

# Gradient Weight

**Designing for** relatively **hard materials** that do not deform too much **is** commonly **handled by software that calculates** and optimizes **structures** using mathematical **models** that are well understood and easily applied. But there is **an expanding class of design challenges for things that incorporate soft materials** -- biological materials, engineered tissues, membranes, and even shape-shifting fluids that respond to electromagnetic fields. **Predicting how** these **soft** and fluidic **materials respond to forces is more challenging** than predicting the behavior of **hard materials**. **Real world applications** can **include design of artificial hearts** and **heart valves or robot materials** that mimic flesh and soft tissue.

To meet this challenge, a team of **Tufts researchers** led by Tim Atherton, professor of physics, **created Morpho, an open-source programmable environment that enables researchers** and engineers **to solve shape optimization problems** for soft materials. **The software** recently described in Nature Computational Science **is meant to be easy to use, free to use, and applicable** to a broad range of **scenarios**. Among the team developing the software were **James Adler**, professor of mathematics, **and Chaitanya Joshi**, postdoctoral scholar in physics.