

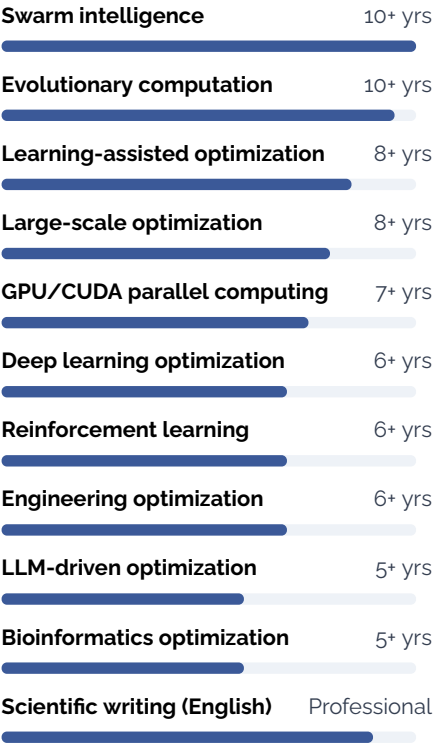


Qingke Zhang (张庆科)

Ph.D. | Associate Professor
Master's Supervisor

- ▶ Chinese (native), English (working)
- ▶ Jinan, Shandong, P.R. China
- ▶ Nationality: Chinese

Research



Biography

Dr. Qingke Zhang is an **Associate Professor** and **Master's Supervisor** at the School of Computer Science and Artificial Intelligence, Shandong Normal University, China. He received his Ph.D. in Computer Science and Technology from Shandong University in 2017, where he was honored as an Outstanding Graduate of both Shandong University and Shandong Province.

His research centers on **swarm intelligence, evolutionary computation, learning-assisted optimization, and GPU-parallel intelligent computing**, targeting high-dimensional, dynamic, noisy, and expensive black-box optimization problems with mechanism-aware, explainable, and self-evolving algorithms. He further integrates **deep learning** and **reinforcement learning** into the optimization pipeline for landscape modeling, surrogate-assisted evaluation, and adaptive control of search strategies, advancing learning-to-optimize across benchmark and engineering problems. He has published **over 40 papers** in leading SCI journals including *Information Sciences*, *Knowledge-Based Systems*, *Expert Systems with Applications*, and *Engineering Applications of Artificial Intelligence*, **two of which are ESI Highly Cited Papers**. He holds **five granted invention patents**, serves as a **reviewer for 20+ SCI journals**, and independently developed the open-source **PlatECO** optimization visualization & analysis platform. His research outcomes in intelligent optimization have demonstrated broad applicability across diverse scientific and engineering domains, including UAV path planning, bioinformatics, intelligent disease diagnosis, advanced manufacturing, and energy-system optimization.

Work Experience

Associate Professor | Master's Supervisor

01/2024 - present

School of Computer Science and Artificial Intelligence
Shandong Normal University, China

Leading research on computational intelligence and artificial intelligence; supervising graduate students on swarm intelligence and learning-assisted optimization; teaching courses on computational intelligence and optimization theory.

Lecturer

07/2017 - 12/2023

School of Computer Science and Artificial Intelligence
Shandong Normal University, China

Conducted research on optimization theory, evolutionary algorithms and their engineering applications; taught undergraduate courses on object-oriented programming and computational intelligence; awarded the Outstanding Teaching Award.

Signature Research Contributions

- **Growth Optimizer (GO).** Pioneered a growth-inspired learning-reflection optimization paradigm that embeds knowledge acquisition, experience accumulation, and self-adaptive reflection into evolutionary search, providing powerful and efficient search ability for complex optimization problems. The framework has demonstrated broad applicability across diverse scientific and engineering domains, established a new direction for data-driven optimization.
- **Alpha Evolution (AE).** Pioneered a novel evolutionary framework based on evolution-path adaptation and matrix-based generation, providing a principled approach for adaptive information evolution beyond conventional metaphor-driven optimization.
- **Optimization-State and Strategy Adaptation.** Established a research line from search-state recognition to adaptive strategy control (OSCOA, QAGO, HLABC, multi-strategy DE), enabling optimizers to perceive search dynamics and autonomously adjust search behaviors.
- **GPU/CUDA Gradient Growth Optimizer.** Designed a GPU-parallel architecture achieving up to $7.8\times$ CPU speed-up, demonstrating strong scalability and engineering potential for large-scale numerical optimization.
- **Learning-to-Optimize (Deep & Reinforcement Learning).** Integrated deep and reinforcement learning into metaheuristic search to support surrogate modeling, landscape-aware strategy selection, and cross-problem knowledge transfer.
- **PlatECO: Intelligent Optimization Visualization & Analysis Platform.** Independently developed an open-source platform integrating algorithm implementation, batch evaluation, statistical comparison, and visualization, supporting reproducible research and engineering deployment.

Education

09/2013 - 06/2017

Ph.D. in Computer Science and Technology

Shandong University
Outstanding Graduate of Shandong University and Shandong Province.

09/2010 - 06/2013

M.Eng. in Computer Application Technology

University of Jinan
Outstanding Graduate and Recipient of the National Graduate Scholarship.

09/2006 - 06/2010

B.Eng. in Computer Science and Technology

Qingdao Binhai University
Outstanding Graduate and Inaugural Distinguished Alumni of the university.

Research Interests

- Swarm intelligence
- Evolutionary computation
- Meta-black-box optimization
- Causal optimization
- Deep learning-assisted optimization
- Reinforcement learning-guided optimization
- Large-scale optimization
- LLM-driven optimization
- GPU/CUDA computing
- Bioinformatics optimization
- Engineering applications

Selected Publications

- **Qingke Zhang***, Hao Gao, Zhi-Hui Zhan, Junqing Li, and Huaxiang Zhang, "Growth Optimizer: A Powerful Metaheuristic Algorithm for Solving Continuous and Discrete Global Optimization Problems," *Knowledge-Based Systems*, vol. 261, p. 110206, 2023. **(ESI Highly Cited)**
- **Qingke Zhang**, Weiguo Liu, Xiangxu Meng, Bo Yang, and Athanasios V. Vasilakos, "Vector Co-evolving Particle Swarm Optimization Algorithm," *Information Sciences*, vol. 394-395, pp. 273-298, 2017.
- **Qingke Zhang***, Xianglong Bu, Zhi-Hui Zhan, Junqing Li, and Huaxiang Zhang, "An Efficient Optimization State-Based Coyote Optimization Algorithm and Its Applications," *Applied Soft Computing*, vol. 147, p. 110827, 2023.
- Hao Gao, **Qingke Zhang***, Xianglong Bu, and Huaxiang Zhang, "Quadruple Parameter Adaptation Growth Optimizer With Integrated Distribution, Confrontation, and Balance Features for Optimization," *Expert Systems with Applications*, vol. 235, p. 121218, 2024.
- Xianglong Bu, **Qingke Zhang***, Hao Gao, and Huaxiang Zhang, "Multi-Strategy Differential Evolution Algorithm Based on Adaptive Hash Clustering and Its Application in Wireless Sensor Networks," *Expert Systems with Applications*, vol. 246, p. 123214, 2024.
- Hao Gao and **Qingke Zhang***, "Alpha Evolution: An Efficient Evolutionary Algorithm With Evolution Path Adaptation and Matrix Generation," *Engineering Applications of Artificial Intelligence*, vol. 137, p. 109202, 2024. **(ESI Highly Cited)**
- Shuzhao Pang, **Qingke Zhang***, Zhi-Hui Zhan, Junqing Li, and Huaxiang Zhang, "Sparse-Driven Auxiliary Mask Regulation and Hierarchical Action Selection for Large-Scale Multi-Objective Optimization," *Expert Systems with Applications*, vol. 302, p. 130489, 2026.
- Conglin Li, **Qingke Zhang***, Junqing Li, Sichen Tao, and Diego Oliva, "Adversarial Game Optimization: A Game-Theoretic Metaheuristic for Efficient Complex Optimization and Engineering Applications," *Information Sciences*, vol. 735, p. 123022, 2026.
- Xiaoyu Liu, **Qingke Zhang***, Junqing Li, and Huaxiang Zhang, "Multi-Strategy Boosted Dung Beetle Optimizer and Its Applications for Photovoltaic Models and Engineering Applications," *International Journal of Machine Learning and Cybernetics*, vol. 16, pp. 10667-10701, 2025.
- **Qingke Zhang***, Xianglong Bu, Hao Gao, Tianqi Li, and Huaxiang Zhang, "A Hierarchical Learning Based Artificial Bee Colony Algorithm for Numerical Global Optimization and Its Applications," *Applied Intelligence*, vol. 54, pp. 169-200, 2024.
- **Qingke Zhang***, Wenliang Chen, Shuzhao Pang, Sichen Tao, Conglin Li, and Xin Yin, "GPU/CUDA-Accelerated Gradient Growth Optimizer for Efficient Complex Numerical Global Optimization," *Parallel Computing*, vol. 126, p. 103160, 2025.
- Xiaoyu Liu, **Qingke Zhang***, Shuzhao Pang, Jiajun Sun, and Huaxiang Zhang, "Pulse-Strategy Collective Learning Swarm Optimizer for Large-Scale Global Optimization," *Applied Intelligence*, vol. 55, p. 777, 2025.

* Corresponding Author (Sole)

Patents and Research Translation

- **Five granted Chinese invention patents**, first inventor on four of them.
- Core inventions cover a parameter-adaptive Growth Optimizer, biological multiple-sequence alignment, multilevel-threshold image segmentation, and gene-sequence alignment.
- Research outputs have been extended to UAV path planning, medical and engineering image analysis, sensor deployment, photovoltaic parameter estimation, and distributed scheduling.

Research Projects

National Natural Science Foundation of China (NSFC)

2021 - 2024

Young Scientists Fund, No. 62006144 | Principal Investigator

Large-scale global optimization for biological multiple-sequence alignment; completed.

Postdoctoral Research Project

2018 - 2021

Shandong Normal University | Principal Investigator

Optimization theory and methods for complex high-dimensional problems; completed.

Contact

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Industry–University Cooperative Education Project

2018 - 2020

Ministry of Education, China | Principal Investigator

Curriculum development and reform of Mobile Computing under the new-engineering background; completed.

University Young Faculty Project

2018 - 2019

Shandong Normal University | Principal Investigator

Particle swarm optimization with aggregation–dispersion cooperation; completed.

Teaching and Mentoring

- Teaches five courses across undergraduate, master's and doctoral programs;
- Recipient of the Shandong Normal University Outstanding Teaching Award.
- Principal investigator of the doctoral-course reform project *Optimization Theory and Methods* (2026–2028).
- Supervised 20+ master's students; mentees received the National Graduate Scholarship and Outstanding Master's Thesis awards.
- Guided national-level undergraduate innovation training projects; mentored student teams to 50+ awards in academic competitions, including the China Software Cup and mathematical modeling contests.

Honours and Academic Service

- Council Member of the Shandong Association of Artificial Intelligence; Deputy Secretary-General of its Computational Intelligence Committee.
- Member of IEEE and the China Computer Federation (CCF); reviewer for 20+ SCI journals and CCF conferences.
- Recipient of two Outstanding Academic Paper Awards from the Shandong Association of Artificial Intelligence.
- Provincial Outstanding Trainee in the young-faculty teaching-capacity development program; Outstanding Graduate of Shandong University and Shandong Province.
- CSC Visiting Scholar Fellowship, China Scholarship Council, 2025.

Jinan, China, August 15, 2026

