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Debdoot Sheet · Daguang Xu (Eds.)

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Distributed, Collaborative, and Federated Learning, and Affordable AI and Healthcare for Resource Diverse Global Health

Third MICCAI Workshop, DeCaF 2022
and Second MICCAI Workshop, FAIR 2022
Held in Conjunction with MICCAI 2022
Singapore, September 18 and 22, 2022
Proceedings

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Preface DeCaF 2022

Machine learning approaches have demonstrated the capability of revolutionizing almost every application and every industry through the use of large amounts of data to capture and recognize patterns. A central topic in recent scientific debates has been how data is obtained and how it can be used without compromising user privacy. Industrial exploitation of machine learning and deep learning (DL) approaches has, on the one hand, highlighted the need to capture user data from the field of application in order to yield a continuous improvement of the model, and on the other hand it has exposed a few shortcomings of current methods when it comes to privacy.

Innovation in the way data is captured, used, and managed, as well as how privacy and security of this data can be ensured, is a priority for the whole research community. Most current methods rely on centralized data stores, which contain sensitive information and are often out of the direct control of users. In sensitive contexts, such as healthcare, where privacy takes priority over functionality, approaches that require centralized data lakes containing user data are far from ideal, and may result in severe limitations in what kinds of models can be developed and what applications can be served.

Other issues that result in privacy concerns are more intimately connected with the mathematical framework of machine learning approaches and, in particular, DL methods. It has been shown that DL models tend to memorize parts of the training data and, potentially, sensitive information within their parameters. Recent research is actively seeking ways to reduce issues caused by this phenomenon. Even though these topics extend beyond distributed and collaborative learning methods, they are still intimately connected to them.

The third MICCAI Workshop on Distributed, Collaborative and Federated Learning (DeCaF 2022) aimed at creating a scientific discussion focusing on the comparison, evaluation, and discussion of methodological advancement and practical ideas about machine learning applied to problems where data cannot be stored in centralized databases; where information privacy is a priority; where it is necessary to deliver strong guarantees on the amount and nature of private information that may be revealed by the model as a result of training; and where it's necessary to orchestrate, manage, and direct clusters of nodes participating in the same learning task.

During the third edition of DeCaF, 18 papers were submitted for consideration, and, after peer review, 14 full papers were accepted for presentation. Each paper was rigorously reviewed by at least three reviewers in a double-blind review process. The papers were assigned to reviewers considering (and avoiding) potential conflicts of interest and recent work collaborations between peers. Reviewers were selected from among the most prominent experts in the field from all over the world.

Once the reviews were obtained, the area chairs formulated final decisions over acceptance, conditional acceptance, or rejection of each manuscript. These decisions were always taken according to the reviews and could not be appealed. In the case of conditional acceptance, authors had to make substantial changes and improvements

to their paper according to reviewer feedback. The nature of these changes aimed to increase the scientific validity as well as the clarity of the manuscripts.

Additionally, the workshop organizing committee granted the Best Paper Award to the best submission presented at DeCaF 2022. The Best Paper Award was assigned as a result of a secret voting procedure where each member of the committee indicated two papers worthy of consideration for the award. The paper collecting most votes was then chosen by the committee.

The double-blind review process with three independent reviewers selected for each paper, united with the mechanism of conditional acceptance, as well as the selection and decision process through meta-reviewers, ensured the scientific validity and the high quality of the works presented at the third edition of DeCaF, making our contribution very valuable to the MICCAI community, and in particular to researchers working on distributed and collaborative learning. We would therefore like to thank the authors for their contributions and the reviewers for their dedication and fairness when judging the works of their peers.

August 2022

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Preface FAIR 2022

As we witness a technological revolution that is spinning diverse research fields including healthcare at an unprecedented rate, we face bigger challenges ranging from the high cost of computational resources to the reproducible design of affordable and innovative solutions. While AI applications have been recently deployed in the healthcare systems of high-income countries, their adoption in developing and emerging countries remains limited.

Given the breadth of challenges faced, particularly in the field of healthcare and medical data analysis, we presented the first Workshop on Affordable AI and Healthcare (FAIR) aiming to i) raise awareness about the global challenges in healthcare, ii) strengthen the participation of underrepresented communities at MICCAI, and iii) build a community around affordable AI and healthcare in low resource settings. Our workshop stands out from other MICCAI workshops as it prioritizes and focuses on developed AI solutions and research suited to low infrastructure, point-of-care-testing, and edge devices. Examples include, but are not limited to, AI deployments in conjunction with conventional X-rays, ultrasound, microscopic imaging, retinal scans, fundus imaging, and skin lesions. Moreover, we encouraged works that identify often neglected diseases prevalent in low resource countries and propose affordable AI solutions for such diseases using medical images. In particular, we were looking for contributions on (a) making AI affordable for healthcare, (b) making healthcare affordable with AI, or (c) pushing the frontiers of AI in healthcare that enables (a) or (b).

In the second edition of the FAIR workshop (FAIR 2022), held in conjunction with MICCAI 2022 (Singapore), nine papers, eight regular and one white paper, were submitted for consideration, and after the peer review process, only four regular papers were accepted for publication (an acceptance rate of: 50%) along with the white paper. The topics of the accepted submissions are around deep ultrasound segmentation, portable OCT image quality enhancement, self-attention deep networks, and knowledge distillation in a low-regime setting. Papers were presented both virtually and in-person in Singapore.

We followed the same review process as the main MICCAI conference by employing a double-blind review process with three to four reviewers per submission. Reviewers were selected from a pool of excellent researchers in the field, who have published at top-tier conferences, and manually assigned to the papers avoiding potential conflict of interest. Submissions were ranked based on the overall scores. Final decisions about acceptance/rejection and oral presentations were made by the Program Chairs according to ranking, quality, and the total number of submissions. Springer's Editorial Policy was shared with the authors to aid the preparation of camera-ready versions.

We would like to thank the authors for their contributions and the reviewers for their commitment, patience, and constructive feedback. Also, we would like to thank the publicity committee and the advisory committee for their support.

August 2022

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