

ORIGINAL RESEARCH ARTICLE

Machine learning-enabled prediction and inverse screening of elastic modulus in Euclidean-tiling structures

Supplementary Files

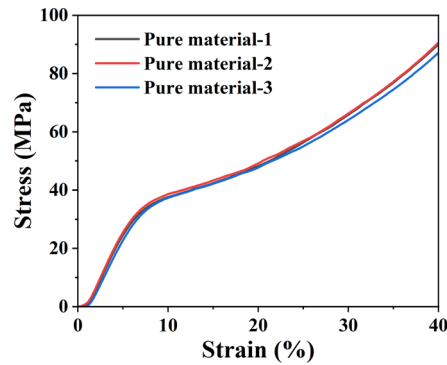


Figure S1. Compressive stress–strain curves of compact cylindrical samples (diameter 5 mm, height 5 mm)

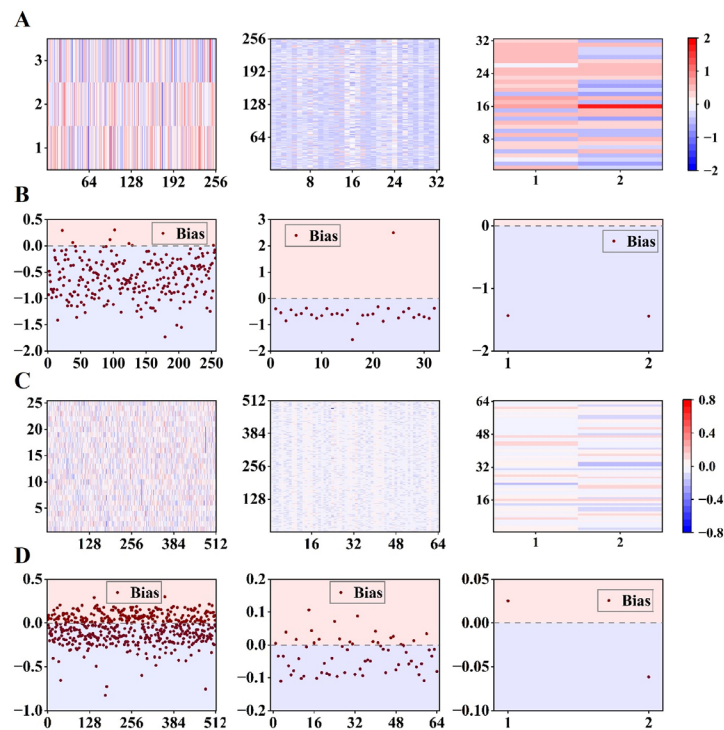


Figure S2. Visualization of FCNN hyperparameter. (A, B) Weight matrices and corresponding bias terms in the UCAE model; (C, D) Weight matrices and corresponding bias terms in the UCFS model.

Abbreviations: FCNN: Fully connected neural network; UCAE: Unit cell arrangement encoding; UCFS: Unit cell frequency statistic.

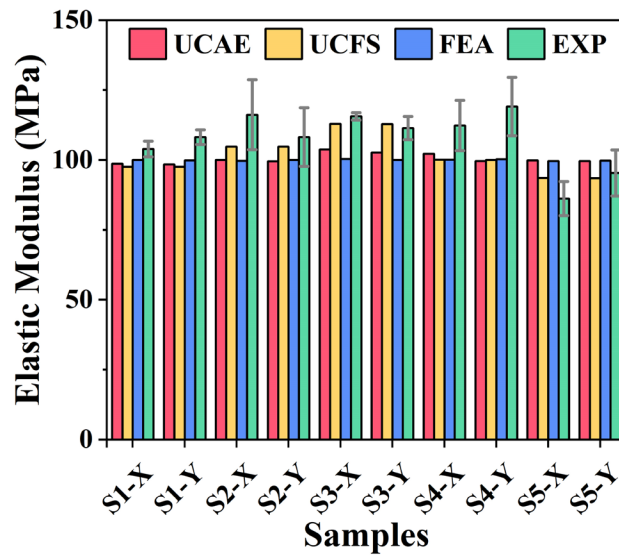


Figure S3. Elastic modulus (and) from FEA, UCAE-FCNN, UCFS-FCNN, and experiments for the five KNN selected candidates (S1-S5)
Abbreviations: EXP: Experimental data; FCNN: Fully connected neural network; FEA: Finite element analysis; KNN: K-nearest neighbors; UCAE: Unit cell arrangement encoding; UCFS: Unit cell frequency statistic.

Table S1. 3D printing parameters for the fabricated samples

No. of layers	Light intensity (mW·cm ⁻²)	Exposure time (s)	Layer thickness (µm)	Settling time (s)
1	80	4.0	20	2000
4	80	3.5	20	1500
15	80	3.0	20	1000
80	80	3.0	20	800

Table S2. Relative density of the five KNN-selected candidates (S1-S5)

Sample	Tris	Quads	Oct	Relative density
S1	0.64	0.08	0.28	0.4104
S2	0.08	0.8	0.12	0.3544
S3	0.52	0.32	0.16	0.4104
S4	0.36	0.44	0.2	0.3824
S5	0.16	0.64	0.2	0.3544

Abbreviations: KNN: K-nearest neighbors.

Table S3. Elastic modulus (and) from FEA, UCAE, UCFS, and experiments for the five KNN-selected candidates (S1–S5)

Sample–Axis	UCAE	UCFS	FEA	EXP
S1–X	98.67327	97.58540	100.00432	103.92187 ± 2.77182
S1–Y	98.38116	97.52422	99.84411	108.15927 ± 2.59969
S2–X	99.97245	104.79828	99.70386	116.15819 ± 12.50720
S2–Y	99.47723	104.71822	99.97056	108.19047 ± 10.50722
S3–X	103.74733	112.91879	100.30554	115.59336 ± 1.32590
S3–Y	102.60028	112.81749	100.04129	111.38188 ± 4.13503
S4–X	102.22752	100.07483	100.05872	112.29603 ± 9.00987
S4–Y	99.57181	100.00713	100.30312	119.08125 ± 10.44209
S5–X	99.86104	93.52818	99.62257	86.17121 ± 6.08243
S5–Y	99.60574	93.47760	99.71839	95.35364 ± 8.20070

Abbreviations: EXP: Experimental data; FEA: Finite element analysis; KNN: K-nearest neighbors; UCAE: Unit cell arrangement encoding; UCFS: Unit cell frequency statistic.