Miao **Keyan**

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"To harden the mind."

Education

Degree D.Phil. Univeristy of Oxford
Oxford, UK

DEPARTMENT OF ENGINEERING SCIENCE： CONTROL GROUP
2021.09 - 2025.04

- Supervised by Prof. Antonis Papachristodoulou and Dr. Konstantinos Gatsis
- Funded by EPSRC DTP& Univeristy of Oxford (Oxford-Ashton Memorial Graduate Scholarship)

Degree M.S. Imperial College London
London, UK

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING： CONTROL SYSTEMS
2019.09 - 2020.09

- Award: Outstanding Achievement: Control Systems MSc & Hertha Ayrton Centenary Prize (Best Project)
- Overall GPA: 83.02/100 Graduation Project: 84.90/100 Distinction
- Ranking: 1

Degree B.E. Northwestern Polytechnical University
Xi'an, Shaanxi

DEPARTMENT OF COMPUTER SCIENCE: COMPUTER SCIENCE AND TECHNOLOGY (2015.09 - 2016.09)

DEPARTMENT OF ASTRONAUTICS： DETECTION, GUIDANCE AND CONTROL (2016.09 - 2019.06)
2015.09 - 2019.06

- Award: Outstanding Graduation Thesis
- Overall GPA: 89.8/100 Major GPA: 92.88/100 Graduation Project: 96.8/100
- Ranking: 2

Publications

2024 — K. MIAO AND K. GATSIS, *How deep do we need: Accelerating training and inference of neural odes via control perspective*, in Forty-first International Conference on Machine Learning, 2024

2024 — L. ZHAO, K. MIAO, K. GATSIS, AND A. PAPACHRISTODOULOU, *Nlbac: A neural ordinary differential equations-based framework for stable and safe reinforcement learning in human-aligned tasks*, in HARL workshop @ ICRA, 2024

2023 — K. MIAO AND K. GATSIS, *Towards optimal network depths: Control-inspired acceleration of training and inference in neural ODEs*, in The Symbiosis of Deep Learning and Differential Equations III, 2023

2023 — K. MIAO AND K. GATSIS, *Learning robust state observers using neural odes*, in Learning for Dynamics and Control Conference, PMLR, 2023, pp. 208–219

2021 — K. MIAO AND R. VINTER, *Optimal control of a growth/consumption model*, Optimal Control Applications and Methods, 42 (2021), pp. 1672–1688

Research and Project Experience

Accelerating Training and Inference of Neural ODEs via Control Perspective

Oxford, UK

CONTROL GROUP, UNIVERSITY OF OXFORD

2023.02 - 2023.12

- Accepted by 41st International Conference on Machine Learning (ICML) and will be published on PMLR
- Proposed a novel concept in Neural ODEs to tackle depth complexity by transforming it into an interval adjustment challenge within ODE integration, focusing on optimizing terminal time for enhanced efficiency
- Introduced a Minimum-time Optimal Control approach to directly optimize terminal time while maintaining network performance, allowing for accelerated single-stage processing
- Employed the Lyapunov method from control theory during pre-training to ensure dynamic convergence with guaranteed speed, followed by iterative refinement of terminal time for optimized performance
- Demonstrated through experiments on supervised learning and generative models that our methods significantly reduce training and inference time, achieving an order of magnitude improvement over traditional Vanilla Neural ODEs and optimizing both spatial and temporal dynamics performance

Learning Robust State Observers using Neural ODEs

Oxford, UK

CONTROL GROUP, UNIVERSITY OF OXFORD

2022.06 - 2023.01

- Published on PMLR and presented on 5th Learning for Dynamics and Control Conference (L4DC) at University of Pennsylvania, USA
- Proposed a complete approach to the design of state observers for nonlinear systems using Neural ODEs
- Showed the relationship between the paramaters of tuneable KKL observer and its rate of convergence and robustness to model uncertainty
- Incorporated this relationship in the training process as a way to design robust observers and show numerically the advantages of this approach compared to the literature

Master's Graduation Project - Optimal Control and Economics: Consumption Versus Investment

London, UK

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING, IMPERIAL COLLEGE LONDON

2020.05 - 2020.09

- Publication: Miao, Keyan, and Richard Vinter. "Optimal control of a growth/consumption model." Optimal Control Applications and Methods 42.6 (2021): 1672-1688.
- Learned the analytical methods for solving optimal control problems (Pontriyakin Maximum Principle, bang-bang principle, Dynamic Programming)
- Discussed the "consumption-investment" problem by using the Maximum Principle and Dynamic Programming
- Interpreted the optimal solution derived by optimal control theory in terms of economics and verified some economic conclusions by using optimal control theory

Undergraduate Graduation Project - Research on Dehaze Methods Based on Visible Light Images (Outstanding Graduation Thesis)

Xi'an, Shaanxi

DEPARTMENT OF ASTRONAUTICS, NORTHWESTERN POLYTECHNICAL UNIVERSITY

2019.02 - 2019.06

- Implemented image defogging by using dark channel prior (DCP) algorithm with C++ language
- Improved the DCP algorithm by adding thresholds, transforming the color space, and using Gamma correction
- Discussed a machine learning method of image dehazing using convolutional neural network (CNN-Dehaze) and its neural network architecture
- Analyzed the effects of various defogging algorithms from qualitative and quantitative perspectives, and completed the video defogging

Working Experience

Department of Engineering, University of Oxford

Oxford, UK

LAB DEMONSTRATOR

2023 - 2024

- Served as a lab demonstrator for B15 and Lego coursework, guiding undergraduate students through course labs, reports and presentations.

Advanced Institute of Information Technology, Peking University

Hangzhou, Zhejiang

RESEARCH INTERN

2021.04 - 2021.07

Jiangsu Zhongshe Group Co., Ltd

Nanjing, Jiangsu

Computer Vision Intern

2020.10 - 2021.02

Honors & Awards

2023	**NeurIPs Travel Grant (G-Research November 2023 Grant Winners)**, G-Research	*Oxford, UK*
2021	**Research Studentship & Oxford-Ashton Memorial Graduate Scholarship**, 2021 - 2025 University of Oxford	*Oxford, UK*
2020	**Prize for Outstanding Achievement in the Control Systems Master of Science**, 2019 - 2020 Department of Electrical and Electronic Engineering, Imperial College London	*London, UK*
2020	**Hertha Ayrton Centenary Prize (Best Project)**, 2019 - 2020 Department of Electrical and Electronic Engineering, Imperial College London	*London, UK*
2019	**Outstanding Graduation Thesis**, Northwestern Polytechnical University	*Xi'an, Shaanxi*
2018	**First Prize Scholarship** , Northwestern Polytechnical University	*Xi'an, Shaanxi*
2017	**Provincial Second Prize (String Quintets <Spring>)**, The 5th China Undergraduate Art Exhibition	*Xi'an, Shaanxi*

Extracurricular Activity

Oxford Women in Computer Science Society

Oxford, UK

Member

2022.09 - now

Hertford College Music Society - Orchestra

Oxford, UK

Member / Violinist

2022.09 - now

Symphony Orchestra of Northwestern Polytechnical University

Xi'an, Shaanxi

Assistant Concertmaster

2015.09 - 2019.06

Northwestern Polytechnical University Model United Nations

Xi'an, Shaanxi

Member

2016.12 - 2017.03