# Susu Xu

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## RESEARCH INTERESTS

**Physics-guided Learning for Smart City**

- Machine Learning
- Mobile Crowd Sensing
- Internet of Things (IoT)
- Smart City

## EDUCATION

**Carnegie Mellon University**, Pittsburgh (Aug 2014 – Aug 2019)

- **Ph.D.** in Advanced Infrastructure System
- **M.S.** in Machine Learning

**Tsinghua University**, Beijing (Aug 2010 – Jul 2014)

- **B.S.** in Environmental Science and Engineering

## HORNORS AND AWARDS

MIT CEE Rising Star, 2019
Best Paper Award, IEEE International Conference on Machine Learning Applications, 2019
Liang Ji-Dian Graduate Fellowship, Carnegie Mellon University, 2018
NeurIPS Adversarial Vision Challenge, Robust Defense Track, 1st Place, 2018
NeurIPS Adversarial Vision Challenge, Targeted Attack Track, 1st Place, 2018
NeurIPS Adversarial Vision Challenge, Untargeted Attack Track, 3rd Place, 2018
Dowds Fellowship, Carnegie Mellon University, 2017
Fenves Travel Grant, Carnegie Mellon University, Fall 2016/Spring 2017
Dean's Fellowship, College of Engineering, Carnegie Mellon University, 2015
Veolia Scholarship, Tsinghua University, 2013

## JOURNALS

[1] **Susu Xu**, and Hae Young Noh. "An Information-theoretic Approach for Earthquake-induced Building Damage Diagnosis." Submitted to Earthquake Engineering and Structural Dynamics.

[2] **Susu Xu**, and Hae Young Noh. "Knowledge Transfer between Buildings for Post-Earthquake Damage Diagnosis without Historical Data". Submitted to Earthquake Engineering and Structural Dynamics.

[3] Xidong Pi, **Susu Xu**, Zhen (Sean) Qian. "Optimal Curbside Designated Pick-up/Drop-off Locations for Ridesourcing and Ridesharing Autonomous Vehicles". Submitted to IEEE Transactions on Intelligent Transportation Systems.

[4] Xinlei Chen*, **Susu Xu***, Carlee Joe-Wong, Hae Young Noh, Pei Zhang. "ASC: Actuation System for City-scale Ride Sharing Vehicular Mobile Crowdsensing." Submitted to IEEE Internet of Things Journal.

[5] **Susu Xu,** Xinlei Chen, Carlee Joe-Wong, Pei Zhang, and Hae Young Noh. "iLOCuS: Incentivizing Vehicle Mobility to Optimize Sensing Distribution in Crowd Sensing." in *IEEE Transactions on Mobile Computing*. DOI: 10.1109/TMC.2019.2915838

[6] Prakash Anand, **Susu Xu**, Ram Rajagopal, and Hae Young Noh. "Robust Building Energy Load Forecasting Using Physically-Based Kernel Models." Energies 11, no. 4 (2018): 862.

[7] Shijia Pan, **Susu Xu**, Mostafa Mirshekari, Pei Zhang, and Hae Young Noh. "Collaboratively adaptive vibration sensing system for high-fidelity monitoring of structural responses induced by pedestrians." Frontiers in Built Environment 3 (2017): 28.

[8] **Susu Xu,** Lin Zhang, Pei Zhang, and Hae Young Noh. "Information-Theoretic Approach for Indirect Train Traffic Monitoring Using Building Vibration." Frontiers in Built Environment 3 (2017): 22.

## PEER-REVIEW CONFERENCES

[8] Jingxiao Liu, **Susu Xu**, Mario Berges, Jacobo Bielak, James H. Garrett, Hae Young Noh. "An expectation-maximization algorithm-based framework for vehicle-vibration-based indirect structural health monitoring of bridges". International Workshop on Structural Health Monitoring 2019.

[9] **Susu Xu**, Xinlei Chen, Xidong Pi, Carlee Joe-Wong, Pei Zhang, and Hae Young Noh. "Incentivizing vehicular crowdsensing system for large scale smart city applications." In Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2019, vol. 10970. International Society for Optics and Photonics, 2019.

[10] **Susu Xu**, Xinlei Chen, Xidong Pi, Carlee Joe-Wong, Pei Zhang, and Hae Young Noh. "Vehicle dispatching for sensing coverage optimization in mobile crowdsensing systems." In Proceedings of the 18th International Conference on Information Processing in Sensor Networks, ACM, 2019.

[11] Smailagic, Asim, Hae Young Noh, Pedro Costa, Devesh Walawalkar, Kartik Khandelwal, Mostafa Mirshekari, Jonathon Fagert, Adrián Galdrán, and **Susu Xu**. "MedAL: Deep Active Learning Sampling Method for Medical Image Analysis." 2018 17th IEEE International Conference on Machine Learning and Applications (ICMLA), Orlando, FL, 2018, pp. 481-488. DOI: 10.1109/ICMLA.2018.00078

[12] **Susu Xu**, Lin Zhang, Pei Zhang, and Hae Young Noh. "An Indirect Traffic Monitoring Approach Using Building Vibration Sensing System." In Proceedings of the 14th ACM Conference on Embedded Network Sensor Systems CD-ROM, ACM, 2016.

[13] **Susu Xu**, Pei Zhang, and Hae Young Noh. "Information Theoretic Approach for Seismic Damage Localization." The 16th World Conference on Earthquake Engineering, Santiago, Chile, 2016.

## CONFERENCES & PREPRINTS

[14] Chen, Xinlei*, **Susu Xu***, Haohao Fu, Carlee Joe-Wong, Lin Zhang, Hae Young Noh, and Pei Zhang. "ASC: actuation system for city-wide crowdsensing with ride-sharing vehicular platform." In Proceedings of the Fourth Workshop on International Science of Smart City Operations and Platforms Engineering, pp. 19-24. ACM, 2019.

[15] Hongyang Zhang, **Susu Xu,** Jiantao Jiao, Pengtao Xie, Ruslan Salakhutdinov, and Eric P. Xing. "Stackelberg GAN: Towards Provable Minimax Equilibrium via Multi-Generator Architectures." arXiv preprint arXiv:1811.08010 (2018).

[16] **Susu Xu**, Weiguang Mao, Yue Cao, Hae Young Noh, and Nihar B. Shah. "An Incentive Mechanism for Crowd Sensing with Colluding Agents." arXiv preprint arXiv:1809.05161 (2018).

[19] Yu, Tong, Shijia Pan, **Susu Xu**, Xinlei Chen, Mostafa Mirshekari, Jonathon Fagert, Hae Young Noh, Pei Zhang, and Ole J. Mengshoel. "Ilpc: Iterative learning using physical constraints in real-world sensing data." In Workshops at the Thirty-Second AAAI Conference on Artificial Intelligence. 2018.

## POSTER & PRESENTATION

[18] "Vehicle Dispatching for Sensing Coverage Maximization in Crowdsensing Systems." *18th ACM/IEEE Conference on Information Processing in Sensor Networks,* Montreal, Canada, 2019

[19] "Physics-guided Information Acquisition and Learning with Constrained Sensing Capability in Urban Infrastructure Systems." *18th ACM/IEEE Conference on Information Processing in Sensor Networks,* Montreal, Canada, 2019

[20] "Adversarial Vision Challenge: Theory-inspired Approaches for Adversarial Machine Learning." *Neural Information Processing Systems (NeurIPS),* Montreal, Canada, 2018

[21] "Incentivizing Large-scale Vehicular Crowdsensing System for Smart City Applications." *SPIE Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems,* Denver, Co, 2019

[17] "An Indirect Traffic Monitoring Approach Using Building Vibration Sensing System". *Proceedings of the 14th ACM Conference on Embedded Network Sensor Systems*, Stanford, CA, 2015

## PATENT

Xinlei Chen, **Susu Xu**, Shijia Pan, Hae Young Noh, Pei Zhang. "Adaptive Hybrid Model-enabled Sensing System (HMSS) for Mobile Fine-Grained Air Pollution Estimation." Provisional

## WORKING EXPERIENCE

**Research Intern at Petuum Inc.** May 2018 – Aug 2018

- Developed and Implemented the algorithm to extract financial knowledge graph from web-sourced text data based on reinforcement learning.
- Developed Stackelberg GANs which alleviates the instability issue in the GAN training procedure via new architecture design, and evaluated the performance of the algorithm on public datasets like CIFAR-10 and ImageNet.

**Intern Data Scientist at Nike Inc. (Strategy & analytics team)** Jun 2017 – Aug 2017

- Proposed hierarchical model based on LSTM to deal with hierarchical time-series product sales data.
- Implemented the algorithm on multiple Nike products to forecast the product sales in various time granularities, and improve the prediction accuracy by up to 30 percentages, and report the results to Nike's world headquarter leadership.

**Intern Data Scientist at IBM Research, China** Jun 2015 – Aug 2015

- Proposed neural network-based model to predict long-term Air Quality Index and concentration of multiple air pollutants in 34 cities.
- Implemented the algorithm on the crawled time-series air pollution data, and improve the prediction accuracy by 12%.

## TEACHING EXPERIENCE

**Sensing and Data Mining in Infrastructure Systems,** Carnegie Mellon University
Spring 2016/2017/2018/2019

*Teaching Assistant*

Course Description: This course introduces smart monitoring systems for applications in physical structures and systems. This course include weekly assignment and course projects, which helps student learn to define a sensing and/or data analysis problem, identify information they need to solve the problem, build their sensor network and data collection systems, select and apply or develop machine learning techniques to analyze the collected data, and evaluate their performance according to their cyber-physical system applications.

My Role:

- 1-2 Lectures per semester highlighting the machine learning and signal processing algorithms
- I managed 9-12 students per semester, meeting with them weekly and guiding them through the development and completion of their assignments and course projects.

## SERVICES

**Referee**

- IEEE Transactions on Vehicular Technology
- International Conference on Machine Learning (ICML)
- IEEE Access
- Structural Control and Health Monitoring
- Energies
- Journal of Ambient Intelligence & Humanized Computing

**Workshop Chair**:
Ubicomp Workshop on Continual and Multimodal Learning for Internet of Things (https://cmliot2019.github.io/)

## STUDENT SUPERVISION

- **Rui Ma,** Ph.D. in Electronic Engineering, Tsinghua University
- **Jingxiao Liu,** Ph.D. in Civil Engineering, CMU
- **Yujie Wei,** Ph.D. in Civil Engineering, CMU
- **Prakash Anand**, Master in Civil Engineering, CMU
- **Qiyang Chen,** Master in Civil Engineering, CMU
- **Qianyue Zhang,** Master in Civil Engineering, CMU
- **Jingqiu Tao**, Master in Civil Engineering, CMU
- **Lingqiu Kong**, Master in Civil Engineering, CMU
- **Akhil Mathur**, Master in Civil Engineering, CMU
- **Nyla Khan**, Master in Civil Engineering, CMU
- **Janani Venkataraman**, Master in Civil Engineering, CMU

## PROFESSIONAL MEMBERSHIPS

- Member, Association for Computing Machinery (ACM)
- Member, American Society of Civil Engineers (ASCE)
- Member, Institute of Electrical and Electronics Engineers (IEEE)

Member, Society of Photographic Instrumentation Engineers (SPIE)

## TECHNICAL SKILLS

**Programming Languages:**

- Python, MATLAB, C, R, SQL

**Library & API:**

- Tensorflow, Pytorch, Pandas, Scikit-learn, Hadoop, Spark

**Tools:**

- AWS, Git, Sublime, Bash