PUMPS + AI Summer School 2022

Objectives

The Barcelona Supercomputing Center (BSC) currently offers a number of courses covering CUDA architecture and programming languages for parallel computing. Please contact us for possible collaborations.

The 12th edition of the Programming and Tuning Massively Parallel Systems + Artificial Intelligence summer school (PUMPS+AI) is aimed at enriching the skills of researchers, graduate students and teachers with cutting-edge technique and hands-on experience in developing applications for many-core processors with massively parallel computing resources like GPU accelerators.

The following is a list of some of the *topics* that will be covered during the course:

- Deep Learning
- High-level programming models (OpenACC, Python, and Mathematica on GPUs)
- CUDA Algorithmic Optimization Strategies
- Dealing with Sparse and Dynamic data
- Efficiency in Large Data Traversal
- Reducing Output Interference
- Controlling Load Imbalance and Divergence
- Acceleration of Collective Operations
- Dynamic Parallelism and HyperQ
- Debugging and Profiling CUDA Code
- Multi-GPU Execution
- Architecture Trends and Implications
- Introduction to OmpSs and to the Paraver analysis tool
- OmpSs: Leveraging GPU/CUDA Programming
- Hands-on Labs: CUDA Optimizations on Scientific Codes; OmpSs Programming and Tuning

Important dates:

- ~~Applications due: July 17, 2022~~ **Last spots available, first come first served**
  - Due to space limitations, early application is strongly recommended. You may also be suggested to attend an online prerequisite training on basic CUDA programming before joining PUMPS
- ~~Notification of acceptance: July 25, 2022~~ **First come first served**
- Summer school: **September 3-6**

Organized by:

- Barcelona Supercomputing Center (BSC)
- University of Illinois at Urbana-Champaign (University of Illinois)
- HiPEAC Network of Excellence (HiPEAC)
- PUMPS is part of this year PRACE Advanced Training Centre program

Looking forward to see you at the PUMPS Summer School

Contact: pumps [at] bsc [dot] es
https://pumps.bsc.es/2022/about-pumps-ai

Requirements

- Basic CUDA knowledge is required to attend the course. Applicants that cannot certify their experience in CUDA programming will be asked to take a short on-line course covering the necessary introductory topics
- C, C++, Java, or equivalent programming knowledge. Skills in parallel programming will be helpful

Learning Outcomes

Participants will have access to GPU servers and will learn to program and optimize applications and AI techniques in languages such as CUDA and OmpSs. Teaching Assistants will be available to help with your hands-on lab assignments. At poster and hackathon sessions you may show your current work and applications you are optimizing. NVIDIA will award the best poster presentation.

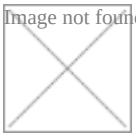
By the end of the summer school, participants will:

Be able to design algorithms (including deep learning / AI) that are suitable for accelerators.
Understand the most important architectural performance considerations for developing parallel applications.
Be exposed to computational thinking skills for accelerating applications in science and engineering.
Engage computing accelerators on science and engineering breakthroughs.

Programming Languages: CUDA, MPI, OmpSs, OpenACC
Hands-on Labs: Afternoon labs with teaching assistants for each audience/level.

Participants are expected to bring their own laptops to access the servers with GPU accelerators.
The afternoon lab sessions will provide hands-on experience with various languages and tools covered in the lectures and will comprise a brief introduction to the programming assignments, followed by independent work periods. Teaching assistants will be available in person and on the web to help with assignments.

Academic Staff



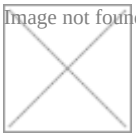
- PUMPS Co-Directors:

Mateo Valero (BSC-UPC) and Wen-mei Hwu (Univ. of Illinois)
- Local Organization Chair:
Antonio J. Peña (BSC)
- Invited Lecturers:

Juan Gómez-Luna (ETH Zurich), Carl Pearson
- BSC / UPC Lecturers:
Antonio J. Peña, Marc Jorda, Leonidas Kosmidis, Xavier Martorell and Xavier Terue
- Hackathon:
Juan Gómez-Luna (ETH Zurich) and Pedro Valero-Lara (Oak Ridge National Laboratory)

- PUMPS 2022 Distinguished Lecturer:
Wen-mei Hwu (UIUC and NVIDIA)

Further information



For more information please visit the **PUMPS** website.

Barcelona Supercomputing Center - Centro Nacional de Supercomputación

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