**Monday 13th: Morning (day 1)**

| Start Time (CET) | End Time (CET) | Topic: HPC infrastructures, pre- and exa-scaling | |
|---|---|---|---|
| 8:30 | 09:00 | **Introduction to the school on numerical methods for parallel CFD: aims and objectives**<br>*G. Amati*<br>SuperComputing Applications and Innovation (SCAI) Department, CINECA<br>*I. Spisso*<br>Leonardo Labs, Leonardo Finmeccanica<br>*S.Pirozzoli*<br>Department of Mechanical and Aerospace Engineering<br>University of Rome "La Sapienza" | INTRO1 |
| 9:00 | 10:00 | **A long journey to exascale: State of the art, pre-exascale and towards the exascale**<br>*G. Amati*<br>SuperComputing Applications and Innovation (SCAI) Department, CINECA | HPC 1 |
| 10:00 | 11:00 | **Principle/re-cap of parallel computing paradigms on standard and heterogeous architectures: MPI, OpenMP, GpGPU**<br>*G. Amati*<br>SuperComputing Applications and Innovation (SCAI) Department, CINECA | HPC 2 |
| 11:00 | 11:30 | **coffee break** | |
| 11:30 | 12:00 | **GPUs for CFD: Intel XE HPC architecture**<br>*A. Luiselli*<br>INTEL ITS & GPU Specialist | Vendor1 |
| 12:00 | 12:45 | **Two-phase 3D Lattice Boltzamm Method optimization**<br>*G. Amati*<br>SuperComputing Applications and Innovation (SCAI) Department, CINECA | CFD0 |
| 12:00 | 14:30 | **Lunch Break** | |

**Afternoon (day 1)**

| Start Time (CET) | End Time (CET) | Topic: GPUs porting | |
|---|---|---|---|
| 14:30 | 16:00 | **CPUs for CFD: architectural status and trend by AMD**<br>*M. Gontier*<br>Field Support Manager, HPC CPU apps, AMD, France | Vendor2 |
| 16:00 | 16:45 | **coffee break** | |
| 16:45 | 18:30 | **GPUs for CFD: architectural status and trend by Nvidia**<br>*M. Fatica*<br>Director @ Nvidia, San Jose, California, US<br>*J. Romero*<br>Developer Technology Engineering @ Nvidia | Vendor3 |

**Day 2, Tuesday 14th: Morning**

| Start Time (CET) | End Time (CET) | Topic: Multi-phase flows | |
|---|---|---|---|
| 08:50 | 09:00 | Introduction | INTRO 2 |
| 9:00 | 11:00 | **Physics and high-performance computation of turbulent flows with interfaces**<br>*A. Soldati*<br>Institute of Fluid Mechanics and Heat Transfer, Vienna | CFD1 |
| 11:00 | 11:15 | **coffee break** | |
| 11:15 | 13:15 | **Adaptive numerical methods for fluid mechanics**<br>*S. Popinet*<br>Directeur de recherche, CNRS, Sorbonne Universitè | CFD2 |
| 13:15 | 14:30 | **Lunch Break** | |

**Day 2: Afternoon**

| Start Time (CET) | End Time (CET) | Topic: Immersed boundary techiniques | |
|---|---|---|---|
| 14:30 | 16:30 | **Numerical modeling with Immersed boundary techniques**<br>*R. Verzicco*<br>Dipartimento di Ingegneria Industriale, University of Rome “Tor Vergata” /<br>Physics of Fluids Group, MESA+ Institute, and J. M. Burgers Centre for Fluid Dynamics, University of Twente | CFD3 |
| 16:30 | 16:45 | **coffee break** | |
| 16:45 | 18:45 | **Fluid-structure interaction involving thin shells**<br>*M. De Tullio*<br>Full Professor @ Department of Mechanics, Mathematics and Management, Politecnico di Bari, Italy | CFD4 |

**Day 3, Wednesday 15th: Morning**

| Start Time (CET) | End Time (CET) | Topic: Spectral Methods | |
|---|---|---|---|
| 08:50 | 09:00 | Introduction | INTRO 3 |
| 9:00 | 11:00 | **Spectral methods and spectral element methods**<br>*C. M. Casciola*<br>Department of Mechanical and Aerospace Engineering<br>University of Rome "La Sapienza" | CFD 5 |
| 11:00 | 11:15 | **coffee break** | |
| 11:15 | 13:15 | **Turbulence simulations with Nek5000**<br>*P. Schlatter*<br>Professor @KTH Royal Institute of Technology, Sweden | CFD6 |
| 13:15 | 14:15 | **Lunch Break** | |

**Day 3, Wednesday 15th: Afternoon**

| Start Time (CET) | End Time (CET) | Topic: Compressible flow | label |
|---|---|---|---|
| 14:30 | 16:30 | **Numerical Methods for compressible/high-speed flow**<br>*S. Pirozzoli/M. Bernardini*<br>Department of Mechanical and Aerospace Engineering<br>University of Rome "La Sapienza", Italy | CFD 9 |
| 16:30 | 16:45 | **coffee break** | |
| 16:45 | 18:45 | **High Performance Computing in Fluid Simulations:<br>Task Based Parallelism and Ensemble Simulations**<br>*G. Iaccarino*<br>Director, Institute for Computational Mathematical Engineering<br>Professor, Mechanical Engineering, Stanford University | CFD 10 |

**Day 4, Thursday 16th: Morning**

| Start Time (CET) | End Time (CET) | Topic: Lattice Boltzmann Methods | |
|---|---|---|---|
| 08:50 | 09:00 | Introduction | INTRO 4 |
| 9:00 | 11:00 | **An introduction to the Lattice Boltzamm method for fluids and beyond**<br>*S. Succi*<br>Research Director @ CNR (National Research Council), Italy | CFD 11 |
| 11:00 | 11:15 | **coffee break** | |
| 11:15 | 13:15 | **Advanced Lattice Boltzmann algorithms for multiscale simulations**<br>*G. Falcucci*<br>Associate Professor @ University of Rome "Tor Vergata" | CFD 12 |
| 13:15 | 14:30 | **Lunch Break** | |

**Day 4, Thursday 16th: Afternoon**

| Start Time (CET) | End Time (CET) | Topic: High-order Methods | |
|---|---|---|---|
| 14:30 | 16:30 | **The PyFR framework**<br>*F. Witherden*<br>Assistant Professor (Texas A&M Univeristy) | CFD 13 |
| 16:30 | 16:45 | coffee break | |
| 16:45 | 17:15 | **Turbulence modeling for industrial CFD**<br>*L. Capone*<br>Senior Manager for AI, Big Data and HPC R&D, Leonardo Labs, Genova, Italy | CFD 14 |
| 17:15 | 18:45 | **Discontinuous Galerkin Methods**<br>*A. Colombo*<br>Department of Engineering and Applied Science, University of Bergamo | |

**Day 5, Friday 17th**

| Start Time (CET) | End Time (CET) | Topic: Unstructed Finite Volume (FV): The OpenFOAM framework | |
|---|---|---|---|
| 08:50 | 09:00 | Introduction | INTRO 5 |
| 09:00 | 09:45 | **Introduction to the Finite Volume method**<br>*F. Piscaglia*<br>Associate Professor @ Dept. of Aerospace Science and Technology, Politecnico di Milano | CFD 15 |
| 09:45 | 10:45 | **OpenFOAM: Governace and recent highlights**<br>Fred Mendonça<br>Managing Director at OpenCFD Limited | CFD 16 |
| 10:45 | 11:15 | **HPC Technical Committee: commitment, remits and priorities**<br>*I. Spisso*<br>Chairman of HPC TC committee | HPC 3 |
| 11:15 | 11:30 | **coffee break** | |
| 11:30 | 12:00 | **The ExaFOAM Project: Mission, overview and challanges**<br>*M. Nóbrega*<br>Associate Professor at Institute for Polymers and Composites, University of Minho, Portugal | CFD 17 |
| 12:00 | 13:00 | **Semi-automated approach for code verification within the OpenFOAM framework**<br>*Bruno Ramôa*<br>Institute for Polymers and Composites, University of Minho, Portugal | CFD 18 |
| 13:00 | 14:00 | **Lunch Break** | |
| 14:00 | 15:00 | **High-Fidelity Methods for CFD computations of Multiphase and Reactive Flows in the Finite Volume Framework**<br>*F. Piscaglia*<br>Associate Professor @ Dept. of Aerospace Science and Technology, Politecnico di Milano | |
| 15:00 | 16:00 | **Accelerating CFD applications with GPUs: the OpenFOAM - AmgX case study**<br>*M. Martineau*<br>Compute Performance Developer Technology Engineer (Devtech), @Nvidia<br>*S. Bnà*<br>SuperComputing Applications and Innovation (SCAI) Department, CINECA | CFD 18 |
| 16:00 | 16:30 | **Final Remarks, Conclusions** | |