Automated Design & Data Science Approaches for Scaled-up Additive Manufacturing

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Additive manufacturing (AM) technologies enable a significant amount of flexibility in the design and functionality of products by being able to place any material at any geometric position in a product. It has become a vital tool for producing unprecedented products that can outperform any product seen today. The applications of metal & non-metal AM technologies, including SLM (Selective Laser Melting), EBM (Electron Beam Melting), and stereolithography (SLA), are already popular in industrial sectors, and everyday objects are fabricated through these printers. However, there still lacks a fundamental understanding of the unpredictable effects of the current printing processes. Full-scale manufacturing with AM remains one of the biggest challenges in smart manufacturing. It currently requires time-consuming trialand-error processes to identify the best printing parameters to ensure reliable outcomes. There is still not much confidence in the structural integrity of the printed parts due to the layers being melted together. Moreover, the existing design processes for AM do not carefully reflect manufacturing constraints. This talk will present Georgia Tech's efforts to achieve the scaling of manufacturing with AM through the development of novel design & data science approaches and certification processes for AM. It will demonstrate an advanced design framework that can bridge the gap between research developments and commercial manufacturers.

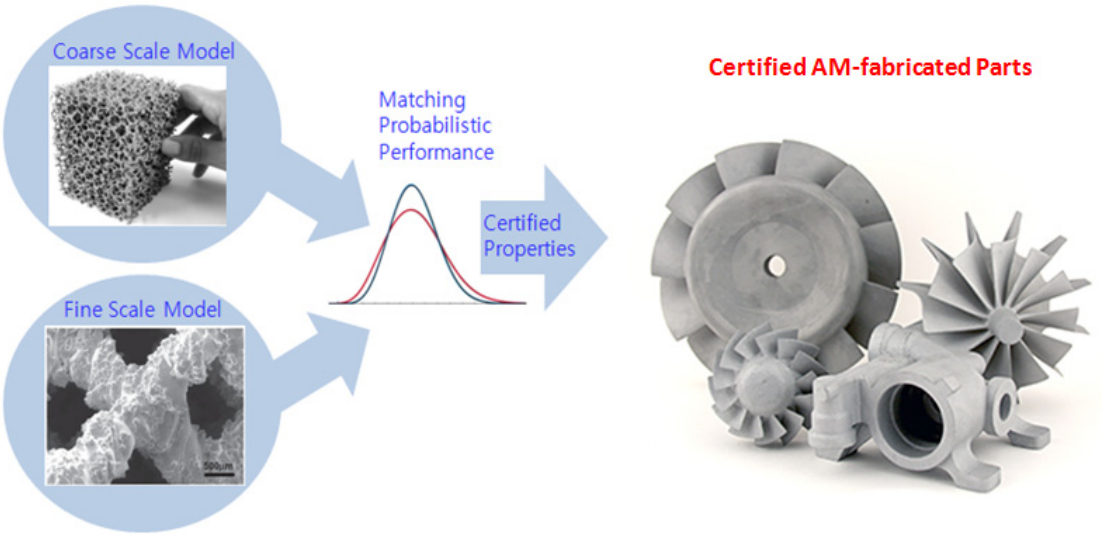

Fig. 1 Born-qualified AM-fabricated parts by developing fully automated data capturing system, and advanced design framework