Tuo Li

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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, churn prediction, and marketing revenue generation on **AWS**. The dealer churn prediction model and dealer retention model generate **$5,000,000+** revenue annually.
• Lead 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]
• 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 churn 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.
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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 persistence 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.

Computer Skills

Programming	R, Python, Matlab, Scala.
Data Tools	MySQL, Spark.
Others	Shiny, Rmarkdown, Spark, Bash Script, Git, Linux, Jupyter, HTML, CSS, LaTeX, OpenOffice, GNUplot.

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 Modell**.
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.*

Data Science Certifications

12/2015 Data Science Specialization, Johns Hopkins University.
License: F3B87LWRAS5J

10/2015 The Data Scientist's Toolbox, Johns Hopkins University, Score: 100/100.
License: WZKDG8MQ9A

10/2015 R Programming, Johns Hopkins University, Score: 100/100.
License: CF4SAV6D77

10/2015 Getting and Cleaning Data, Johns Hopkins University, Score: 100/100.
License: Z725RFB4GZ

10/2015 Practical Machine Learning, Johns Hopkins University, Score: 100/100.
License: 7KQJPR37PY

10/2015 Statistical Inference, Johns Hopkins University, Score: 100/100.
License: ACM6R3ADRQ

10/2015 Reproducible Research, Johns Hopkins University, Score: 95/100.
License: R52KZ8J4MX

10/2015 Regression Models, Johns Hopkins University, Score: 94/100.
License: G5PV6YTXBE

10/2015 Developing Data Products, Johns Hopkins University, Score: 97/100.
License: 8EFBKUGRNS

10/2015 Data Science Capstone, Johns Hopkins University, Score: 100/100.
License: 8SDEHL93RW

08/2015 Big Data XSeries Certificate, UC Berkeley.
License: 664ff045d39043b3b8baf843dc5ea82b

08/2015 Introduction to Big Data With Apache Spark, UC Berkeley, Score: 100/100.
License: 12124e27958740548193e20264acf5ae

07/2015 Scalable Machine Learning, UC Berkeley, Score: 100/100.
License: ff35da03e2df4d5f9673810c382759bb