JIAXI CHEN

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EDUCATION

University of Massachusetts, Lowell, MA **Sep. 2021 – May. 2025**
Ph.D. Graduate in Computer Engineering

- Research focuses on the optimization of transform-based lossy compression.
- In-depth exploration of mathematical background of the quantization process and proposed the fixed-PSNR (Peak Signal-to-Noise Ratio) mode of DCTZ (Discrete Cosine Transformation Compressor) which allows user to specify the PSNR before compression.
- Applied the machine learning methodology to predict the compression ratio with multiple implementations of transform-based lossy compressor.
- Research Interests: High Performance Computing, Parallel Computing, Parallel I/O, Data-Intensive Computing, Embedded Systems.

University of Massachusetts, Lowell, MA **Jan. 2018 – May 2020**
Master of Science in Computer Engineering (GPA 3.8/4.0)

- **Relevant Courses:** Algorithms, Computer Architecture and Design, Computing III(C++), Operating System, Data Base, Data Communications, Data Intensive Computing, Probability and Random Process.
- **Master Thesis:** Focus on lossy data compression algorithms for scientific data sets. Use C programming language to build its own algorithm based on the JPEG compression mechanism and optimize the quantization table to reach a better compression ratio. Use z-checker to compare my algorithm's performance with other lossy compressors such as SZ and ZFP. The paper of this research is published on HPEC 2020.

Beijing Jiaotong University, Beijing, China **Sept. 2002 – July 2006**
Bachelor of Science in Electrical Engineering

SKILLS

- Programming Languages: C/C++/C#, Java, JavaScript/TypeScript, Node.js, SQL, MATLAB
- Technical Skills: Git, Docker, MIT SuperCloud
- Operating System: Linux, macOS

PROFESSIONAL EXPERIENCE

Summit Digestive & Liver Disease Specialists, Oakbrook Terrace, IL **Nov 2020 – May 2021**
Software Engineer

- Applied and maintained the patient management IT system.
- Provided the on-site support and trained the employees to adapt with new features.

University of Massachusetts, Lowell **May 2020 – Oct. 2020**
Research Intern

- Set up a Prometheus instance with docker and a 3 node Ceph storage cluster with Ceph erasure code and compression. Run Prometheus benchmarks to come up with experiment data, analyze the data to evaluate if Ceph storage pool is a "good" candidate for serving as a backing storage for Prometheus tsdb.

Hanergy Holding Group Ltd., Beijing, China **April 2010 – Sept. 2015**
Senior CDM (Clean Development Mechanism) Consultant

- Managed and led 20+ various kinds of projects, including wind power, hydro power, solar, landfill gas and wastewater disposal.
- Managed clients in Europe and coordinate sales process for emission reduction solutions and applications.

RESEARCH & ACADEMIC PROJECTS

- **Fixed-PSNR Mode for Transform-based Lossy Compression** **May 2025**
  An in-depth exploration of mathematical background of the quantization process, such as the relationship between the error bound applied and the total data distortion.
- **PSNR-Aware Quantization for DCT-based Lossy Compression** **Fall 2023**
  A novel quantization method to support a fixed-PSNR mode for DCTZ to meet maximum compression potential and user-defined PSNR simultaneously.
- **Towards Guaranteeing Error Bound in DCT-based Lossy Compression** **Fall 2022**
  A preconditioning method based on level offsetting and scaling to control the magnitude of input data in order to guarantee user-defined error bound.
- **Bit-error aware quantization for DCT-based lossy compression** **Summer 2020**

A unique ordering mechanism based on the quantization table and extend the encoding index to improve the performance of DCTZ.

- **Implement Index Nested Loop Join With B+ Tree** **Spring 2019**
  Setup the code and environment. Got familiar with the code and had deeply understanding of OOP. Programmed Java to implemented B+ Tree and Index nested loop join operator. Test two table join and three table join to verify the code design.
- **Kafka Compression Algorithm Evaluation on MIT Supercloud** **Spring 2019**
  Configured a multi-node Kafka cluster on MIT Supercloud. Submitted the jobs with Slurm script. Evaluated and analyzed the four different compression algorithms, including gzip, snappy, lz4 and zstd.
- **Simulation of the effectiveness for different scheduling algorithms** **Spring 2018**
  Wrote a program in C to simulate several CPU scheduling algorithms (FCFS, SJF, STCF, RR) and its behavior when making scheduling decisions about a set of processes and exported the result to a txt file in Linux (CentOS).
- **Fundamental theory of multithreading and synchronization** **Spring 2018**
  Used C to write a multithreaded version of producer-consumer model with the data stored in a circular buffer which was managed as a FIFO queue in Linux (CentOS).
- **Simulating cache memory** **Spring 2018**
  Analyzed the effectiveness of a two-stage memory hierarchy (cache and main memory) with C++, implemented the design of direct mapping, two way associative and fully associative with Least Recently Used (LRU) replacement policy, keep track of the number of cache misses, miss rate and clock cycle.

SELECTED PUBLICATIONS

- J. Chen, and S. W. Son, “PSNR-Aware Quantization for DCT-based Lossy Compression,” in 2023 IEEE International Conference on Big Data (Big Data), 2023, pp. 4223-4232
- J. Chen, A. Moon, and S. W. Son, “Towards Guaranteeing Error Bound in DCT-based Lossy Compression,” in 2022 IEEE International Conference on Big Data (Big Data), 2022, pp. 3139-3145.
- A. Moon, J. Chen, S. W. Son and M. Kim, "Characterization of Transform-Based Lossy Compression for HPC Datasets," in 2022 IEEE/ACM 8th International Workshop on Data Analysis and Reduction for Big Scientific Data (DRBSD), 2022, pp. 56-62,
- J. Zhang, J. Chen, X. Zhuo, A. Moon, and S. W. Son, “DPZ: Improving Lossy Compression Ratio with Information Retrieval on Scientific Data,” in 23rd IEEE International Conference on Cluster Computing (CLUSTER), 2021, pp. 320-331.
- J. Zhang, J. Chen, A. Moon, X. Zhuo, and S. W. Son, “Bit-error aware quantization for DCT-based lossy compression,” in 2020 IEEE High Performance Extreme Computing Conference (HPEC), 2020, pp. 1-7.