

Gao,Ting(高婷)

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

Jan. 2021 – present

- **Extracting governing laws of stochastic dynamical systems under non-Gaussian noise**
 - Time evolutionary latent stochastic dynamical systems
 - Interaction kernels in particle systems
 - Time-varying network reconstruction
- **Learning and controlling effective dynamics in stochastic dynamical systems**
 - Transition pathways in chemistry, biophysics and brain science
 - Effective reduced order dynamics
- **Explainable AI**
 - Reinforcement learning, Meta Learning, Generative Modelling
 - Reservoir Computing, Spiking Neural Network
- **Applications on high-dimensional complex data analysis and tipping phenomena**
 - Brain Diseases: functional network construction, early warning biomarker and control
 - MIMO 5G communication: channel estimation and error control
 - Quantitative Finance: investment optimization and risk management
 - Privacy Computing: TFHE based private preserving SNN

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

- o Markov chain modeling for cohort flow/churn prediction.
- o Created a tree based generic bucketing framework for time series anomaly detection.
- Long term revenue prediction
 - o Created revenue targeting and prediction model/UI to help sales reach monthly revenue goal and game feature release.
 - o Built random probability matching algorithms for real time creative optimization.
 - o 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
 - o Game: kingdom open/close control, kingdom war pairing, inflation analysis, etc.
 - o 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 Analysis; Stochastic Dynamical Systems; Advanced Probability and Statistics; Stochastic Optimal Control; Statistical Learning; Deep Learning; Deep Reinforcement Learning

PUBLICATIONS & PATENTS

[1] L Yang, F Lu*, **T Gao**, W Wei, J Duan, Learning Levy density via adaptive RKHS regression with bi-level optimization, arXiv:2512.23621, 2025.

[2] Cheng J, **Gao T***, Duan J. Adaptive control for multi-scale stochastic dynamical systems with stochastic next generation reservoir computing[J]. arxiv:2505.09327, 2025.

[3] Pei H, Liao J X, Zhao Q, **Gao T**, Zhang S, Zhang X, Fan F L. NeuronSeek: On Stability and Expressivity of Task-driven Neurons[J]. arxiv preprint arxiv:2506.15715, 2025.

[4] S Li, Z Liao, T Hou, **T Gao***, Latent Iterative Refinement Flow: A Geometric Constrained Approach for Few-Shot Generation, arXiv:2509.19903, 2025.

[5] Ding Y, Yuan G, Zuo D, **Gao T***. Hedging with Sparse Reward Reinforcement Learning. arxiv: 2503.04218, 2025.

[6] Yixin Wang, **Ting Gao***, Jinqiao Duan. Beyond Distance: Quantifying Point Cloud Dynamics with Persistent Homology and Dynamic Optimal Transport, under review in Philosophical Transactions of the Royal Society A. 2025.

[7] J Liu, M Yi, **T Gao**, X Chen, Analysis of influencing factors and the most probable transition pathway in the narrow escape problem for molecular systems based on deep learning method, Chaos: 35 (9)

- [8] Y Zhang, D Liu, Z Liang, J Cheng, K Lou, J Duan, **T Gao***, B Hu*, Q Liu*, Artificial intelligence as a surrogate brain: Bridging neural dynamical models and data, National Science Review, 2025. nwaf457.
- [9] Chao Ying, Duan Jingiao, **Gao, Ting**, Wei, Pingyuan* (Alphabetical order), Well-posedness and averaging principle for non-Gaussian McKean-Vlasov stochastic differential equations with locally Lipschitz coefficient. Advances in Applied Probability, 1-44, 2025.
- [10] MianXuan Yao, MinYi Yao, Jia Gu, **Ting Gao**, YiMian Yuan, YangKun Chen, YongLin Liu. Early heart rate predicts 3-month outcomes in acute ischemic stroke patients receiving intravenous thrombolysis: a machine learning approach. Frontiers in Neurology, 2025, 16: 1668901.
- [11] Chen, Hu, Wang, **Gao***, Duan. Correspondence Research of the Most Probable Transition Paths between a Stochastic Interacting Particle System and its Mean Field Limit System, arXiv: 2404.07552. 2025.
- [12] P Zhang, **T. Gao***, J. Guo, J. Duan, Action Functional as Early Warning Indicator in the Space of Probability Measures via Schrodinger Bridge. Quantitative Biology, Vol 13(3), 2025.
- [13] L. Yang, **T. Gao***, W. Wei, M. Dai, C. Fang, J. Duan, Multi-task meta label correction for time series prediction, Pattern Recognition. Vol 150, 110319. 2024.
- [14] L Feng, **T. Gao***, W. Xiao, J. Duan, Early warning via transitions in latent stochastic dynamical systems, Chaos : An Interdisciplinary Journal of Nonlinear Science. 34(3). 2024.
- [15] P. Zhang, **T. Gao***, J. Guo, J. Duan, S.Nikolenko, Early Warning Prediction with Automatic Labeling in Epilepsy Patients, ANZIAM. 2025.
- [16] W. Xiao, **T. Gao***, K. Liu, J. Duan, M. Zhao, Fourier neural operator based fluid – structure interaction for predicting the vesicle dynamics, Physica D: Nonlinear Phenomena, 134145. 2024.
- [17] J. Guo, **T. Gao***, P. Zhang, J. Duan, Deep Reinforcement Learning in Finite-Horizon to Explore the Most Probable Transition Pathway, Physica D: Nonlinear Phenomena, 458: 133955. 2024.
- [18] J. Chen, **T. Gao***, Y. Li and J. Duan, Detecting the Most Probable High Dimensional Transition Pathway Based on Optimal Control Theory, Applied Mathematical Modelling, 127: 217-236. 2024.
- [19] P Li, **T. Gao***, H. Huang, J. Cheng, S. Gao, Z. Zeng, J. Duan, Privacy-Preserving Discretized Spiking Neural Networks with TFHE, ICNC 2023.
- [20] **T. Gao**, J. Duan*, Stochastic Dynamics and Data Science, Stochastics and Dynamics. Vol. 23, No. 08, 2340003. 2023.
- [21] J. Guo, **T. Gao***, Y. Lan, P. Zhang, S. Yang, J. Duan, Learning Stochastic Dynamical Systems as an Implicit Regularization with Graph Neural Network, ICML 2023 workshop on High-dimensional Learning Dynamics.
- [22] Y. Chao, J. Duan, **T. Gao**, P. Wei*, Well-posedness and averaging principle for Levy-type McKean-Vlasov stochastic differential equations under local Lipschitz conditions, submitted to Journal of Differential Equations, 2023.
- [23] C. Fang, Y. Lu*, **T. Gao**, J. Duan, Reservoir Computing with Error Correction: Long-term Behaviors of Stochastic Dynamical Systems, Physica D: Nonlinear Phenomena, Volume 456, 15, 133919. 2023.
- [24] L. Feng, **T. Gao***, M. Dai, J. Duan, Learning reduced effective dynamics from data-driven stochastic dynamical systems, Chaos 33 (4), 043131, 2023.
- [25] H. Huang, **T. Gao***, P. Li, J. Guo, P. Zhang, N. Du, J. Duan, Model Based Reinforcement Learning with Non-Gaussian Environment Dynamics and its Application to Portfolio Optimization, Chaos: An Interdisciplinary Journal of Nonlinear Science, 2023, 33(8).

- [26] Feng L, **Gao T**, Li T, et al. Approximations of Lévy processes by integrated fast oscillating Ornstein–Uhlenbeck processes[J]. *Stochastics and Dynamics*, 2340005. 2023.
- [27] 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.
- [28] 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.
- [29] C. Fang, Y. Lu, **T. Gao*** and J. Duan, An end-to-end deep learning approach for extracting stochastic dynamical systems with α -stable Lévy noise, *Chaos*, 32, 063112, 2022.
- [30] 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.
- [31] 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.
- [32] **Ting Gao**, C. Lam, etc. Sales inflation recommendation based on DDPG. *Application number 62/856,536*. 2019.6.3.
- [33] **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.
- [34] **Ting Gao**, J. Duan*, 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.
- [35] **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.
- [36] **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.
- [37] 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.
- [38] J. Duan, **T. Gao**, G. He, Quantifying Model Uncertainties in the Space of Probability Measures. *Interdisciplinary Mathematical Sciences.* Volume 13, p.99-110, 2012.
- [39] 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.
- [40] **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.
- [41] **Ting Gao**, Wendi Wang, Global analysis of a viral model with delayed intracellular immune response. *Journal of Southwest University (Natural Science)*, April, 2009.
- [42] Ruida Wang; Junbao Zhou; Zhuan Cheng; Jinqiao Duan; **Ting Gao**; Yan Jiao; Yang Liu; Biyun Zeng; Pengbo Li ; Homomorphic Ciphertext-PC, 2022-10-06, PCT/SE2022/050900 .
- [43] Zhuan Cheng; Shuyu Jin; Ruida Wang; **Ting Gao**; Jinqiao Duan; Yan Jiao; Yang Liu; Biyun, Zeng; Pengbo Li ; Homomorphic recommendation-PC, 2022-10-06, PCT/SE2022/050898.
- [44] **高婷**, 李鹏博等, 一种基于全同态加密的跨医院脑疾病预警机制和方法, 2023113108808. 2023-10-10
- [45] 樊浩杰, **高婷**等, 一种基于电路自举和SNN的脑肿瘤分类方法及系统, 202510568325.8.

[46] 郭龙飞, 高婷等, 多模态脑卒中智能预警方法及系统, 2025109460333

FUNDING

Academic Research Projects

NSFC International Collaboration Fund for Creative Research Teams W2541005, 2026 - 2028. Co-PI. 600,000 / 6M

National Key Research and Development Program of China, 2021ZD0201300, 2021.11 - 2026.11. 300,000 / 5,712,000

National Natural Science Foundation of China, 12141107, 2022 - 2025. 300,000 / 3M

National Natural Science Foundation of China, 12401233, 2025- 2027. PI. 300,000

Industry Research Project

“Effective Dynamics of Generative Models and Stochastic Optimal Transport”, Huawei Lagrangian Institute de Paris
2025.9 - 2027.8, PI. 2,470,000

GUEST EDITOR

Editor on Board: Stochastic and Dynamics

Special Issue, “Tipping Phenomena in Science and Engineering” in Journal “Philosophical Transactions of the Royal Society A”

Special Issue, “Recent Advances in Fractional Differential Equations and Their Applications” in Journal “Fractal and Fractional”

INVITED TALKS & WORKSHOP ORGANIZATION

Interdisciplinary Frontier Workshop on Dynamic Characterized Life Sciences, Tianyuan Mathematics Research Center, 12/7 - 12/12, 2025.

Random Dynamical Systems, Konstanze, Germany. 2025. 07.22-26

Critical Transition and Tipping in Brain Diseases, SIAM 2025. 05, Denver, USA.

Inverse Problems and Critical Transitions in Brain Science, AIMS, 2024, 12.

“DATA-DRIVEN STOCHASTIC DYNAMICS: GOVERNING LAW EXTRACTION AND TIPPING DETECTION”, International Conference on Multiscale Modeling and Simulation based on Physics and Data, April 25 - 26, 2024, at Inst for Pure and Applied Mathematics (IPAM), UCLA, Los Angeles, USA.

“Functional Tipping Indicators via Schrodinger Bridge”, Mathematical Biology workshop in Southwest University. Chongqing, 2024. 4. 5

“Stochastic Dynamical Systems with Applications to Financial Engineering”, the Second Chinese Causal Inference Conference, Hubei, 2024. 3. 29 - 2024. 3.1

“Stochastic Dynamical Systems and Data Science: Identification, Prediction and Optimal Control”, Dynamical Systems and nonlinear Analysis Conference, Guangzhou-Foshan, 2023. 12. 10

“AI and Stochastic Dynamical Systems”, Learning on Graphs Meetup Satellite, Shanghai, 2023. 11.30

“Stochastic Dynamical Systems and Data Science”, HKSIAM: Hong Kong Society for Industry and Applied Mathematics, Hong Kong, 2023.8.28 - 2023.9.1

“Neural network stochastic differential equation models and applications”, ICIAM 2023, Japan, 2023.08.20 - 2023.08.25

“ Learning Most Probable Transition Pathway for Stochastic Dynamical Systems ”, International Conference Dynamical Systems and Semi-algebraic geometry: interactions with Optimization and Deep Learning , Da Lat University, 2023.7.17 - 2023.7.21

“Learning long-term dynamics in stochastic dynamical systems”, 国家天元数学中部中心随机动力系统会议, Wuhan, 2023.6.14 2023.6.18

“Identification , Prediction and Control in Non-Gaussian Stochastic Dynamical Systems”, National Tianyuan Math Northwestern Center “Stochastic Analysis and Applications in Special Areas Workshop” 2022.10.23 - 2022.10.24

“Data Driven Problems in Stochastic Dynamical Systems: Identification, Forecasting and Optimal Control”, HUST-UPSaclay Joint Workshop on "Math for Data Science", 2022.09.22 - 2022.09.23

“Identifying and learning effective reduced dynamics in stochastic dynamical system”, The 7th International Conference on Random Dynamical Systems, Hanoi, 2022.06.23

“Data assimilation with non-Gaussian Lévy noise”, 9th International Congress on Industrial and Applied Mathematics - ICIAM 2019, Valencia, 2019.07.15 - 2019.07.19

