

# Mo Zhou

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## EMPLOYMENT

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**UCLA** Assistant adjunct professor in Department of Mathematics  
mentor: Prof. Stan Osher

*July 2023 - present*

## EDUCATION AND INTERNSHIP

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**Duke University** Ph.D. in Department of Mathematics  
advisor: Prof. Jianfeng Lu

**GPA 4.0/4.0**

*August 2018 - May 2023*

**Flatiron institute** Research internship at Center for Computational Mathematics  
mentor: Prof. Jiequn Han and Prof. Manas Rachh

*Jun 2022 - Aug 2022*

**Tsinghua University** Bachelor in Mathematics

**GPA 91/100**

*August 2014 - July 2018*

## RESEARCH INTERESTS

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deep learning and reinforcement learning, optimal control, mean field control and games

## RESEARCH EXPERIENCE

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At **UCLA** with Prof. Stanley Osher and other researchers

- Actor-critic flow for mean field games [13] *Aug 2024 - Oct 2025*
- Neural characteristic flow for optimal transport [7] *Mar 2025 - Sep 2025*
- Mean field control of score-based normalizing flows [12] *Oct 2024 - May 2025*
- Variational conditional normalizing flows for mean field control [8] *Sep 2024 - Mar 2025*
- Score-based neural ODE for mean field control [11] *Mar 2024 - Sep 2024*
- Forward-backward score dynamics for mean field control problems [10] *June 2023 - Feb 2024*

At **Duke University**, with Prof. Jianfeng Lu and Prof. Jiequn Han

- PhD thesis: Deep Learning Method for Partial Differential Equations and Optimal Problems [3]
- Convergence of actor-critic flow for optimal control [6] *February 2023 - February 2024*
- Convergence of policy gradient flow for optimal control [9] *February 2022 - February 2023*
- Provably convergence of actor-critic algorithms in reinforcement learning [4] *April 2021 - January 2022*
- Deep learning method to solve the HJB equation [2] *August 2019 - March 2021*
- Neural network based eigenvalue problem solver [1] *July 2018 - February 2020*

At **Flatiron institute** with Prof. Jiequn Han, Prof. Manas Rachh, and Prof. Carlos Borges

- Deep learning for the inverse scattering problem [5] *May 2022 - November 2022*

## PUBLICATIONS

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- [1] Jiequn Han, Jianfeng Lu, and Mo Zhou. "Solving high-dimensional eigenvalue problems using deep neural networks: A diffusion Monte Carlo like approach". In: *Journal of Computational Physics* 423 (2020), p. 109792.
- [2] Mo Zhou, Jiequn Han, and Jianfeng Lu. "Actor-critic method for high dimensional static Hamilton–Jacobi–Bellman partial differential equations based on neural networks". In: *SIAM Journal on Scientific Computing* 43.6 (2021), A4043–A4066.

- [3] Mo Zhou. “Deep Learning Method for Partial Differential Equations and Optimal Problems”. PhD thesis. Duke University, 2023.
- [4] Mo Zhou and Jianfeng Lu. “Single timescale actor-critic method to solve the linear quadratic regulator with convergence guarantees”. In: *Journal of Machine Learning Research* 24.222 (2023), pp. 1–34.
- [5] Mo Zhou et al. “A neural network warm-start approach for the inverse acoustic obstacle scattering problem”. In: *Journal of Computational Physics* 490 (2023), p. 112341.
- [6] Mo Zhou and Jianfeng Lu. “Solving Time-Continuous Stochastic Optimal Control Problems: Algorithm Design and Convergence Analysis of Actor-Critic Flow”. In: *arXiv preprint arXiv:2402.17208* (2024).
- [7] Yesom Park et al. “Neural Hamilton–Jacobi Characteristic Flows for Optimal Transport”. In: *arXiv preprint arXiv:2510.01153* (2025).
- [8] Jiayi Zhao et al. “Variational conditional normalizing flows for computing second-order mean field control problems”. In: *arXiv preprint arXiv:2503.19580* (2025).
- [9] Mo Zhou and Jianfeng Lu. “A policy gradient framework for stochastic optimal control problems with global convergence guarantee”. In: *SIAM Journal on Control and Optimization* 63.4 (2025), pp. 2605–2631.
- [10] Mo Zhou, Stanley Osher, and Wuchen Li. “A deep learning algorithm for computing mean field control problems via forward-backward score dynamics”. In: *Research in the Mathematical Sciences* 12.3 (2025), p. 42.
- [11] Mo Zhou, Stanley Osher, and Wuchen Li. “Score-based neural ordinary differential equations for computing mean field control problems”. In: *Journal of Computational Physics* (2025), p. 114369.
- [12] Mo Zhou, Stanley Osher, and Wuchen Li. “Simulating Fokker-Planck equations via mean field control of score-based normalizing flows”. In: *arXiv preprint arXiv:2506.05723* (2025).
- [13] Mo Zhou, Haosheng Zhou, and Ruimeng Hu. “Learning Mean-Field Games through Mean-Field Actor-Critic Flow”. In: *arXiv preprint arXiv:2510.12180* (2025).

## TEACHING EXPERIENCE

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### At UCLA

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|--------------------------------------------------------|--------------------|
| Instructor of Math 164 Optimization                    | <i>Fall 2025</i>   |
| Instructor of Math 135 Ordinary differential equations | <i>Spring 2025</i> |
| Instructor of Math 151A Applied numerical methods      | <i>Winter 2025</i> |
| Instructor of Math 151B Applied numerical methods      | <i>Fall 2024</i>   |
| Instructor of Math 151B Applied numerical methods      | <i>Spring 2024</i> |
| Instructor of Math 151AH Numerical analysis            | <i>Winter 2024</i> |
| Instructor of Math 135 Ordinary differential equations | <i>Fall 2023</i>   |

### At Duke

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|--------------------------------------------------------------------------------------------------------|--------------------|
| Teaching assistant of Matrices and Vectors                                                             | <i>Spring 2022</i> |
| Project manager of DoMath: Duke Summer Undergraduate Research Program                                  | <i>Summer 2021</i> |
| taught my students basic knowledge about Radon transform and its application in X-ray image            |                    |
| encourage them to design an innovative treatment plan                                                  |                    |
| answer their questions, both theoretical ones and coding                                               |                    |
| Instructor of Calculus II for college students                                                         | <i>Fall 2020</i>   |
| Instructor of Calculus I for college students (my class ranked first among nine sections in the final) | <i>Fall 2019</i>   |
| Teaching assistant of Calculus I for college students                                                  | <i>Fall 2018</i>   |

## INVITED TALKS

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|                                                                                    |                       |
|------------------------------------------------------------------------------------|-----------------------|
| SIAM DS25 Data-driven Dynamics in Dynamical Systems                                | <i>May 2025</i>       |
| Statistics seminar at USC                                                          | <i>April 2025</i>     |
| SIAM MDS24 Advances of SDEs in Machine Learning                                    | <i>October 2024</i>   |
| ICERM Interacting Particle Systems: Analysis, Control, Learning and Computation    | <i>May 2024</i>       |
| Applied mathematics seminar at UCSB                                                | <i>April 2024</i>     |
| Scientific computing and large data workshop at UofSC                              | <i>December 2023</i>  |
| Level set meeting at UCLA                                                          | <i>April 2023</i>     |
| SIAM SEAS23 Methods, Models, and Analysis of Complex Systems                       | <i>March 2023</i>     |
| SIAM CSE23 Fast Methods for integral equations in forward and inverse problems     | <i>March 2023</i>     |
| SIAM MDS22 Mathematical Theories of Deep Learning for PDEs in Scientific Computing | <i>September 2022</i> |
| Applied Mathematics Seminar at UC Berkeley                                         | <i>September 2022</i> |
| IMA Workshop on Mathematical Foundation and Applications of Deep Learning          | <i>August 2021</i>    |
| SIAM CSE21 Recent Advances in Machine Learning and Data-driven Methods             | <i>March 2021</i>     |

## HONORS AND AWARDS

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|-----------------------------------------------------------------------------------------------|-----------------------|
| Merit case to Assistant Adjunct Professor                                                     | <i>August 2025</i>    |
| Institute for Digital Research and Education fellowship at UCLA (only one in math department) | <i>September 2024</i> |
| Second place SIAM SEAS23 student presenter (top 4 out of 53)                                  | <i>March 2023</i>     |
| Silver Award, Alibaba Global Mathematics Competition (rank 9/55000+, top 0.2‰)                | <i>Summer 2022</i>    |
| Honorable Mention, Alibaba Global Mathematics Competition (rank 49/52850, top 1‰)             | <i>Summer 2021</i>    |
| Duke University Summer Fellowship                                                             | <i>2019, 2020</i>     |
| Excellent Graduate in Tsinghua University (top 10%)                                           | <i>Summer 2018</i>    |
| GRE Mathematics Subject Test 970/990 (top 1%)                                                 | <i>Fall 2017</i>      |
| Honorable Mention, American Interdisciplinary Contest in Modeling                             | <i>Spring 2016</i>    |