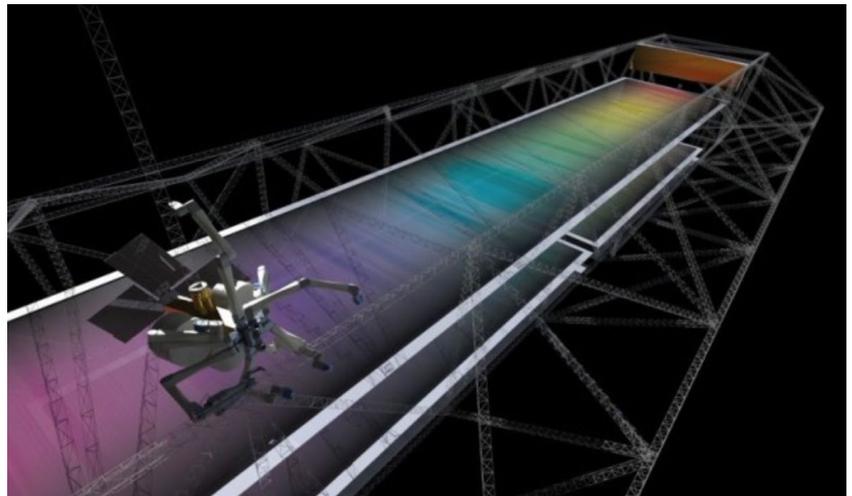


# Bachelor Thesis

## Development and testing of algorithms for the modular generation of 3D printed, continuous trusses without support material

In-Space Manufacturing (ISM) is a current topic of research in the space industry and at the Institute of Space Systems (IRAS). It offers the possibility of manufacturing structures in orbit that can be much larger than the limited storage capacity of rockets currently allows. Due to its low cost and high flexibility, additive manufacturing is a promising technology for this purpose. There is currently particular interest in the production of truss structures.



These are often used as load-bearing structures in space technology, for example as the backbone of the International Space Station (ISS)

Currently, research is being conducted at IRAS on the creation of such trusses in the ELISSA test environment, which offers frictionless conditions and can thus simulate the weightless environment in space in two dimensions. For this purpose, programmes already exist that provide so-called G-code for the creation of simple 1D trusses. In the next step, these programmes are to be expanded so that more complex trusses can be created in a modular fashion. Special attention must be paid to continuity during the printing process, as the trusses are partly reinforced with carbon fibre that cannot be cut during the printing process.

The focus of this work is on the creation of modular software components in Python, which can be assembled in different ways to create more complex truss shapes. For this purpose, the following subtasks have to be performed:

1. Subdivide existing algorithms for creating structures into modular segments
2. Identify which modules to create certain geometric shapes are missing
3. Supplement the missing modules
4. Verify the algorithms through print tests

**Contact:** Niklas Kyriazis, M.Sc.  
Tel. 0531 / 391-9971; E-Mail: [n.kyriazis@tu-braunschweig.de](mailto:n.kyriazis@tu-braunschweig.de)  
Hermann-Blenk-Str. 23, 38108 Braunschweig