

Education

2008-2015 **Ph.D. in Computational Physics**, University of Illinois at Chicago.

Research Area: *Anomaly Detection, Conditional Monitoring, Deep Learning, Signal Processing, Wireless Security, DFT calculations, Multivariate Statistical Modeling, Advanced Mechanics Modeling, and Machine Learning Applications.*

2012-2013 **MS in Statistics**, University of Illinois at Chicago.

Master's Exam: High Pass.

2010-2012 **MS in Applied Mathematics**, University of Illinois at Chicago.

Master's Exam: High Pass.

2008-2011 **MS in Physics**, University of Illinois at Chicago.

Qualifying exam: All Pass.

Machine Learning and Data Science Work Experience

05/2018-Present **Lead Data Scientist**, Cars.com, Great Chicago Area.

- Lead a team of engineers and data scientists to conduct dealer retention model, churn prediction model, and **marketing revenue generation model** on **AWS**. The dealer churn prediction model and dealer retention model generate **\$5,000,000+** revenue annually.
- Lead and conduct research and development on machine learning image processing tool (MLIP) (**tensorflow, keras, opencv, skimage, scipy**) which enables *image recognition, image quality enhancement, and image scoring*. This tool is featured in cars.com technology medium and is able to process million-level listing images. [0]
- Conduct listing/advertisement **best match machine learning processing** which scores listings with the goal of identifying the most relevance by consumer searches. The click conversion rate is increased by **30%** based on the best match model.
- Conduct **listing/advertisement recommendation model** to provide contextual product recommendations to users.
- Mentor team members on data analysis and modeling tasks including deploy data science models into **AWS (terraform, ecs, ec2, sagemaker, codecommit, cloudwatch)**, data visualization, data-story-telling.
- Manage data science engagements for targeting new automobile dealers. Lead research and design dealer retention models (**xgboost, lightgbm, scikit-learn, numpy, pandas, gensim**), and deploy them into production using *aws, jenkins, and terraform*.

10/2015-05/2018 **Data Science Lead**, Uptake Technologies, Great Chicago Area.

- Research and develop multivariate statistical modelings (**R data.table, xgboost; Python pandas, scikit-learn, scipy**) based on *PCA, local kernel regression, tree-based model and local similarity based modeling*.
- Hold **4 U.S. machine learning patents/patent applications** regarding unsupervised learning, supervised learning, anomaly detections in multivariate data, and remedy of software anomalies.
- Develop and deploy **machine learning anomaly detection (MLAD)** cloud computing platform, which is monitoring over 1 billion streaming readings per day. This anomaly detection engine is productized and detecting anomalous for **500+ wind turbines** all over the world. [1].
- Perform regular code reviews, write **R(Rstudio)** and **Python(Jupyter)** software packages and manage version control through **git**.
- Design and implement model performance report using **MySQL, Elasticsearch**, and **Cassandra**. This has significantly improved the robustness and accuracy of models' performance up to 50%.
- Lead a team of data scientists and software engineers. we are responsible for the development of machine learning technology with special emphasis on diagnostics, prognostics, **unsupervised learning algorithms**. Hold routine customer-facing meetings with subject matter experts regarding model validation and mechanical system prognostics.

06/2015-08/2015 **Data Scientist (Intern)**, Huawei Technologies, Great Chicago Area.

- Conduct wireless network data mining, machine learning (**scikit-learn**, **spark**) and big data security analysis (Python) in order to detect unknown attacks, zero-day attacks, and advanced persistent threat. The analysis includes: 1. data preprocessing (Linear Regression, Principal Component Analysis); 2. user clustering using adapted algorithms (K-Means Clustering); 3. anomaly detection through predictive modeling (One-Class Support Vector Machines).
- *Hold 1 U.S. patent [2]* which illustrates a machine learning methodology to improve the anomaly detection rate. 98% TPR and 7.6% FPR were obtained by applying embodiment anomaly detection techniques to the KDD 99 dataset. The testing results outperform other known anomaly detection techniques.

Machine Learning Patents and Patent Applications

- 10/2015 **Methodology to Improve Anomaly Detection Rate.**
Zhibi Wang and Tuo Li, Huawei Technologies, US Patent 62/236,745.
- 09/2016 **Detection of Anomalies in Multivariate Data.**
Tuo Li et al., Uptake Technologies, US Patent 63/382,639.
- 10/2017 **Computer System and Method for Detecting Anomalies in Multivariate Data.**
Tuo Li and James P Herzog, Uptake Technologies, U.S Patent Application Serial No.:15/788,622.
- 11/2017 **Systems and Methods for Detecting and Remedying Software Anomalies.**
Yuan Tang, Tuo Li, and James P Herzog., Uptake Technologies, U.S Patent 10/635,519.
- 04/2018 **Computer System and Method for Creating a Supervised Failure Model.**
Tuo Li et al., Uptake Technologies, US Patent 10/635,095.

Data Science and Data Analysis Publications

- 08/2019 **Applications of Machine Learning Image Processing in Digital Marketing.**
Tuo Li, <https://tech.cars.com/applications-of-machine-learning-image-processing-in-digital-marketing-982ee296dc8a>
- 07/2015 **Density Functional Theory Analysis of Hexagonal Close-Packed Elemental Metal Photocathodes.**
Tuo Li, B.L. Rickman, and W.A. Schroeder, Physical Review ST Accelerators and Beams 18.073401 (2015): 10.1103.
- 03/2015 **Emission Properties of Group VIb Elemental Photocathodes.**
Tuo Li, B.L. Rickman, and W.A. Schroeder, Journal of Applied Physics 117.13 (2015): 134901.
- 02/2016 **Photoelectric Emission Properties of Photocathode Materials.**
Tuo Li, Ph.D. thesis, University of Illinois at Chicago.
- 04/2017 **PbTe(111) Sub-Thermionic Photocathode: A Route to High-Quality Electron Pulses.**
Tuo Li and W.A. Schroeder, arXiv preprint arXiv:1704.00194 (2017).
- 05/2017 **Nonparametric Modeling of Face-Centered Cubic Metal Photocathodes.**
Tuo Li and W.A. Schroeder, arXiv preprint arXiv:1704.05371 (2017).
- 11/2012 **Excited-state Thermionic Emission in III-Antimonides: Low Emittance Ultrafast Photocathodes.**
J.A.Berger, B.L. Rickman, Tuo Li and W.A. Schroeder, Applied Physics Letters 101.19 (2012): 4103.
- 11/2007 **Four Wave Mixing with Matter Waves.**
Tuo Li, China Modern Education with Honor, 2007.

Computer Skills

Programming	R, Python, Matlab.
Data Tools	MySQL, Spark.
Others	Bash Script, Git, Linux, Jupyter.