PRESS RELEASE

Invitation to ISC24

High Performance computing and Artificial Intelligence from Fraunhofer ITWM

The division »High Performance Computing« of the Fraunhofer Institute for Industrial Mathematics ITWM, known for its exascale-capable programming tools and the BeeGFS parallel file system, is coming to Hamburg with innovative solutions for the HPC community in the fields of parallel programming and Artificial Intelligence. At the joint booth with ThinkparQ, a Fraunhofer ITWM spin-off, the experts will be presenting various innovations from the institute at ISC High Performance Computing 2024.

On site, the researchers will be demonstrating CARME, a new open source software environment. The aim is to »simplify interactive machine learning on HPC systems«. GaspiLS pushes the limits of scalability for iterative solvers, which are fundamental for CFD and FEM simulations. With the STX processor board, the Fraunhofer ITWM is presenting the first result of its HPC processor development. ThinkparQ will also be presenting its ambitious BeeGFS roadmap.

In terms of green computing, the institute encourages visitors to learn about the latest developments of the Fraunhofer ITWM HPC processor to accelerate simulation codes. The Neural Architecture Search Engine (NASE) demonstrates massive energy savings through optimization and hardware adaptation of DNNs.

Networking at Booth L40

The team from the mathematical institute invites all visitors from the ISC 2024 to visit the joint booth and find out about the latest technologies. Intensive discussions and new networking opportunities will provide an opportunity for exchange.

A highlight awaits visitors to the Fraunhofer ITWM stand: The talented and up-and-coming artist, Gesche Karnik, will be on site and will be creating new works during the fair. Here, interested visitors will have the opportunity to experience the creation of the artworks live and to talk to the artist in person.

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Softwarestack CARME for Interactive ML on HPC Systems

We are delighted to introduce our open-source software stack, CARME, at the International Supercomputing Conference (ISC) 2024. CARME encapsulates our expertise in both Artificial Intelligence (AI) and High Performance Computing (HPC), and can be effortlessly integrated into your HPC systems. With CARME, you can concentrate fully on your AI development objectives without needing any prior experience or knowledge of workload management tools or hardware. That's because CARME handles all of this for you.

CARME is designed to be user-friendly, secure, and flexible. It provides web-based access and two-factor authentication (2FA), incorporates container technology, and offers a variety of other features. All these make it an easy-to-use and robust tool to manage both interactive and batch AI workloads on HPC systems. At ISC we present version 1.0 with its easy installation process.

GaspiLS – A Scalable Iterative Linear Solver for CFD- and FEM-Simulations

GaspiLS, our scalable iterative solver library, has demonstrated exceptional scalability in Independent Software Vendor (ISV) and industry codes. Given the prevalence of workstations with over 100 cores and small High Performance Computing (HPC) installations with thousands of cores, the strong scalability of our solver library is indispensable for engineering solutions.

GaspiLS is not just a library, it's a toolbox that enables you to design the optimal solver for your code. It features highly scalable Algebraic Multigrid (AMG) and hybrid Incomplete LU (ILU) preconditioners that outperform competitors such as HYPRE and PETSc. In addition, GaspiLS is open source, fostering a collaborative approach to improving its capabilities. GaspiLS can be integrated seamlessly into any code that uses Message Passing Interface (MPI) or Global Address Space Programming Interface (GPI), making it a versatile choice.

NASE – Neural Architecture Search Engine

The NASE (Neural Architecture Search Engine) at Fraunhofer ITWM is a powerful AI tool designed to optimize Neural Network models towards the underlying hardware – e.g. AI accelerators, customs AISCs and FPGAs. This service automates the process of finding efficient AI models tailored to specific performance needs such as speed, latency and power consumption. By incorporating unique hardware characteristics into model design, NASE ensures that each neural architecture is both optimal and custom-fitted to the user's requirements. This solution leverages advanced algorithms and extensive computing resources to deliver ready-to-use, efficient neural networks for

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real-world applications.

At our booth, we'll show how NASE enhances medical devices by optimizing Neural Networks for low energy consumption, critical in wearables like ECG monitors. This optimization significantly reduces energy usage, achieving dramatic improvements across several orders of magnitude

The STX Processor

This year, the Fraunhofer ITWM booth will feature the STX Processor card, showcasing the PCIe 5 Board equipped with four STX chiplets. These chiplets excel in bandwidth-limited applications, particularly with stencil algorithms.

The system offers developers a user-friendly programming interface through a C++ and OpenMP layer, efficiently masking the underlying complexity. Our compiler team has successfully optimized this setup to deliver peak performance across various simulation kernels, streamlining development and enhancing computational efficiency.

Researchers from the Fraunhofer ITWM at the ISC High Performance 2024. © Fraunhofer ITWM/ISC

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About the Fraunhofer Institute for Industrial Mathematics ITWM

The Fraunhofer Institute for Industrial Mathematics ITWM in Kaiserslautern is one of the largest research institutes for applied mathematics in the world. We see it as our task to further develop mathematics as a key technology and to provide innovative impulses. Our focus is on the implementation of mathematical methods and technology in application projects and their further development in research projects. The close cooperation with partners from industry guarantees the high practical relevance of our work.

Their integral building blocks are consulting, implementation and support in the application of high-performance computing technology and the provision of customized software solutions. Our various areas of expertise address a wide range of customers: the automotive industry, mechanical engineering, the chemical industry, energy and the financial sector. This also benefits from our excellent networking, for example in the Simulation and Software-based Innovation Center.

About the Fraunhofer-Gesellschaft

The Fraunhofer-Gesellschaft, based in Germany, is the world's leading organization for application-oriented research. With its focus on future-oriented key technologies and the utilization of results in business and industry, it plays a central role in the innovation process. As a guide and driving force for innovative developments and scientific excellence, it helps to shape our society and our future. Founded in 1949, the organization currently operates 76 institutes and research facilities in Germany. More than 30,000 employees, most of whom are trained in the natural sciences or engineering, work on the annual research volume of 2.9 billion euros. Contract research accounts for 2.5 billion euros of this total.