CompBioMed

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e-Seminar Series

e-Seminar #19
Biomedical Supercomputing Applications

9 November 2021 2pm CET / 1pm GMT (2h duration)

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Part 1 Organ level simulations represent both a challenge and an opportunity: the Virtual Patient modelling for precision medicine. It is the ultimate example on supercomputers usage for multiphysics / multiscale modelling problems. At organ level, modelling is done by tightly coupling different physics (e.g. fluid, tissue, electrophysiology, chemical reactions, heat, transport of large bodies, particles or species) with contributions from different time and space scales (cells, tissue, organ, system). In this talk we will define the challenges and showcase them with some examples of the cardiovascular and respiratory systems.

Part 2 To make those multiphysics simulations possible and efficient, several algorithmic and computational optimizations have been carried. In particular, we will present classical actuations to enhance the strong and weak scalabilities of the code, but also several original optimization strategies to enhance the code efficiency, and therefore reduce the energy print of our simulations.

This is the 19th in a series of online e-Seminars organised by CompBioMed.

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G Houzeaux studied physics at the Université de Montréal and obtained Master of Applied Science in CFD at Concordia University. He then went to Spain to undertake a PhD in Domain Decomposition methods applied to CFD at UPC, Barcelona. In 2005, he joined the newly created Barcelona Supercomputing Center (BSC-CNS) to start the CFD and HPC research line in the Department of Computer Applications in Science and Engineering. At the present time, G Houzeaux is leading, together with other three team leaders, a group of 50 researchers whose main mission is to develop and apply the multi-physics parallel simulation platform ALYA. His research involves physical modelling, numerical algorithms and code development and optimization. He has published around 80 papers and has been participating to numerous national and European projects, centres of excellence, but also contributed to industrial contracts. He is also co-founder of ELEM Biotech, a BSC's spinoff company.

Mariano Vázquez is a researcher at the Barcelona Supercomputing Center, where since 2005 has co-leaded the Alya Project. He is also CSO/CTO of ELEM Biotech, a BSC's spinoff company. ELEM's mission is speeding up the technology transfer from BSC to the biomedical domain, putting our supercomputer-based tool sin the hands of those that need them to improve healthcare. His main research lines fall within Computational Science, such as Computational Bio-Mechanics (particularly Solid Mechanics of organic tissue and Electrophysiology) at organ and system level. Following these lines, the team develops a simulation tool to study the cardiovascular and respiratory systems targeted to biomedical researchers in academia, medical devices sector and pharmaceutical industry. Infarction, ageing, aneurisms rupture risk, arrhythmias, stent design or drug delivery are among the topics where such a tool can become a decisive help.

Moderated by Tim Weaving, **UCL**

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