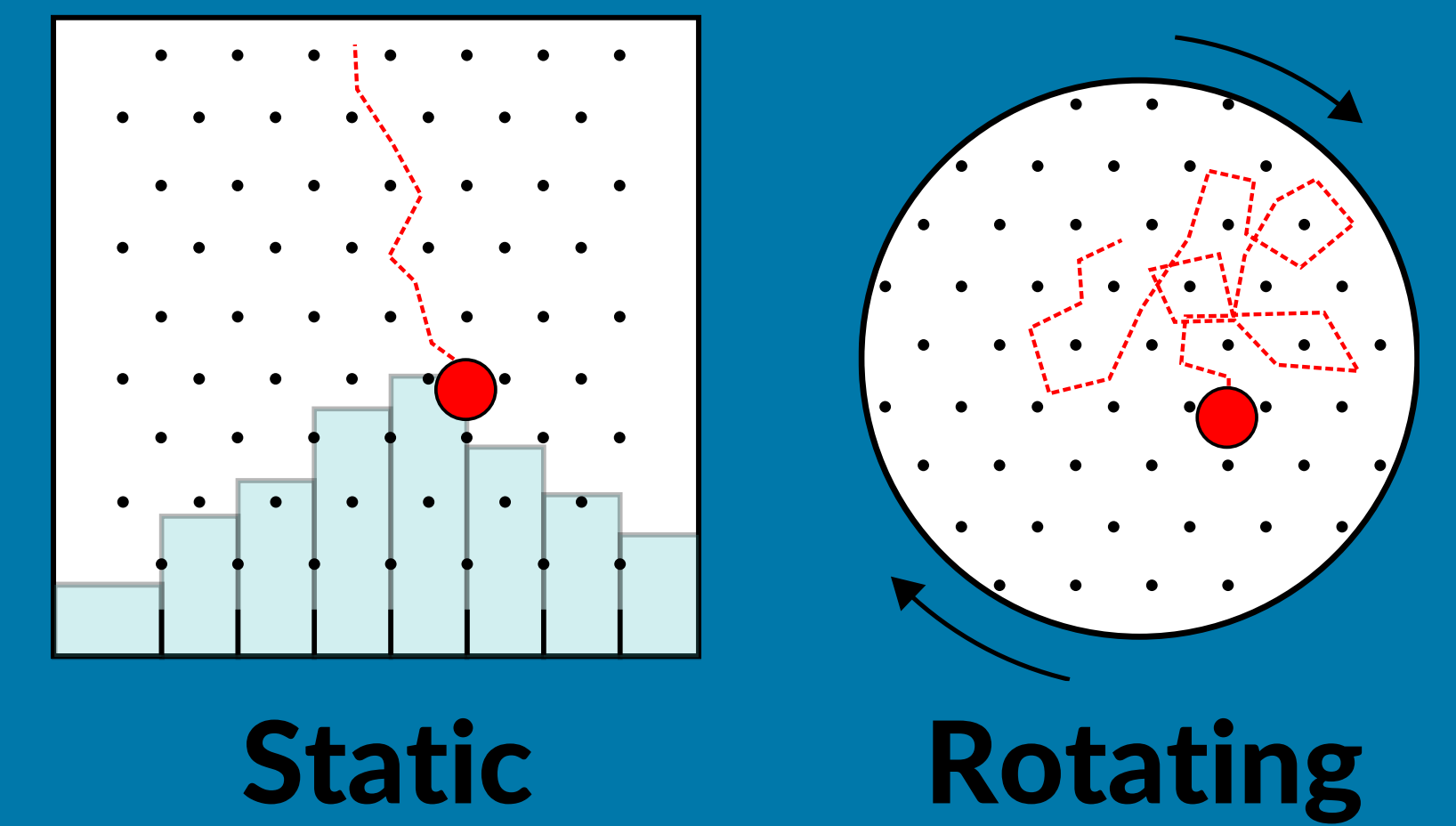


Morphological design introduces controllability to our plinko-based chaotic systems.



Reinventing Plinko: The dynamic effects of passive morphologies in the Galton Board

David Hardman and Fumiya Iida

INTRO

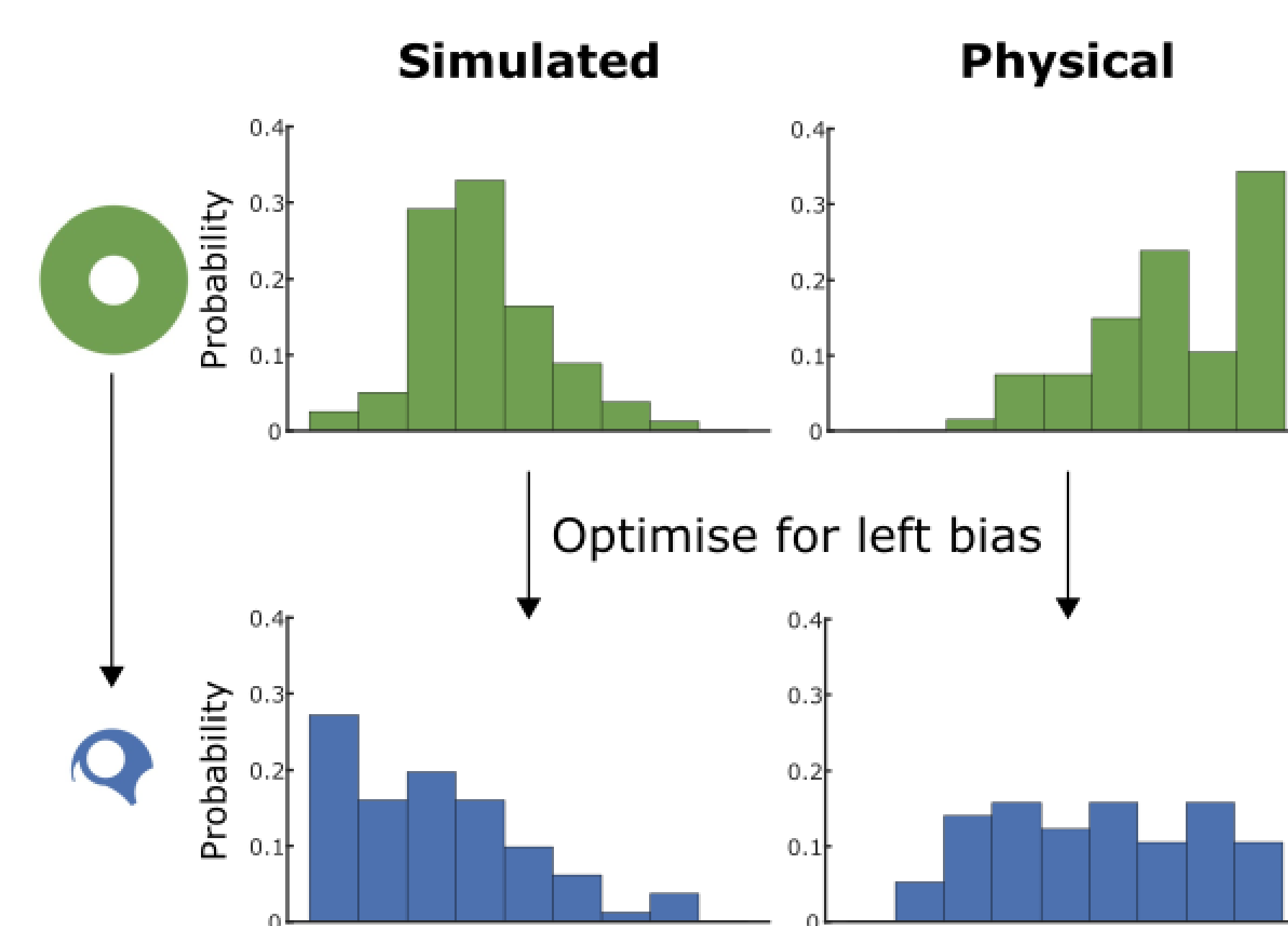
- The Galton Board ('Plinko') system dynamics have been shown to be chaotic¹, with fractal input \rightarrow output mapping².
- These studies use idealised systems; by changing the counter's passive morphology and materials, can we control the output distributions?

METHODS

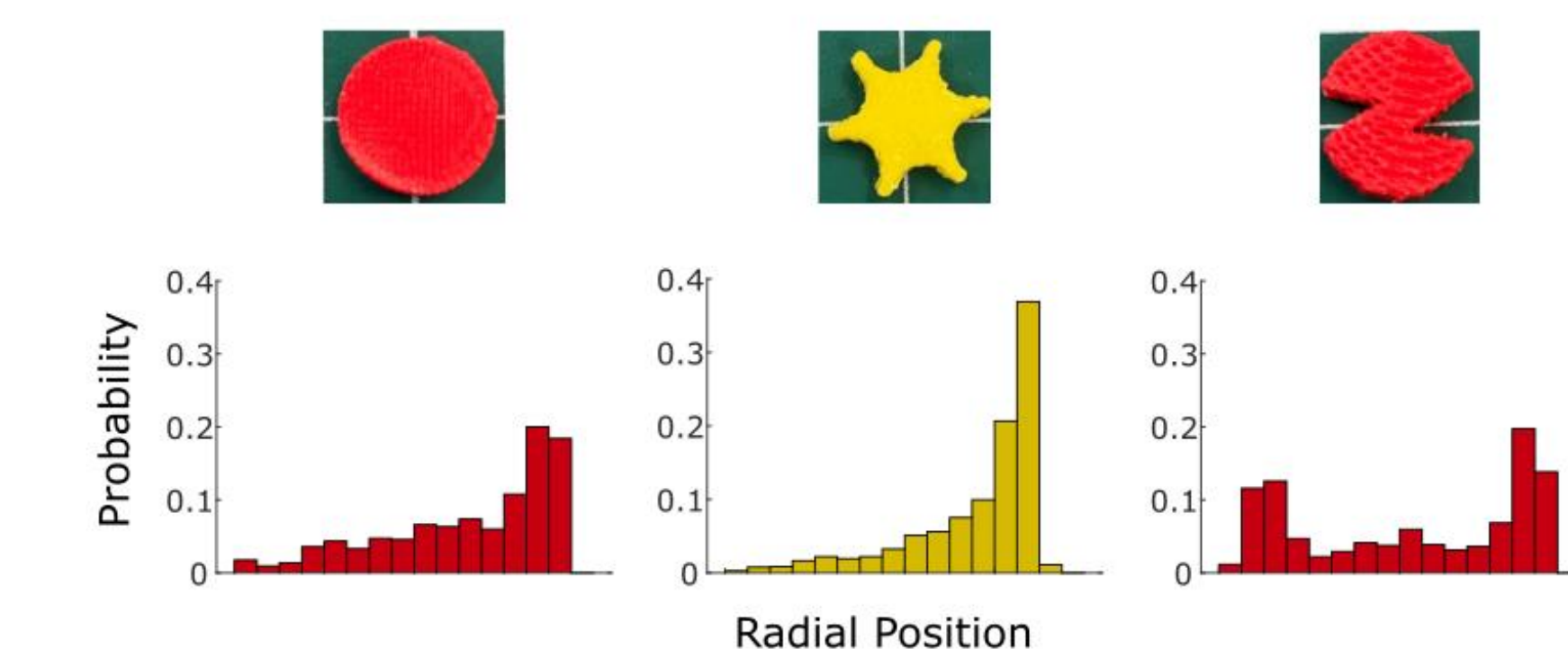
- Bayesian optimisation in PyChrono simulations.
- Physical deformable 3D prints generated using IceSL³ & TPU filament.
- Computer vision (MATLAB) tracks paths during physical experiments..

RESULTS

Static

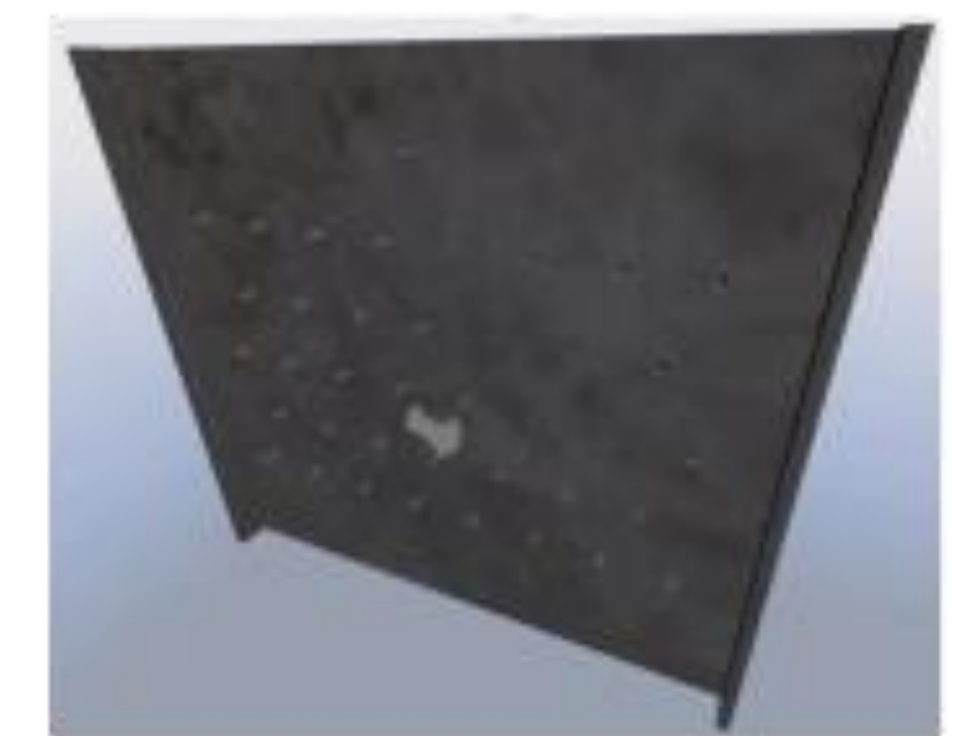


Rotating

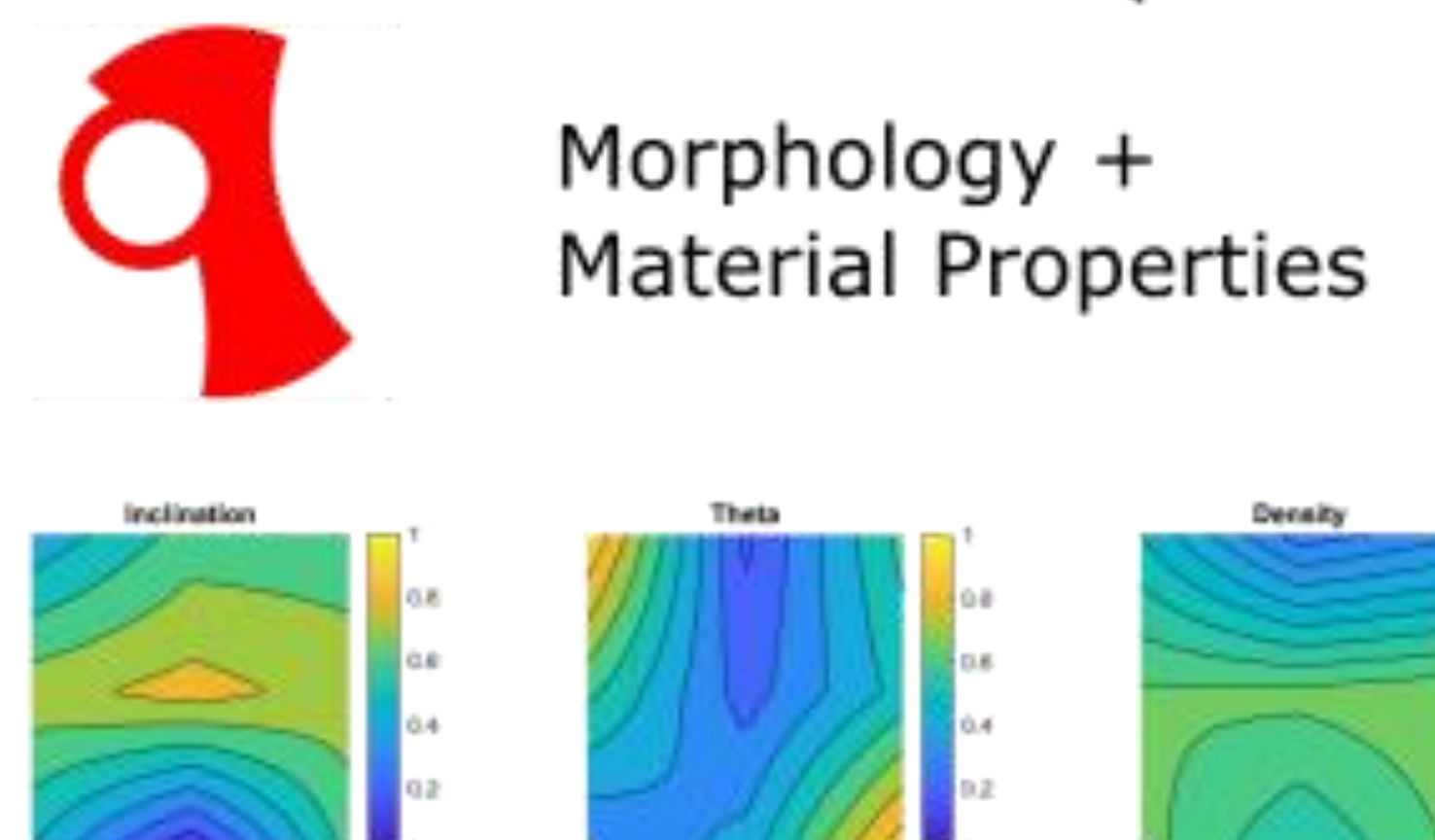


- Early results confirm the ability of morphology to bias the system's output distributions.
- Further work uses this framework to examine the effect of heterogeneous materials on counter behaviours.

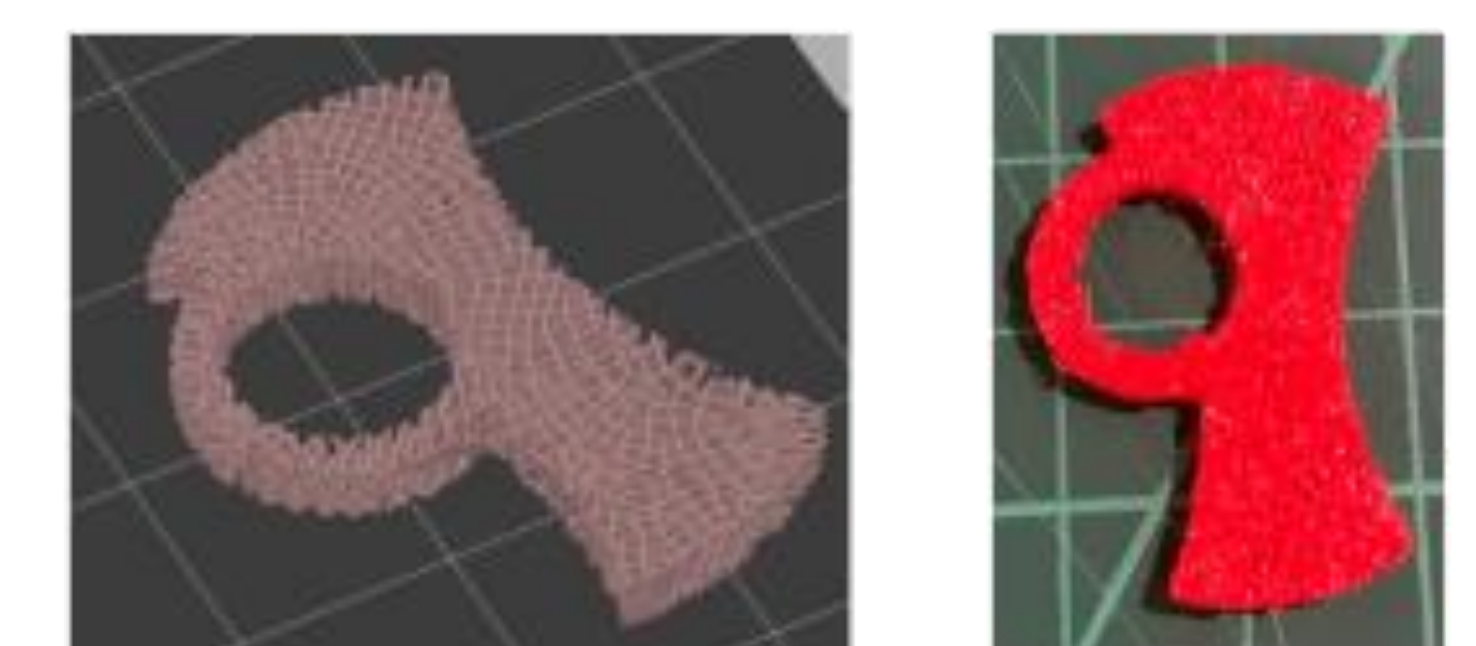
Simulate



Generate



Fabricate



Evaluate (Physical)



REFERENCES

- Judd, *International Journal of Bifurcation and Chaos*, 2007
- Arai et al., *Phys. Rev. E*, 2012
- Tricard et al., *ACM Transactions on Graphics*, 2020

