AUTODESK. UNIVERSITY

Stressing Out: Simulation Workspace in Fusion 360

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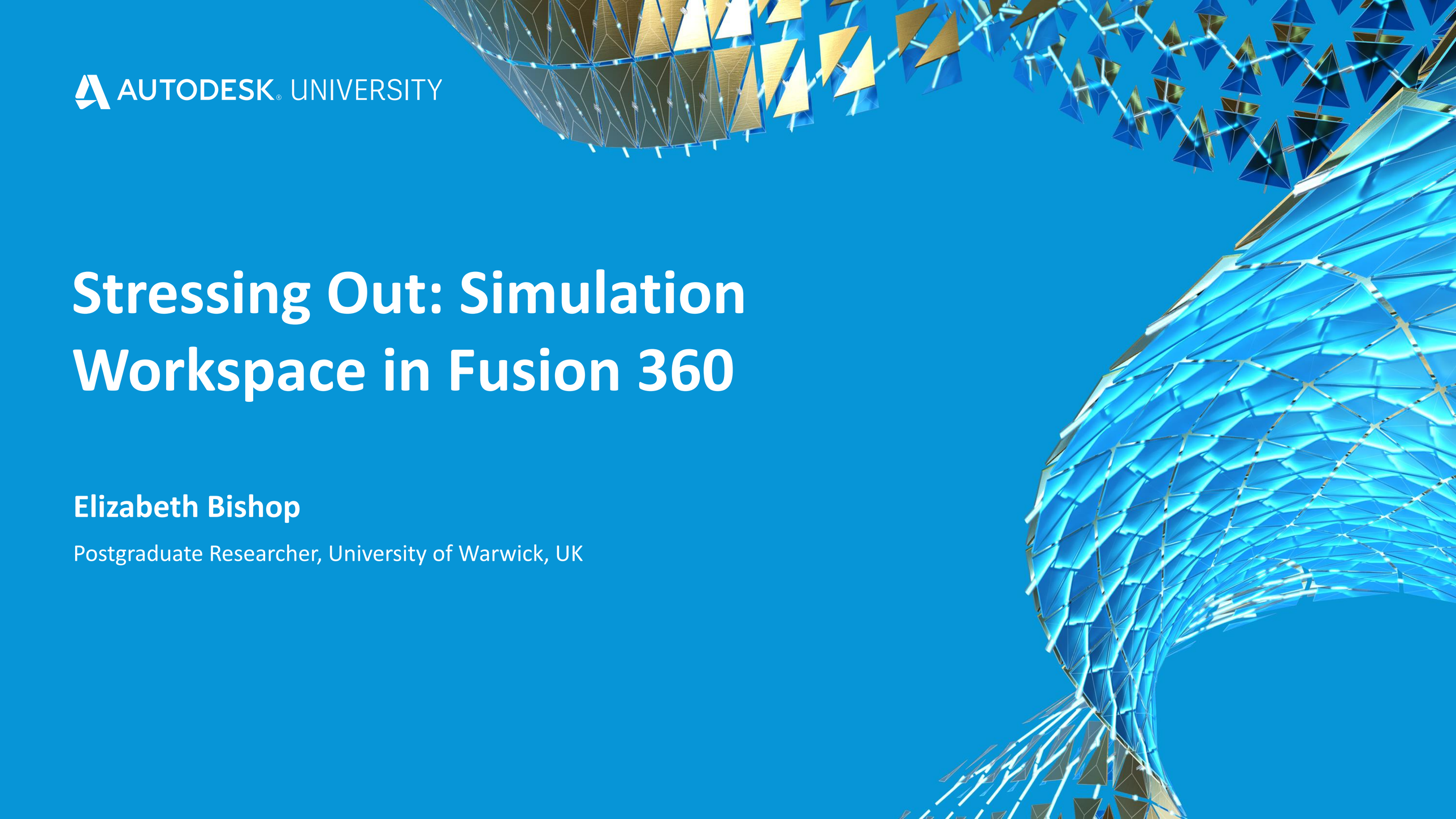

About me

Elizabeth Bishop

- **2012 – 2017 MEng Mechanical Engineering**
- **2016 – 2017 UAV Group Project**
- **2017 – 2021 PhD in Large-Scale Additive Manufacturing (3D Printing)**
- **Maker in Residence at Warwick Engineering Build Space**

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Learning Objectives

OBJECTIVE 1

Learn about the basics of setting up a simulation in Fusion 360

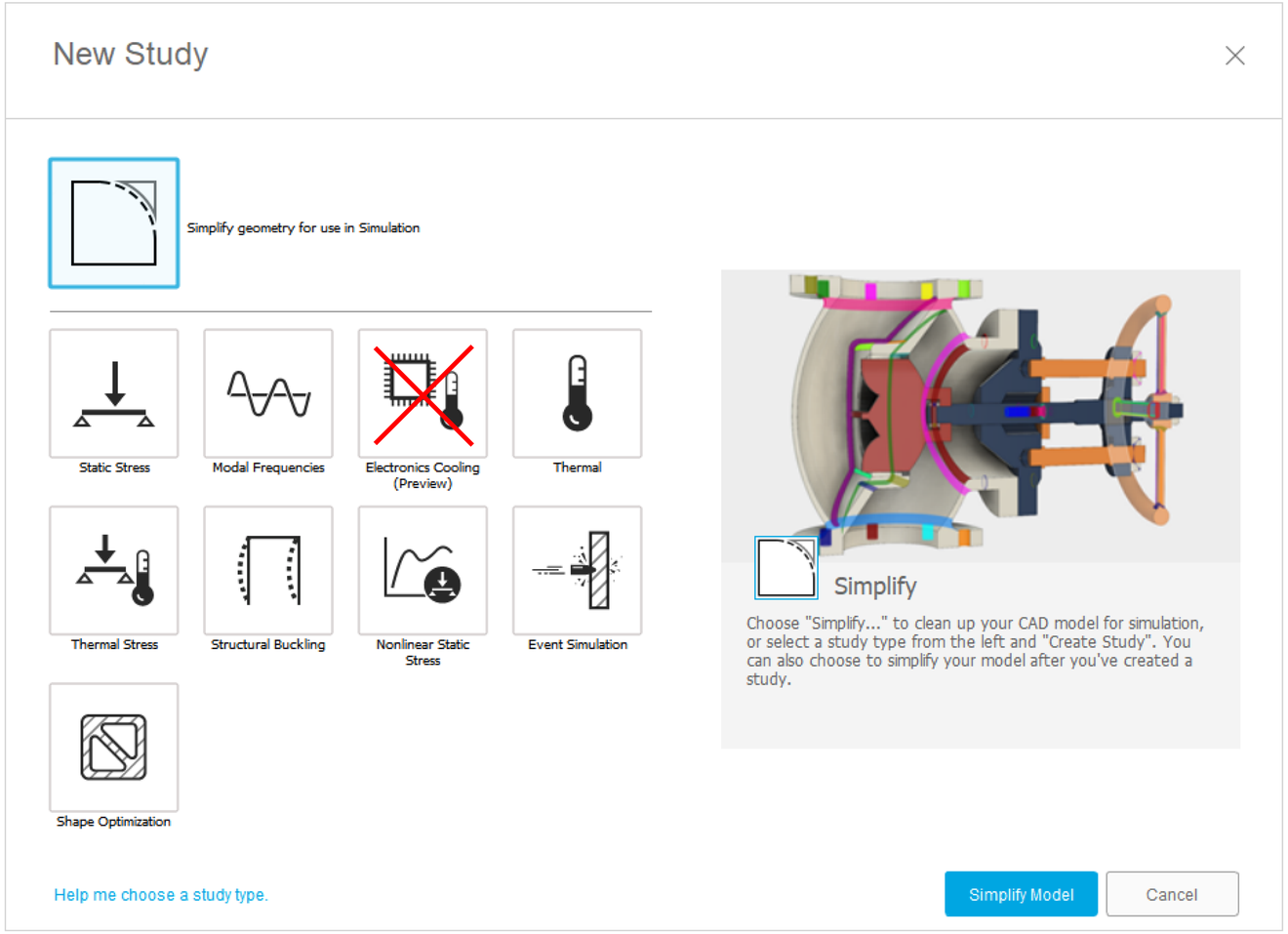
OBJECTIVE 2

Learn how to understand which simulation study type to choose

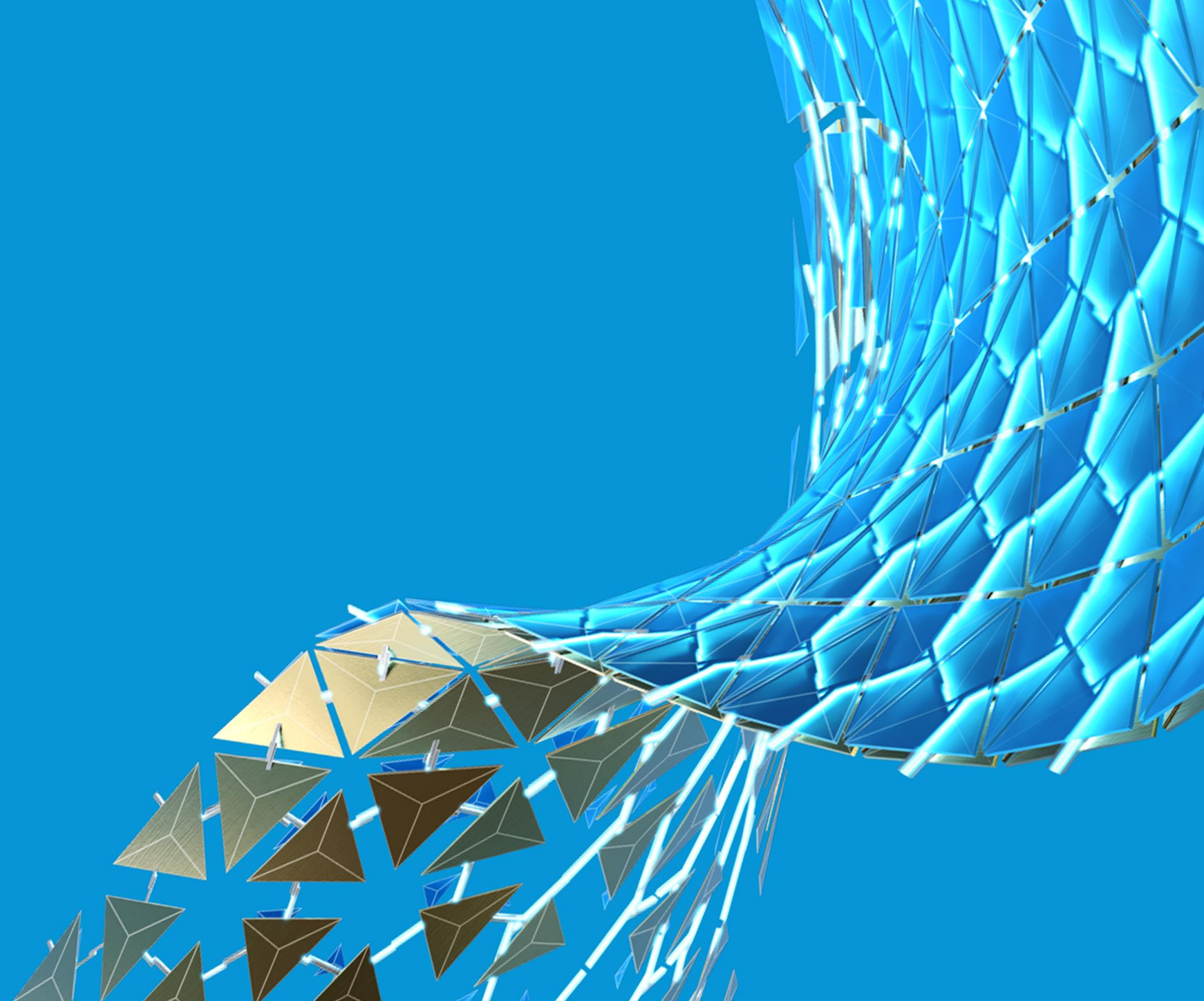
OBJECTIVE 3

Explore simulation outputs and how to use them in iterative design methods

Simulation Workspace

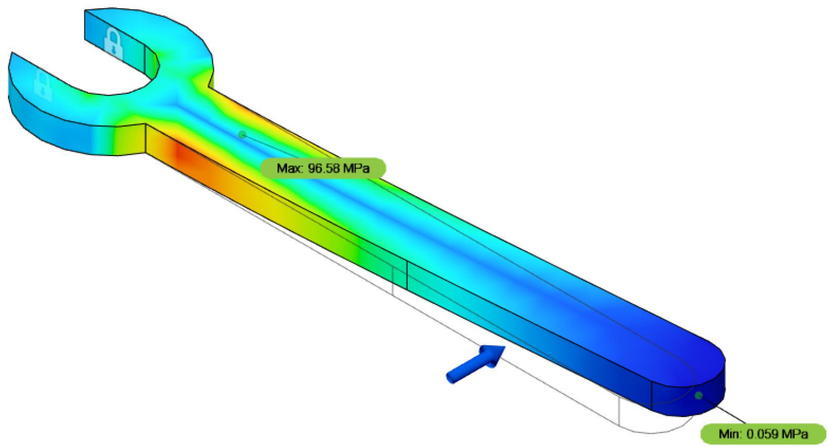


Static Stress



Static Stress

SPANNER



SPICE SHELF BRACKET

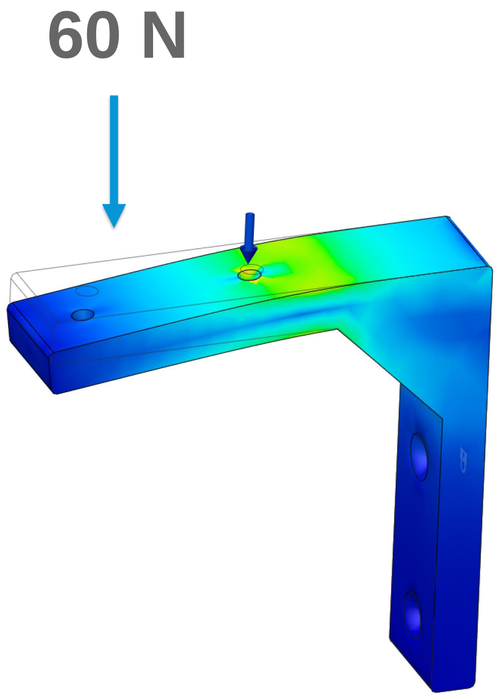
Spice Shelf Loading

bishs_kitchen

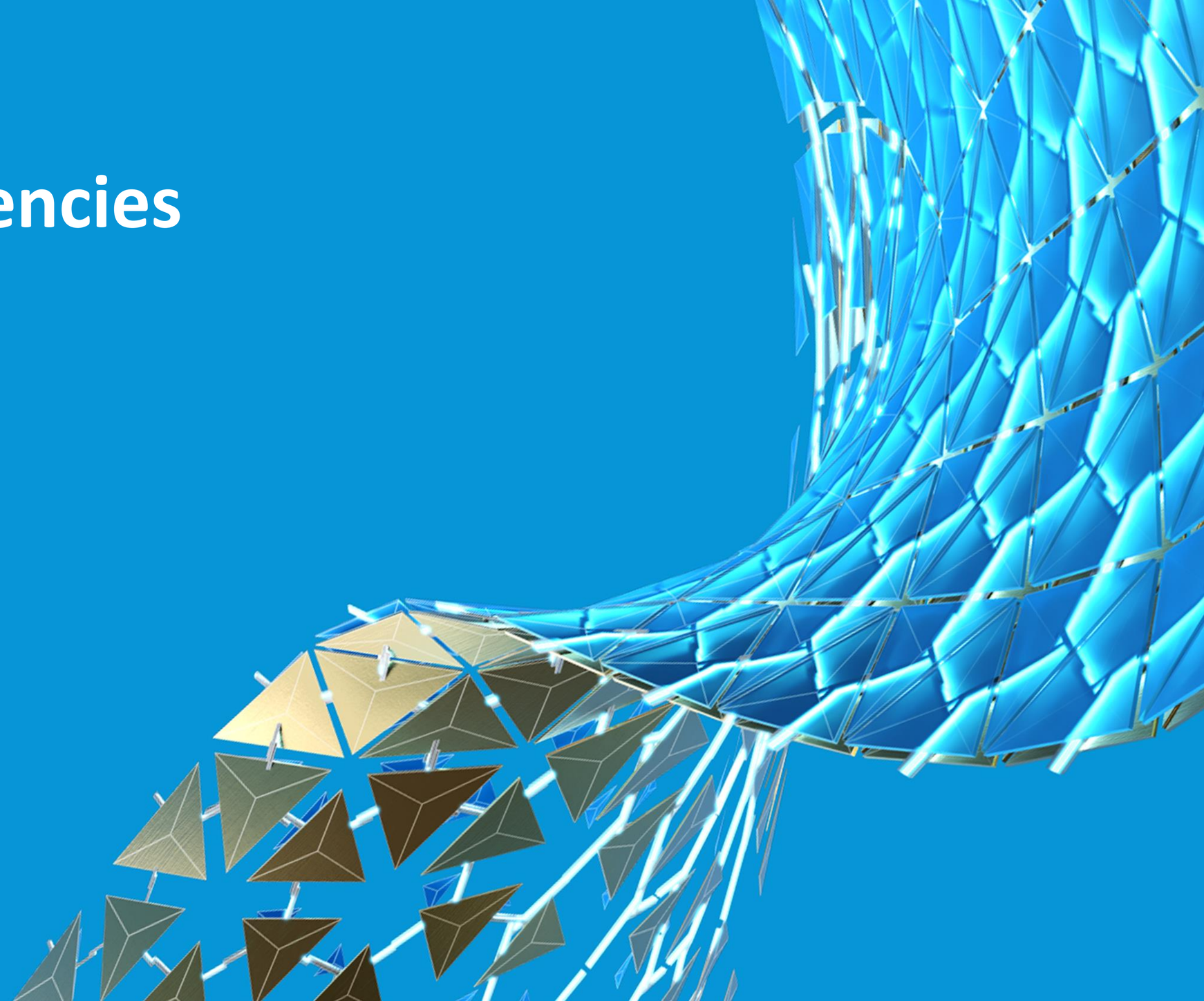
Spice Shelf Loading

150 g x 35 = 5250 g = 5.25 kg ~ 6 kg

6 kg x gravity = 60 Newtons

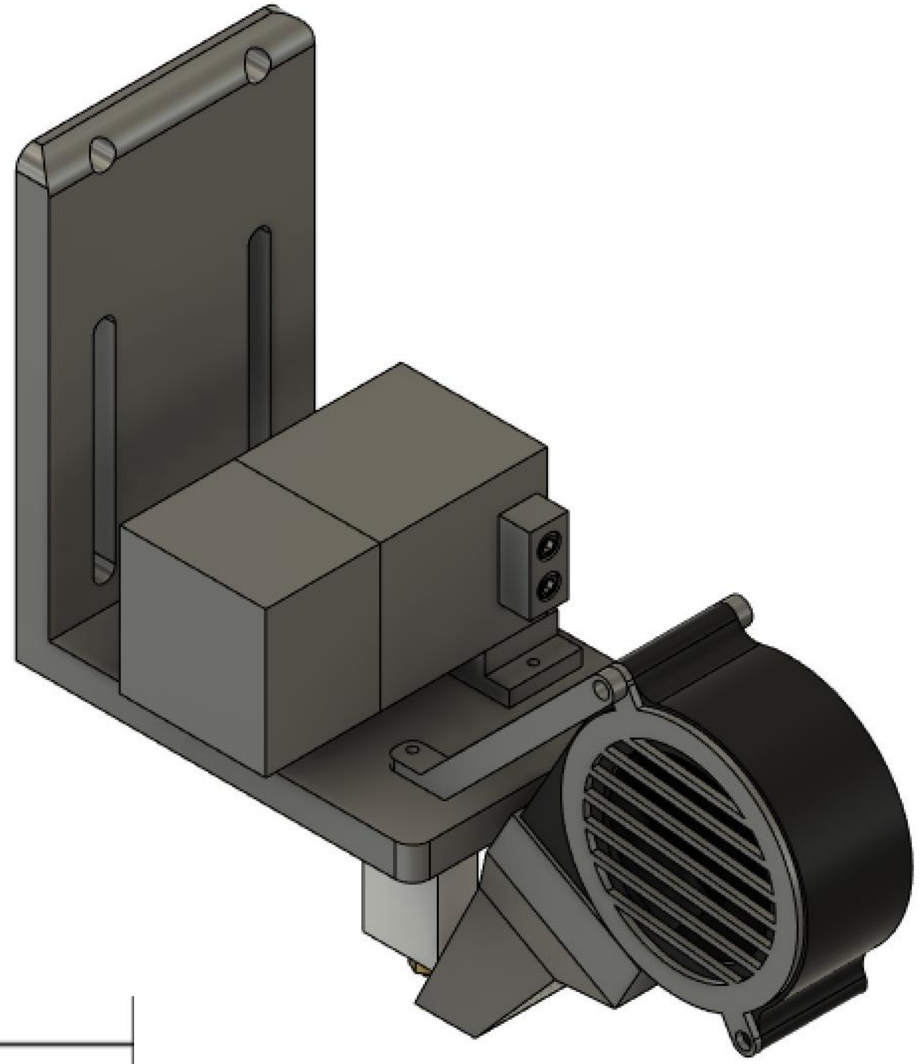


Modal Frequencies



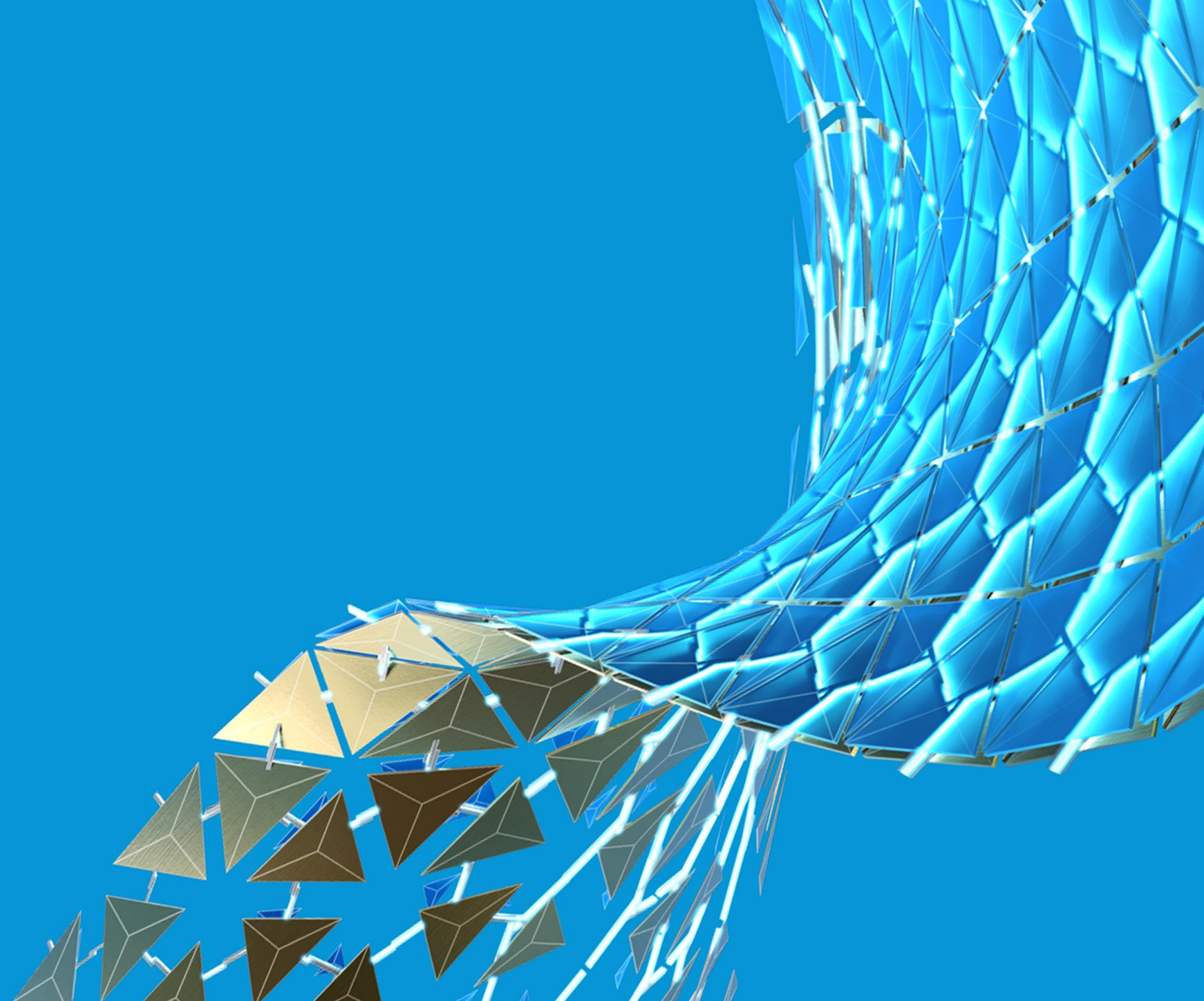
Modal Frequencies

- **Don’t want driven speed/frequency to be close to the part’s natural or resonate frequency**
- **Fan spins at 3000 rpm = 3000 / 60 = 50 rev per second = 50 Hz**
- **Avoid 50 Hz**



Input Power	2.88 W
Rated Speed (RPM)	3000
Airflow (CFM)	10

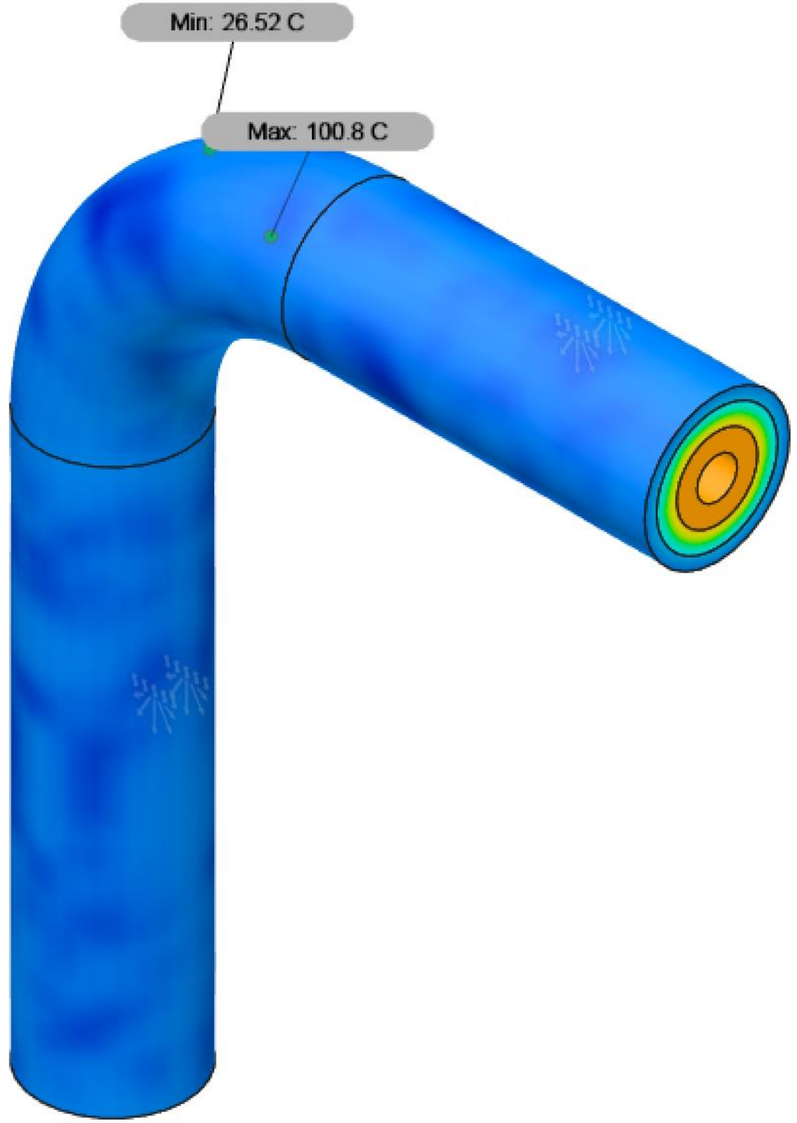
Thermal



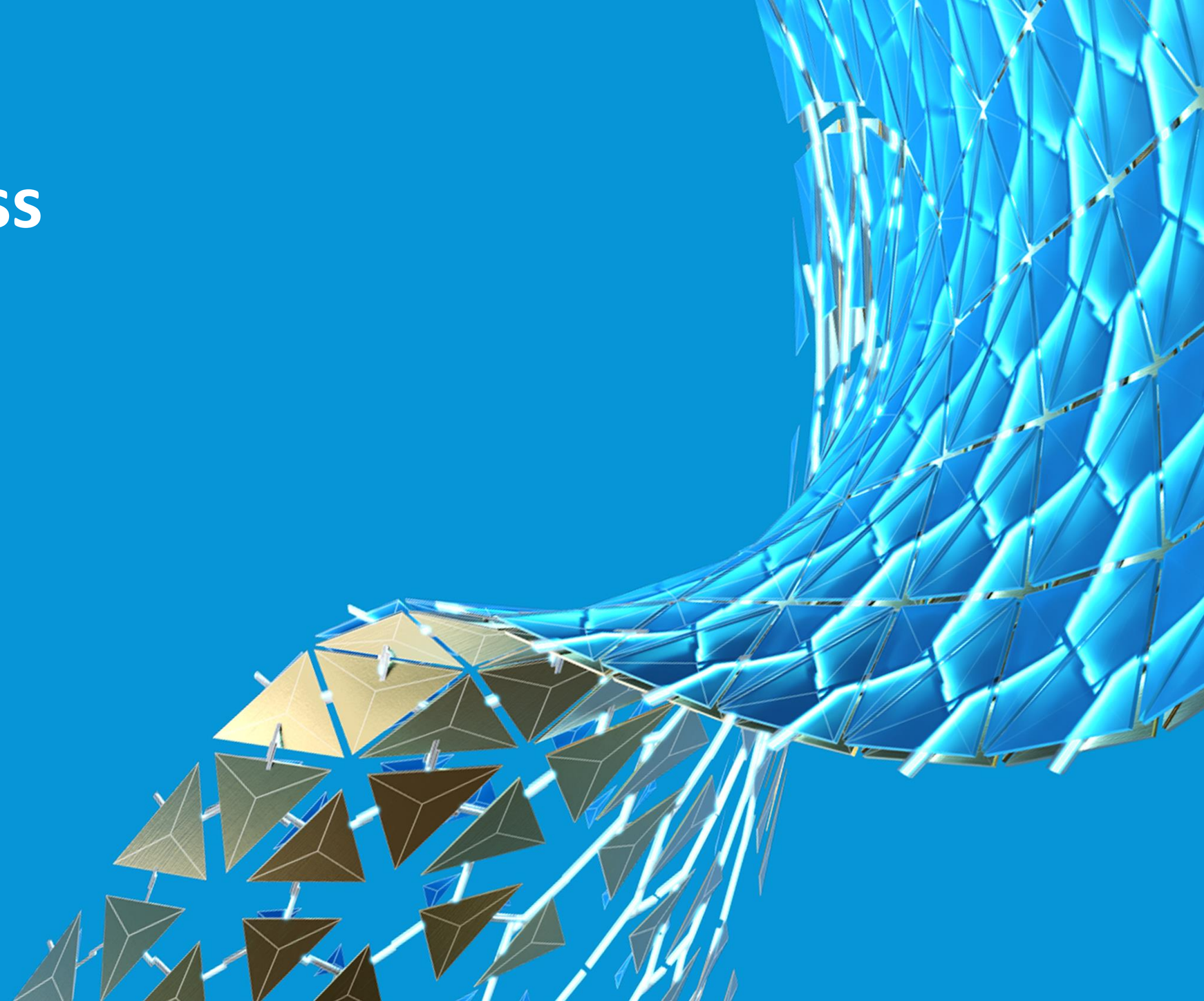
Thermal Analysis

- **Used to model thermal problems e.g.**
  - Cooling Fins
  - Insulations

- **Insulating a Pipe**
  - Explore different insulation materials
  - Explore different insulation thicknesses

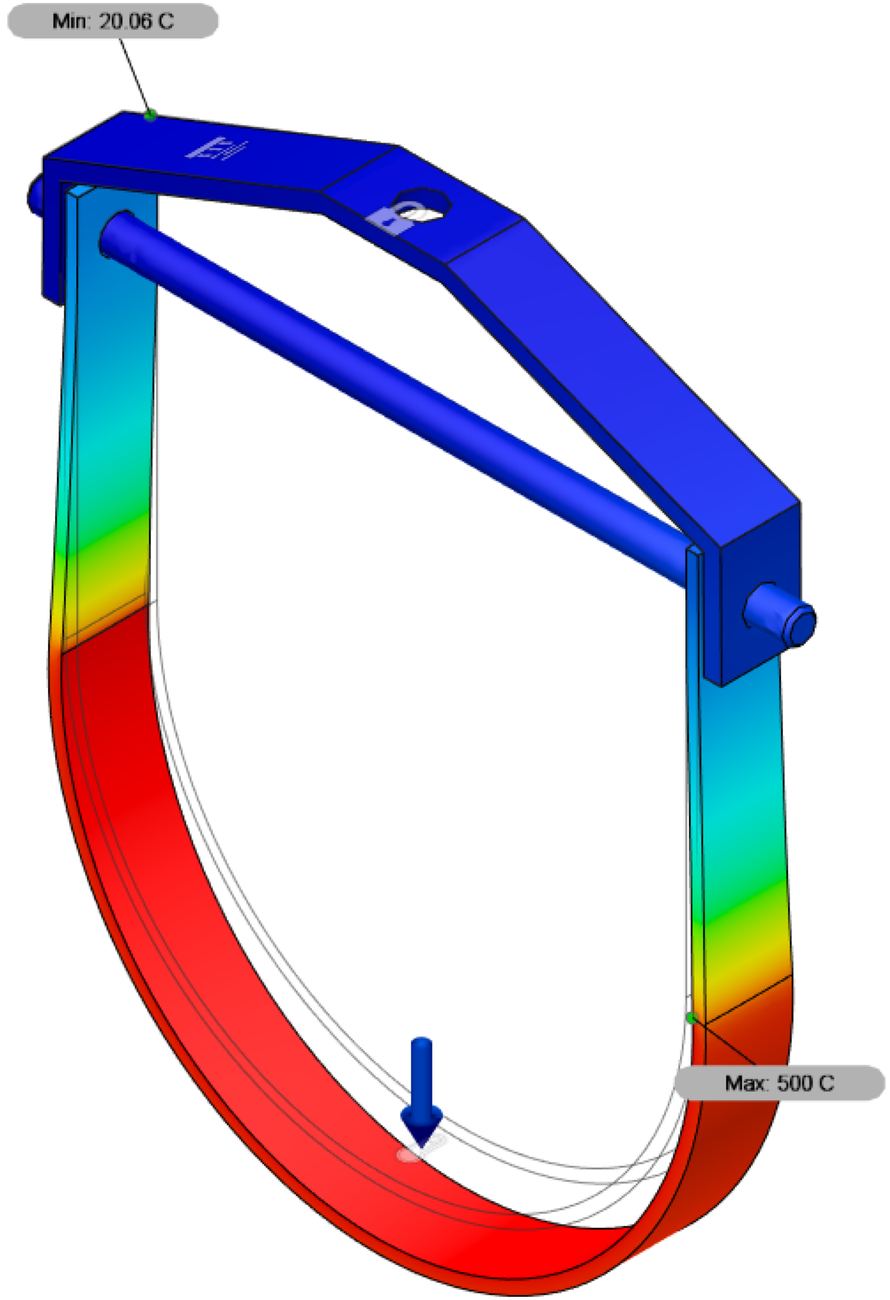


Thermal Stress

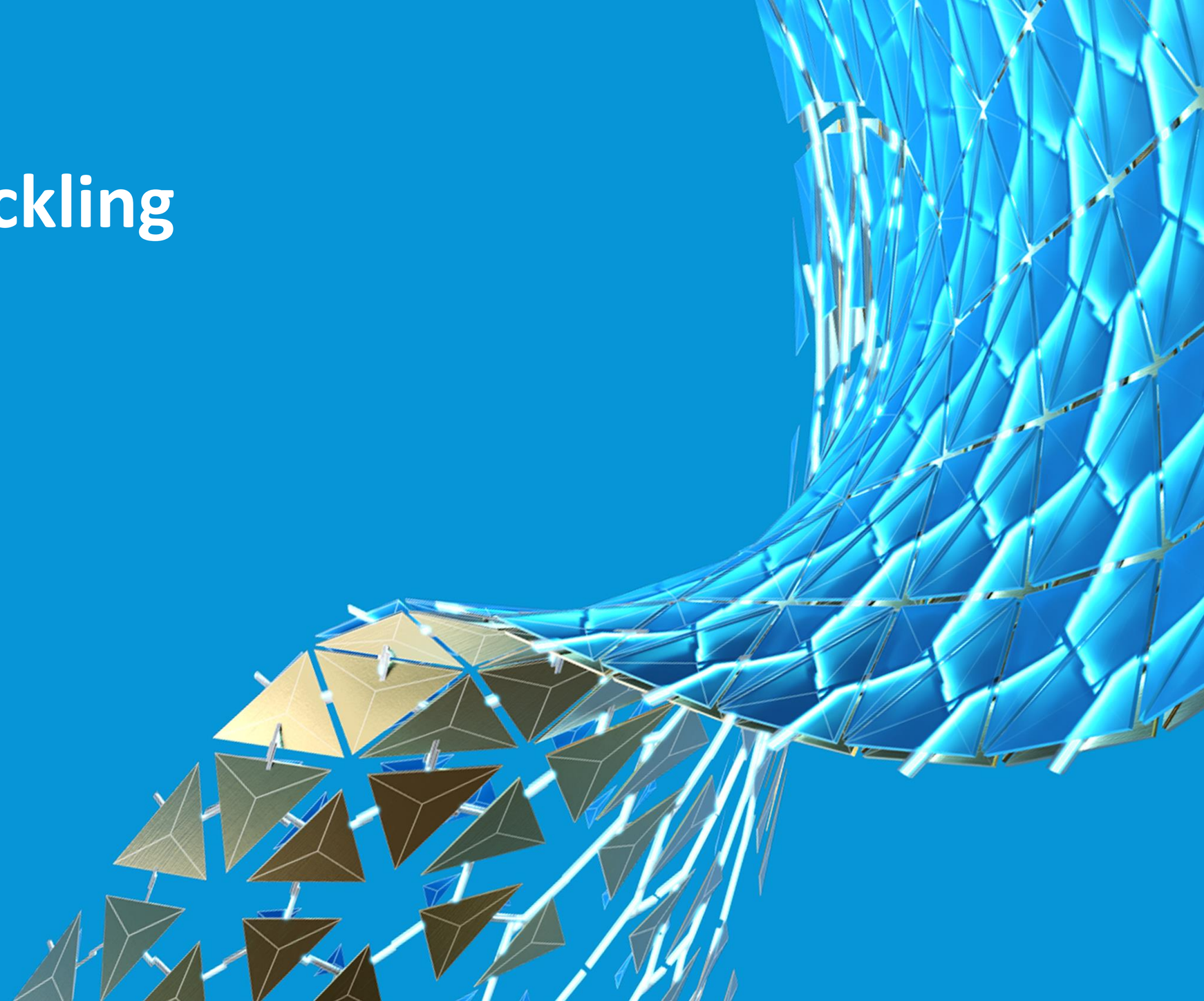


Thermal Stress

- **Simulate both static stress and thermal in the same set up**
  - Consider the thermal stress on a high temperature steam pipe hanger

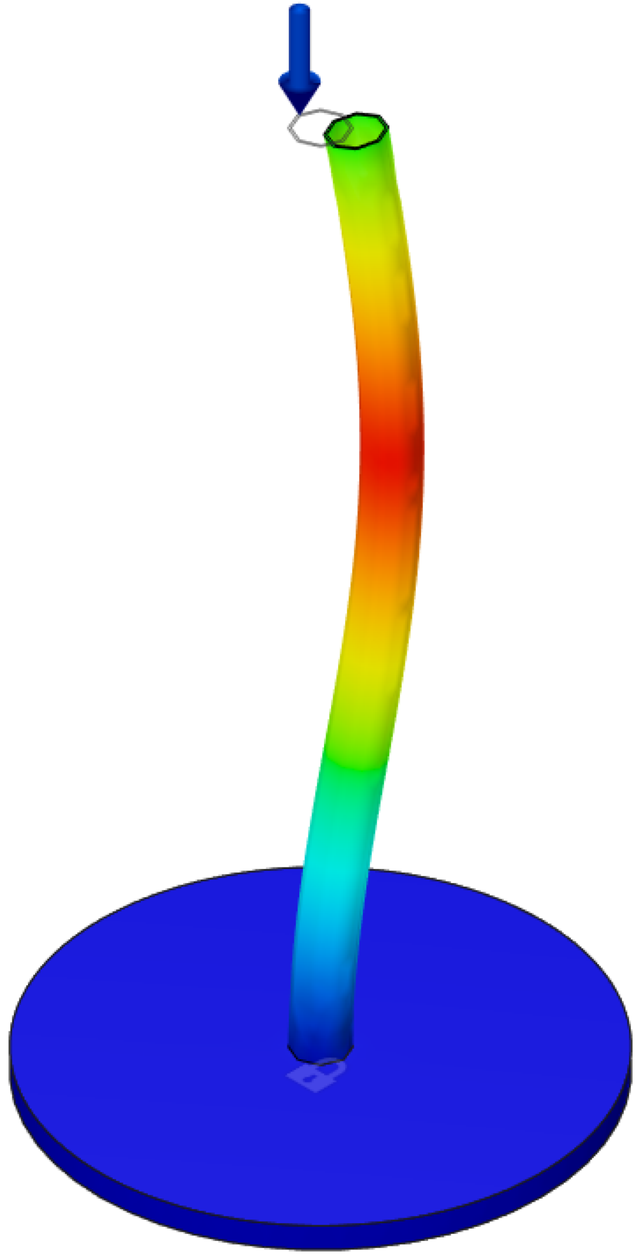


Structural Buckling



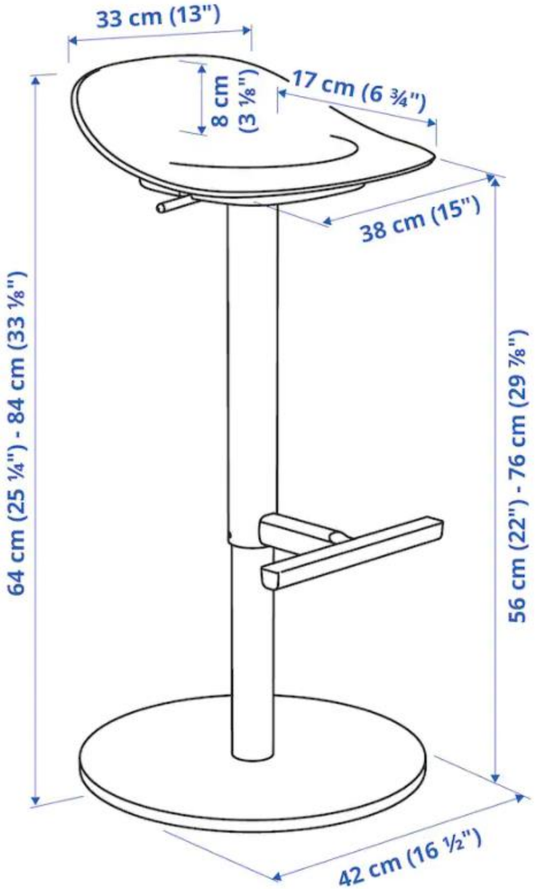
Structural Buckling

- **Buckling is a sudden change in shape of an object when subjected to compressive forces**
- **Usually happens when the length is long compared to the cross sectional area of the object**
- **Very different response compared to standard compression**

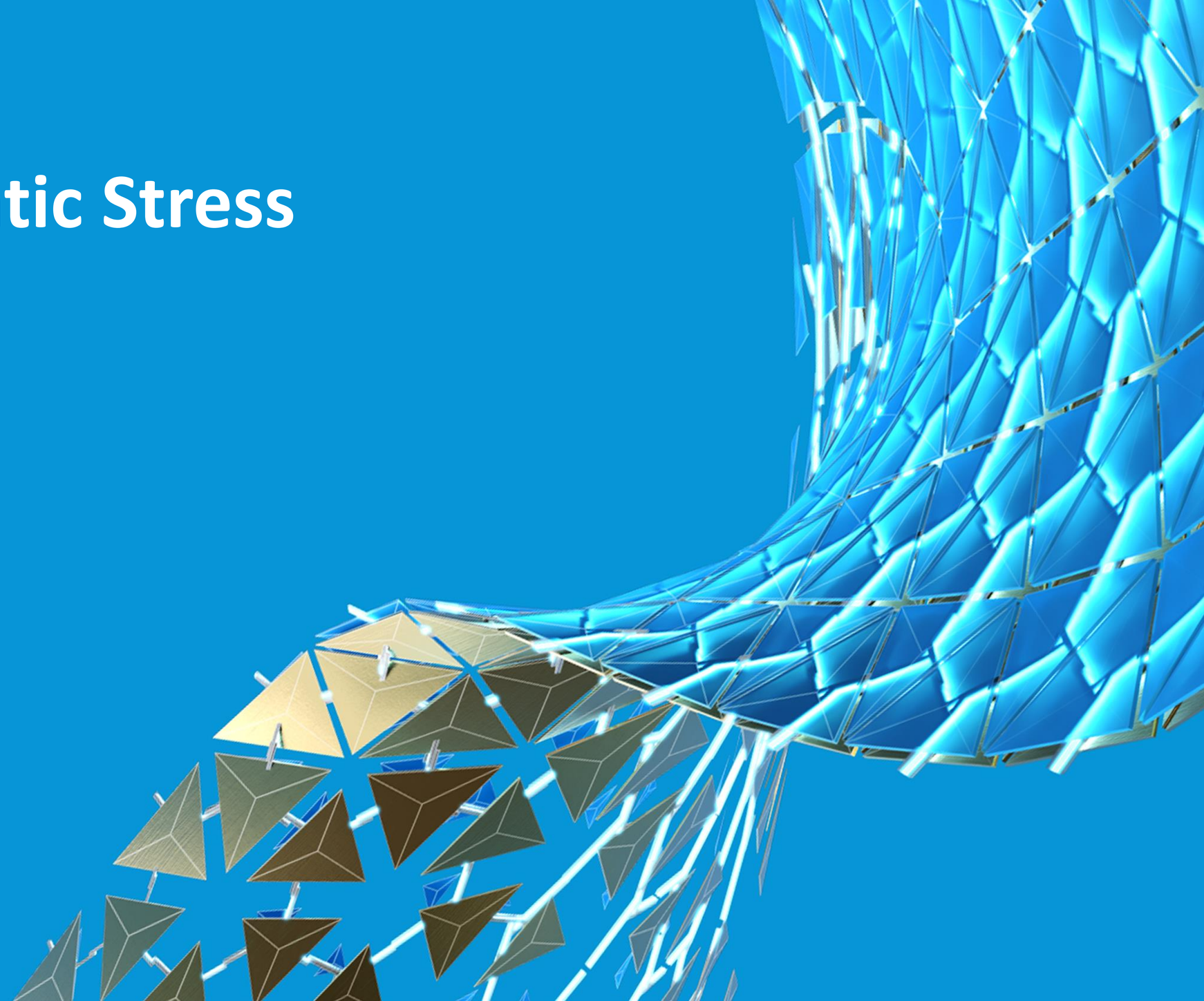


Bar Stool Example

Tested for: 110 kg
Width: 38 cm
Depth: 36 cm
Height: 84 cm
Diameter: 42 cm
Seat height: 76 cm
Min. seat height: 56 cm
Max. seat height: 76 cm

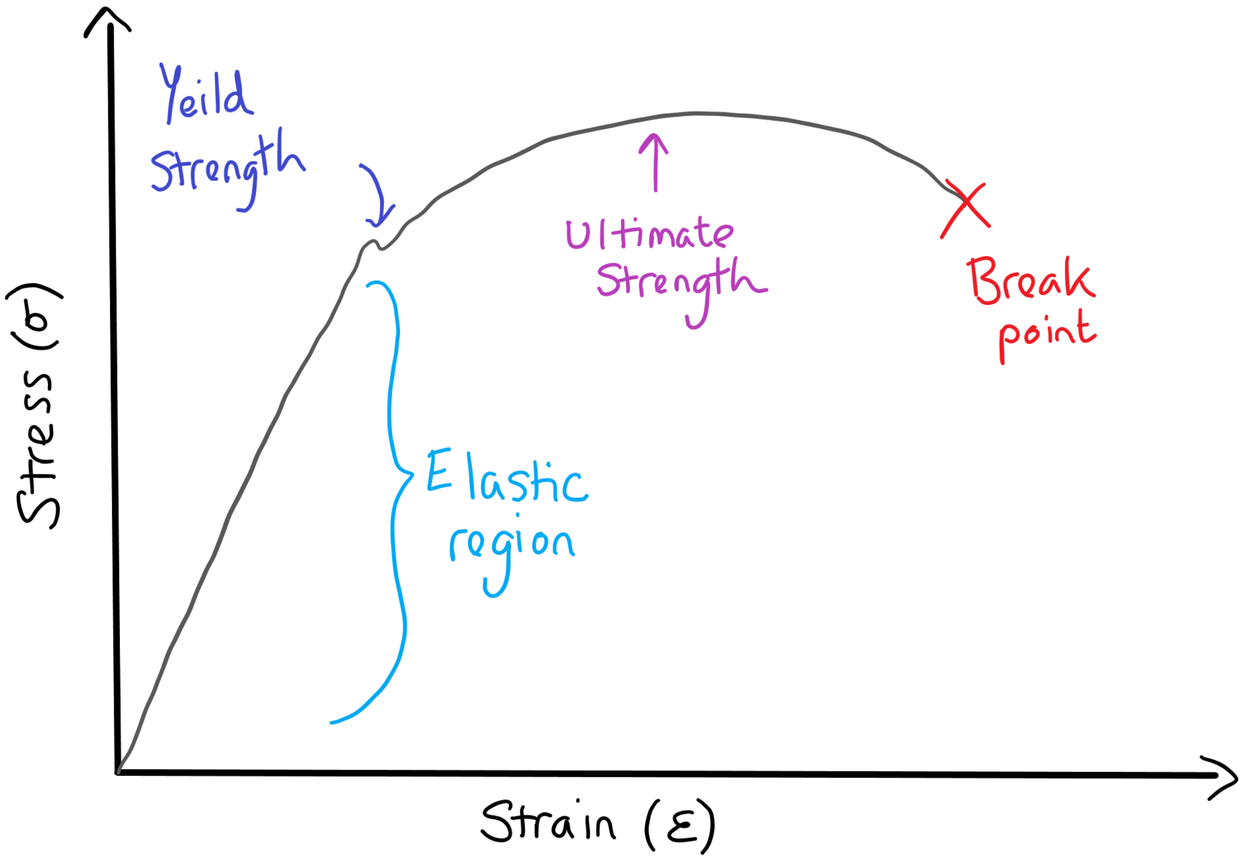


Nonlinear Static Stress

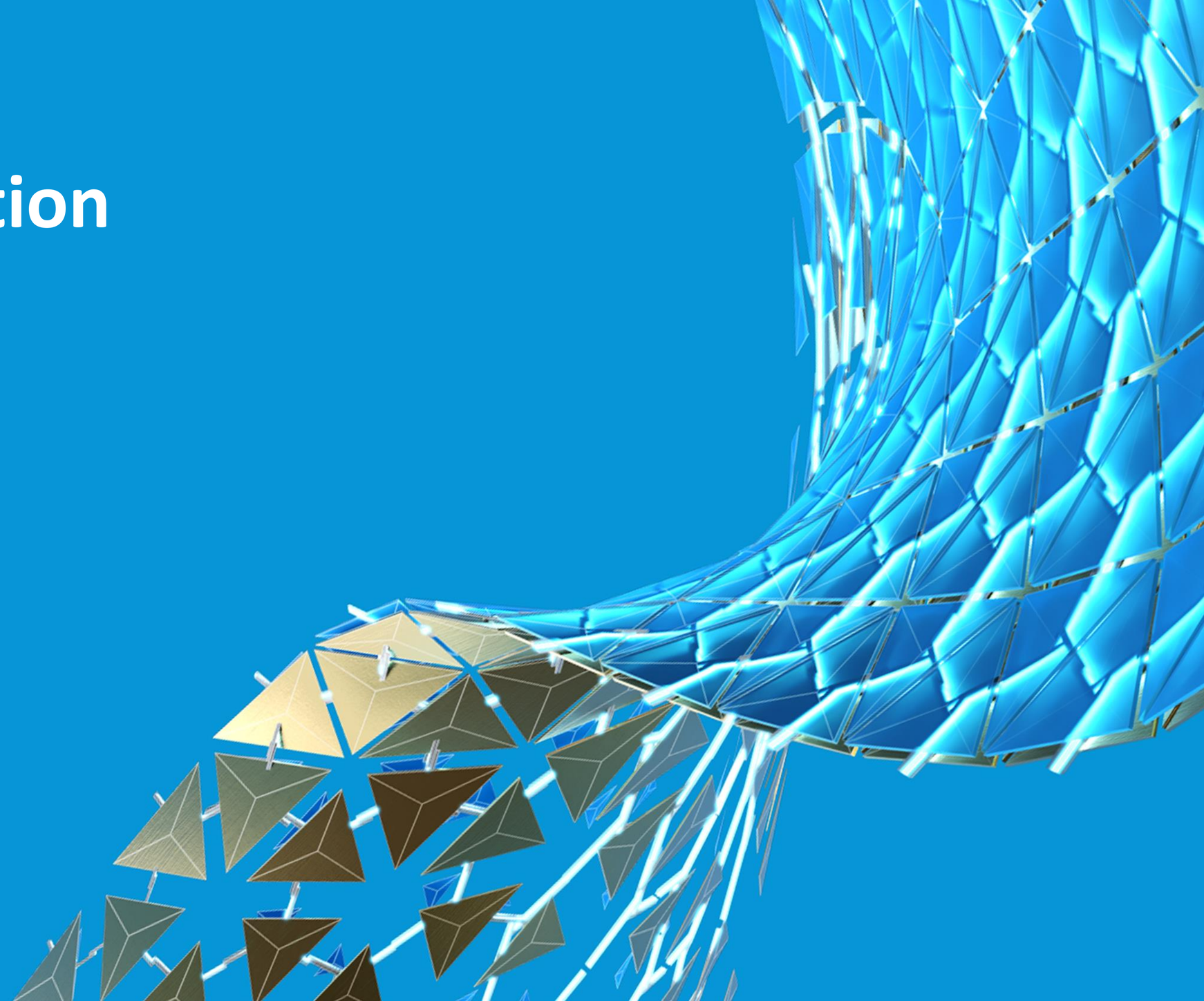


Nonlinear Static Stress

- **Take into account the non-linear properties of materials**

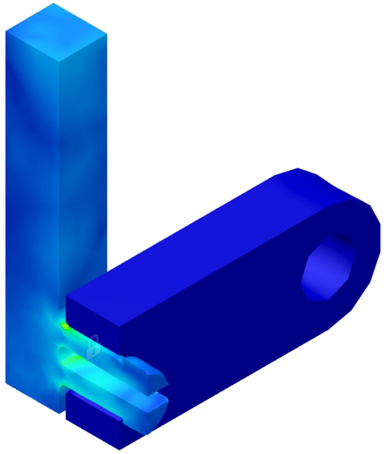


Event Simulation

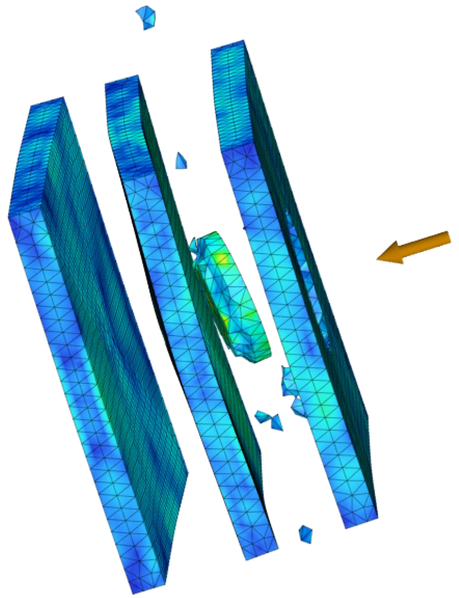


Event Simulation

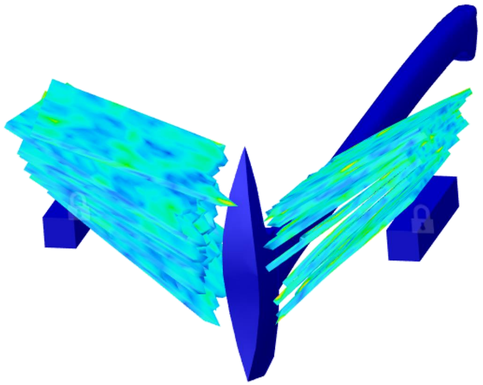
SNAP FIT CONNECTOR



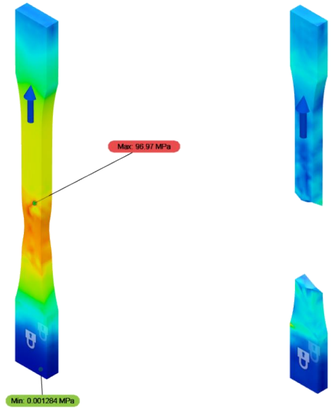
WALL IMPACT



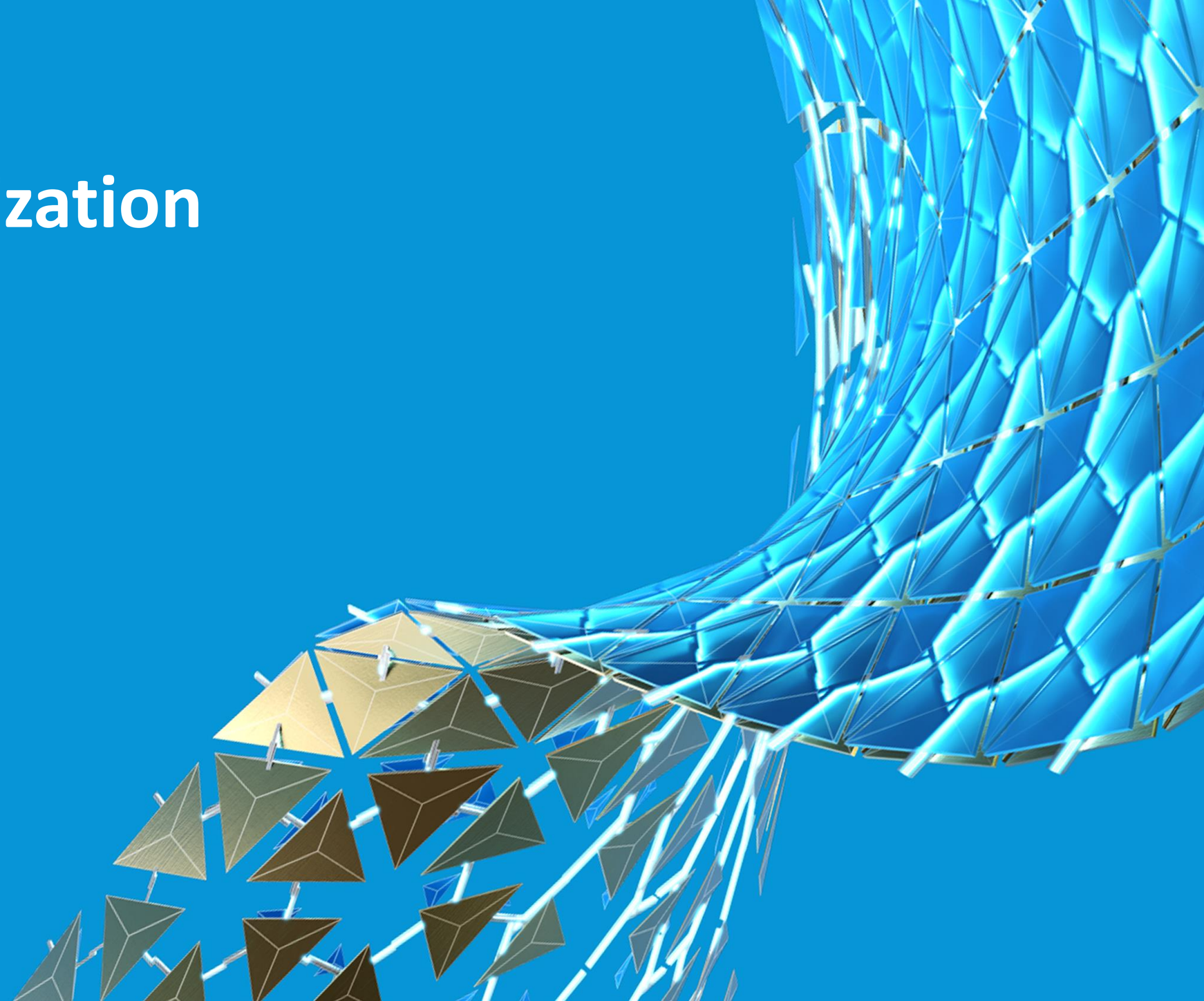
AXE CHOP



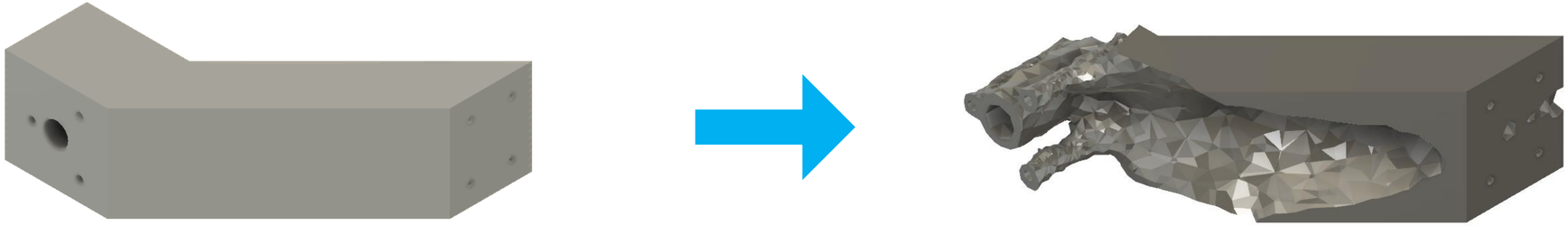
TENSILE TEST



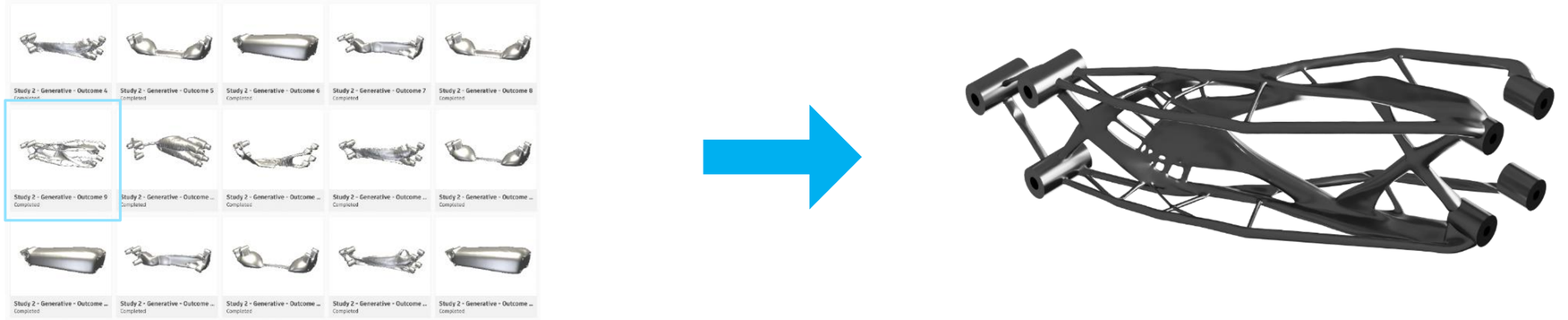
Shape Optimization



SHAPE OPTIMISATION

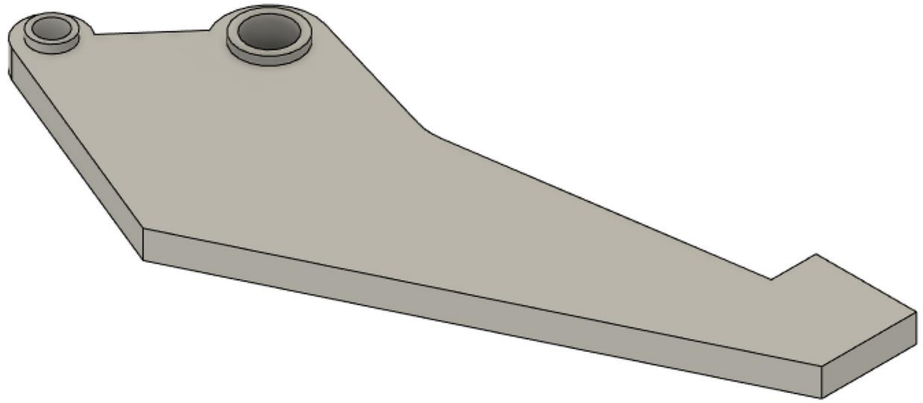


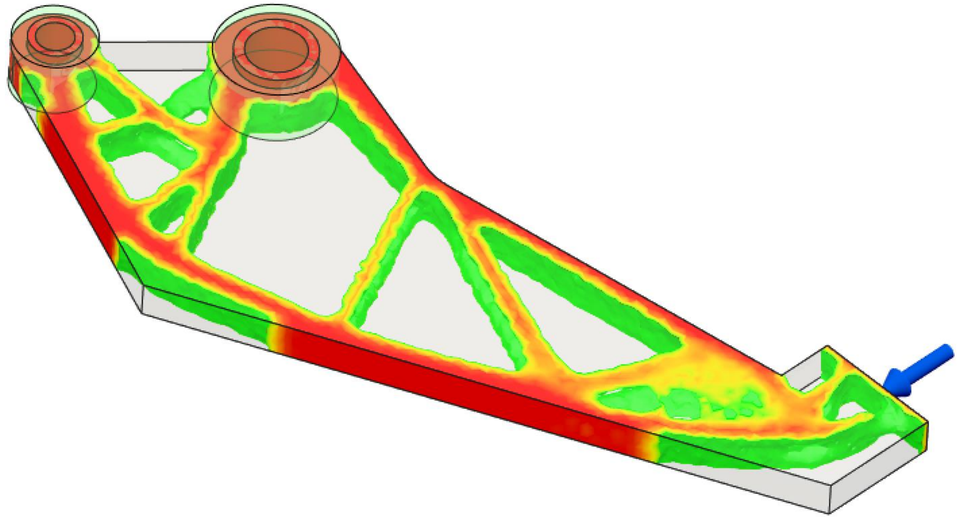
GENERATIVE DESIGN



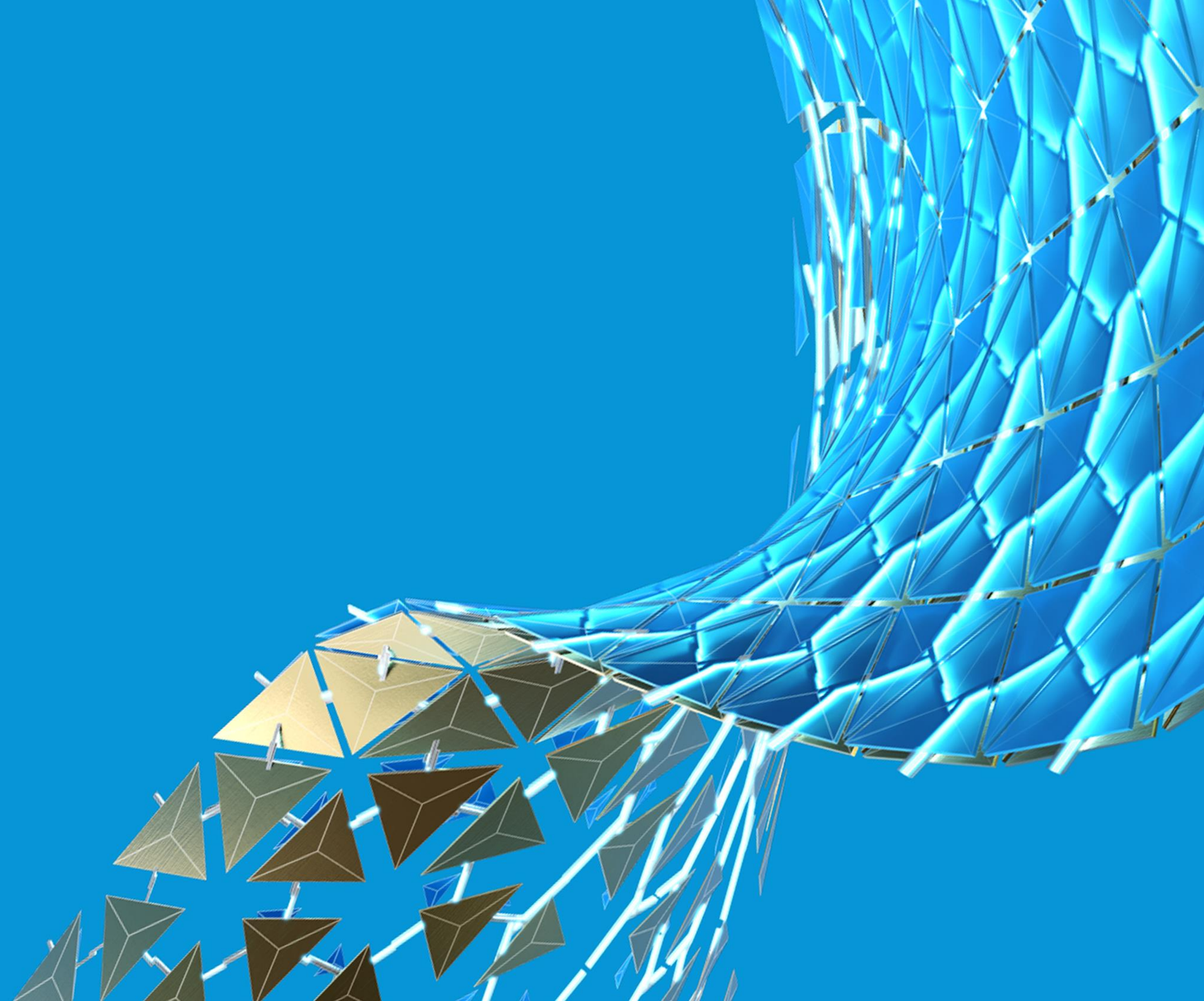
Shape Optimization

- **Mass target**
- **Remove material along non-critical paths**
- **Iterative design influence**





Conclusions



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