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Conference report

Stars shine: The report of 2021 BenchCouncil awards

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ABSTRACT

This report introduces the awards presented by the International Open Benchmark Council (BenchCouncil) in 2021 and highlights the award selection rules, committee, awardees, and their contributions.

1. The introduction of BenchCouncil 2021 awards

According to the decision of the BenchCouncil Steering committee, four awards were set up to encourage and reward scientists who have made contributions in benchmarking, standardizing, measuring, evaluating and optimizing: the Benchcouncil Achievement Award, the Benchcouncil Rising Star Award, the BenchCouncil Distinguished Doctoral Dissertation Award, and the BenchCouncil Bench conference Best Paper Award. In addition, Prof. Tony Hey donated to set up the BenchCouncil Bench conference Tony Hey Best Student Paper Award.

The virtual award ceremony was held at the 2021 BenchCouncil International Symposium on Benchmarking, Measuring, and Optimizing (Bench'21). The Bench'21 General Chairs are Prof. Resit Sendag from the University of Rhode Island, USA, Dr. Arne J. Berre from SINTEF Digital, Norway. The Program Chairs are Dr. Lei Wang from ICT, Chinese Academy of Sciences, China; Prof. Axel Ngonga, from Paderborn University, Germany; and Prof. Chen Liu from Clarkson University, USA. The Special Session Chair is Prof. Xiaoyi Lu from The University of California, Merced, USA. Three associate coordinators from BenchCouncil: Ke Liu, Simin Chen, Fanda Fan from the University of Chinese Academy of Sciences, and one coordinator from BenchCouncil: Shaopeng Dai from ICT, Chinese Academy of Sciences, provided technical services for organizing this virtual event.

2. The BenchCouncil Achievement Award

This award recognizes a senior member who has made long-term contributions to benchmarking, standardizing, measuring, evaluating and optimizing. The winner will automatically become BenchCouncil Fellow and join the BenchCouncil Achievement and Rising Star Award Committees the following year. The award carries a $3,000 honorarium.

2.1. Award committee

The 2021 BenchCouncil Achievement Award committee consists of six members. They are Prof. Lizy John from the University of Texas at Austin (architecture), Prof. Geoffrey Fox from Indiana University (systems and applications), Prof. D.K. Panda from the Ohio State University (high-performance computing), Prof. Jianfeng Zhan from the Chinese Academy of Sciences (systems, architecture, and applications), Prof. Tony Hey from Rutherford Appleton Laboratory STFC (systems and applications), and Prof. David Lilja from the University of Minnesota (high-performance computing and architecture).

2.2. Award selection rule [1]

Only the award committee members can nominate the candidates. Each committee member can nominate one person. A coordinator in the award committee is responsible for collecting the nomination and votes. After receiving the nominations, the coordinator will send the nomination information to all members. Before the voting is over, the nominator is anonymous. After that, all details of who nominated who and who voted will be disclosed within the committee. The candidate who gets the highest votes will become the winner.

2.3. The awardee and contribution

BenchCouncil Achievement Award is given to Dr. Jack J. Dongarra from the University of Tennessee. He specializes in numerical algorithms in linear algebra, parallel computing, the use of advanced computer architectures, programming methodology, and tools for parallel computers. His research includes developing, testing, and documentation of high-quality mathematical software. According to the decision

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Fig. 1. Prof. Jack. J. Dongarra is honored with 2021 BenchCouncil Achievement Award for the "novel and substantial contribution to development, testing and documentation of high-quality mathematical software" and "benchmarking HPC systems".

Fig. 2. Prof. Jack. J. Dongarra's award certification.

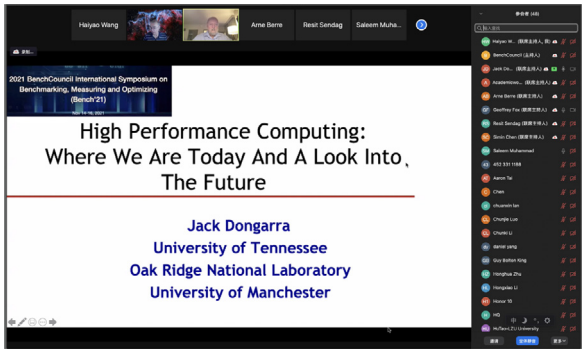

Fig. 3. Prof. Jack. J. Dongarra delivered a keynote speech at the Bench21 award ceremony. Prof. Geoffrey Fox from Indiana University chaired the speech.

of the award committee, Prof. Jack J. Dongarra has been selected for the "novel and substantial contribution to development, testing and documentation of high-quality mathematical software [2–4]" and "benchmarking HPC systems [5,6]".

Dr. Jack J. Dongarra is a Member of the US National Academy of Engineering, a Foreign Member of the Russian Academy of Sciences, and a Foreign Fellow of the British Royal Society (see Figs. 1–3).

3. BenchCouncil Rising Star Award

This award recognizes young researchers who demonstrate outstanding research and practice in benchmarking, standardizing, measuring, evaluating, and optimizing. The winner will automatically become BenchCouncil Senior Fellow and join the BenchCouncil Rising Star Award Committee the following year. The award carries a $1,000 honorarium.

Fig. 4. Dr. Petter Mattson from Google is honored with 2021 BenchCouncil Rising Star Award. Prof. Jianfeng Zhan from Chinese Academy of Sciences chaired the award ceremony.

3.1. Award committee

The 2021 BenchCouncil Rising Star Award committee consists of seven members. They are Prof. Lizy John from the University of Texas at Austin (architecture), Prof. Geoffrey Fox from Indiana University (systems and applications), Prof. D.K. Panda from the Ohio State University (high-performance computing), Prof. Jianfeng Zhan from the Chinese Academy of Sciences (systems, architecture, and applications), Prof. Tony Hey from Rutherford Appleton Laboratory STFC (systems and applications), and Prof. David Lilja from the University of Minnesota (high-performance computing and architecture), and Prof. Torsten Hoefler from ETH Zurich (high-performance computing).

3.2. Award selection rule [7]

Only the award committee members can nominate the candidates. Each committee member can nominate one researcher or a group of researchers up to three people who co-advance the state-of-the-art and state-of-the-practice in the same field. A coordinator in the award committee is responsible for collecting the nomination and votes. After receiving the nominations, the coordinator will send the nomination information to all members. Before the voting is over, the nominator is anonymous. After that, all details of who nominated who and who voted will be disclosed within the committee. The candidate (one researcher or a group of researchers) who gets the highest votes will win.

3.3. Awardees and their contributions

Three primary contributors to the MLPerf and AIBench projects were honored with the 2021 BenchCouncil Rising Star Award: Dr. Peter Mattson from Google, Prof. Dr. Vijay Janapa Reddi from Harvard University, and Prof. Dr. Wanling Gao from the Chinese Academy of Sciences.

Dr. Peter Mattson was chosen for the contributions "as a lead researcher, proposing AI training benchmarks and performing large-scale industry testing [8,9]" and "co-proposing memory access scheduling technique that reorders memory references to exploit locality within the 3-D memory structure [10]".

Dr. Peter Mattson leads the ML Performance Measurement at Google. He co-founds and is General Chair of the MLPerf consortium. Previously, he founded the Programming Systems and Applications Group at NVIDIA Research. He ever was V.P. of software infrastructure for Stream Processors Inc (SPI), and a managing engineer at Reservoir Labs. His research focuses on accelerating and understanding the behavior of machine learning systems by applying novel benchmarks and analysis tools (see Figs. 4–6).

Dr. Wanling Gao was selected for the contributions "as one of the primary researchers, proposing AI scenario [11], AI training [12], and

Fig. 5. Dr. Petter Mattson's Award Certificate.

Fig. 8. Dr. Wanling Gao's Award Certificate.

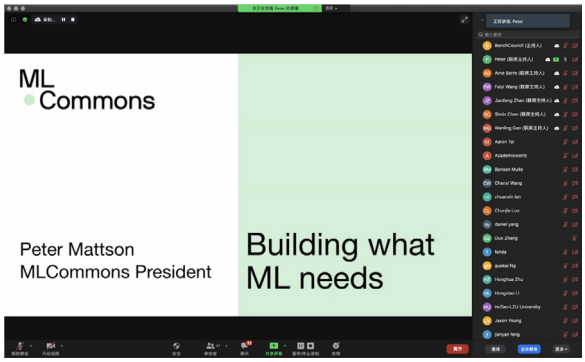

Fig. 6. Dr. Petter Mattson delivered a keynote speech at the Bench 21 award ceremony.

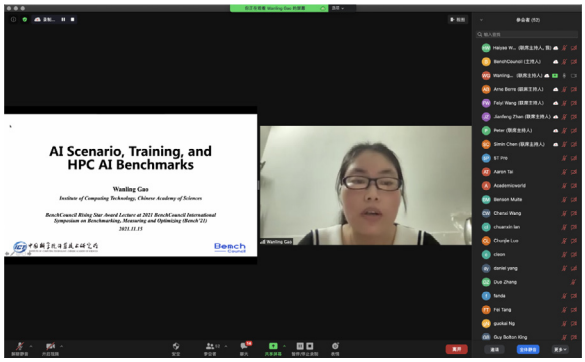

Fig. 9. Dr. Wanling Gao delivered a keynote speech at the Bench 21 award ceremony.

Fig. 7. Dr. Wanling Gao from Chinese Academy of Sciences is honored with 2021 BenchCouncil Rising Star Award. Prof. Jianfeng Zhan from Chinese Academy of Sciences chaired the award ceremony.

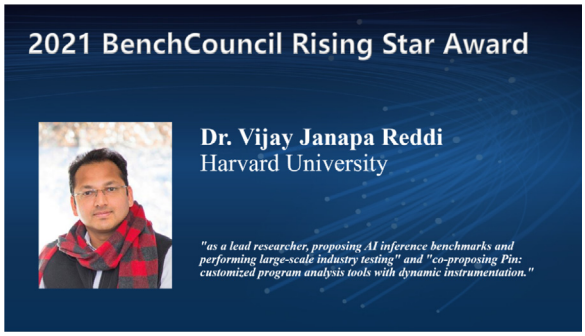

Fig. 10. Dr. Vijay Janapa Reddi from Harvard University is honored with the 2021 BenchCouncil Rising Star Award. Prof. Jianfeng Zhan from Chinese Academy of Sciences chaired the award ceremony.

HPC AI benchmarks [13]" and "proposing a data motif abstraction that tries to unify the big data and AI workloads [14]".

Dr. Wanling Gao is an Associate Professor at the Institute of Computing Technology, Chinese Academy of Sciences. Dr. Wanling Gao received her B.S. degree from Huazhong University of Science and Technology in 2012, and her Ph.D. degree from the Institute of Computing Technology, the Chinese Academy of Sciences, and the University of Chinese Academy of Sciences in 2019. Her works focus on big data and AI benchmarking, workload characterization, computer architecture, and proxy benchmarks for simulation (see Figs. 7–9).

Dr. Vijay Janapa Reddi was selected for the contributions "as a lead researcher, proposing AI inference benchmarks and performing large-scale industry testing [9,15]" and "co-proposing Pin: customized program analysis tools with dynamic instrumentation [16]".

Dr. Vijay Janapa Reddi is an Associate Professor in the John A. Paulson School of Engineering and Applied Sciences (SEAS) at Harvard University. His research is centered on mobile and edge-centric computing systems (see Figs. 10–12).

4. BenchCouncil Distinguished Doctoral Dissertation Award

This award recognizes and encourages superior research and writing by doctoral candidates in the broad field of benchmarking, standardizing, measuring, evaluating, and optimizing. Among the submissions, four candidates will be selected as finalists. They will be invited to give a 30-minute presentation at the BenchCouncil Bench Conferences and contribute research or survey articles to BenchCouncil Transactions on Benchmarks, Standards, and Evaluation. Finally, one among the four will receive the award, which carries a $1,000 honorarium.

Fig. 11. Dr. Vijay Janapa Reddi's Award Certificate.

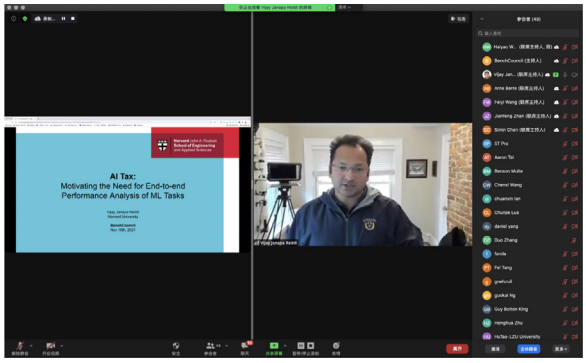

Fig. 12. Dr. Vijay Janapa Reddi delivered a keynote speech at the Bench 21 award ceremony.

4.1. Award committee

The 2021 BenchCouncil Distinguished Doctoral Dissertation Award consists of five members. They are Prof. Jack Dongarra from University of Tennessee (high-performance computing), Prof. Dr. Xiaoyi Lu from The University of California, Merced (high-performance computing), Dr. Jeyan Thiyagalingam from STFC-RAL (scientific Computing and AI), Dr. Lei Wang, ICT, Chinese Academy of Sciences (Systems and architecture), Prof. Dr. Spyros Blanas from The Ohio State University (data management). The committee members cannot nominate their students.

4.2. Award selection rule [17]

The committee welcomes the proposals from the following but not limited to the following communities: architecture, systems, database, high-performance computing, machine learning or AI, scientific computing, medicine, or other disciplines.

Only those awarded Ph.D. in the past two years are eligible for this award. Only the accepted final version of a nominated Ph.D. dissertation will be considered, and it must have been filed with the writer's institution during the nomination cycle. The writer or the writer's Ph.D. advisor can nominate a dissertation, nominated only once. The benchmarks, data, or tools that are the essential contributions of the dissertation should be open-sourced.

At least two supporting letters should be included from experts in the field who can provide additional insights or evidence of the dissertation's impact. The nominator/advisor may not write a letter of support. Each letter should include the name, address, and telephone number of the endorser. The nominator should collect the letters and bundle them for submission.

Fig. 13. Dr. Romain Jacob is selected as one of the finalists for the 2021 BenchCouncil Distinguished Doctoral Dissertation Award. Prof. Xiaoyi Lu from The University of California, Merced chaired the finalist speech.

In the first round, the four candidates will be singled out. Each one will give a 30-minute presentation in the distinguished Ph.D. dissertation session in the Bench conference https://www.benchcouncil.org/conferences.html#benchconf chaired by the committee.

Each finalist must submit an article to the BenchCouncil Transactions on Benchmarks, Standards, and Evaluations (TBench). In advance, each submitter is encouraged to submit a survey article or a research article to TBench. The article should include the following contents. (a) The fundamental issue your dissertation tackles. Why is it essential and challenging? (10%). (b) The summary of state-of-the-art and state-of-the-practice (30%). (c) How do you advance state-of-the-art and state-of-the-practice? What are your innovative approaches, systems, tools, and insights? (40%) (d) Open issues and future work (20%).

The article that is submitted to TBench will be reviewed for technical depth and significance of the research contribution, the potential impact on theory and practice. Finally, one among the four finalists will receive the award. The committee will present the award at the award ceremony of the Bench conference.

4.3. Finalists and citations

Dr. Romain Jacob from ETH Zurich, Dr. Pei Guo from University of Maryland, Baltimore County (UMBC), Dr. Kai Shu from Arizona State University, and Dr. Belen Bermejo from University of the Balearic Islands are selected as the finalists.

Dr. Romain Jacob completed his doctoral studies under the supervision of Prof. Lothar Thiele at ETH in 2019. His dissertation is entitled Leveraging Synchronous Transmissions for the Design of Real-time Wireless Cyber–Physical Systems. He was suggested for "his leading efforts in establishing benchmarks for low-power wireless networking and for the development of a concrete methodology to foster the replicability of networking experiments [18,19]".

Dr. Romain Jacob's advisor, Prof. Lothar Thiele, is a Full Professor of Computer Engineering at ETH Zurich. His research interests include models, methods, and software tools for designing real-time embedded systems, the internet of things, cyber–physical systems, sensor networks, embedded software, and bioinspired optimization techniques (see Figs. 13–15).

Currently, Dr. Romain Jacob is a postdoctoral researcher at ETH Zurich in the group of Prof. Laurent Vanbever. His current interests focus on computer networks, communication protocols, (real-time) scheduling theory, and statistics applied to experimental design.

Dr. Pei Guo received her Ph.D. in Information Systems from the University of Maryland, Baltimore County, in 2021. Her dissertation is entitled Scalable Multivariate Causality Discovery From Large-scale Global Spatio-temporal Climate Data. She was selected for "the interdisciplinary research on causality discovery approaches for climate

Fig. 14. Dr. Romain Jacob completed his doctoral studies under the supervision of Prof. Lothar Thiele.

Fig. 15. Dr. Romain Jacob's Finalist Certificate.

Fig. 16. Dr. Pei Guo is selected as one of the finalists for the 2021 BenchCouncil Distinguished Doctoral Dissertation Award. Prof. Xiaoyi Lu from The University of California, Merced, chaired the finalist speech.

data and extensive benchmarking of proposed work via both synthetic datasets and real-world applications [20,21]".

Dr. Pei Guo's advisor, Prof. Jianwu Wang, is an Associate Professor at the Department of Information Systems, University of Maryland, Baltimore County (UMBC). His current research interests include Big Data Analytics, Distributed Computing, and Scientific Workflows with an application focusing on climate and manufacturing (see Figs. 16–18).

Currently, Dr. Pei Guo is working as a Data Scientist at Wyze Labs. She involves in the research on spatiotemporal causal modeling on large-scale data, big data application parallelizing, and cloud computing.

Dr. Kai Shu obtained his Ph.D. in Computer Science at Arizona State University in 2020 and was the recipient of the 2020 ASU Engineering

Fig. 17. Dr. Pei Guo completed his doctoral studies under the supervision of Prof. Jianwu Wang.

Fig. 18. Dr. Pei Guo's Finalist Certificate.

Fig. 19. Dr. Kai Shu is selected as one of the finalists for the 2021 BenchCouncil Distinguished Doctoral Dissertation Award. Prof. Xiaoyi Lu from The University of California, Merced, chaired the finalist speech.

Dean's Dissertation Award. His dissertation is entitled Understanding Disinformation: Learning with Weak Social Supervision. He was suggested for "creating, curating and maintaining FakeNewsNet - a widely used, de facto benchmark data repository on Fake News Detection in his doctoral dissertation [22,23]".

Dr. Kai Shu's advisor, Prof. Huan Liu, is a professor of Computer Science and Engineering at Arizona State University. He is a Fellow of ACM, AAAI, AAAS, and IEEE. His research interests are in data mining, machine learning, social computing, and artificial intelligence, investigating interdisciplinary problems that arise in many real-world, data-intensive applications with high-dimensional data of disparate forms such as social media.

Currently, Dr. Kai Shu is a Gladwin Development Chair Assistant Professor in the Department of Computer Science at Illinois Institute of Technology since Fall 2020. His research and computational tool development address challenges on fake news detection, explainable

Fig. 20. Dr. Kai Shu completed his doctoral studies under the supervision of Prof. Huan Liu.

Fig. 21. Dr. Kai Shu's Finalist Certificate.

Fig. 22. Dr. Belen Bermejo is selected as one of the finalists for the 2021 BenchCouncil Distinguished Doctoral Dissertation Award. Prof. Xiaoyi Lu from The University of California, Merced, chaired the finalist speech.

machine learning, trust social computing, and social media mining (see Figs. 19–21).

Dr. Belen Bermejo obtained a Ph.D. degree in 2020 at the University of the Balearic Islands. Her dissertation is entitled Performance and Energy Consumption Tradeoff in Server Consolidation. She was suggested for "the creation of the CiS2 index which is based on monitoring and benchmarking to manage the trade-off between power consumption and performance in virtualized servers [24,25]".

Dr. Belen Bermejo's advisor, Prof. Carlos Juiz, is heading the ACSIC research group (http://acsic.uib.es) at the University of the Balearic Islands. He is a senior member of the IEEE and a senior member of the ACM. His research interest mainly focuses on performance engineering, Green IT, and IT governance (see Figs. 22–24).

Currently, Dr. Belen Bermejo is an assistant lecture at the University of the Balearic Islands and a member of the ACSIC research group (http://acsic.uib.es). Her researches focus on the performance and energy consumption of virtualized systems.

Fig. 23. Dr. Belen Bermejo completed his doctoral studies under the supervision of Prof. Carlos Juiz.

Fig. 24. Dr. Belen Bermejo's Finalist Certificate.

Fig. 25. The group photo of the awardees of the Best Paper Award. From left to right are Ross Miller, Dr. Aristeidis Tsaris, Dr. Junqi Yin (the first author), Dr. Sajal Dash, Dr. Mallikarjun (Arjun) Shankar, and Dr. Feiyi Wang from Oak Ridge National Laboratory.

5. BenchCouncil Bench 21 Best Paper Award and Tony Hey Best Student Paper Award

5.1. BenchCouncil Bench 21 Best Paper Award

A group of computer scientists at Oak Ridge National Laboratory (ORNL) received the best paper award for the paper titled "Comparative Evaluation of Deep Learning Workload for Leadership-class Systems [26]" (see Figs. 25–27).

Since deep learning (DL) applications rely heavily on DL frameworks and underlying compute (CPU/GPU) stacks, it is essential to

Fig. 26. Prof. Tony Hey chaired the award ceremony of the best paper award.

Fig. 27. Best Paper Award Certificate.

gain a holistic understanding from compute kernels, models, and frameworks of popular DL stacks, and to assess their impact on science-driven, mission-critical applications. This paper employs a set of micro and macro DL benchmarks established through the Collaboration of Oak Ridge, Argonne, and Livermore (CORAL) to evaluate the AI readiness of the next-generation supercomputers. This paper presents the early observations and performance benchmark comparisons between the Nvidia V100 based Summit system with its CUDA stack and an AMD MI100 based testbed system with its ROCm stack.

The following introduces each author. Dr. Junqi Yin is a computational scientist in Analytics & AI Methods at Scale (AAIMS) group of National Center for Computational Sciences at ORNL. His research interests range from scalable machine learningdeep learning. Dr. Aristeidis Tsaris is a research scientist in the Analytics & AI Methods at Scale (AAIMS) group of National Center for Computational Sciences at ORNL. His research focus is on scalable machine learning applications on HPC systems, benchmarking, and imaging. Ross Miller has B.S. and M.S. degrees in computer science. He has been working at ORNL for 12 years on a variety of supercomputer-related topics including filesystems for SSD's, data archiving systems and exploring ARM architecture for HPC use. Dr. Sajal Dash is currently a postdoctoral research associate at Analytics & AI Methods at Scale (AAIMS) group of National Center for Computational Sciences at ORNL. His research interests include exploring scaling approaches for large-scale deep learning applications.

Dr. Feiyi Wang is a Senior Research Scientist and Group Leader of Analytics and AI methods at Scale Group (AAIMS) at National Center for Computational Sciences of ORNL. He is also a Senior Member of IEEE. His research interests include large-scale data analytics, distributed machine learning and benchmarking, high-performance storage systems, parallel I/O, and file systems. Dr. Mallikarjun (Arjun) Shankar is the Section Head for the Advanced Technologies Section (ATS) in the National Center for Computational Science at ORNL. He is the director of the Compute and Data Environment for Science (CADES) at ORNL. He is a member of the AAAS, a Senior Member of the ACM, and a Senior Member of the IEEE. His research involves designing large-scale data analysis, modeling systems, sensor networking systems, energy grid monitoring, and control frameworks, and deploying middleware to overlay data, computation, and control across systems and infrastructure.

Fig. 28. The group photo of the awardees of the Tony Hey Best Student Paper Award. From left to right are Prof. Guangzhong Sun, Dr. Jingwei Sun, Zhongtian Xu, and Jiaqiang Liu (the first author) from the University of Science and Technology of China.

5.2. BenchCouncil Bench 21 Tony Hey Best Student Paper award

A graduate student, Jiaqiang Liu, from the University of Science and Technology of China, and the other members, supervised by Prof. Guangzhong Sun, received the Tony Hey Best Student Paper Award for the paper titled 11Latency-Aware Automatic CNN Channel Pruning with GPU Runtime Analysis [27]" (see Figs. 28–30).

The huge storage and computation cost of convolutional neural networks (CNN) make them challenging to meet the real-time inference requirement in many applications. This paper proposes a latency-aware automatic CNN channel pruning method (LACP) to search for low latency and accurate pruned network structure automatically. The inference latency of convolutional layers on GPU is analyzed to bridge model pruning and inference acceleration. Results show that the inference latency of convolutional layers exhibits a staircase pattern along with channel number due to the GPU tail effect. Based on that observation, the search space of network structures is greatly shrunk. Then an evolutionary procedure is applied to search a computationally efficient pruned network structure, which reduces the inference latency and maintains the model accuracy. Experiments and comparisons with state-of-the-art methods on three image classification datasets show that the method in this paper can achieve better inference acceleration with less accuracy loss.

The short introduction of each author is as follows. Jiaqiang Liu is a graduate student at the University of Science and Technology of China. His research interests include high-performance computing and performance modeling. Dr. Jingwei Sun is currently a postdoctoral researcher with the School of Computer Science and Technology, University of Science and Technology of China. His research interests include high-performance computing, performance modeling, and algorithm optimization. Zhongtian Xu is a graduate student at the University of Science and Technology of China. His research interests include high-performance computing and algorithm optimization. Dr. Guangzhong Sun is a professor at the School of Computer Science and Technology, University of Science and Technology of China. He is also

Fig. 29. Prof. Tony Hey chaired the award ceremony of the Tony Hey Best Paper Award.

Fig. 30. The Tony Hey Best Paper Award Certificate.

a member of the National High-Performance Computing Center (Hefei) and the principal investigator of the Algorithm and Data Application (Ada) Research Group. His research interests include high-performance computing, algorithm optimizations, and data processing.

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Taotao Zhan contributes Sections One, Two, and Three; Simin Chen contributes Sections Four and Five. We are very grateful to BenchCouncil Steering Committee, Award Committee for presenting these awards, and Bench 21 general chairs, program chairs, and other teams for organizing the excellent Bench 21 event. For simplicity, we do not list their names one by one.

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