

Hanshu Shao

Add.: 77 Xiuguan Street, Longquanyi District, Chengdu, Sichuan, CHN, 610000

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EDUCATION BACKGROUND

Fu Foundation Sch of Engineering & Applied Science, **Columbia University**, New York, USA 09/2022-05/2024
Degree: Master of Science in Applied Mathematics **GPA: 3.905/4.0**

College of Arts and Sciences, **Boston University**, Boston, USA 09/2020-05/2022
Degree: Bachelor of Arts in Mathematics (Magna Cum Laude) **GPA: 3.91/4.0**
Major: Mathematics **Minor:** Economics
Dean's List: Spring 2022, Fall 2021, Spring 2021, Fall 2020

College of Natural Science, **Michigan State University**, East Lansing, USA 09/2018-05/2020
Undergraduate Major: Mathematics **GPA: 3.7881/4.0**
Dean's List: Spring 2020, Fall 2019, Spring 2019

Saint Bernard School, Uncasville, USA 09/2014-05/2018
Grades 9 to 12

WORK EXPERIENCE

IoT Theory & Application Researcher, **Chengdu Qinchuan IoT Tech Co., Ltd.**, Chengdu, CHN 06/2024-Present
<https://www.cdqckj.com/>

- Research on the Industrial Internet of Things (IIoT), a way to enhance the efficiency and quality of an industry's management including manufacturing, selling, marketing, etc.
- Develop and implement IoT solutions to optimize operational workflows and assist in the development of training materials and workshops to introduce IoT technologies and their applications
- Keep learning and stay updated on emerging IoT technologies and practices

PUBLICATION

Book:

Hanshu Shao, *Principles of Industrial Internet of Things*, Publishing House of Electronics Industry, 02/2025

Paper:

Hanshu Shao, *A Discrete Optimal Transport Based Melding Defect Detection Method for PCB in Gas Meter*, 11/2024 (Submitted to Journal of Engineering)

DOI: <https://www.preprints.org/manuscript/202410.2513/v1>

Hanshu Shao, Yongwen Tan, Jingbo Li, Hengkai Gao, and Huiying Yin, *A Non-Local Adaptive Network for Cross-Domain Intelligent Fault Diagnosis Leveraging Multi-Source IOT Data*, 11/2024 (Submitted to Journal of Mechanical Science and Technology)

Xue Li, Zhichao You, Hengkai Gao, Haorong Deng, Zuomei Lai, and **Hanshu Shao**, *Ship Target Detection Method Based on Improved YOLOv8 for SAR Images*, 10/2024 (Submitted to International Journal of Remote Sensing)

Patent:

United States Patent and Trademark Office

<https://orcid.org/0009-0002-6681-7710>

1. Control Methods, Systems, and Equipment for Handling Equipment Based on Industrial Internet of Things (Under Review), 2024, APPLICATION # 18/811,741
2. Data Management Methods and Devices Based on Industrial Internets of Things (IIOT) and Electronic Devices (Under Review), 2024, APPLICATION # 18/798,835
3. Methods and Systems for Determining Device Anomaly Based on Industrial Internet of Things (Under Review), 2024, APPLICATION # 18/805,719
4. Methods, Systems, and Storage Media for Intelligent Diagnosis of Device Failures Based on Industrial Internet of Things (IIOT) (Under Review), 2024, APPLICATION # 18/805,699
5. Method and System for Intelligent Recommendation of Production Process by Industrial Internet of Things Information Cloud Sharing (Under Review), 2024, APPLICATION # 18/914,045
6. Methods, Systems, and Storage Media for Information Service of Industrial Internet of Things (IIOT) Based on Cloud Platforms (Under Review), 2024, APPLICATION # 18/916,694
7. Method and System for Intelligent Monitoring of CNC Machine Tools Based on Industrial Internet of Things (Under Review), 2024, APPLICATION # 18/961,676
8. Methods and Systems for Industrial Internet of Things (IIOT) Security Management Based on Management Cloud Platform (Under Review), 2024 APPLICATION # 18/963,738
9. Method and System for Intelligent Monitoring of CNC Processing Based on Industrial Internet of Things (Under Review), 2024, APPLICATION # 18/963,717

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China National Intellectual Property Administration

<http://epub.cnipa.gov.cn/>

1. Control Methods, Systems, and Equipment for Handling Equipment Based on Industrial Internet of Things (Granted), 2024, PAT: 202410832665.2
2. Data Management Methods and Devices Based on Industrial Internet of Things (IIOT) and Electronic Devices (Granted), 2024, PAT: 202410841900.2
3. Methods and Systems for Determining Device Anomaly Based on Industrial Internet of Things (Granted), 2024, PAT: 202411017658.3
4. Methods, Systems, and Storage Media for Intelligent Diagnosis of Device Failures Based on Industrial Internet of Things (IIOT) (Granted), 2024, PAT: 202411017663.4
5. Method and System for Intelligent Monitoring of CNC Machine Tools Based on Industrial Internet of Things (Under Review), 2024, PAT: 202411364867.5
6. Method and System for Intelligent Monitoring of CNC Processing Based on Industrial Internet of Things (In Registration Process), 2024, PAT: 202411364800.1
7. Methods, Systems, and Storage Media for Information Service of Industrial Internet of Things (IIOT) Based on Cloud Platforms (Granted), 2024, PAT: 202411228332.5
8. Method and System for Intelligent Recommendation of Production Process by Industrial Internet of Things Information Cloud Sharing (Granted), 2024, PAT: 202411215452.1
9. Methods and Systems for Industrial Internet of Things (IIoT) Security Management Based on Management Cloud Platform (Under Review), 2024, PAT: 202411505527.X
10. Method, System and Medium for Pushing Information of the Industrial Internet of Things Based on a Service Cloud Platform (Under Review), 2024, PAT: 202411523910.8
11. Method, Systems and Medium for Assembly Quality Control Based on the Industrial Internet of Things (Under Review), 2024, PAT: 202411686939.8
12. Service Information Processing System and Method of the Industrial Internet of Things Based on a Service Cloud Platform (Under Review), 2024, PAT: 202411756402.4
13. A Method, System, and Medium for Assembly Optimization Based on the Industrial Internet of Things (Under Review), 2024, PAT: 202411776330.X

RESEARCH EXPERIENCES

Researcher, **Non-Local Wasserstein Distance**, NY, USA 01/2023-05/2024

Supervisor: Professor Kui Ren, Columbia University

- Studied the paper “Nonlocal Wasserstein Distance: Metric and Asymptotic Properties” by Dejan Slepčev and Andrew Warren, along with related works like “A Computational Fluid Mechanics Solution to the Monge-Kantorovich Mass Transfer Problem” by Benamou and Brenier
- Gained insights into the Dynamical Formulation of Wasserstein Distance, including how the Non-Local Wasserstein Distance problem can be transformed into the least action problem, and explored the relationship between strong and weak topology and the upper and lower bound of the non-local distance

Researcher, **A Fixed-Point Approach to Barycenters in Wasserstein Space**, NY, USA 01/2023-05/2023

Supervisor: Professor Lu Zhang, Rice University

- Studied the paper “A Fixed-Point Approach to Barycenters in Wasserstein Space” by Pedro C. Alvarez-Esteban, E. del Barrio, J.A. Cuesta-Albertos, and C. Matr´an
- Authored a research paper, utilizing Python to reproduce the numerical results and comparing them with those presented in the original paper

Researcher, **Intro to Wasserstein Distance and Optimal Transport**, NY, USA 08/2022-11/2022

Supervisor: Professor Kui Ren, Columbia University

- Reviewed the papers “Notions of Optimal Transport Theory and How to Implement Them on a Computer” by Bruno Levy and Erica Schwindt, “Optimal Transport and Wasserstein Distance” by Larry Wasserman, and “A Brief Introduction to Optimal Transport Theory” by D. P. Bourne
- Understood Optimal Transport concepts, including Monge’s Problem, Kantorovich’s relaxed problem, the Kantorovich Dual Problem, Semi-discrete Optimal Transport, etc.
- Compiled a report summarizing these three papers, wrote notes to solve problems in D. P. Bourne’s work, and reproduced sections of Levy’s paper.

Research Assistant, **Macroeconomics and Entrepreneurship in Global Economy (Online)** 08/2021-11/2021

Supervisor: Professor Jack M. Kaplan

- Studied the impact of the overall economy and market influence entrepreneurship and learned to apply classical economic models for macroeconomics analysis through coursework
- Completed a comprehensive analysis of Danone, which included a SWOT analysis, assessment of social impact, financial analysis, and future expectations of Danone

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Analyst, **Demographic Analysis of Wenjiang District**, Chengdu, CHN 08/2020-10/2020

Initiated by the Population Research Institute of the Southwestern University of Finance and Economics

- Employed Python to assess the population status of Wenjiang District by examining factors such as demographics, economics, and public satisfaction
- Predicted the future demographic trends using models developed in Python

Researcher Assistant, **Research on the Concept of Internet of Things**, Chengdu, CHN 05/2019-08/2019

Initiated by Chengdu Qinchuan IoT Technology Co., Ltd.

- Investigated “Five Platforms Concept” (user, service, management, perception, object) via a literature review
- Understood the structure and the cloud platform of IoT and identified the operational rules of the IoT system
- Analyzed the relationships between three cloud platforms and five IoT platforms

PROJECT EXPERIENCES

Auto-Trade Program by Python 08/2022-10/2023

- Developed simulating-based automated trading of stocks/options on Webull, mimicking actions of real persons
- Created API-based automated high-frequency trading of cryptocurrency on Coinbase Pro
- Conducted data analysis, including noise reduction, interpolation and extrapolation and explored new strategies through trade simulation using a Python class I developed

The Chandrasekhar-H Equation and Multigrid V-Cycle Spring 2023

Form APMA 4302: Methods in Computational Science

- Implemented the Chandrasekhar-H Equation using Python and numerically solved it for different c and μ
- Developed a Multigrid V-Cycle in Python and numerically estimated the convergence factor

Generalized Minimum Residual Method by Python Spring 2023

Form APMA 4302: Methods in Computational Science

- Developed a Generalized Minimum Residual Method based on the Arnoldi method using Python
- Compared the computational cost and time efficiency of this method for matrices of various sizes against NumPy’s default solving algorithm, and analyzed the eigenvalues for matrices in different sizes

SELF-DIRECTED RESEARCH

Research on IoT 2018-Present

- Studied IOT theory and continued research in the field, exploring ways to integrate IoT technologies into urban settings and industrial applications
- Investigated the potential of IoT to enhance smart city projects and focused on applications such as traffic management, energy efficiency, public safety, etc.
- Analyzed case studies of successful IoT implementations in various industries

Research on Traditional Chinese Philosophy 2015-Present

- Explored traditional Chinese philosophy by studying texts such as Tao Te Ching and Zhuangzi
- Annotated the Tao Te Ching and reflected my personal interpretations and insights
- Developed a new theoretical framework for understanding the world

Research on Tai Chi Pushing-Hands 2015-Present

- Learned Tai Chi push-hand techniques, practiced Tai Chi regularly, and shared my experience with others
- Explored the philosophical principles underlying Tai Chi, such as balance, harmony, mindfulness, etc.

OTHER INFORMATION

Languages: Chinese (Native), English (Advanced)

IT Skills: Python, JavaScript, MATLAB, STATA, Microsoft Office, etc.

Academic Interests: Internet of Things, Pure Math and Applied Math

- Interests in IoT: Theory and Applications in Industrial Internet of Things, Smart City Internet of Things
- Interests in Math: Applied and Pure Math including Numerical Analysis, Scientific Computation, Applied Analysis, Applied Partial Differential Equation, Inverse Problems and Imaging, Probability Theory and Measure Theory, Math Application on Specific Scenes in Industrial IoT and Smart City IoT

Hobbies: Tai Chi, Composing Traditional Chinese Poetry, Philosophy of Taoism, Playing Guqin, Cooking, Badminton, Photography