workshop</i>	<i>Summer 2019</i>
Best Student Poster Award, <i>Georgia Statistics Day</i>	<i>Fall 2018</i>
Travel Award, <i>ATD workshop</i>	<i>Fall 2018</i>
Best Poster Presentation Award, <i>ASA at 2018 Forecasting from Complexity Workshop</i>	<i>Spring 2018</i>
2018 Smart 50 Award, <i>Smart Cities Connect Conference & Expo</i>	<i>Spring 2018</i>
<i>Qualcomm Scholarship</i> , BUPT	<i>Fall 2015</i>
Best Business Prospect Award (1st Place), <i>Volkswagen Data Science Hackathon</i>	<i>Summer 2015</i>

PRESENTATIONS

Oral Presentations

1. “Data-driven optimization for Atlanta police zone design”
2021 INFORMS Wagner Prize, Anaheim, California, USA.
2021 INFORMS Invited Talk, Anaheim, California, USA.
2. “Data-driven optimization for police beat design in South Fulton, Georgia”
KDD Workshop on Data Science for Social Good 2021 (Virtual).
3. “Early detection of COVID-19 hotspots using spatio-temporal data”
Contributed Talk in ICML Time Series Workshop 2021 (Virtual).
2021 INFORMS Workshop on Data Mining and Decision Analytics.

4. “Deep Fourier kernel for self-attentive point processes”
2021 International Conference on Artificial Intelligence and Statistics (Virtual).
5. “Sequential adversarial anomaly detection for one-class event data”
2020 INFORMS Workshop on Data Mining and Decision Analytics (Virtual).
2021 IEEE International Conference on Acoustics, Speech and Signal Processing (Virtual).
6. “Interpretable deep generative spatio-temporal point processes”
2020 NeurIPS AI for Earth Sciences Workshop (Virtual).
7. “Adversarial anomaly detection for marked spatio-temporal streaming data”
2020 IEEE International Conference on Acoustics, Speech and Signal Processing (Virtual).
8. “Data-driven optimization for police zone design”
2019 INFORMS Doing Good with Good OR, Seattle, Washington, USA.
9. “Crime incidents embedding using restricted Boltzmann machines”
2018 IEEE International Conference on Acoustics, Speech and Signal Processing, Calgary, Alberta, Canada.

Poster Presentations

1. “Early detection of COVID-19 hotspots using spatio-temporal data”
Cornell ORIE Young Researchers Workshop 2021, Ithaca, New York, USA.
2021 Georgia Statistics Day at Emory University, Atlanta, Georgia, USA.
2. “Adversarial anomaly detection for marked spatio-temporal streaming data”
2019 Georgia Statistics Day at Georgia Tech, Atlanta, Georgia, USA.
3. “Imitation learning of neural spatio-temporal point processes”
Deep Learning SAMSI workshop at Duke University, Durham, North Carolina, USA.
4. “Spatio-temporal-textual point processes with applications in crime linkage detection”
2018 Georgia Statistics Day at University of Georgia, Athens, Georgia, USA.
2018 NSF ATD Annual Workshop at American University, Washington DC, USA.
2018 Forecasting from Complexity Workshop at University of Minnesota, Minnesota, USA.
5. “Sequential adaptive detection for in-situ transmission electron microscopy (TEM)”
2018 IEEE International Conference on Acoustics, Speech and Signal Processing, Calgary, Alberta, Canada.

MENTORING

Student Mentoring in Research

Zheng Dong, Ph.D. student at Georgia Tech	<i>Fall 2021</i>
Alexander Bukharin, undergrad student at Georgia Tech * Now Ph.D. student at Georgia Tech.	<i>Spring 2020 ~ Summer 2021</i>
Ruyi Ding, graduate student at Georgia Tech * Now Ph.D. student at Northeastern University.	<i>Fall 2019</i>
Le Lu, graduate student at Georgia Tech * Now Ph.D. student at UT Austin.	<i>Summer 2019 ~ Fall 2019</i>
Yongsuk Lee, graduate student at Georgia Tech	<i>Summer 2019 ~ Fall 2019</i>
Ashley Kwon, high school student at Lambert High School * Now undergrad student at Georgia Tech.	<i>Summer 2019</i>
Aalok Shanbhag, graduate student at Georgia Tech	<i>Summer 2018 ~ Fall 2018</i>

Summer Undergraduate Research in Engineering/Sciences (S.U.R.E.) Program

Ashley McDaniels, undergrad student at North Dakota State University	<i>2021 summer</i>
Emmanuel Teferi, undergrad student at Princeton University	<i>2018 summer</i>

TEACHING EXPERIENCE

Graduate Teaching Assistant at Georgia Tech

ISyE 6414: Statistical Modeling and Regression Analysis	<i>Fall 2017</i>
ISyE 6416: Computational Statistics (Guest Lecture)	<i>Spring 2019</i>
ISyE 6416: Computational Statistics	<i>Spring 2021</i>

OTHER WORK EXPERIENCE

Argonne National Laboratory <i>Research Intern</i>	<i>May 2020 ~ Jan 2021</i>
Beijing Institute of Big Data Research, Peking University <i>Research Assistant</i>	<i>May 2016 ~ Sep 2016</i>
Ecommerce Dept. Phoenix Nest Revenue, Baidu Inc. <i>Machine Learning Engineer</i>	<i>Sep 2015 ~ Mar 2016</i>
Beijing Laboon Tech Ltd <i>Co-Founder & Tech Lead</i>	<i>Sep 2014 ~ Dec 2015</i>

PROFESSIONAL SERVICE

Session Chair for "Machine learning for spatio-temporal data modeling and analysis" in the 2021 INFORMS Data Mining section.

Session Chair for 2020 INFORMS Annual Meeting Data Mining and Decision Analytics.

Journal Referee of IEEE Journal on Selected Areas in Information Theory.

Journal Referee of IEEE Transactions on Signal Processing.

Journal Referee of IEEE Transactions on Intelligent Transportation Systems.

Journal Referee of IEEE Transactions on Power Systems.

Journal Referee of ACM Transactions on Management Information Systems.

Journal Referee of INFORMS Journal on Data Science.

Journal Referee of Neurocomputing.

Conference Reviewer for: KDD 2021; AISTATS 2021; INFOCOM 2021; NeurIPS 2021.

REFERENCES

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Prof. He Wang

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