E0358 Aug 3:1

Advanced Techniques in Programming and Compilation for Parallel Architectures

Instructor

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Department: CSA

Course Time: Tue, Thu: 11 am - 12:30 pm

Lecture venue: E0227

Detailed Course Page: http://www.csa.iisc.ac.in/~uday/e0358

Announcements

Brief description of the course

The course introduces students to advanced techniques in parallelization and compiler optimization for modern parallel architectures and accelerators, and studies state-of-the-art research papers in this area.

Prerequisites

Basic knowledge of computer architecture, compiler design, and programming.

Syllabus

Compilers in the 21st century, Parallel architectures (history, evolution, taxonomy), Approaches to Parallel Programming, Domain-Specific Languages

Polyhedral compiler framework, Polyhedral model - representation, Dependence analysis, Transformations and scheduling, Affine transformations

Optimizations and Parallelization, Code generation, tools, and libraries

De-Facto Parallel Programming Models and Issues, OpenMP, MPI,

Measuring parallel performance and scaling.

A list of state-of-the-art research papers in the area of high-performance compilation.

Course outcomes

Theoretical and practical understanding of topics in compiler parallelization and optimization for parallel architectures, high-performance domain-specific languages and compilers, and an understanding of the state-of-the-art research in this area.

Grading policy

50% for assignments, 25% for class participation in discussions and seminars, 25% for own seminar

Assignments

Asst-1: Code parallelization using tiling and other optimizations, performance analysis

Asst-2: Parallelization of a deep neural network-based object detection algorithm

Resources

1. Book: Compilers - Aho, Lam, Sethi, and Ullman, Chapter 11
2. Book: Parallel Computer Architecture by David Culler et al.