

# **In-Core Performance Engineering (online, test run)**

**Thursday, October 6, 2022 - Friday, October 7, 2022**

**Zoom**

## **Scientific Program**

## Introduction

Basic processor and core architecture

Out-of-order execution

Instruction scheduling

Throughput and latency of instructions

Critical path and loop-carried dependencies

Introduction to the x86-64 Instruction Set Architecture (ISA)

Understanding scalar and vectorized assembly code

Performance analysis of simple kernels

Example: STREAM Triad on Intel Ice Lake

Hands-on: Dot product on Intel Ice Lake

Introduction to the Open-Source Architecture Code Analyzer (OSACA)

How to use OSACA

How to use the Compiler Explorer

Analyzing kernels using OSACA to find potential bottlenecks

Hands-on: PI by integration on Intel Ice Lake

In-core analysis with an Arm ISA

Fujitsu A64FX core architecture

AArch64 ISA introduction

Understanding scalar and vectorized Arm assembly

Case studies: In-core performance engineering on A64FX

Sparse Matrix-Vector (SpMV) Multiplication on A64FX

Domain Wall kernel from Lattice Quantum Chromodynamics (QCD) on A64FX

Hands-On: 2D Gauss-Seidel on Intel Ice Lake