

## XIAOMU LIU

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### EXPERTISE

**Mathematical and applied statistics:** Frequentist and Bayesian inference, estimation theory, hypothesis testing, regression analysis, sampling theory, design of experiments

**Machine learning:** supervised and unsupervised learning algorithms, anomaly detection, probabilistic graphical models

**Stochastic process:** time series analysis, signal processing, image processing, state-space models

**Optimization:** linear and nonlinear programming

**Computational statistics:** Monte Carlo simulation

### EXPERIENCE

#### Data Scientist

Nov 2019 - Present

*Amazon.com, Inc., Seattle, WA*

Perform quantitative modeling and analysis for transportation network design and planning team. Deliver recommendations to a wide variety of stakeholders, including executive-level sponsors.

- Developing models for forecasting transportation network's ability to promise fast deliveries.
- Used queueing theory to analyze warehouse backlog issues.
- Conducted a quasi-experimental study on elasticity of demand to delivery promises displayed on the detail page of an item.

#### Data Scientist

Sep 2017 - Nov 2019

*Uptake Technologies Inc., Chicago, IL*

Responsible for helping major industry customers optimize asset performance and reduce downtime through leveraging industrial Internet-of-things (IoT) data, including conducting proof of concept and bridging the gap to model production.

- *General Motors:* Led the work of developing data-driven solutions for improving effectiveness of the alarm system of stamping press lines. Productionized a model for detecting premature wear and tear.
- *Ryder:* Identified signal patterns of health status on a variety of operating modes from satellite transmitted truck sensor data. Prototyped a condition monitoring model for exhaust and cooling systems.
- *Ford:* Supported data insight generation for the performance of rivet gun robots by conducting statistical analysis; Designed experiments for comparing failure rate, maintenance effectiveness, and asset availability for two rivet feeding systems
- *Panduit:* Enhanced the functionalities of network monitoring system by adding anomaly detection for potential disconnection issues. Studied K-way association between environmental factors and intranet data transmission interruption.
- *Caterpillar:* Improved models for predicting component life and failures of spark plugs and compressor valves on gas compression engines.

#### Research Assistant

Aug 2010 - Aug 2017

*Medical Imaging Research Center, Illinois Institute of Technology, Chicago, IL*

Predictive policing project in collaboration with the Chicago Police Department, funded by the National Institute of Justice.

- Built temporal models for predicting daily citywide violent crime count. Identified the most influential factors that lead to daily crime rate fluctuation.
- Developed a framework that predicts Chicago daily violent crime rates at the district level, including a mesh grid model for spatially adaptive crime density mapping which was further integrated in modeling stochastic point process.
- Applied probabilistic-graphical-model-based clustering to identify regions of common crime patterns. Proposed an approach that provides a way to extend the concepts of accuracy and reproducibility to clustering model selection.
- Conducted feature engineering utilizing geospatial data, designed and built street-level spatiotemporal models that predict crime incidents in a city block next day.

- Designed experiments for location selection for surveillance camera placement. Drew causal inference for the attribution of the presence of surveillance camera in crime reduction.
- Participated in social network analysis research on assessing individual involvement in violent criminal activities.

Application of sparse Bayesian learning in computer-aided breast cancer diagnosis

- Applied relevance vector machine model to detecting microcalcifications in mammograms.

Application of Curvelet transform in tomography image reconstruction

- Compared two fast discrete curvelet transform algorithms in terms of sparsity and complexity.

### **Curriculum Designer (Remote, Part time)**

May 2017 - Aug 2017

*Flatiron School, subsidiary of WeWork, New York, NY*

Assisted lead instructors in designing instructional materials including curriculum plans, eLearning handouts and other training materials for data science bootcamp courses.

### **Software Engineer (Contractor)**

Jan 2014 - Aug 2016

*Chicago Police Department, Chicago, IL*

Deployed a real-time forecast dashboard incorporated in the internal web portal.

### **Teaching Assistant**

Jan 2011 - May 2012

*Department of Electrical and Computer Engineering, Illinois Institute of Technology, Chicago, IL*

Led lab sessions, prepared and graded assignments for several signal processing track courses.

### **Research Assistant**

May 2008 - Jun 2009

*Bioinformatics Center, United Genes Group Ltd., Shanghai, China*

Conducted Meta-analysis for identification of cell-cycle regulated genes and transcription factors in microarray gene expression data.

### **Bioinformatics Analyst (Intern)**

July 2008 - Aug 2008

*Biochip National Engineering Research Center, CapitalBio Technology Co., Ltd and*

*Tsinghua University Joint laboratory, Beijing, China*

Responsible for protein chip data transformation automation.

## **EDUCATION**

Ph.D. in Electrical Engineering, GPA 4.0, Illinois Institute of Technology, Chicago, IL

Aug 2017

*Thesis: Temporal and spatiotemporal models for short-term crime prediction*

M.S. in Electrical Engineering, GPA 4.0, Illinois Institute of Technology, Chicago, IL

Dec 2011

B.S. in Biomedical Engineering, Fudan University, Shanghai, China

Jul 2009

## **PUBLICATIONS**

- X Liu, Y Yang, J Candella, J Lewin, and MN Wernick. Mapping the risk terrain: an urban crime forecasting study. *Journal of Quantitative Criminology*, 25(3):325–339, 2017
- X Liu, J Brankov, Y Yang, J Candella, J Lewin, and MN Wernick. Criminal incident prediction using a point-pattern-based density model. *International Journal of Forecasting*, 19(4):603–622, 2015
- P Kump, DH Alonso, X Liu, Y Yang, J Candella, J Lewin, and MN Wernick. Measurement of repeat effects in Chicago's criminal social network. *Applied Computing and Informatics*, 12(2):154–160, 2016

## **ACTIVITIES AND HONORS**

Amazon Machine Learning Conference reviewer, May 2020

2018 Quarter 3 Most Valuable Employee Award (Top 3), Uptake, 2018

Highest Standards of Academic Achievement, Illinois Institute of Technology, Mar 2012

## **TECHNICAL SKILLS**

Python, R, SQL, Matlab, C/C++, Linux, Spark, Bash Scripting, Markdown, Git, LaTeX