Guanhua Wang

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EDUCATION

University of California, Berkeley   08/2015-06/2022
Ph.D. Student in Computer Science, AMPLab
Advisor: Ion Stoica

Hong Kong University of Science and Technology   09/2012-06/2015
Master of Philosophy in Computer Science and Engineering
GPA: 4.0/4.3 (A+ range)
Advisor: Lionel M. Ni

Southeast University, China   08/2008-06/2012
Bachelor of Engineering in Computer Science and Technology
GPA: 3.5/4, Ranking: 1/140 (overall ranking)
***First Prize** of the Outstanding Graduation Project in Jiangsu Province (**Top 0.1%**)*

WORK EXPERIENCE

- **Software Engineer Intern @ Oasis Labs, Berkeley, CA**   **05/2018 – 08/2018**
  Implement distributed key-value store for data query and data migration over blockchain.
  ***Mentor**: Dawn Song (Professor at EECS, UC Berkeley)*

- **Research Intern @ Microsoft Research (MSR), Redmond, WA**   **05/2017 – 08/2017**
  Speeding up communication among GPUs within DGX-1 machine, and across multiple machines.
  ***Mentor**: Amar Phanishayee (Principle Researcher)*

- **Research Intern @ Microsoft Research (MSR), Redmond, WA**   **05/2016 – 08/2016**
  Improving image query accuracy (Microsoft's Bing Image Search Engine) using Microsoft CNTK.
  ***Mentors**: Sanjeev Mehrotra (Principle Software Architect), Jin Li (Partner Researcher Manager)*

RESEARCH PROJECTS

- **Distributed Machine Learning**

  - **Wavelet: Efficient DNN Training with Tick-Tock Scheduling**

    In distributed DNN training, GPU memory reaches peak usage during forward propagation, but is underutilized during backward propagation. Wavelet achieves near optimal on-device memory usage by adopting a simple but novel scheduling scheme called Tick-Tock, which interleaves peak memory usage among different waves of in-parallel training tasks.

  - **sensAI: ConvNets Decomposition via Class Parallelism for Fast Inference on Live Data**

    sensAI achieves extremely low latency for real-time live-data inference via class parallelism, which decouples a ConvNet into disconnected subnets, each is responsible for predicting certain class(es).

  - **Blink: Fast and Generic Collectives for Distributed ML (filed as a US Patent by Microsoft)**

    DNN model parameter synchronization in distributed data parallel training introduces overheads when training at scale. Existing parameter synchronization protocols cannot effectively leverage available network resources in the face of ever increasing hardware heterogeneity. To address this issue, we propose Blink, a collective communication library that dynamically generates optimal solution given any network topology. Compared to the state-of-the-art NCCL2, Blink achieves up to 8x faster model synchronization (AllReduce), and reduce end-to-end DNN training time for image classification by up to 40%.

- **Computer Networks**
  - ➢ **WiHear: We Can Hear You with Wi-Fi!**
    The key insight of WiHear is to sense and recognize the radiometric impact of mouth movements on Wi-Fi signals. WiHear achieves hearing people talking just like lip-reading.

PUBLICATIONS

➢ *Conferences*
- **Guanhua Wang**, Kehan Wang, Kenan Jiang, Xiangjun Li, Ion Stoica, "Wavelet: Efficient DNN Training with Tick-Tock Scheduling", in proceedings of **MLSys**, 2021.
- **Guanhua Wang**, Zhuang Liu, Brandon Hsieh, Siyuan Zhuang, Joseph Gonzalez, Trevor Darrell, Ion Stoica, "sensAI: ConvNets Decomposition via Class Parallelism for Fast Inference on Live Data", in proceedings of **MLSys**, 2021.
- **Guanhua Wang**, Shivaram Venkataraman, Amar Phanishayee, Jorgen Thelin, Nikhil Devanur, Ion Stoica, "Blink: Fast and Generic Collectives for Distributed ML", in proceedings of **MLSys,** 2020.
- **Guanhua Wang**, Amar Phanishayee, Shivaram Venkataraman, Ion Stoica, "Blink: A fast NVLink-based collective communication library", in **MLSys**, 2018.
- **Guanhua Wang**, Yongpan Zou, Zimu Zhou, Kaishun Wu, Lionel M. Ni, "We Can Hear You with Wi-Fi!", in proceedings of **ACM MobiCom**, 2014.
- **Guanhua Wang**, Kaishun Wu, Qian Zhang, Lionel M. Ni, "SimCast: Efficient Video Delivery in MU-MIMO WLANs", in proceedings of **IEEE INFOCOM**, 2014.
- **Guanhua Wang**, Shanfeng Zhang, Kaishun Wu, Qian Zhang, Lionel M. Ni, "TiM: Fine-Grained Rate Adaptation in WLANs", in proceedings of **IEEE ICDCS**, 2014.

➢ *Journals*
- **Guanhua Wang**, Yongpan Zou, Zimu Zhou, Kaishun Wu, Lionel M. Ni, "We Can Hear You with Wi-Fi!", in IEEE Transactions on Mobile Computing, 2016.
- **Guanhua Wang**, Shanfeng Zhang, Kaishun Wu, Qian Zhang, Lionel M. Ni, "TiM: Fine-Grained Rate Adaptation in WLANs", in IEEE Transactions on Mobile Computing, 2015.
- **Guanhua Wang**, Kaishun Wu, Lionel M. Ni, "CSMA/SF: Carrier Sense Multiple Access with Shortest First", in IEEE Transactions on Wireless Communications, 2014.

➢ *US Patent*
- **Guanhua Wang**, Shivaram Venkataraman, Amar Phanishayee, Jorgen Thelin, Nikhil Devanur, "Mitigating Communication Bottlenecks during Parameter Exchange in Data-parallel DNN Training", US20200160171A1, 2020

AWARDS & HONORS
- 2014   IEEE INFOCOM 2014 Student Travel Grant
- 2014   HKUST Research Travel Grant
- 2012-2015   Postgraduate studentship at HKUST
- 2012   First prize of the Outstanding Graduation Project in Jiangsu Province (Top 0.1%)
- 2011-2012   IBM Chinese Excellent Student scholarship
- 2010-2011   China Aerospace Science and Technology Corporation (CASC) scholarship
- 2009-2010   Students in Free Enterprise (SIFE) Elite Student Certificate

- 2008-2009   Champion of Southeast University Soccer Cup
- 04-06/2012   Winner of Outstanding Graduation Project in Southeast University
- 01-03/2011   Successful participant of 2011 International Mathematical Contest in Modeling (MCM)
- 11-12/2010   Award of Excellence in Southeast University FPGA design competition
- 09-10/2010   Award of Excellence in SIFE 2010 national competition
- 09-10/2010   Third prize of National undergraduate mathematical contest in modeling
- 07-09/2010   Second prize of National undergraduate electronic design contest
- 05-07/2010   Top 10 outstanding team in National VMware cloud computing contest
- 04-05/2010   Award of Excellence in 2010 Southeast University smart car competition
- 03-04/2010   Third prize of Southeast University embedded system design competition
- 02-04/2010   Second prize of 2010 Microsoft image cup programming contest
- 02-04/2010   Second prize of Southeast University RoboCup competition
- 01-02/2010   Third prize of Southeast University electronic design competition

EXTRACURRICULAR ROLES
- Core member   Southeast University SIFE union (2009-2011)
- Captain   Men's soccer team in the School of Computer Science and Engineering, Southeast University (2009-2012)

SKILLS
- Programming: C/C++, CUDA, Python, Verilog/VHDL, MATLAB, LaTeX
- Fluent in English and Chinese