

Bake-Ori



2.s998 MITMECHE

3D-Printed Origami Tessellations for Food Patterning & Folding

Marwa Alalawi (malalawi@mit.edu), Ashley Su (sua@mit.edu), Cindy Yang (cindyyan@mit.edu)

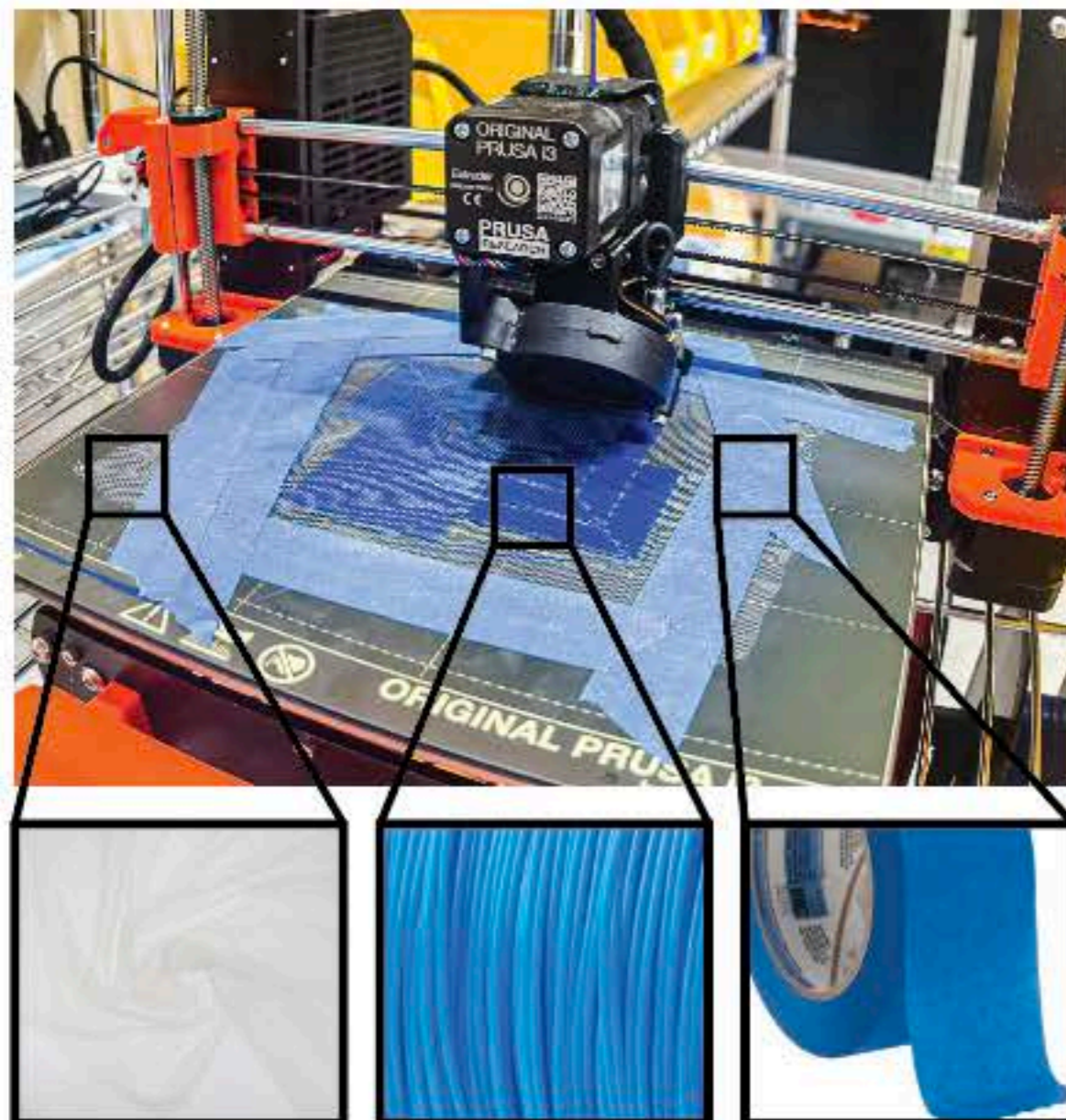
Motivation

Additive manufacturing has gained popularity in several industries, including those related to food, where it is used for 1) extrusion of food-grade filament to achieve complex geometries, 2) creation of customized tooling for geometries that are intricate to create manually. Ori-Mandu [1], for example, uses 3D-printing to fabricate dumpling-folding tools with customized impressions using a simple hinge structure. With Ori-Mandu and other existing tools, the folding mechanisms proposed are relatively straightforward, as edges of a wrapper or dough are simply pressed together to seal the food item. This limited method of folding restricts the complexity of possible folds. We propose **Bake-Ori** as a way to mitigate the limitations of existing tooling for folding food wrappers and dough. We do so by:

- (1) Proposing a hybrid fabrication method for molds using tulle cloth and origami tessellation structures for folding, creasing, and patterning
- (2) Showcasing how the suggested mold structures can be printed in one pass on an FDM 3D printer
- (3) Demonstrating the usability of the molds across several cooking methods (baking, frying, steaming)

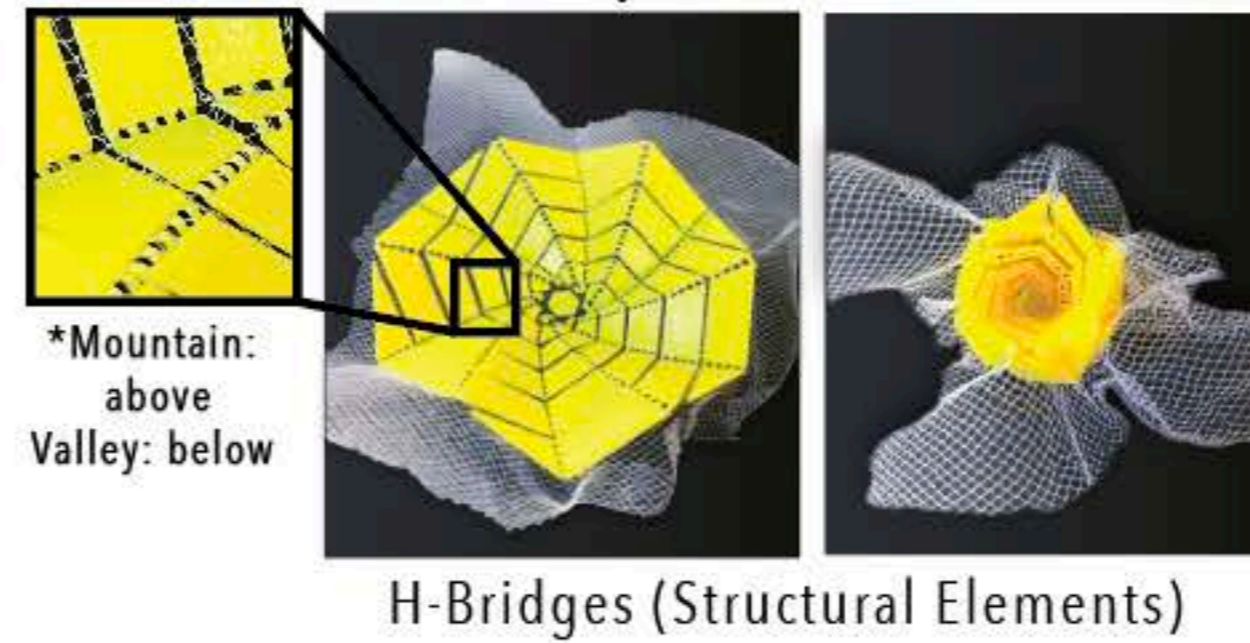
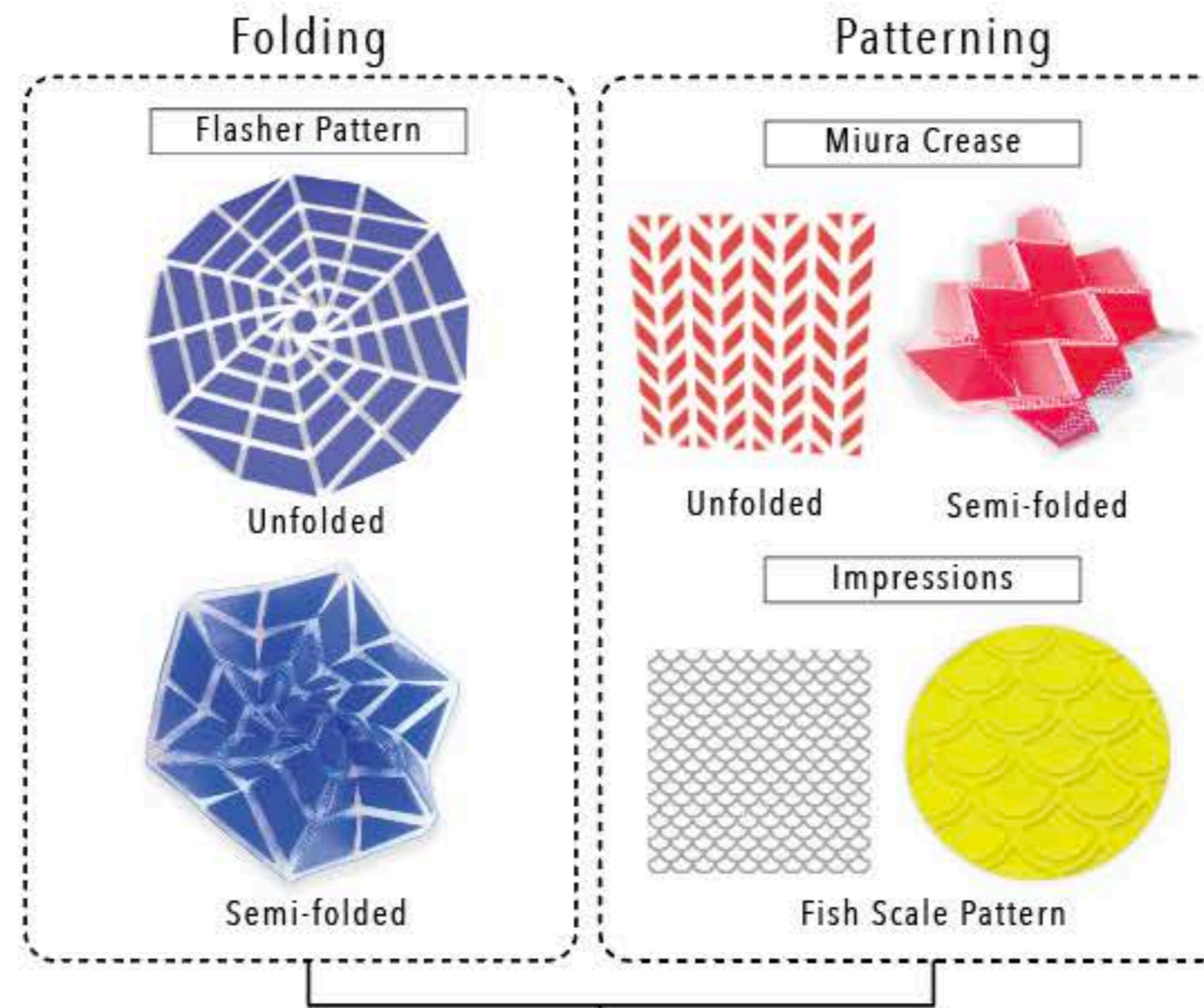
Fabrication

Desktop FDM/FFF Printer Enabled



Tulle Fabric PLA Filament (Food Safe) Painter's Tape

Mold Designs



Implementation

Folding



Dough, Flasher Mold Dough, Miura Mold

Steaming



Dumpling Wrapper 1hr Frozen, Flasher Mold Pasta Dough 30min Frozen, Miura Mold

Baking



Cookie Dough, Miura Mold

Frying



Dough, Flasher Mold

Patterning



Dumpling Wrapper Flasher, Fish Scale

Conclusions

Bake-Ori enables users to use molds for folding dumplings, pasta, and dough into complex geometries with simple origami tessellations 3D-printed on tulle fabric. These origami molds are more advantageous than existing tooling because they are printed flat on the print bed, and can be used on any sheet material of consistent thickness. We have also demonstrated how the same mold may be used across different cooking methods and materials, with the material retaining its shape even after being released from its **Bake-Ori** mold.

[1] Bokyoung Lee et al. Ori-mandu: Korean Dumpling into Whatever Shape You Want. Proceedings of the 2017 Conference on Designing Interactive Systems (2017).