

**NYU**

Top6MetaA

Top6MetaA is a Python-based HPC framework for unified design and CAD generation of advanced architected materials and metastructures.

Product's website:

<https://top6meta.com/>

Technology Overview

Top-6-Class MetaStudio Advanced (Top6MetaA) is a Python-based high-performance computing framework for the unified modeling of architected materials and structures. The software package integrates a large number of three primary architectural families, namely strut-based lattices, more than twenty triply periodic minimal surfaces (TPMS), and stochastic spinodal architectures, together with three derivative classes formed through secondary operations on the primary architectural families. In particular, hybrid multi-morphology designs, functionally graded architectures, and interpenetrating phase composites (IPCs) can be created. Diverse functional gradation patterns are feasible, well-beyond linear gradation profiles, while diverse reinforcement architectures can be selected for IPC designs. All classes are implemented within a common modeling paradigm, enabling seamless transitions between geometrical shapes, topologies and consistent control of geometric and volumetric parameters. Moreover, Top6MetaA features over a unique inner thickness processing module, allowing for the analysis of the inner material distribution of the architected parts, a capability of exceptional importance for the estimation of the 3D-printing feasibility of a given component, as well as for the assessment of its structural robustness. Top6MetaA supports the generation of standalone metamaterials, as well as architected beams, plates, and sandwich structures, bridging mesoscale topology design with macroscale structural applications. The modular software architecture provides extended graphical execution pathways, while diverse multiprocessing operations are integrated to accelerate computationally intensive geometry-generation tasks, a high-performance computing (HPC) module of exceptional importance for diverse intricate and large-scale design tasks. By consolidating diverse architected-material classes within a single extensible framework, Top6MetaA offers a unique versatile and efficient computational platform for the Computer Aided Design (CAD) file generation of next-generation architected materials and metastructures. For a complete overview, visit the product's page:

<https://top6meta.com/>.

Technology ID

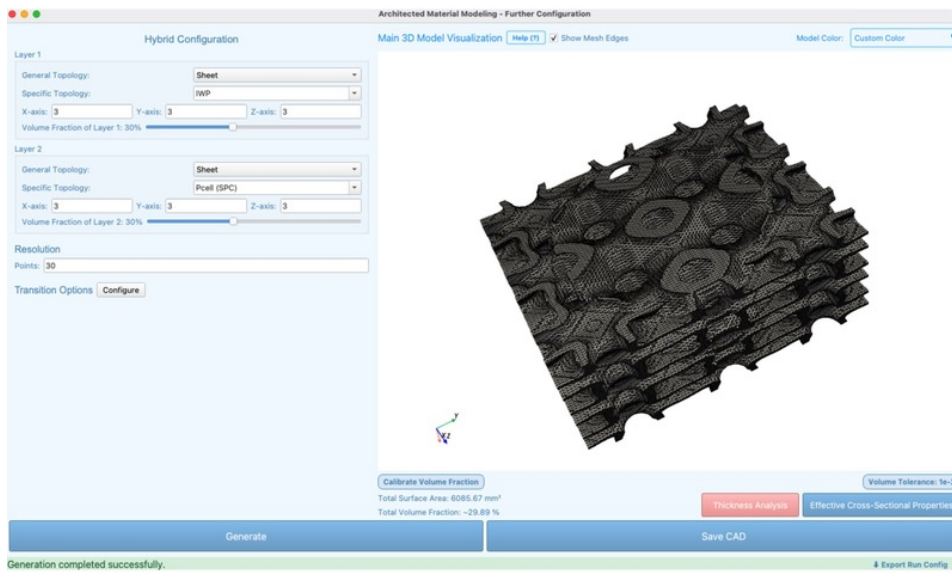
KAR07-02

Category

Engineering & Physical
Sciences/Materials
Engineering & Physical
Sciences/Automotive
Engineering & Physical
Sciences/Robotics
Software & IT/Simulation &
Modeling
Life Sciences/Research
tools/Tissue Engineering
Ahmed Ellaithy
Engineering & Physical
Sciences/Civil
Engineering & Physical
Sciences/Mechanical &
Aerospace

View online





Top6Meta vs Top6MetaA

Top-6-Class MetaStudio (Top6Meta) is a simplified version of Top6MetaA, built upon the same principles, though with overall reduced functionalities. The differences among the two versions are provided below in a tabulated form. To install Top6Meta, visit: <https://top6meta.com/>.

Capability	Top6Meta	Top6MetaA
5 Architected Material Classes		
Sheet – Skeletal – Exoskeletal Networks		
42 Core Topologies		
STL + STEP CAD Export		
3D Interactive visualization		
Linear Functional Grading		
Extended Topology Library (+36 Topologies)	X	
Cosine – Sinusoidal – V-type Grading	X	
Inner Wall Thickness Analysis	X	
Effective Cross-Sectional Properties	X	
IPC Layer Preview & Analysis	X	
HPC Parallel Processing	X	
Priority Support	X	

References

1. Agyapal Singh a 1 , Georgios Mermigkis, Panagiotis Hadjidoukas, Nikolaos Karathanasopoulos , <https://www.sciencedirect.com/science/article/pii/S2665963826000382>