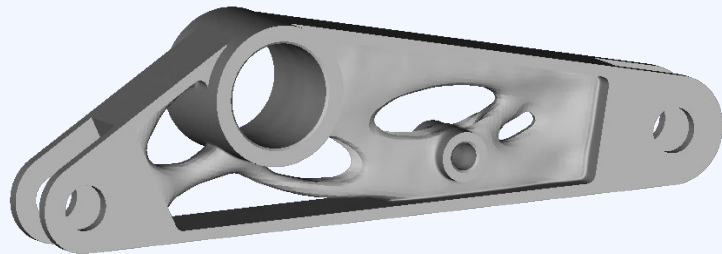


nTopology

Customer Success
onboarding@ntopology.com

Advanced Topology Optimization



Today's Session

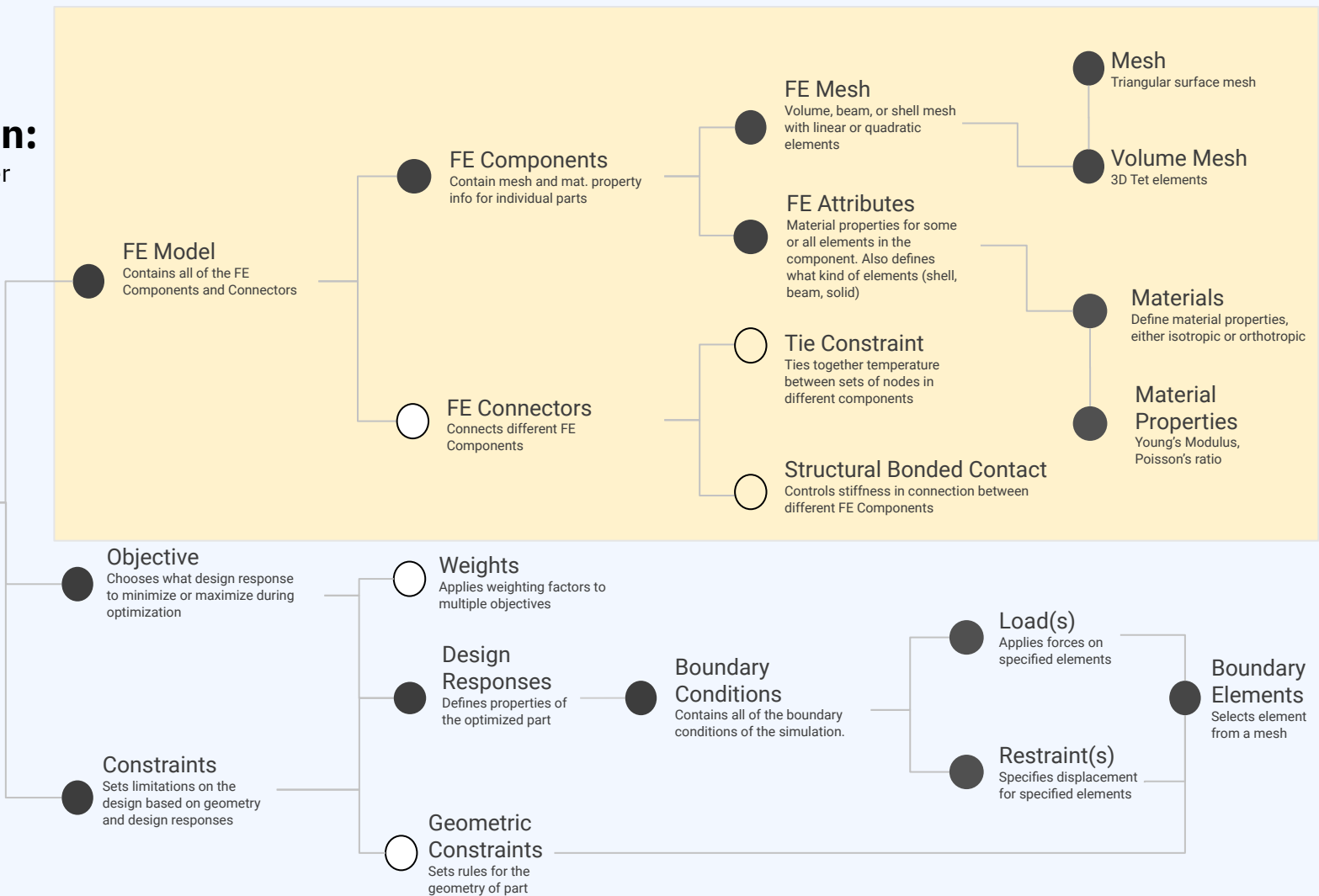
1. Review the **process** of setting up and running simple **topology optimization** using the required blocks in nTopology
2. Learn how to run a topology optimization with **multiple load cases and constraints**
3. Understand how to apply **geometric constraints** such as **planar symmetry**, **passive region**, and **overhang** constraints.

Topology Optimization:

Overall nesting order

Topology Optimization

Runs and displays optimization



● Topology Optimization

Settings FAQ

Explained in **Intro to Design Analysis**

FE Model

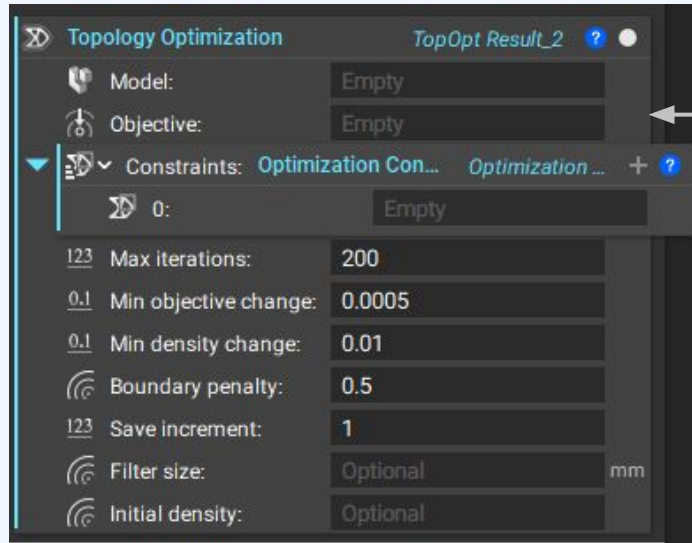
● Contains all of the FE Components and Connectors

Objective

● Chooses what design response to minimize or maximize during optimization

Constraints

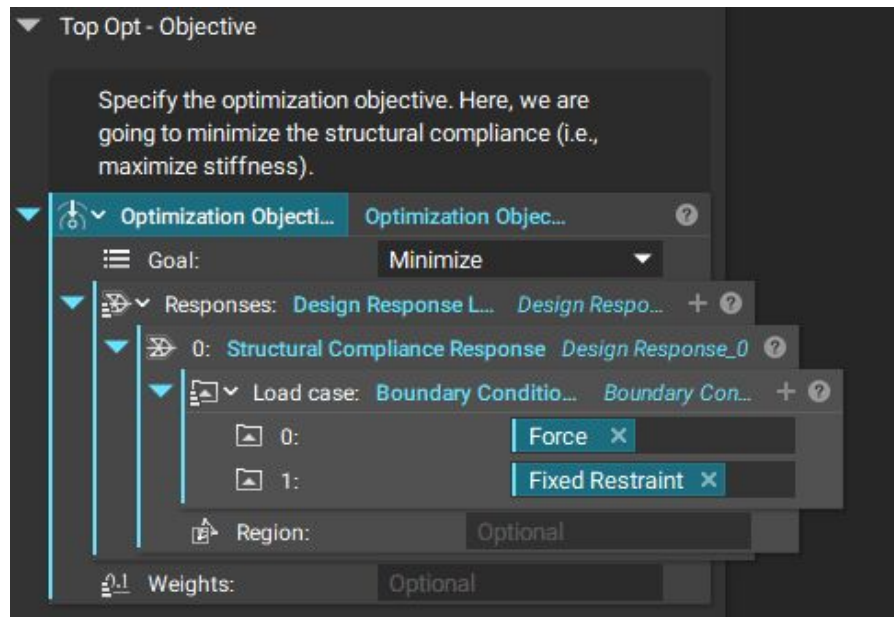
● Sets limitations on the design based on geometry and design responses



● Optimization Objective

[Multiple Objectives FAQ](#)

The objective of this topology optimization is to maximize stiffness (aka minimize compliance)



● Optimization Constraints

Primary Constraints

Defines properties of the optimized part

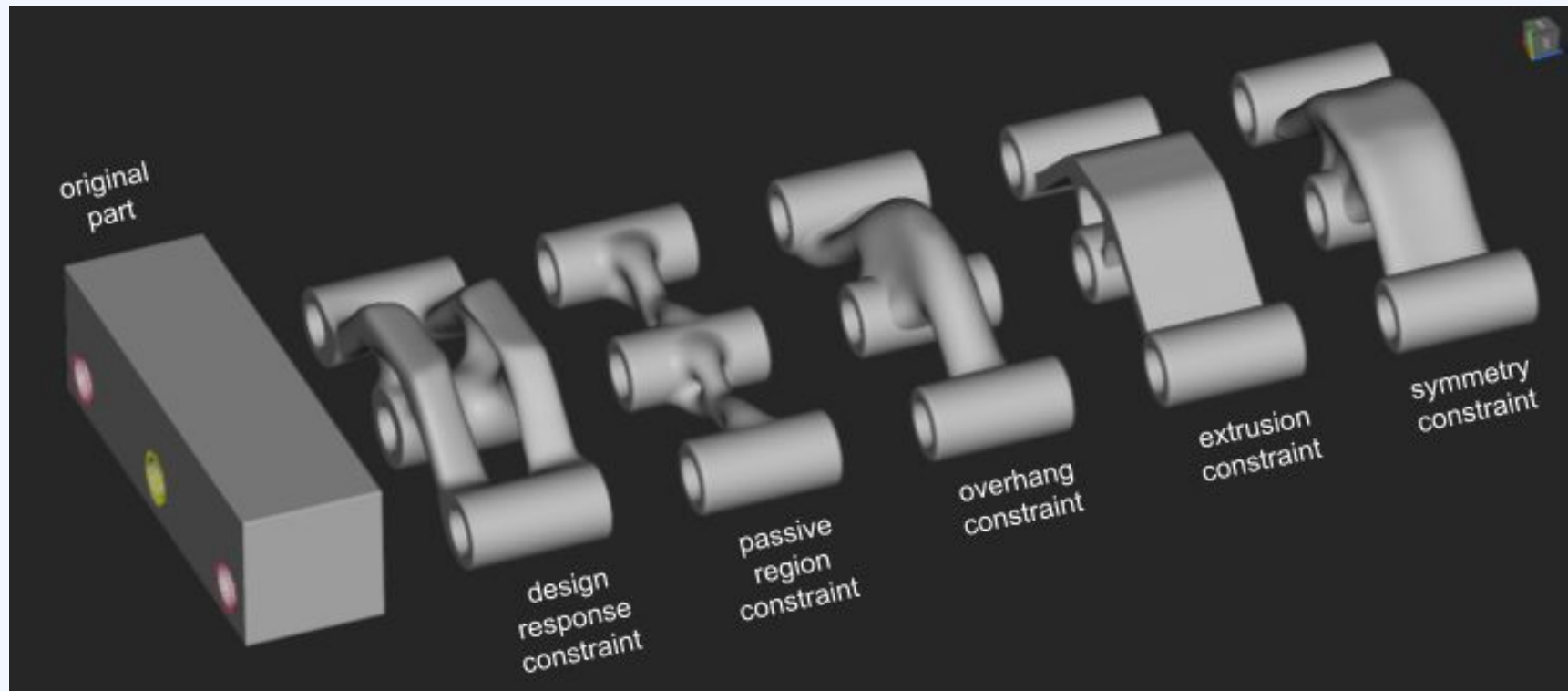
- Design Response

Secondary / Geometric Constraints

Sets rules for the geometry of the optimized part

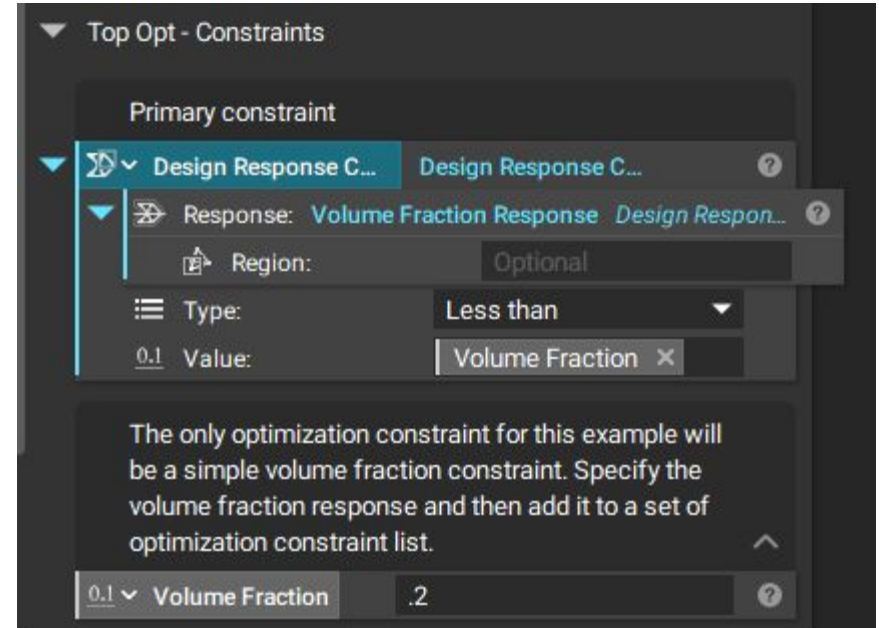
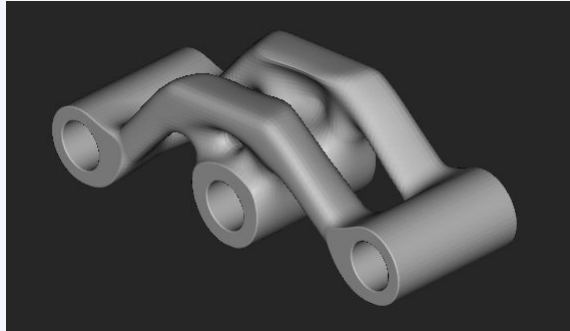
- Passive Region
- Overhang
- Extrusion
- Symmetry
- Pattern Repetition via Cell Map
 - Rectangular
 - Spherical
 - Cylindrical

Example of Constraints in nTop



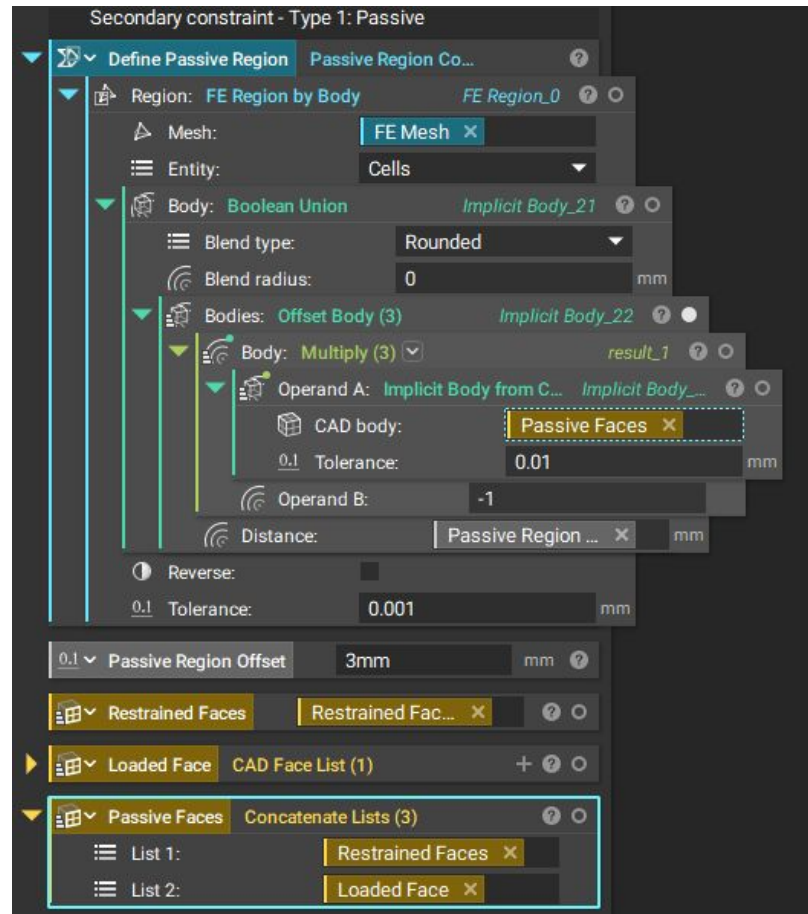
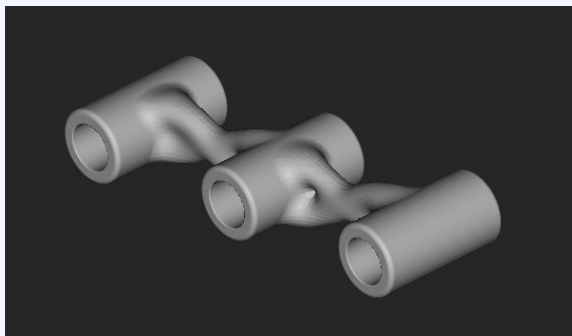
Design Response Constraint

A defined design response drives the TopOpt result, for example Volume Fraction



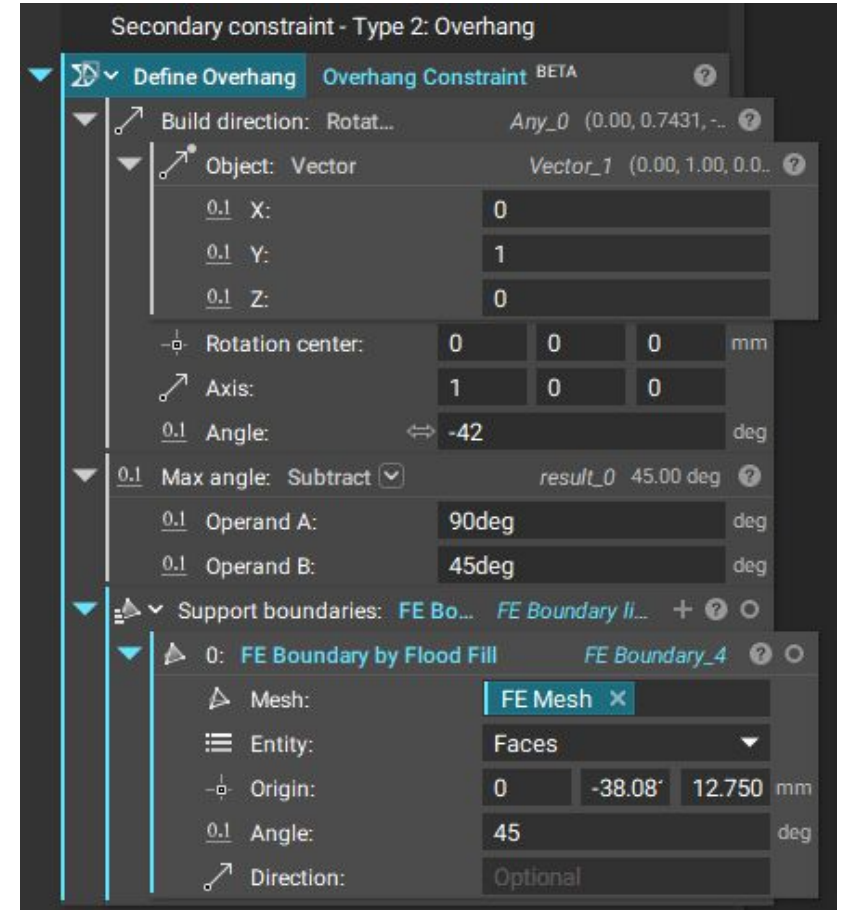
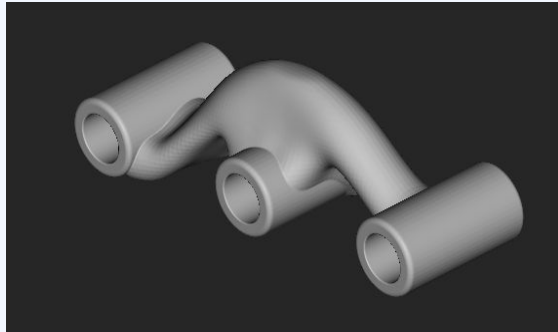
Passive Region Constraint

A defined FE region that is maintained and unaltered during the optimization process



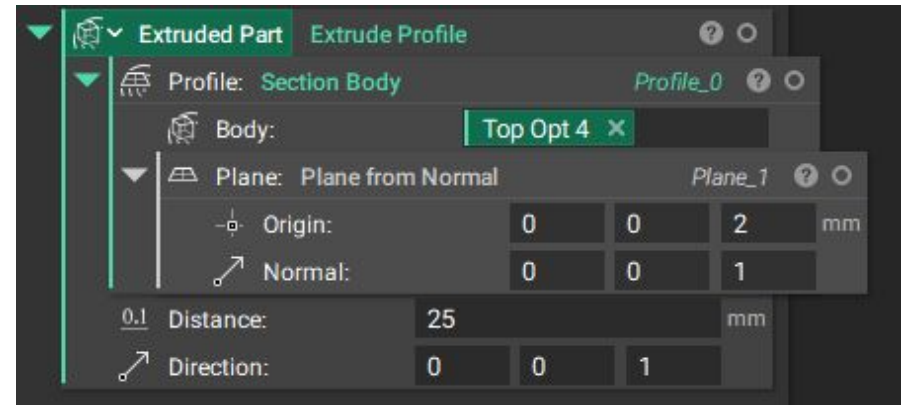
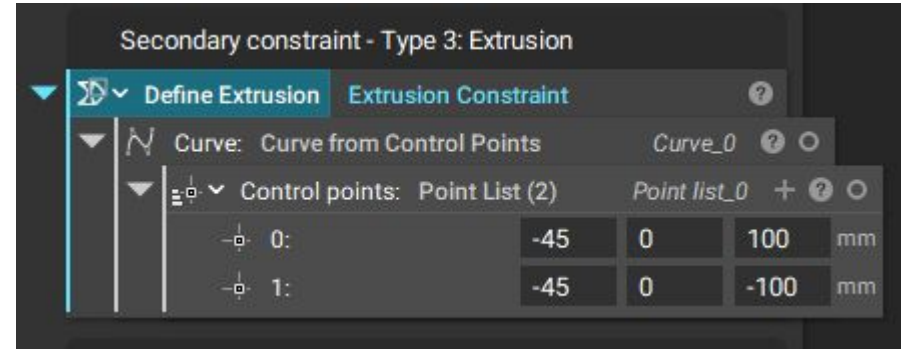
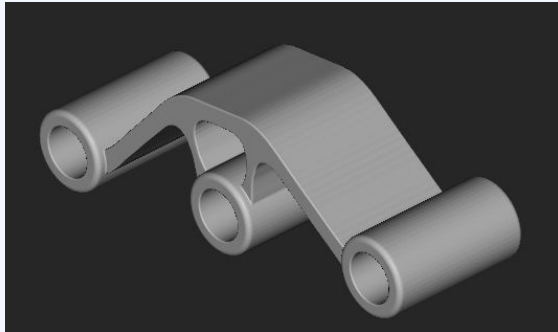
Overhang Constraint

A defined maximum overhang angle as per manufacturing guidelines



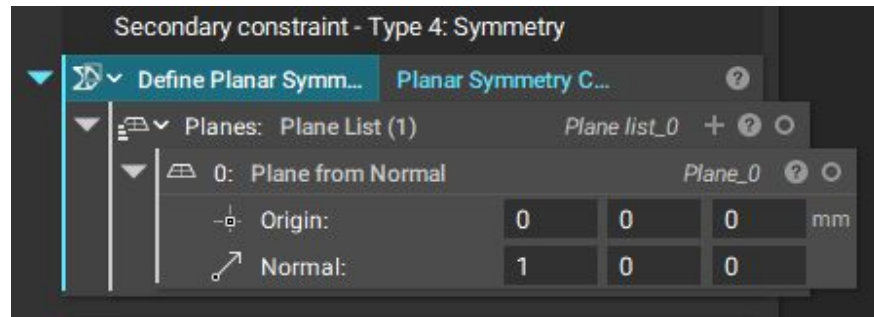
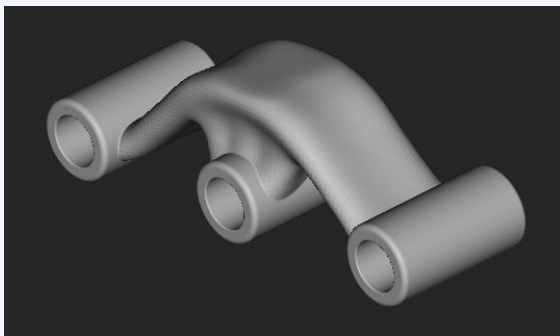
Extrusion Constraint

A defined extrusion profile along the direction of a specified curve, creates a TopOpt result to have a consistent profile for manufacturing



Planar Symmetry Constraint

A defined plane creates a symmetric TopOpt result with the same density on either side



Pattern Repetition Constraint

A defined cell map (rectangular, cylindrical, or spherical), creates a TopOpt result with a chosen symmetry, for instance a radial symmetry such as in this wheel

