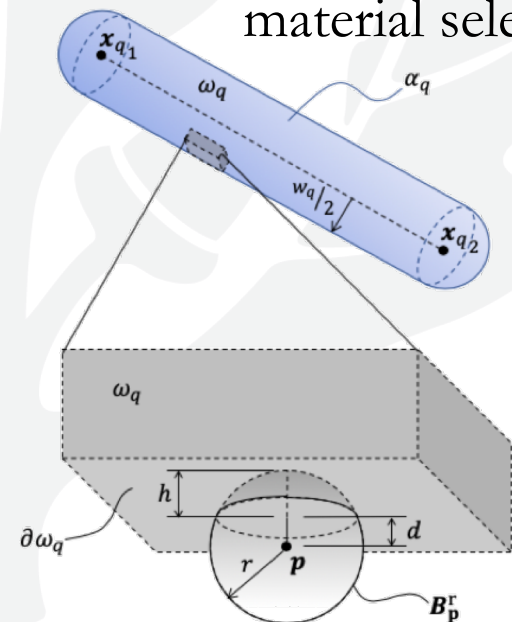


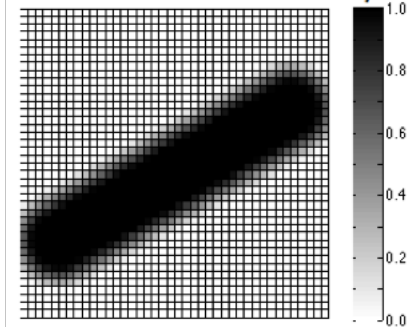
Computational Design of Programmable Lattice Material Systems

JULIÁN NORATO (UConn) & ASHKAN VAZIRI (NEU) / (CMMI-1634563)

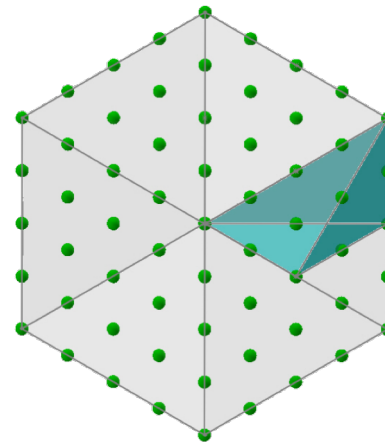
- **Multi-material periodic lattices** → better property/weight ratio
- Open lattices → improved manufacturability via AM
- Topology optimization for simultaneous strut layout & material selection



Geometry projection

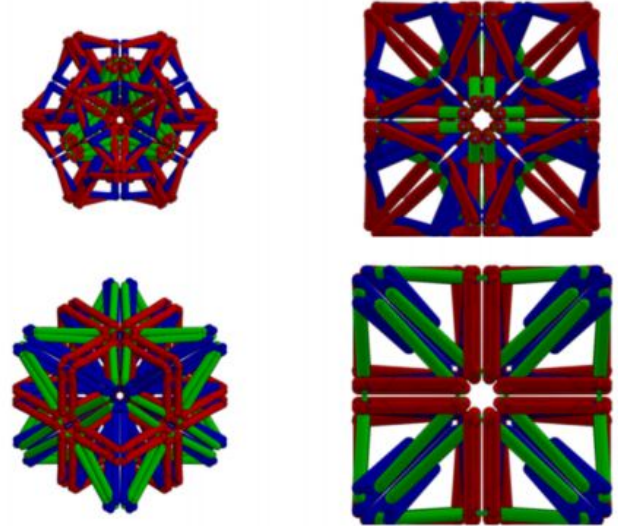


Initial design



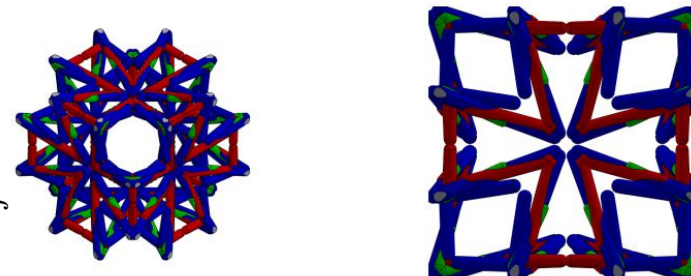
Bulk modulus maximization

$w_f^* = 0.094$
 $w_f^* = 0.1$



Poisson's ratio minimization

$w_f^* = 0.0389$



■ $E_1 = 10, \gamma_1 = 0.9$
■ $E_2 = 7.5, \gamma_2 = 0.675$
■ $E_3 = 5, \gamma_3 = 0.45$

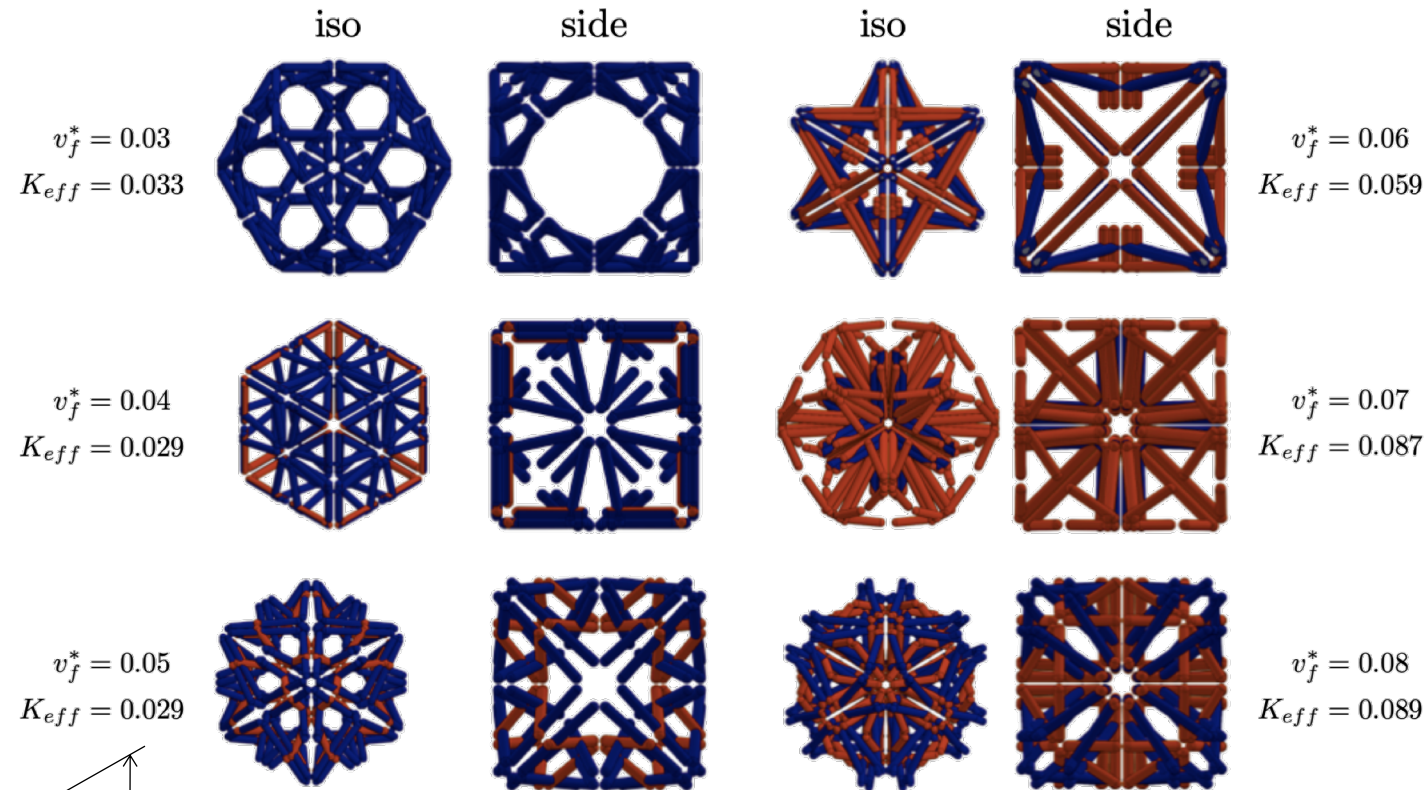


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- **Multi-scale periodic lattices** → better property/weight ratio with single material
- Topology optimization for simultaneous strut layout & strut porosity sizing



$$\begin{aligned} &\max K \\ &\text{s.t.} \\ &w_f \leq w_f^* \\ &0 \leq \beta \leq 0.5 \end{aligned}$$

