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**IET** The Institution of  
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**Travel Award**  
Winner 2022

## **IET Travel Award 2022 – Report**

**Cristiano Martinelli**

BSc, MSc in Mechanical Engineering

Naval Architecture, Ocean & Marine Engineering Department, University of Strathclyde  
James Watt School of Engineering, University of Glasgow

IMAC is an important international conference and exposition on structural dynamics which is organised by the Society of Experimental Mechanics (SEM) and takes place once per year. The aim of the conference is to provide an international forum for academics, researchers, industry experts, and engineers to discuss and share ideas about the field of structural dynamics and vibrations. This year the 41<sup>st</sup> edition of IMAC was held at the Renaissance Hotel in Austin, Texas from the 11<sup>th</sup> to the 16<sup>th</sup> of February 2023 with the topic: “keeping IMAC weird: Traditional and Non-Traditional Applications of Structural Dynamics”. The first two days of the conference were dedicated to courses and tutorials related to modal analysis and structural dynamics while the last four days were instead devoted to the presentations of the attendees.

IMAC represents a competitive international conference which gathers brilliant academics and engineers from all over the world who work in the engineering field of vibrations. Indeed, more than 600 people participated in this edition of the conference. The conference was divided into sessions which touched on a very broad range of topics related to structural dynamics and vibrations, like active control, systems produced via additive manufacturing techniques, energy harvesting, experimental techniques, modal analysis, modal parameters identifications, model validations and uncertainty quantification, sensors and instrumentation, nonlinear structures and systems, and many other topics. In addition, during the conference, many expositions took place: exhibitors from the industry showcased tools and instrumentation like laser vibrometers, accelerometers, control systems, data acquisition systems, signal analysers and much more.

The booths were organised so that people attending the conference could see and test the instrumentations that were showcased. The exhibitions represented a very good opportunity to know more about new instrumentations and software features which are produced by the world's top industries in the field of vibration measurements like Polytec, ATEC, Crystal instruments, Data Physics, PCB electronics, and Siemens. The exhibitions were also an important occasion for networking as all participants gathered in the same room to have coffee or lunch breaks.

This experience was amazing and marked a milestone in my career as a PhD student. Indeed, I had the chance to speak and connect with other researchers from the UK, the US, Europe and Asia but also I had the opportunity to meet important professors from different institutions who work in my same field of research. The breaks and the exhibitions allowed me to network, share ideas, and more importantly discuss my research with young researchers and engineers: this is fundamental for PhD students like me as it allows to create connections for possible collaborations and future jobs. This conference gave me also the possibility to present my research to a wide public of experts who work in the most prestigious universities and national bodies (e.g. NASA) of the world. In particular, I presented two papers: the first one, entitled: "Experimental Parameter Identification of Nonlinear Mechanical Systems via Meta-Heuristic Optimisation Methods", was strictly related to my own research and my PhD while the second one with the title: "Identification of Nonlinear Characteristics of an Additive Manufactured Vibration Absorber" was part of a student's final year project I collaborated with. This experience allowed me to test not only my oral presenting capabilities but also my ability to field questions from experts in the subject. Finally, attending the presentations of other researchers, I had the possibility to see the work of my colleagues and to understand which are the most discussed issues and topics in the structural dynamics field. Particularly, I attended the session "nonlinear systems and structures" where I had the chance to discuss with researchers who work on the topic of nonlinear dynamics like me.

After the conference, I visited Austin and Houston, two of the largest cities in Texas. In Austin, I discovered a lovely vibrant city which hosts a beautiful downtown. In Houston instead, I had the possibility to visit the park, the downtown, and the Johnson Space Centre (NASA) which attracts thousands of visitors any year. The visit to the Houston NASA Space Centre was very interesting and allowed me to know more about the current and planned NASA missions on Mars and the Moon. During the visit, I had the chance to visit the rocket park where it is possible to see in person one of the three remaining rockets SATURN V which was used for the Apollo space missions in the '70s by NASA. There, I learned more about the various Apollo missions, the history of the program, and the working principles of this huge rocket.

I am extremely grateful to the IET and to my supervisors who allowed me to live this fantastic experience. I believe that important international conferences, like IMAC, permit students to grow not only from the professional point of view but also to develop the soft skills and connections which are nowadays fundament to enter the new job market. I strongly recommend any student or young researcher, who wants to attend an international conference, to apply for the IET Travel Award.

# Experimental Parameter Identification of Nonlinear Mechanical Systems via Meta-Heuristic Optimisation Methods

**Authors:** Cristiano Martinelli<sup>1,3</sup>, Andrea Coraddu<sup>2</sup>, Andrea Cammarano<sup>3</sup>

<sup>1</sup>Naval Architecture, Ocean & Marine Engineering Department, University of Strathclyde, U.K.

<sup>2</sup>Department of Maritime & Transport Technology Delft University of Technology, The Netherlands

<sup>3</sup>James Watt School of Engineering University of Glasgow, U.K

**Presenter:** Cristiano Martinelli



Fig.1 – First presentation at the conference IMAC in the session Nonlinear Structures & Systems. This works is part of my research for my PhD in mechanical engineering.

# Identification of Nonlinear Characteristics of an Additive Manufactured Vibration Absorber

**Authors:** Cristiano Martinelli<sup>1,2</sup>, Rohit Avadhani<sup>2</sup>, Andrea Cammarano<sup>2</sup>

<sup>1</sup>Naval Architecture, Ocean & Marine Engineering Department, University of Strathclyde, U.K.

<sup>2</sup>James Watt School of Engineering., University of Glasgow, U.K

**Presenter:** Cristiano Martinelli



Fig.2 – Second presentation at the conference IMAC in the session Nonlinear Structures & Systems. This work is part of a student final year project I collaborated with.



Fig.3 – Conference registration