



中国科学技术大学

University of Science and Technology of China

To whom it may concern,

As the research advisor of Wenyu Pan, it is my great pleasure to have a chance to work with her and write a strong assessment letter for her. Currently, I am a research professor at the School of Computer Science and Technology, University of Science and Technology of China (USTC). Before that, I obtained my Ph.D. degree at Max Planck Institute for Software Systems (Germany) and worked at Oracle Labs Swiss. My research interests lie in distributed systems, storage systems, and operating systems. In particular, I proposed a set of fine-grained distributed consistency models and various system support to strike a reasonable tradeoff between system performance and consistency semantics in geo-distributed or deep learning environments, which were published at top revenues in the system community such as SOSP, OSDI, FAST, VLDB, ATC, EuroSys, etc. I am also a member of ACM Future of Computing Academy and serve on the program committee of conferences such as SOSP, ICDCS, DSN, SRDS, and HotStorage. I am also the recipient of the 2021 ACM ChinaSys Rising Star Award.

I had known Wenyu since June 2021 when she visited me at USTC. She told me that she would like to work with me to explore various research opportunities for a semester. She made regular appointments with me during that month and dropped by my office to discuss her professional career planning. I was happy to help define her path towards future success. I got to know her well throughout the several discussions we had, and some of her brilliant ideas, passion, and positive attitudes left me with a deep impression.

Wenyu's keen interest in computer systems research deeply touched me with more frequent interactions. To help her build a solid background in computer systems and assess if she is qualified for research, in July 2021, I recruited Wenyu as a research intern in my lab (Advanced Data Systems Lab, or ADSL for short). The mission of ADSL mainly focuses on building scalable and reliable distributed computing and storage systems. She joined a team led by one of my Ph.D. students to eliminate the network bottleneck faced by large-scale data-parallel DNN training. To give some background, we build a data compression-aware data-parallel training framework HiPress, which enables easy development and deployment of various gradient compression algorithms and their integration into multiple data-parallel training systems for acceleration. This paper has been accepted by SOSP 2021. As follow-up work, we would like to address some challenges of applying such a framework in practice. Wenyu comes to help us develop new algorithms within HiPress, which are much more



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complex than the case studies we put into the paper. Exercising new algorithms against HiPress allows us to stress the ability of HiPress and understand the limits of HiPress, which will drive innovations to improve the system design.

At the early stage of her study, she found many recently published papers about advanced gradient compression algorithms, and summarized these algorithms, and made a very clear comparison against the case studies in our SOSP paper. This study is critical for understanding the applicability and generality of HiPress. Thank Wenyu, we learned from this study that HiPress could easily support most algorithms except 3LC. Compared to all other algorithms, 3LC differs because it combines both quantization and sparsification. Following that, Wenyu and her teammate together identified a few missing functions of HiPress to make 3LC work. This discovery process is very challenging and time-consuming as it requires understanding the algorithm logics and the system architecture and communication/compression management of HiPress. Finally, she independently proposed a few solutions to complement the shortcomings of HiPress and successfully made 3LC well supported by HiPress. The final evaluation shows that the performance with 3LC in HiPress significantly outperforms the baselines, including both non-compression and compression-enabled open-source solutions. Currently, this project is progressing well, and Wenyu is helping exercise more algorithms and generalize the design principles to extend HiPress to support activation compression. It is expected that we will complete a high-quality top-tier conference or journal submission in February 2022.

About research, I think Wenyu significantly developed her problem identifying and solving skills, paper reading and presentation skills, leadership and cooperation skills, and enhanced her creativity and critical thinking skills. In particular, I enjoy reading the weekly reports she put together and the summaries she made when she achieved milestones. In addition to the research skills, Wenyu also developed her communication and question-asking skills. Right now, I believe she has become more confident and brave to explore new ideas.

All this proves that Wenyu is a good student and has a solid overall quality in leadership, communication skills, and cooperation spirits. Her performance and achievements all demonstrate the high-quality education at your university. So again, I am delighted to supervise her and look forward the future collaborations. If you need any further information, please feel free to contact me.



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Most sincerely,

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