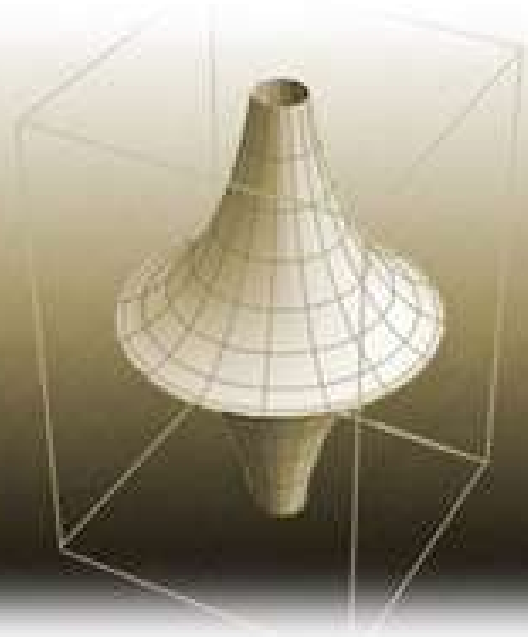# UNIVERSITÀ DEGLI STUDI DELL'AQUILA
M&MOCS

International Research Center for the
MATHEMATICS AND MECHANICS OF COMPLEX SYSTEMS

EUGENIO BELTRAMI
INTERNATIONAL PRIZE 2022

LAUDATIO OF PROF.
STEPHANE BORDAS

MEMOCS CENTER

Professor Stéphane Bordas is a renowned multi-disciplinary computational and data science researcher, educator, mentor, and coach. He holds the position of Professor Head of Computational Mechanics at the University of Luxembourg and Founding Director of the Doctoral Programme in Data and Computational Sciences. He is also Chief Scientific Officer in Ariana Technologies, a Luxembourg-based startup focusing on risk management. He is also on the Scientific Board of several Startup companies.

He has been a visiting professor at Utah University, Warwick University.University of Strasbourg Institute of Advanced Study, Mathematics and Mechanics Department of Université de Franche Comté. He is a Fellow of The Learned Society of Wales and a mentor for the World Gifted Institute.

Since 2009, he has been a Professor of Computational Mechanics at Cardiff University, where he set up a multi-disciplinary team funded in part by the European Research Council, which developed data-driven methods and digital twins. One of the applications of this work is the biomechanics of the brain and the development of surgical simulators for the brain and the breast.

He has collaborated with dozens of institutes worldwide and has a close relationship with India, Taiwan, and Vietnam. He leads a group of over 30 researchers in Luxembourg who have been working under his direct supervision along different lines of research.

His team has been working on multi-disciplinary data-driven quality-controlled numerical methods at the interface between applied mathematics for partial differential equations and applications. After completing his PhD, in which he developed a numerical method capable of addressing industrial-scale fracture mechanics and biofilm growth, he developed error estimation techniques, which are accessible open-source online and commercially in use for aerospace applications.

In 2006, his group started working on know-how transfer to the clinic; through an ERC StG, they developed the first real-time error estimation for surgical simulation and developed a program of work for data-driven machine learning algorithms to address patient specificity in clinical environments. These results led to publications that have become landmarks in the field. Today, his research team contributes to the generation of a new field where models are learned through data as the surgical operation takes place.

His team was the first to propose real-time error estimators in biomechanics and has worked in areas ranging from computational archeology, science of science, sociology, psychology, social sciences, energy, chemical engineering, computational biomechanics, and fracture mechanics.

Recently, the group pioneered new machine learning technology to help with the identification of optimal material models for biomechanics and applied those to full-field data acquired from various imaging modalities.

Alongside his research activities, he has supervised over 35 PhD students and has been in the top 150 most cited researchers in computer science engineering and cross-field for the past 7 years according to Clarivate Analytics (2015-2022).

He is the Editor-in-Chief of numerous journals, including Advances in Applied Mechanics, which ranks number one in Computational Mechanics in 2020.

Professor Bordas' impact on all the sectors in which his results have been applied, his training and dissemination commitment make him undoubtedly one of the most influential scientists in his framework of study.

He has made significant contributions to the development of the next generation of scientists by actively supporting and mentoring PhD students, postdocs, and young academics at various stages of their careers. He has shown a strong commitment to nurturing their potential and talent, which will play a vital role in shaping the future of science.

Therefore, the committee entrusted by the Scientific Committee of the International Research Center MeMoCS with the responsibility of awarding the International Eugenio Beltrami Prize unanimously proposes Professor Stéphane Bordas as the recipient of the 2022 edition.