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DESIGN OF STRUCTURES AND METAMATERIALS FOR 3D PRINTING USING ADVANCED MATHEMATICAL TECHNIQUES

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ABSTRACT

In recent years, the demand for innovative and efficient designs in fields such as engineering, architecture, and material science has increased exponentially, particularly in the realm of 3D printing. The development of advanced structures and metamaterials, specifically tailored for 3D printing applications, has become a priority. This evolution requires not only creativity but also a deep understanding of the underlying physical and manufacturing phenomena. Mathematical models play a crucial role in this context, offering a rigorous framework for the prediction, analysis, and optimization of new designs, ensuring that they meet the specific constraints and capabilities of 3D printing technologies.

Many mathematical techniques can drive the design of innovative structures and metamaterials for 3D printing. For instance, the analysis of ordinary and partial differential equations, computational geometry theory, multi-objective optimization, and multiphysics and multiscale modeling enable the investigation of complex systems, allowing the creation of robust and efficient designs that are optimized for additive manufacturing processes. Moreover, machine learning and artificial intelligence are emerging as key tools for discovering new metamaterials and optimizing structural solutions, adding an unprecedented data-driven dimension to the 3D printing design space.

This session aims to serve as a platform for discussing recent advances in the application of mathematical models to design innovation in the context of 3D printing. Topics of interest include, but are not limited to:

*advanced mathematical modeling techniques;

*multiphysics and multiscale modeling;

*shape and topology optimization for 3D printing;

*metamaterial design for additive manufacturing;

*applications of design optimization in different fields of engineering related to 3D printing.