



FLOW Spring School on Advanced Numerical Methods in Fluid Dynamics

April 18-22, 2016
Linné FLOW Centre, KTH Mechanics
Royal Institute of Technology
Stockholm, Sweden



www.flow.kth.se/?q=node/253

Scope:

The motion of fluids in various geometries is a very important topic within today's engineering world, with applications ranging from microfluidics (inkjet printers, lab-on-a-chip) to environmental physics (large-scale atmospheric turbulent transport in the atmosphere). The use of numerical simulations has become crucial to study and understand these complex flows. Given the large spread in characteristic properties of the various flows, numerical methods suitable to address these problems become more and more diverse and specific, with examples such as low and high-order grid-based method (such as Spectral Elements), and various immersed boundary methods. All these methods have advantages and disadvantages which are not always easy to assess. In addition, modern computers require specific implementations of these methods, in particular in the light of large-scale simulations running on thousands of processors. Finally, the data produced by such simulations gives rise to the problem of properly visualising quantities of physical interest. All these aspects will be discussed in our school with distinguished speakers.

At KTH, the research and education within high-performance computing and numerical methods is organised within the Linné FLOW Centre and the Swedish e-Science Research Centre (SeRC).

Invited lecturers:

Paul Fischer, Computer Science and Mechanical Science and Engineering, University of Illinois in Urbana-Champaign, USA

Jan Hesthaven, Computational Mathematics and Simulation Science, École Polytechnique Fédérale de Lausanne, Switzerland

Alfredo Pinelli, Department of Mechanical Engineering & Aeronautics, City University London, UK

Tino Weinkauff, Visualization and Data Analysis Laboratory, KTH, Stockholm, Sweden

Stefano Markidis, PDC Centre for High Performance Computing, KTH, Stockholm, Sweden

Topics:

The spring school is intended to give the students an overview of both general and more specific topics within the area of numerical methods and high-performance computing, including latest research. For the exercises, you will need a laptop with installed Matlab, preferably running Linux. The schedule is:

- Monday (18/4), starting just before lunch
Welcome, organisation of the school, administration
Paul Fischer: Continuous Galerkin (CG), spectral element method
- Tuesday (19/4)
Paul Fischer: continuation
Stefano Markidis: Introduction to HPC, computer architectures, MPI
- Wednesday (20/4)
Tino Weinkauff: Scientific visualisation and feature extraction
- Thursday (21/4)
Jan Hesthaven: Discontinuous Galerkin (DG) method
- Friday (22/4)
Alfredo Pinelli: Immersed boundary method, fluid structure interaction
Wrap-up of school, projects

Administrative details:

Lectures will be given April 18 to 22, 2016 in the seminar room of KTH Mechanics (room Faxén) located on the KTH main campus, close to the city centre of Stockholm. The FLOW graduate school will provide lunches to the registered participants. The programme includes a school dinner on Wednesday night in a restaurant within walking distance from KTH. A project will be performed by pairs of student and sent electronically to the school organisers for the final evaluation, worth 3.5 ECTS points (if requested).

The course is free of charge, and includes lunches plus the school dinner. Interested PhD students are invited to contact Philipp Schlatter (pschlatt@mech.kth.se) for registration. For further information visit the school homepage on www.flow.kth.se.

Contact and organiser:

Dr. **Philipp Schlatter**

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