Ke Luo

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Ph.D. in Computer System Architecture Huazhong University of Science and Technology (HUST)
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Highly-motivated Ph.D. in Computer Science(Computer Architecture) with good foundations of math and statistics. Proficient in storage channel modeling, analysis, and signal processing and enthusiastic about data storage technologies and deep learning inspired information theory. Skilled in Matlab/Octave, Python, C/C++ programming, and Nmag/μmag simulation tools. Passionate about computer science, hiking, and photography.

Education

Till now	Wuhan National Laboratory for Optoelectronics, **Huazhong University of Science and Technology**
March 2023	Postdoc. in Optical Engineering , Mentor: Prof. Jincai Chen, Prof. Jingyu Zhang
December 2022	Wuhan National Laboratory for Optoelectronics, **Huazhong University of Science and Technology**
September 2016	Ph.D. in Computer Architecture , Supervisor: Prof. Jincai Chen
June 2016	College of Electronics and Information, **South-Central Minzu University**
September 2012	Bachelor in Electronics and Information Engineering

Research Projects

- National Natural Science Foundation of China, General Program, No. 62272178, Study of Write Mechanism of Ultra-high Density Three-Dimensional Heat-Assisted Magnetic Recording, 2023/01 to 2026/12, ongoing, participant
  - Research Achievements and Innovations: 3D magnetic recording medium model, 3D data readback model.
  - Main Contributions: Writing the proposal and obtaining funding, 3D magnetic recording read channel modeling, 3D readback signal equalization and detection.
  - Research Impact: Achieved dual-layer magnetic data recording to ensure the reliability of 3D magnetic data reading, doubling the storage density, providing theoretical foundation and technical support for ultra-high-density 3D magnetic storage.
- National Natural Science Foundation of China, General Program, No. 61672246, Key Technologies of Read Heads Array and The Recording System for Two-Dimensional Magnetic Recording at Ultra-high Densities, 2017/01 to 2020/12, completed, participant
  - Research Achievements and Innovations: 2D magnetic recording medium model, 2D data readback model.
  - Main Contributions: Conducted modeling of 2D magnetic recording media, read/write processes, and readback signal processing. Designed a method for generating a 2D Voronoi medium particle model and analyzed write errors under different medium and recording bit size parameters.
  - Research Impact: This study proposes selection criteria for two-dimensional readback response intervals that balance accuracy and computational overhead. It establishes a systematic framework for two-dimensional magnetic recording, including writing, readback, and data recovery channels. Additionally, it introduces a neural network-based block equalization detection method and a constraint control encoding method that limits consecutive magnetization transitions. These advancements effectively enhance the reliability of magnetic storage systems and provide important theoretical

guidance and practical value for significantly increasing magnetic storage density and capacity.

- National Natural Science Foundation of China, General Program, No. 61272068, Key Technologies of Ultra-high Density Shingled Magnetic Recording on Bit Patterned Media, 2013/01 to 2016/12, completed, participant
  - Research Achievements and Innovations: Bit-patterned magnetic recording medium model, bit-patterned data readback model.
  - Main Contributions: Modeling of bit-patterned magnetic recording read channels, study of recording bit arrangement, and readback signal simulation analysis.
  - Research Impact: This study proposes a bit-patterned magnetic recording (BPMR) medium model and develops a corresponding magnetic recording read channel model. It provides a theoretical foundation and technical support for shingled recording technology in bit-patterned media.
- Corporate Collaboration, PRML Algorithms and Techniques for Multi-layer Blu-ray Discs Cooperation Project, 2024/07 to 2025/02, ongoing, participant
  - Research Achievements and Innovations: Multi-layer blue-ray disc PRML signal processing algorithm and simulation model based on an independent guiding layer.
  - Main Contributions: Research on multi-layer disc PRML models and signal quality assessment methods.
  - Research Impact: Achieved RF signal sample detection for 300GB-500GB multi-layer blue-ray discs, meeting commercial requirements, providing technical support for the domestic production of ultra-large capacity optical discs.
- Corporate Collaboration, PRML Model Design and Implementation Based on BDXL Standard, 2022/08 to 2023/06, completed, participant
  - Research Achievements and Innovations: PRML detector design for blue-ray discs based on the BDXL standard.
  - Main Contributions: Completed algorithm design for a PRML simulation model of blue-ray storage based on the BDXL standard.
  - Research Impact: The designed PRML channel solution was tested in commercial optical discs, achieving detection results at the international advanced level.
- Corporate Collaboration, HDD Prototype Algorithms and Advanced Magnetic Recording Technology Cooperation Project, 2022/03 to 2023/03, completed, participant
  - Research Achievements and Innovations: Micromagnetic simulation analysis and modeling of magnetic recording systems, advanced magnetic recording system algorithm design and simulation.
  - Main Contributions: Conducted research on HDD-related technologies, algorithms, and literature based on PMR/TDMR, optimized algorithms for PMR and TDMR, and developed, designed, and optimized key technologies related to magnetic heads, storage density, reliability, equalization, detection, and encoding/decoding.
  - Research Impact: Based on PMR+TDMR magnetic recording technology, this study provides prototype/commercially viable HDD algorithms with industry-competitive performance, along with floating-point algorithm simulation code development, supporting prototype system development and validation.

Publications and Patents

[1] **Ke Luo**, Ziqian Liu, Yuqian Zhao, Yugen Jian, Simon Greaves, Jincai Chen, and Ping Lu, "Interference mitigation via top-layer-assisted signal rescaling in dual-layer 3d magnetic recording," English, in *2025 The Magnetic Recording Conference*, 2025, pp. 1–2.

[2] **Ke Luo**, Yuqian Zhao, Ziqian Liu, Yugen Jian, Simon Greaves, Jincai Chen, and Ping Lu, "Enhancing bottom-layer detection in dual-layer 3d magnetic recording via top-layer-assisted signal rescaling," English, *IEEE Transactions on Magnetics*, pp. 1–6, 2025. DOI: 10.1109/TMAG.2025.3601437.

[3] Chuanbo Zhu, Chao Sun, Yifan Liu, Jincai Chen*, and **Ke Luo***, "Enhancing speech emotion recognition with speech dynamic modeling and multi-modal knowledge distillation," in *2025 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2025.

[4] Yifan Liu, **Ke Luo***, and Jincai Chen, "Multi-modal image reflection removal with prior knowledge of reflection structure inconsistency," in *The 10th IEEE International Conference on Data Science and Systems (DSS 2024)*, 2024.

[5] **Ke Luo**, Yanzhe Liao, Kezheng Zhang, Yugen Jian, Shaobing Wang, Jincai Chen*, and Ping Lu, "On the impact of interlayer misalignment for dual-layer data detection in three dimensional magnetic recording," *Journal of Magnetism and Magnetic Materials*, vol. 610, p. 172 522, 2024. DOI: 10.1016/j.jmmm.2024.172522.

[6] **Ke Luo**, Kezheng Zhang, Yufei Wu, Yanzhe Liao, Hongyu Gao, Wei Li, Yugen Jian, Ziqian Liu, Yuqian Zhao, Jincai Chen*, Ping Lu, and Shaobing Wang, "The compatible partial response maximum likelihood detection schemes for blu-ray discs," in *2024 21st International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON)*, 2024, pp. 1–5. DOI: 10.1109/ECTI-CON60892.2024.10594973.

[7] Yanzhe Liao, Kezheng Zhang, Yugen Jian, Shaobing Wang, Jincai Chen, Ping Lu, and **Ke Luo***, "Decision-Feedback Single-Layer Read Reconstruction and Separation for Three-dimensional Magnetic Recording," in *2024 IEEE International Magnetics Conference (INTERMAG)*, Rio de Janeiro, Brazil, May 2024, pp. 1–2.

[8] **Ke Luo**, Yufei Wu, Yanzhe Liao, Shaobing Wang, Yugen Jian, Jincai Chen*, and Ping Lu, "Quaternary Neural Network Equalization for Three-Dimensional Magnetic Recording," in *2024 IEEE International Magnetics Conference (INTERMAG)*, Rio de Janeiro, Brazil, May 2024, pp. 1–2.

[9] **Ke Luo**, Yugen Jian, Yanzhe Liao, Kezheng Zhang, Jincai Chen*, and Ping Lu, "A Graded Precompensation Scheme by Pattern Classification on Nonlinear Transition Shift for Perpendicular Magnetic Recording," *IEEE Transactions on Magnetics*, vol. 59, no. 8, pp. 1–6, 2023. DOI: 10.1109/TMAG.2023.3288371.

[10] Yugen Jian, **Ke Luo**, Wei Li, Vitaliy Lomakin, Jincai Chen*, and Ping Lu, "Pattern Constraints Limiting Nonlinear Transition Shift in High Density Magnetic Recording," *Journal of Magnetism and Magnetic Materials*, vol. 588, p. 171 370, 2023. DOI: https://doi.org/10.1016/j.jmmm.2023.171370.

[11] Wei Chen, Jincai Chen*, Zongsong Gan, Yaxiong Ma, **Ke Luo**, Zhenxing Huang, Yang He, and Ping Lu, "A Simple and Effective Semi-Circle Resonator System for Bit-Patterned HAMR," *Physics Letters A*, vol. 391, p. 127 129, 2021. DOI: https://doi.org/10.1016/j.physleta.2020.127129.

[12] **Ke Luo**, Shaobing Wang, Guoqiang Xie, Wei Chen, Jincai Chen*, Ping Lu, and Weiming Cheng, "Read Channel Modeling and Neural Network Block Predictor for Two-Dimensional Magnetic Recording," *IEEE Transactions on Magnetics*, vol. 56, no. 1, pp. 1–5, 2020. DOI: 10.1109/TMAG.2019.2950704.

[13] Wei Chen, Jincai Chen*, Zongsong Gan, **Ke Luo**, Zhenxing Huang, and Ping Lu, "High-Field Enhancement of Plasmonics Antenna Using Ring Resonator for HAMR," *IEEE Transactions on Magnetics*, vol. 56, no. 7, pp. 1–5, 2020. DOI: 10.1109/TMAG.2020.2990525.

[14] **Ke Luo**, Shaobing Wang, Kheong Sann Chan, Wei Chen, Jincai Chen*, Ping Lu, and Weiming Cheng, "A Study on Block-Based Neural Network Equalization in TDMR System With LDPC Coding," *IEEE Transactions on Magnetics*, vol. 55, no. 11, pp. 1–5, 2019. DOI: 10.1109/TMAG.2019.2931760.

[15] **Ke Luo**, Shaobing Wang, Kheong Sann Chan, Wei Chen, Jincai Chen*, Ping Lu, and Weiming Cheng, "A Study on Block-Based Neural Network Equalization in TDMR System with LDPC Coding," in *The 30th Magnetic Recording Conference (TMRC 2019)*, Minneapolis, UM, USA, Jul. 2019, pp. 1–2.

[16] Shaobing Wang, Jincai Chen*, **Ke Luo**, Guoqiang Xie, Ping Lu, and Weiming Cheng, "Performance Evaluation of Four-Reader Array Detection for Two-Dimensional Magnetic Recording," *Science of Advanced Materials*, vol. 11, no. 6, pp. 835–841, Jun. 2019.

[17] Shaobing Wang, Jincai Chen*, **Ke Luo**, Guoqiang Xie, Ping Lu, and Weiming Cheng, "Joint Four-Reader Array Equalization and Detection for a Single Track in TDMR," *IEEE Transactions on Magnetics*, vol. 55, no. 12, pp. 1–6, 2019. DOI: 10.1109/TMAG.2019.2936181.

[18] Guoqiang Xie, **Ke Luo**, Shaobing Wang, Ping Lu, Weiming Cheng, and Jincai Chen*, "Rounded Corner Effect on Write Performance for Shingled Magnetic Recording System," in *2018 Asia-Pacific Magnetic Recording Conference (APMRC)*, USST, China, Nov. 2018, pp. 1–2. DOI: 10.1109/APMRC.2018.8601116.

[19] **Ke Luo**, Shaobing Wang, Guoqiang Xie, Jincai Chen*, Ping Lu, and Weiming Cheng, "Read Channel Modeling and Neural Network Block Predictor for TDMR," in *2018 Asia-Pacific Magnetic Recording Conference (APMRC)*, USST, China, Nov. 2018, pp. 1–2. DOI: 10.1109/APMRC.2018.8601082.

[20] Shaobing Wang, Jincai Chen*, **Ke Luo**, Ping Lu, and Weiming Cheng, "Four-Reader Array Detection for Two-Dimensional Magnetic Recording," in *2018 Asia-Pacific Magnetic Recording Conference (APMRC)*, USST, China, Nov. 2018, pp. 1–2. DOI: 10.1109/APMRC.2018.8601111.

[21] Jincai Chen, Guoqiang Xie, **Ke Luo**, Weiming Cheng, Ping Lu, and Yao Wang*, "Study of Erase Band and Write Performance in Shingled Mag-netic Recording with Exchanged Coupled Composite Media," in *2018 IEEE International Magnetics Conference (INTERMAG)*, Singapore, Apr. 2018, pp. 1–1. DOI: 10.1109/INTMAG.2018.8508564.

[22] Jincai Chen, Guoqiang Xie, **Ke Luo**, Shaobing Wang, Ping Lu, and Yao Wang*, "Study of Erase Band and Write Performance for Shingled Magnetic Recording With FePt-Based Exchanged Coupled Composite Media," *IEEE Transactions on Magnetics*, vol. 54, no. 11, pp. 1–6, 2018. DOI: 10.1109/TMAG.2018.2829848.

[23] **Ke Luo**, Yufei Wu, Jincai Chen, Ping Lu, Kezheng Zhang, Yanzhe Liao, and Yuegn Jian, *A method for detecting readback signal sample sequences in optical disc data reading process*, National Invention Patent of China, to be authorized, 2025.

[24] **Ke Luo**, Kezheng Zhang, Yugen Jian, Wei Li, Yanzhe Liao, Yufei Wu, Hongyu Gao, Jincai Chen, and Ping Lu, *A Classification Compensation Method for Non-Linear Transition Shift in the Process of Disk Data Writing*, National Invention Patent of China, CN 117059134 A, Nov. 2023.

[25] Jincai Chen, **Ke Luo**, Ping Lu, Zongsong Gan, Shaobing Wang, Wei Chen, Xing Liu, and Jinxing Bao, *Two-Dimensional Channel Equalization Model Training Method and Two-Dimensional Channel Equalization Methods*, National Invention Patent of China, CN 110211611 B, 2019.