Origami is a term generally associated with paper folding, however its techniques reach far more broadly in material, scale, and purpose than the traditional Japanese art. When folding tessellations, because of their inherent geometry, certain origami surfaces become structurally stable while remaining quite flexible. When mechanized for industrial applications, the hinging that occurs along folding edges in origami is typically actuated by a motorized system. However, there are some critical limitations of motorized systems. These systems of actuation and powering incorporate complex linkages of a large number of parts are cumbersome to work with, difficult to waterproof for exterior functions, and their mass makes them difficult to purpose at architectural scales. Further, mechanized systems often require large amounts of non-renewable energy sources.
Our aim is to replace the use of shape-memory alloys to replace the motors in the transformation of structural origami patterns from one shape to another. Shape-memory alloys (SMA) are metals that can be made to transform from one shape to another within a certain range of temperature change by annealing the material into the desired forms. Incorporating SMAs in origami structures both simplifies the mechanics of the system by eliminating otherwise bulky components as well as introduces the possibility of either electrically inducing a heat change or employing changes in environmental conditions to activate a passive heat transfer. Others have used SMA for manipulating very small structures and kinetic origami tessellations have been manufactured using other mechanical devices, however we are interested moving this technology to an architectural scale by actuating components and assemblies for human interaction and occupation.

DAVE LEE’s interests involve computational design methods in architecture, particularly where information processes and data structure techniques may aid in design process and production. Current research explores the role of emergent computational processes in contemporary architecture and developing pedagogical tools for implementing computational thought in the classroom.