Ting Gao

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EDUCATION

- **Illinois Institute of Technology** Ph.D., Applied Math — Aug. 2010 – May. 2015
- **Southwest University** M.S., Applied Math — Sep. 2007 – Jul. 2010
- **Southwest University** B.S., Mathematics — Sep. 2003 – Jul. 2007

WORK EXPERIENCE

Associate Professor, Huazhong University of Science and Technology

Wuhan, Hubei — Dec. 2020 – present

- Learning governing laws for stochastic dynamical systems under non-Gaussian Levy noise
  - Time evolutionary latent dynamics
  - Interaction kernels in particle systems
- Learning effective dynamics in stochastic dynamical systems under non-Gaussian Levy noise
  - Transition pathway
  - Long term asymptotic dynamics
- Explanable deep learning modelling through dynamical systems' point of view
- Applications on high-dimensional complex data analysis & Research Labs
  - MIMO
  - Brain Science
  - Private Computing
  - Quantitative Finance

Machine Learning Engineer II, Revenue Science R&D

Twitter, San Francisco — Dec. 2018 – Dec. 2020

- Learning-period ads optimization
  - Improved PCTR prediction via attention mechanism on deep neural network
  - Designed multiple boosting mechanisms for enhancing new campaigns' survival rate during/after learning period as well as better long-term ads budget utilization
  - Designed experiments and analyzed new campaigns' performance to help make business decisions
- Launched a new large scale deep learning model for real time video ads engagement prediction
- Designed and implemented an innovative reinforcement learning framework for real time bidding in ads
- auction Presented state-of-the-art research papers from premier conferences
- Led two summer interns: PCTR exploration through contextual bandit, CPE optimization via reinforcement learning

Senior Data Scientist/Tech Lead, R&D

Machine Zone, Palo Alto — Sep. 2017 – Nov. 2018

- Refactored sales recommendation system to OOP modules and generalized ML tools
  - Scale up personalized sales recommendation system to players at all levels and all price points.
  - Build map-reduce data pipeline to improve data quality with PySpark.
- Developed cohort inflation optimization model and tool to improve total ROI for new game release
  - Automate cohort sales inflation strategies with Multi-arm bandit UCB.
- Built MZ's first sales recommendation system to improve revenue lift and purchase conversion
  - Data pipeline from various data sources: Hive, Vertica, MySQL, Hbase, Redis.
  - Models using DDPG, LSTM, GBT, Clustering & robust Softmax, Sequential Pattern Mining.
  - AB testing experiments framework for model iterations and automatic performance report.

Data Scientist, R&D

Machine Zone, Palo Alto — Mar.2016 – Sep. 2017

- Created a data product to track the healthiness of long term user engagement and optimize strategies on critical

targets
    - Markov chain modeling for cohort flow/churn prediction.
    - Created a tree based generic bucketing framework for time series anomaly detection.
- Long term revenue prediction
    - Created revenue targeting and prediction model/UI to help sales reach monthly revenue goal and game feature release.
    - Built random probability matching algorithms for real time creative optimization.
    - Budget planning and allocation for product release using linear programming and portfolio optimization algorithms.

Data Analyst, R&D
Machine Zone, Palo Alto Feb. 2015 – Mar. 2016
- Built automatic reports for Game KPI and ROI summary to support game design and live operations.
- Designed statistical analysis and Machine learning methods to help make business decision
    - Game: kingdom open/close control, kingdom war pairing, inflation analysis, etc.
    - Marketing TV ads campaign management, ROI prediction.

Graduate Research & Teaching Assistant
Illinois Institute of Technology, Chicago Aug. 2010 – Dec. 2014
- Created numerical algorithms for computing first passage time and escape probability of Non-Gaussian process.
- Quantifying model uncertainty under Non-Gaussian noise.
- Taught courses: Computational Mathematics, Probability and Statistics, Calculus, hand-on Mathematica lab.

Institute for Pure and Applied Mathematics (IPAM), Los Angeles Jan. 2012 – Jul. 2013
- Created numerical algorithms for computing Fokker-Planck equations of Non-Gaussian process.
- Data assimilation under Non-Gaussian noise.

TECHNICAL SKILLS

- Programming Languages: Python, R, Scala, C, Matlab, Tensorflow, Pytorch
- Database & Big Data Ecosystem: MySQL, Vertica, HIVE, Hbase, Redis, Druid, Hadoop, Spark
- Stochastic modeling, Time Series Analysis, Statistical Learning, Deep Learning, Deep Reinforcement Learning

PUBLICATIONS & PATENTS

[1] J. Chen, **T. Gao**, Y. Li and J. Duan, Detecting the Most Probable High Dimensional Transition Pathway Based on Optimal Control Theory, 2023. arXiv:2303.00385 submitted to Physica D.

[2] L. Feng, **T. Gao**, J. Duan, Learning reduced effective dynamics from data-driven stochastic dynamcial systems, 2022, arXiv:2205.04151. submitted to Chaos.

[3] H. Huang, **T. Gao**, Y. Gui, J. Guo, P. Zhang, Model Based Reinforcement Learning with Non-Gaussian Environment Dynamics and its Application to Portfolio Optimization, submitted, 2023. arXiv:2301.09297. submitted to Applied Mathematical Modelling.

[4] L. Yang, **T. Gao**, M. Dai, Y. Lu, W. Wei, J. Duan, Meta contrastive label correction for financial time series, arXiv:2303.08103 submitted. 2023.

[5] L. Feng, **T. Gao**, T. Li, Z. Lin, X. Liu, Approximations of Levy processes by integrated fast oscillating Ornstein-Uhlenbeck processes, submitted to Stochastics and Dynamics. 2023.

[6] L. Yang, T. Gao, Y. Lu, J. Duan, T. Liu, Neural network stochastic differential equation models with applications to financial data forecasting, Applied Mathematical Modelling 115, 279-299, 2023.

[7] W. Wei, **T. Gao**, X. Chen, J. Duan, An Optimal Control Method to Compute the Most Likely Transition Path for

Stochastic Dynamical Systems with Jumps, Chaos, 32, 051102, 2022.

[8] C. Fang, Y. Lu, **T. Gao** and J. Duan, An end-to-end deep learning approach for extracting stochastic dynamical systems with α-stable L´evy noise, Chaos, 32, 063112, 2022.

[9] Y. Lu, R. Maulik, **T. Gao**, F. Dietrich, I. Kevrekidis, J. Duan, Learning the temporal evolution of multivariate densities via normalizing flows, Chaos 32, 033121, 2022.

[10] Min Dai, **Ting Gao,** Yubin Lu, Yayun Zheng, Jinqiao Duan, Detecting the maximum likelihood transition path from data of stochastic dynamical systems, *Chaos*, 30, 113124, 2020.

[11] **Ting Gao**, C. Lam, etc. Sales inflation recommendation based on DDPG. *Application number 62/856,536.* 2019.6.3.

[12] **Ting Gao**, J. Duan, X. Li, Fokker-Planck Equations for Stochastic Dynamical Systems with Symmetric Levy motions. *Appl. Math Comput.* Vol.278, (2016) 1-20.

[13] J. Duan, **Ting Gao**, G. He, Quantifying model uncertainty in dynamical systems driven by non-Gaussian Levy stable noise with observations on mean exit time or escape probability. *Commun Nonlinear Sci Numer Simulat*. 39 (2016) 1-6.

[14] **Ting Gao**, J. Duan, X. Kan, Z.Cheng, Dynamical inference for transitions in stochastic systems with alpha-stable Levy noise. *J Phys A-Math Theor.* Vol.49(29), December, 2015.

[15] **Ting Gao**, J. Duan, X. Li, R. Song, Mean exit time and escape probability for dynamical systems driven by Levy noise. *SIAM J. Sci. Computing. SIAM J. Sci. Computing*. Vol. 36, No. 3, pp. A887-A906, 2014.

[16] M. Hao, **Ting Gao**, J. Duan, W. Wu, Non-Gaussian dynamics of a tumor growth system with immunization. *Inverse Problems & Imaging,* Vol. 7 Issue 3, August, 2013.

[17] **Ting Gao**, J. Duan, G. He, Quantifying Model Uncertaities in the Space of Probability Measures. *Interdisciplinary Mathematical Sciences*. Volume 13, p.99-110, 2012.

[18] J. Ren, C. Li, **Ting Gao**, X. Kan and J. Duan, Mean Exit Time and Escape Probability for a Tumor Growth System under Non-Gaussian noise. *International J. Bifurcation and Chaos,* Vol. 22, No. 4, 2012.

[19] **Ting Gao**, Wendi Wang, Xianning Liu, Mathematical analysis of an HIV model with impulsive antiretroviral drug doses. *Mathematics and Computers in Simulation.* Vol. 82, Issue 4, p.653-665, 2011.

[20] **Ting Gao**, Wendi Wang, Global analysis of a viral model with delayed intracellular immune response. *Journal of Southwest University (Natural Science),* April, 2009.

[21] Ruida Wang; Junbao Zhou; Zhuan Cheng; Jinqiao Duan; **Ting Gao**; Yan Jiao; Yang Liu; Biyun Zeng; Pengbo Li ; Homomorphic Ciphertext-PC, 2022-10-06, 欧洲, PCT/SE2022/050900 (专利) .

[22]Zhuan Cheng; Shuyu Jin; Ruida Wang; **Ting Gao**; Jinqiao Duan; Yan Jiao; Yang Liu; Biyun, Zeng; Pengbo Li ; Homomorphic recommendation-PC, 2022-10-06, 其他国家, PCT/SE2022/050898(专利).