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Guest Editor's Note: High-Level Parallel Programming 2021

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The HLPP series of workshops/symposia, started in 2001, is a forum for researchers developing state-of-the-art concepts, tools, and applications for high-level parallel programming. The general emphasis is on software quality, programming productivity and high-level performance models.

After a rigorous peer-review process in two stages performed by the HLPP-2021 program committee members and additional reviewers (in a first stage for presentation at the HLPP-2021 symposium and in a second stage for inclusion in the special issue), revised versions of 5 of the papers presented at HLPP-2021 have been accepted for publication in this special issue.

HLPP welcomes papers related to topics ranging from the design and implementation of high-level programming languages, libraries, and frameworks to the design and analysis of algorithms for structured models of parallelism. The former theme is usually more represented in both submissions and accepted papers. HLPP 2021 is no exception: four of the five papers are related to programming libraries and APIs, and one proposes an algorithm for the MapReduce model.

A popular paradigm in the HLPP series, is skeletal parallelism. *Algorithmic skeletons* can be seen as higher-order functions implemented in parallel, and possibly manipulating distributed data structures. More generally skeletal parallelism encompasses languages, libraries and frameworks that offer reusable and composable patterns of parallel algorithms.

The paper by August Ernstsson, Nicolas Vandenbergen, Jörg Keller, Christoph Kessler proposes an extension to the algorithmic skeleton library SkePU. In scientific applications, pseudo-random number generators are often part of computations.

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For reproducibility, portability, and performance, having deterministic and distributed generators is very important.

With C++20, the C++ standard library now supports pipelines of operations for a more concise programming style inspired by functional programming. Peter Thoman, Florian Tischler, Philip Salzmann and Thomas Fahringer leverage this new feature as well as C++ concepts to design and implement a new API – *The Celerity High-level API* – following this programming style and targeting heterogeneous architectures.

In their extension of the Muesli skeleton library, Nina Herrmann, Breno A. de Melo Menezes and Herbert Kuchen focus on stencil calculations with algorithmic skeletons, and they also target heterogeneous architectures. The new MapStencil skeleton is particularly useful in scientific applications.

Júnior Löff, Renato B. Hoffmann, Ricardo Pieper and Dalvan Griebler propose a new design and evaluate a new algorithmic skeleton library for stream parallelism in C++ named DSParLib. One of the strengths of DSParLib is that it either completely abstracts data communication or, in the case of user-defined data types, it offers high-level data abstractions via templates to handle serialization.

Similarity join is a necessary operation for many applications that manipulate trajectories, for example in astronomy. In generally, efficiently parallelizing distributed joins is a challenge in the presence of data skew. In their paper Sébastien Rivault, Mostafa Bamha, Sébastien Limet and Sophie Robert propose and evaluate a new algorithm for the MapReduce framework that offers very good load balancing even in the presence of skewed data.

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Thanks also for the two excellent keynotes at HLPP-2019, by:

Marco Aldinucci – on *Tools for the HPC-AI convergence: the StreamFlow workflow system and its applications for COVID-19,* and Bill McColl – on *Heterogeneous Hyperscale Computing.*

Finally, we thank Lavanya Ravi from Springer for the good cooperation with the special issue management for IJPP.

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Virginia Niculescu, Guest editor.

Frédéric Loulergue, Guest editor.