Jianlan Ye

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SUMMARY

Mechanical engineering Ph.D. with 5 years of scientific computing and high-performance computing experience, seeking full-time software development roles in high-performance computing field.

SKILL SETS

- Programming: C++, STL, Python, Git, Linux, Bash scripting
- Acceleration: MPI, Vectorization (SIMD), threading (OpenMP), CUDA, OpenACC
- Molecular dynamics and visualization: LAMMPS, VMD
- Machine learning and HPC environment: PyTorch, CNN, Deep learning, OpenCV, Slurm, Module
- Programming tools: Git, GDB, gprof, Docker,

WORK EXPERIENCE

Lawrence Berkeley National Laboratory, Summer intern May 2023 – Aug 2023

- Wrote benchmark programs and characterized the performance of a new parallel discrete event simulation framework with a hybrid communication model.
- Conducted large-scale scalability tests of the simulator with up to 32,768 CPUs on the new HPC cluster (Perlmutter).
- Identified the performance bottlenecks of the under-performed corner cases and improved algorithms that facilitate the synchronization.

RESEARCH AND PROJECTS

Implementation and Optimization of Intramolecular Force Correlation Simulation Package (arxiv)

- Trained a coarse-grained model with Iterative Boltzmann Inversion for polyethylene that reproduces the correlated distribution function, increased the performance of simulations by **50x** compared with the atomistic model.
- Developed a new LAMMPS package in **C++** to implement the interactions in the bond-angle model and optimized the performance with **MPI**.
- Implemented the training process with a Python program that integrates multiple C++ programs for different tasks.
- Optimized the program and reached a **50x** speed-up compared with its atomistic counterparts.

Developments of cg-distributions, a GPU-accelerated comprehensive MD post-processing program

- Designed and developed a **C++** program that post-processes LAMMPS trajectory files and computes distribution functions, local number density, and mean-squared displacements.
- Optimized the code with **OpenMP** that accelerated the performance by more than three times when using multi-core CPU.
- Implemented a dynamic reading procedure that reduces memory usage when reading files with the sizes of Terabytes.
- Achieved a **10x** acceleration by offloading the RDF and KDE computation to Nvidia GPUs with **CUDA.**

Development of a CNN-based car plate recognizer

- Isolated the plate images from given image from car images with **OpenCV** by recognizing the contours of the plate
- Processed and segmented the images into gray-scale sub-images containing individual characters.
- Trained a convolutional neural network with **PyTorch** to recognize the characters from the sub-images, achieved an accuracy of **98%.**

Development of a Parallel Hybrid Monte Carlo Simulator

- Designed and developed a parallel Python program that utilized the Monte Carlo method to construct semicrystalline systems with topological parameters matching the theoretical data.
- Achieved **25x** acceleration on a 128-core node by parallelizing the program with MPI4PY.
- Accelerated the program by **3x** by invoking **LAMMPS** within **Python** environment to avoid redundant reinitialization.

EDUCATION

Doctor of Philosophy (Ph.D. candidate)**,** Mechanical Engineering — Aug. 2017 – Fall 2023 (prospective)
Ira A. Fulton School of Engineering, Arizona State University — GPA: 3.98

Master of Science, Mechanical Engineering — Aug. 2013 – May 2015
Ira A. Fulton School of Engineering, Arizona State University — GPA: 3.90

Bachelor of Engineering, Building Environment and Equipment Engineering — Sept. 2010 – July 2014
Huazhong University of Science and Technology — GPA: 3.50