GIMC SIMAI Young 2024

Napoli, Italy, July 10-12, 2024

Book of Abstracts

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Società Italiana di Scienza delle Costruzioni (SISCo)
Associazione Italiana per gli Studi sulle Strutture Spaziali e a Guscio (4S)

Welcome

Dear Participants,

welcome to Napoli and to the GIMC SIMAI Young 2024 Conference. This conference, held at the University of Naples Federico II in Palazzo della Facoltà d'Ingegneria, Piazzale Tecchio, from July 10th to 12th, 2024, serves as a vibrant platform for young researchers and scholars (aged ≤ 35) to exchange their latest findings, stay abreast of emerging trends, and cultivate meaningful interactions within the realms of applied mathematics and computational mechanics.

The program of this year's conference features a rich array of activities, including plenary lectures by esteemed researchers in the field of Computational Mechanics and Applied Mathematics, a special session dedicated to young promised selected by the GIMC and SIMAI delegates, and a series of thematic sessions organized by participants that collect a total of 175 contributions covering diverse areas of research.

The contributions span across various thematic areas, reflecting the breadth and depth of contemporary research in applied mathematics and computational mechanics. These areas include, but are not limited to, mathematical modeling for socio-epidemiological dynamics, efficient numerical methods for evolutionary partial differential equations, multi-scale approaches and machine learning techniques in material modeling, computational methods for shells and spatial structures, nonlinear material behavior, computational mechanics for masonry structures, mathematical models in mechanobiology, optimization methods for classical and data-driven approaches, and many more.

We are grateful to the GIMC (Gruppo Italiano di Meccanica Computazionale)

Figure 1: Palazzo della Facoltà d'Ingegneria, University of Naples Federico II

and SIMAI (Società Italiana di Matematica Applicata e Industriale) for entrusting the local organizers with the organization of the conference. Their trust and support have been instrumental in ensuring the success of this event.

We would like to express our sincere thanks to the organizing and co-founding institutions, the DIST (Dipartimento di Strutture per l'Ingegneria e l'Architettura) and the Scuola Politecnica e delle Scienze di Base of the Università di Napoli Federico II, for their unwavering support and dedication in making this conference a success, as well as the moral endorsement of the Società Italiana di Scienza delle Costruzioni (SISCo).

We would like to acknowledge the supporting, helpful, and proactive contribution of the Associazione Italiana per gli Studi sulle Strutture Spaziali e a Guscio (4S). Its involvement has been invaluable in advancing the goals of our conference and fostering collaboration within the scientific community.

Finally, and above all we extend our heartfelt gratitude to all the contributors, session organizers, and participants for their valuable contributions and active engagement, which have enriched the conference program and fostered fruitful discussions. We hope that the Book of Abstracts serves as a comprehensive resource, capturing the essence of the cutting-edge research presented at the GIMC SIMAI Young 2024 Conference. May it inspire further exploration and collaboration in the exciting fields of applied mathematics and computational mechanics.

Warm regards,

The organizing committee of the
GIMC SIMAI Young 2024
Salvatore Cuomo, Arsenio Cutolo, Francesco Marmo

Contents

Elastic-damaging cohesive law for cell-substrate adhesion: positive and negative durotaxis

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The present contribution focuses on the mechanobiological aspects related to cell-substrate adhesion and their involvement in positive durotaxis as well as in the recently discovered negative durotaxis [1]. A key component of this kind of migration is the adhesion between the cell and the extracellular matrix performed through mechanosensitive cell structures called focal adhesion complexes. These structures grow and disrupt during their life cycle undergoing a chemo-physical degradation process which is here modeled by means of an elastic-damaging cohesive law. The resulting traction-sliding law is first applied to a simplified two-element tensegrity model and then exploited in a fully three-dimensional continuum model of a single cell [2-5]. The application of a contractile pre-stretch to the cell shows the inference of the elastic-damaging law. The reversal of positive into negative durotaxis is modelled as a consequence of a force-driven degradation process of the adhesion structures. An optimal stiffness range of the substrate at which the cell deploys its maximum traction force is also detected.

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