

# Xiaopei Jiao, Ph.D.

+86 18801321174  $\diamond$  jiaoxiaopei@bimsa.cn, xiaopeijiao@gmail.com

## PERSONAL INFORMATION

---

BIRTH DATE: March, 2nd, 1995  
NATIONALITY: China  
HOMEPAGE: <https://bimsa.net/people/xpjiao/>  
GOOGLE SCHOLAR: <https://scholar.google.com/citations?user=wDyK4GUAAA&hl=zh-CN&oi=ao>

## EDUCATION

---

2025.02 - 2025.10	<b>Beijing Institute of Applied Mathematics and Application (BIMSA), China</b> Assistant Professor
2024.07 - 2025.01	<b>University of Twente, Netherlands</b> Postdoctoral researcher, (Mentor: <a href="#">Johannes Schmidt-Hieber</a> )
2022.07 - 2024.06	<b>Beijing Institute of Applied Mathematics and Application (BIMSA), China</b> Postdoctoral researcher, (Mentor: <a href="#">Stephen S.-T. Yau</a> )
2017.07 - 2022.06	<b>Tsinghua University, China</b> Ph.D. in <b>Applied Mathematics</b> . Supervisor: <a href="#">Stephen S.-T. Yau</a>
2013.07 - 2017.06	<b>Shanghai Jiao Tong University, China</b> B.S. in <b>Physics</b> , Zhiyuan College Supervisor: <a href="#">David Shen-Ou Cai</a> Dual B.S. in <b>Computer Science</b> .

## RESEARCH INTERESTS

---

Control theory; Stochastic Filter; Physics-informed machine learning; Computational biology.

## PROJECT AND RESEARCH

---

- |           |   |
|-----------|---|
| 2019-2021 | Particle filter algorithm based on optimal transportation<br>By applying optimal transport technique, feedback control algorithm is exploited to make data denoising based on the Monge-Ampere equation. 100 dimensional simulations can be calculated efficiently compared to common algorithms such as the Kalman filter, ensemble filter etc.  |
| 2018-2024 | Theoretical classification of nonlinear filter<br>By applying various pure mathematical tools such as partial differential equation, Lie algebra etc, classification problems of finite dimensional filter system proposed by U.S. academician R. W. Brockert in International Congress of Mathematician has been partially solved successfully. A lots of new results have been finished including Mitter conjecture on non-maximal rank filter and novel filtering finding.   |
| 2018-2022 | Analysis and prediction of COVID-19 genome sequence data<br>We develop a mathematical method to predict new genome sequences from real data. Using natural vector and convex hull principles, our approach optimizes the detection of nucleotide composition in sequences. Validation with SARS-CoV-2 datasets confirms its effectiveness in predicting these compositions.   |
| 2022-2024 | Algorithms of data denoising of stochastic optimal control <ul style="list-style-type: none"><li>• Numerical calculation of backward stochastic differential equation.</li><li>• Analysis on equivalent Hamilton-Jacobi-Bellman equation and stochastic maximal principle related to several types of data smoothing frameworks.</li></ul>  |
| 2022-2025 | Application of Physics-Informed machine Learning in the stochastic filter <ul style="list-style-type: none"><li>• Numerical calculation of parabolic partial differential equation, and use Matlab and Python code for thousands of lines related to the machine learning library.</li><li>• By taking fusion of physics information to Kolmogorov equation, a new high-fidelity and fast inference surrogate model is designed to deal with data denoising algorithm.</li><li>• Deep neural operator based novel filtering algorithm</li></ul> |

## BASIC SKILLS

---

- Applied Math: Numerical Partial Differential Equation; **Scientific machine learning** (Physics-informed Neural Network, Neural Operator); **data denoising/smoothing** (Kalman filter etc, optimal and feedback control); **Biological simulation** (cancer microenvironment modeling, Omics data analysis).
- Computer Science: Proficiency in **Python, Matlab, C++, R**; Familiar with deep learning library **Pytorch**.
- English: Literature reading and writing, fluent communication with native English speakers.

## ACADEMIC SERVICES

---

Guest Editor of *Communications in Information and Systems*  
Peer Reviewer of *IEEE Conference on Decision and Control (CDC)*  
Peer Reviewer of *IEEE Transactions and Automatic Control*  
Peer Reviewer of *American Control Conference (ACC)*.  
Peer Reviewer of *IEEE Access*.

## HONORS AND AWARDS

---

- 2025: **Natural Science Foundation of China (NSFC Young Scholar Class C)**
- 2021: **First class scholarship**, Tsinghua University.
- 2015: **Meritourious Award** in the Mathematical Contest in Modeling (MCM), U.S.

## TEACHING

---

- 2017- 2020: Teaching Asistant in Mathematical department, Tsinghua University

## ACADEMIC VISITS

---

- 2024: **University of Twente, Netherlands**
- 2021: Invited speaker. **SIAM Annual Meeting**, Philadelphia, U.S.
- 2015: Visiting Scholar. **Oxford University**, U.K.

## PUBLICATIONS

---

\* Equal contribution;

### Publications with peer review process

#### 2026:

1. **Xiaopei Jiao**, Shi, J., Chen, X., & Xiong, F. (2026). GsPINN: A novel fast Green kernel solver based on symmetric Physics-Informed neural networks. Accepted by *Neurocomputing*, 132706. (JCR Q1, IF=6.5, 中科院 2 区)
2. Yusong Ye, **Xiaopei Jiao**, Mingjun Han, Zhuodin Yang, *The Phase Polarization induced by Homogeneity Structure of Evolving Random Hypergraph* (2025) Accepted by **Physica A-Statistical Mechanics and Its Applications** (JCR Q2, IF=3.1, 中科院 2 区)

#### 2025:

2. **Xiaopei Jiao\***, Kang J. and Shi J, *Finite dimensional filter with non-maximal rank*, Accepted by **Communications in Information and Systems** (2025) (IF=0.8)
3. Jiayi Kang\*, **Xiaopei Jiao\***, and Stephen S.-T. Yau, *Estimation of the Linear System via Optimal Transportation and Its Application for Missing Data Observations*, *IEEE Transactions on Automatic Control* (2025) (JCR Q1, IF=7.5, 中科院 1 区)

#### 2024:

4. Shi, J\*, **Xiaopei Jiao\***, & Yau, S. S.-T., *A Novel Logarithmic Transformed Deep Galerkin Approach to Optimal Filtering Problem*, **Proceeding of 2024 IEEE 63rd Conference on Decision and Control (CDC)** (2024)

5. Lai, X.\*, **Xiaopei Jiao\***, Zhang, H., & Lei, J., *Computational modeling reveals key factors driving treatment-free remission in chronic myeloid leukemia patients*, **NPJ Systems Biology and Applications** 10(1), 45 (2024) (JCR Q1, IF=4.3, 中科院 2 区)
6. **Xiaopei Jiao**, SST Yau, *Weak form Mitter conjecture on nonmaximal rank estimation algebra: state dimension 4 and rank 3*, **Journal of Systems Science & Complexity** (2024) (JCR Q1, IF=2.6, 中科院 3 区)
7. J Shi\*, **Xiaopei Jiao\***, SST Yau, *DGLG: A Novel Deep Generalized Legendre-Galerkin Approach To Optimal Filtering Problem*, **IEEE Transactions on Automatic Control** (2024) (JCR Q1, IF=7.5, 中科院 1 区)
8. **Xiaopei Jiao**, SST Yau, *Finite-dimensional estimation algebra on arbitrary state dimension with nonmaximal rank: linear structure of Wong matrix*, **International Journal of Control** 97(11), 2669-2676 (2024) (JCR Q3, IF=2.1)

#### 2023:

9. Kang J., **Xiaopei Jiao** and Stephen S-T. Yau, *Finite Dimensional Estimation Algebra For Time-varying Filtering System and Optimal Transport Particle Filter: A Tangent Flow Point of View*, **IEEE Transactions on Aerospace and Electronic Systems** (2023) (JCR Q1, IF=5.7, 中科院 2 区)
10. Yu, H., **Xiaopei Jiao**, & Yau, S. S. T., *Complete Classification of Finite Dimensional Estimation Algebras with State Dimension  $N$ , Linear Rank  $n-1$  and Constant Wong Matrix*, **IEEE Transactions on Automatic Control** (2023) (JCR Q1, IF=7.5, 中科院 1 区)
11. **Xiaopei Jiao** and Stephen S-T. Yau, *Structure of finite dimensional exact estimation algebra on state dimension 3 and linear rank 2*, **International Journal of Control** 96(2), 362-373 (2023) (JCR Q3, IF=2.1)

#### 2022 and before:

12. X Lai\*, **Xiaopei Jiao\***, H Zhang, L Lei, *Mechanism of treatment-free remission in patients with chronic myeloid leukemia revealed by a computational model of CML evolution*, **bioRxiv** (2022)
13. **Xiaopei Jiao**, Shaojun Pei, Zeju Sun, Jiayi Kang and Stephen S.-T. Yau, *Determination of the nucleotide or amino acid composition of genome or protein sequences by using natural vector method and convex hull principle*, **Fundamental Research** 1(5), 559-564 (2021) (JCR Q1, IF=6.3, 中科院 2 区)
14. Zhang, C.\*, Shao, C.\*, **Xiaopei Jiao\***, Bai, Y., Li, M., Shi, H., Lei, J., Zhong, X., *Individual cell-based modeling of tumor cell plasticity-induced immune escape after CAR-T therapy*, **Computational and Systems Oncology** 1(3), e21029 (2021)
15. **Xiaopei Jiao**, & Yau, S. S. T., *New classes of finite dimensional filters with nonmaximal rank estimation algebra on state dimension  $n$  and linear rank  $n-2$* , **SIAM Journal on Control and Optimization** (2020) (JCR Q1, IF=2.6, 中科院 2 区)
16. **Xiaopei Jiao**, & Lei, J., *Dynamics of gene expression based on epigenetic modifications*, **Communications in Information and Systems** (2018) (IF=0.8)

#### Published book

1. Stephen S.-T. Yau, Xiuqiong Chen, **Xiaopei Jiao**, Jiayi Kang, Zeju Sun, and Yangtianze Tao, *Principles of Nonlinear Filtering Theory*. Springer Nature, Book series Algorithms and Computation in Mathematics. Vol. 33 (2024).

#### Submitted publications with peer review process:

1. **Xiaopei Jiao**, Ji Shi and Yau, S. S. T., *Extended Direct Method: A Time-Varying Kolmogorov Equation Approach for Infinite-Dimensional Optimal Filtering problems* (2024) (under review **IEEE Transactions on Aerospace and Electronic Systems**) (Q1, IF=4.6, 中科院 2 区)

Total citation: 70