# Summary

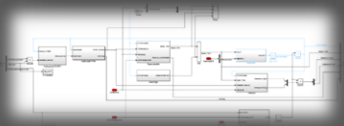
2012-2015
BEng Projects
BEng Thesis

University of Birmingham

Turbocharger project

2015-2016
Internship Projects

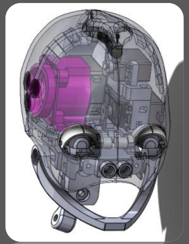
MATLAB & Simulink projects

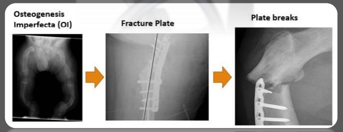


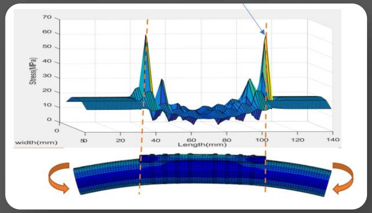
2016-2018
MSc Projects
MSc Thesis

Delft University of Technology

Fracture healing project



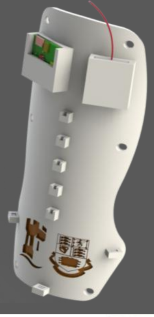


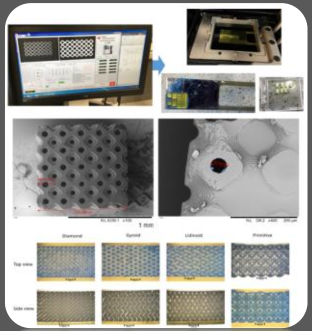



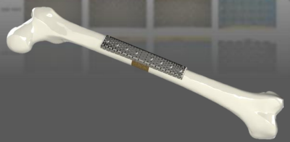

2018-2022
PhD Projects
PhD thesis

University of Nottingham

Design for Additive Manufacturing Tissue Engineering project

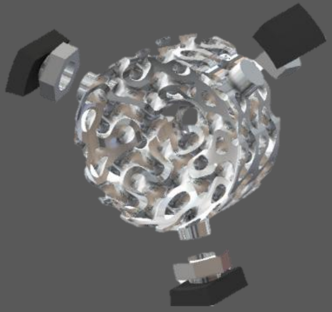


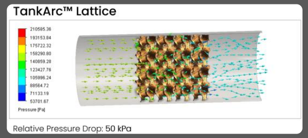




2020-present
Pipeline Organics Technology

Bioelectrodes design project

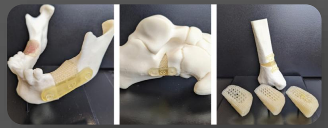


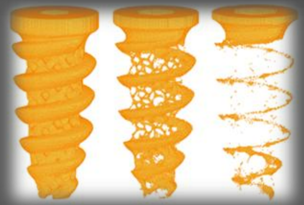


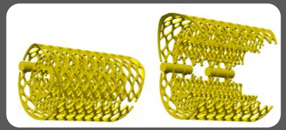

2022-2023
4D Biomaterials

Product Development Engineer

Projects on Design for Additive Manufacturing of Medical devices

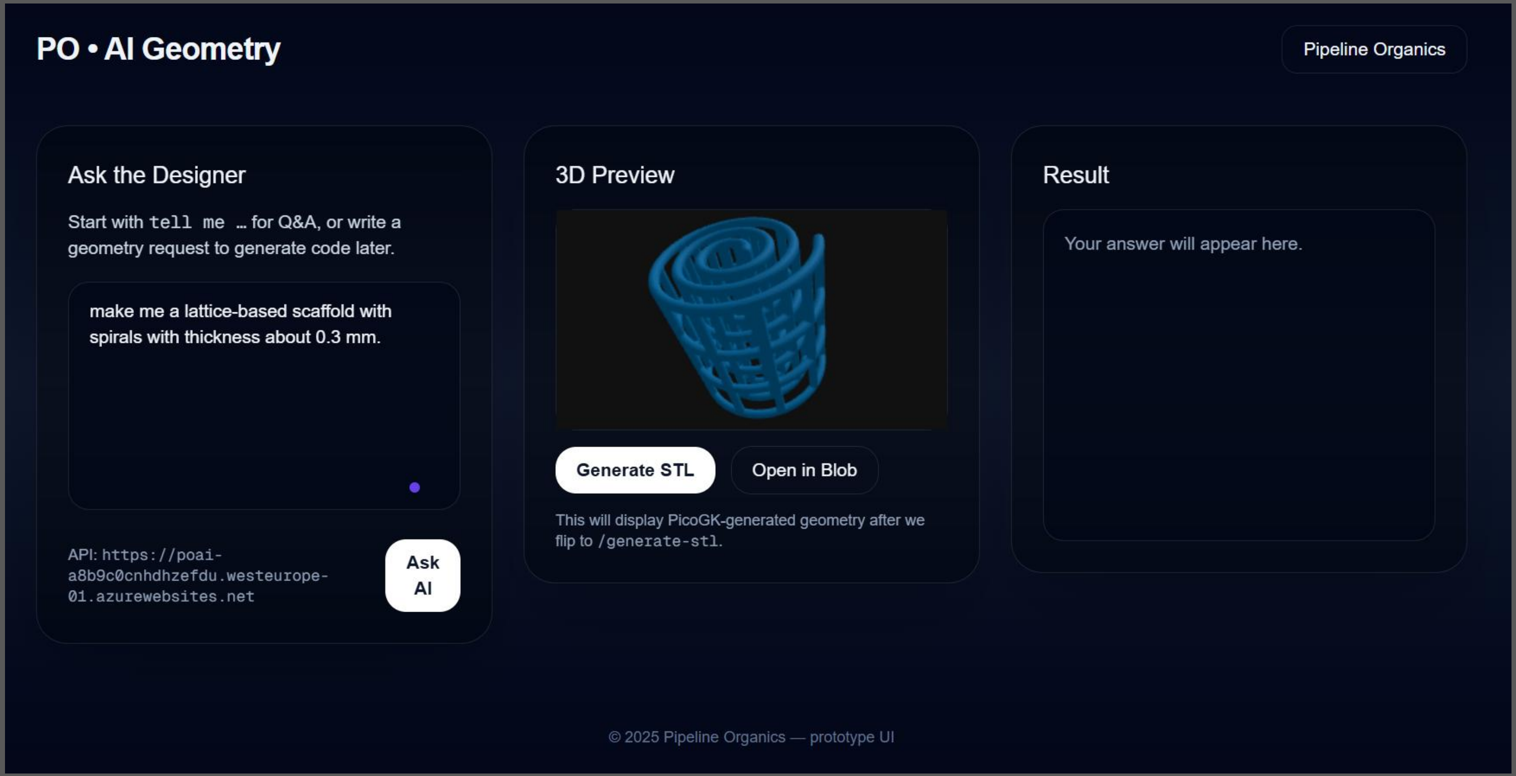






# Azure AI Design Tool

I’m building an AI Designer that brings together my last year of Next.js web work, LLM APIs, and my computational-engineering models in PicoGK/ShapeKernel. The tool turns plain-language inputs into parameterised C# geometry, builds it server-side, and returns a viewable/downloadable part—speeding up concept-to-print while keeping manufacturability in the loop. Link.



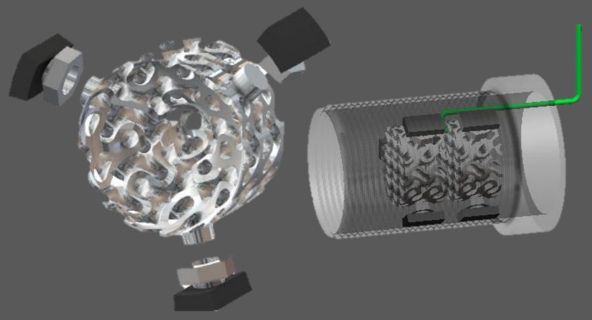
# Pipeline Organics technology

2020-present
Pipeline Organics
(Nottingham)

In 2021 I co-founded Pipeline Organics to turn the idea of generating electricity from wastewater into reality. Our technology, TankArc™, uses functionalised 3D-printed metal lattice electrodes that take advantage of extreme surface-to-volume ratios to boost energy output. Also developed a CFD workflow with VoxShell which allows for CFD optimisation of computationally engineered parts via OpenFoam.

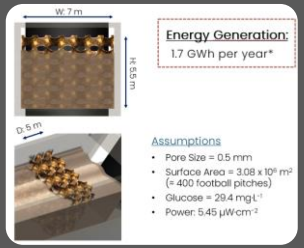
As CTO, I lead the design, simulation, and manufacturability of TankArc, developing computational models in PicoGK and ShapeKernel, building AI-driven design tools, and linking lattice parameters directly to energy modelling. I also coordinate pilots with partners and ensure that our designs can be produced reliably with LPBF metal additive manufacturing.

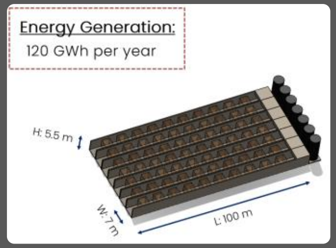
## Earliest design

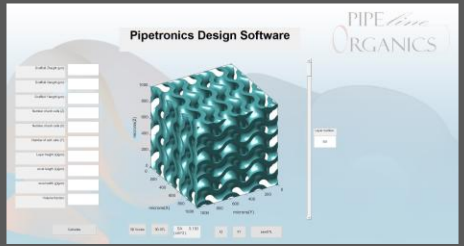


## Today

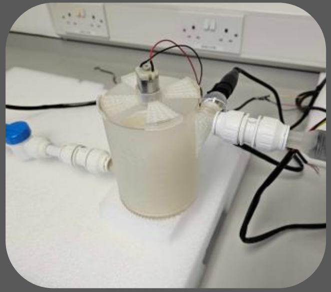
## TankArc™ and modeling energy generation



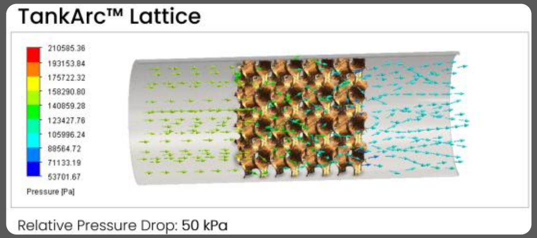




## Printing and testing



## Minimizing pressure drop



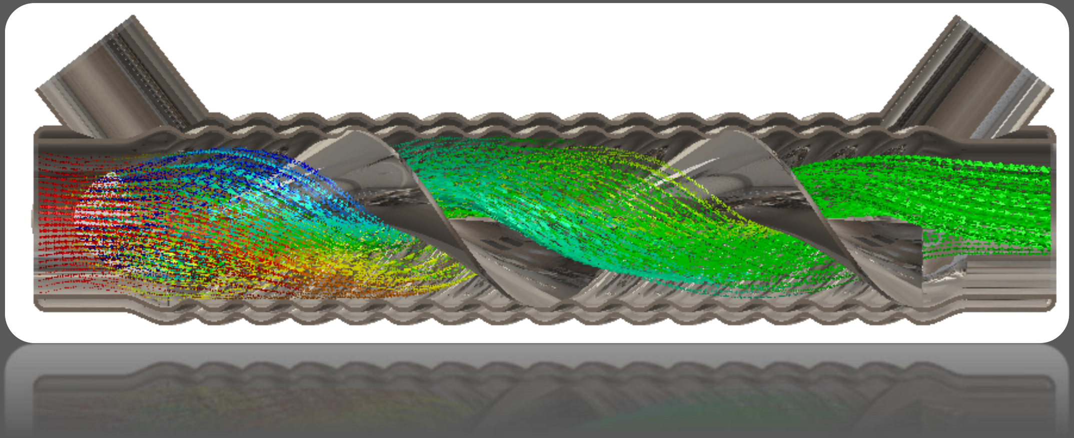
# Metamorphic Additive Manufacturing

2024
Nottingham

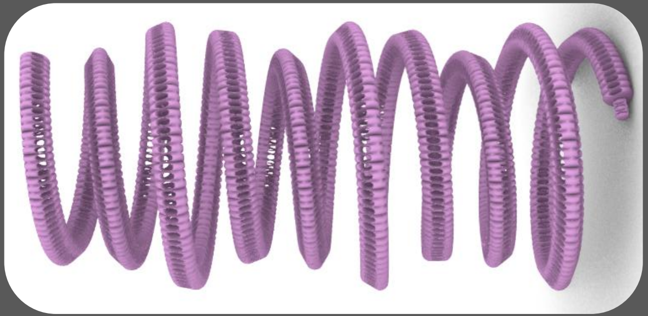
At Metamorphic I used Grasshopper to build parametric models for real mechanical problems. I worked on workflows that connected geometry and quick simulation checks, and print rules, so we could iterate with intent and hand off options that were actually manufacturable.

I can’t share several projects due to confidentiality, but they included novel conceptual design and surrogate modelling to speed decisions. We fit simple response-surface models from sim/print data to predict performance and cut full runs—showing me how computational design helps you learn faster and deliver.

Re-imagining a static mixer using the design freedom of Additive Manufacturing



“sinusoidal modulation” stent



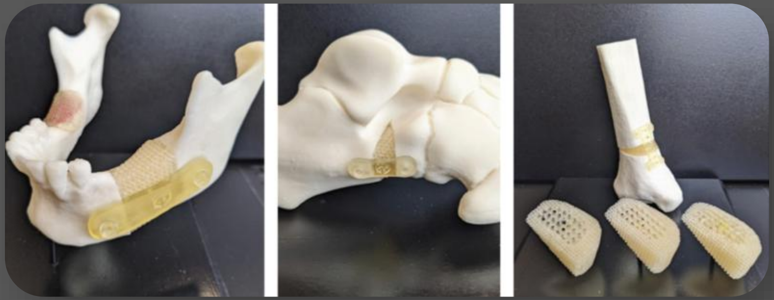
# 4D Biomaterials

2022-present
4D Biomaterials
(Nottingham)

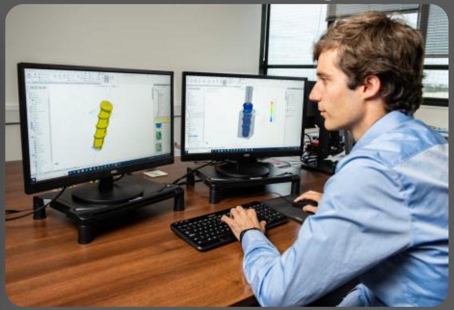
After submitting my PhD thesis, I joined 4D Biomaterials to help show what their DLP-printable implant resin could do. I designed latticed tissue-regeneration parts (SolidWorks + Altair), took them through additive manufacturing and lab testing, and used FEA to guide decisions. I also built a MATLAB degradation model that became a useful tool in client discussions and proposals.

I worked closely with surgeons, clients, and veteran consultants, coordinating suppliers and quality/regulatory needs. Collaborating across teams meant firm timelines—planning carefully and delivering reliably. This role is where I became truly delivery-focused and gained quiet confidence in my judgement and execution.

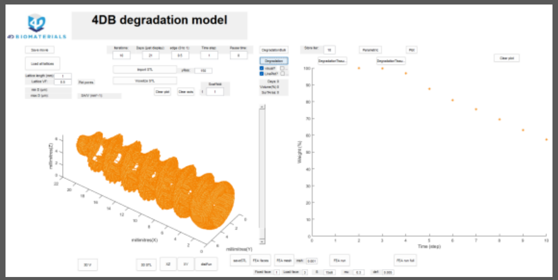
## 3D Printed 4Degra concepts



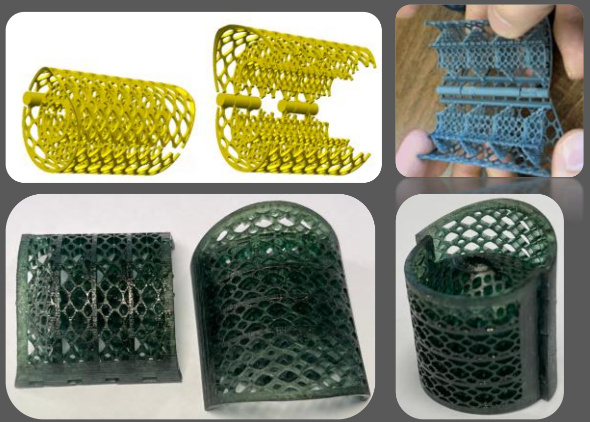
## Working on Interference Screw design



## Degradation model




## Bone graft cage



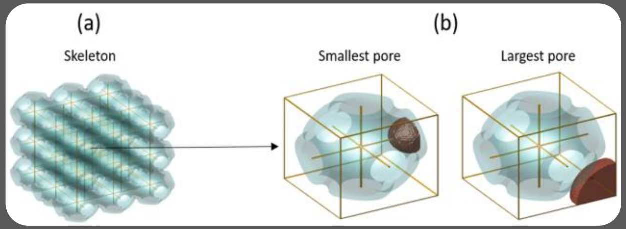
## Other concepts

# PhD project 1: Scaffold design selection framework for enhanced tissue regeneration

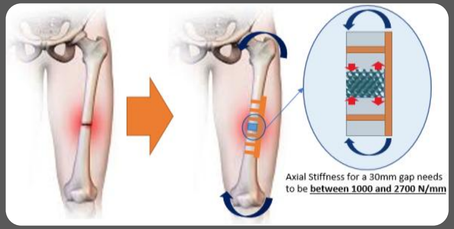
2018-2022
University of Nottingham
(Centre for Additive Manufacturing)

My PhD consisted mainly of three parts. In the first, I developed a novel framework for the optimal selection of TPMS lattice design parameters. The objective function was the tissue growth volume and the constraints were related to pore size and stiffness. For this I also developed a novel MATLAB implementation of a tissue growth model. This part of my project was done mostly during the first year and I presented the work at a conference in Texas. I also published a journal paper.

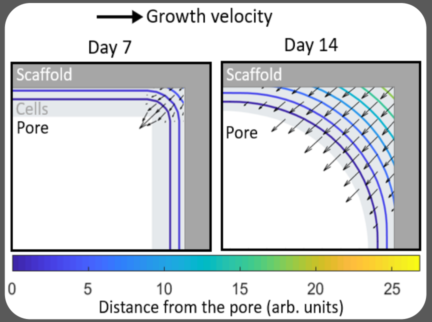
## Pore size constraint:




## Stiffness constraint:



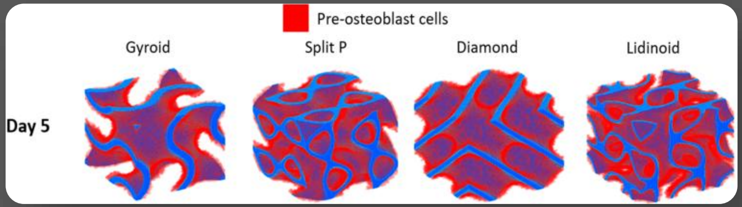

## Model fundamentals:



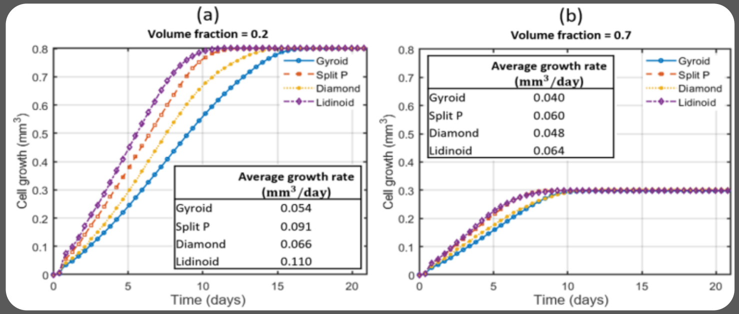

$$\boldsymbol{u} = \begin{cases} -k\boldsymbol{n} & \text{if } k > 0 \\ 0 & \text{if } k \leq 0 \end{cases}$$

$$\frac{\partial \varphi}{\partial t} + \boldsymbol{u} \cdot \nabla \varphi = 0$$

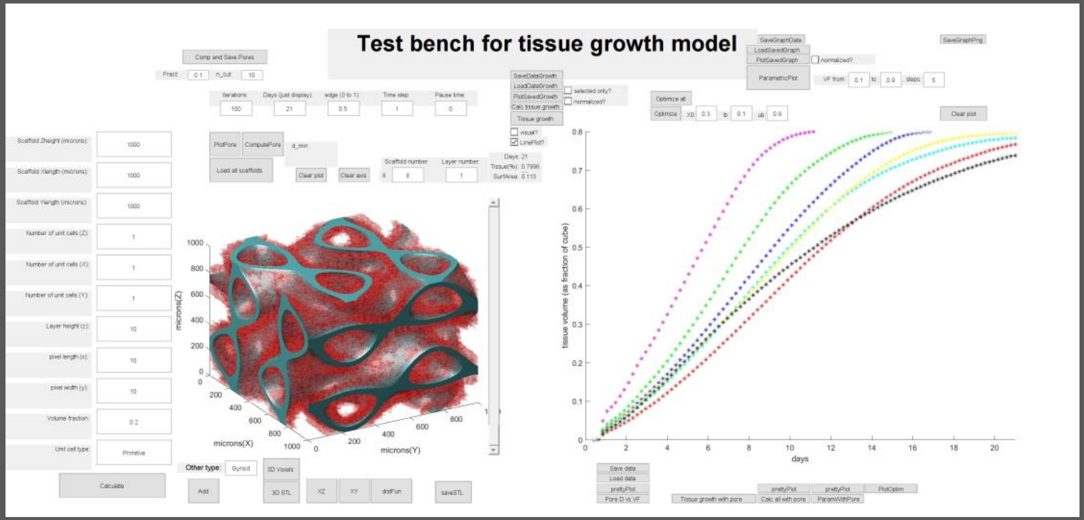
## Cell growth illustration:




## Cell growth graphs:




## Test-bench for tissue growth model:

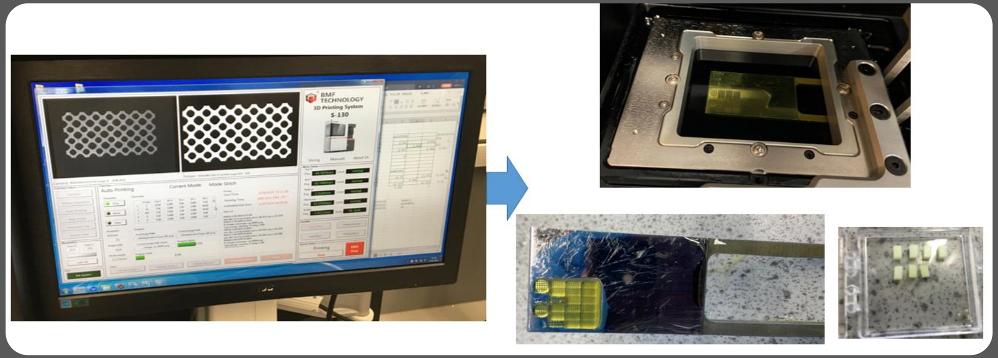


# PhD project 2: 3D Printing of tissue regeneration scaffolds

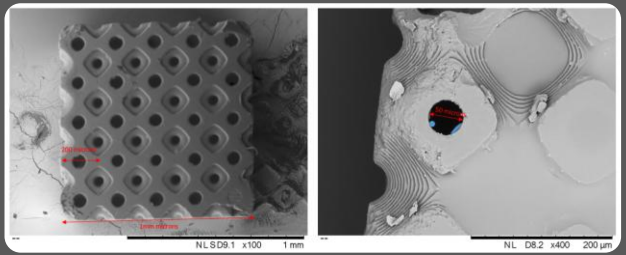
2019-2022
University of Nottingham
(Centre for Additive Manufacturing)

In the second part of my PhD I worked on the additive manufacturing of these tissue growth scaffolds via projection micro-stereolithography (PμSLA). I did this using the microArch S130 from BMF. Due to some challenges slicing the TPMS files with the printer software, I created my own program to design and slice these lattices, and installed it onto the BMF computer for others to use too. I also created a tool to design and slice 2D lattices.

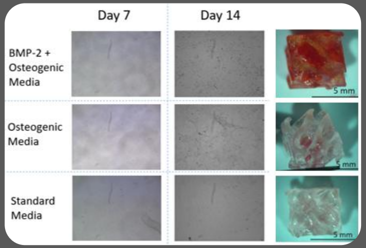
## Printing via PμSLA:



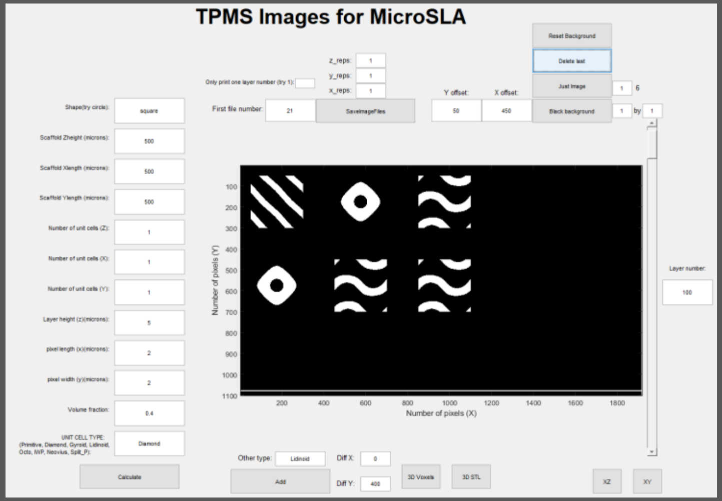
## Visualizing scaffolds on SEM:



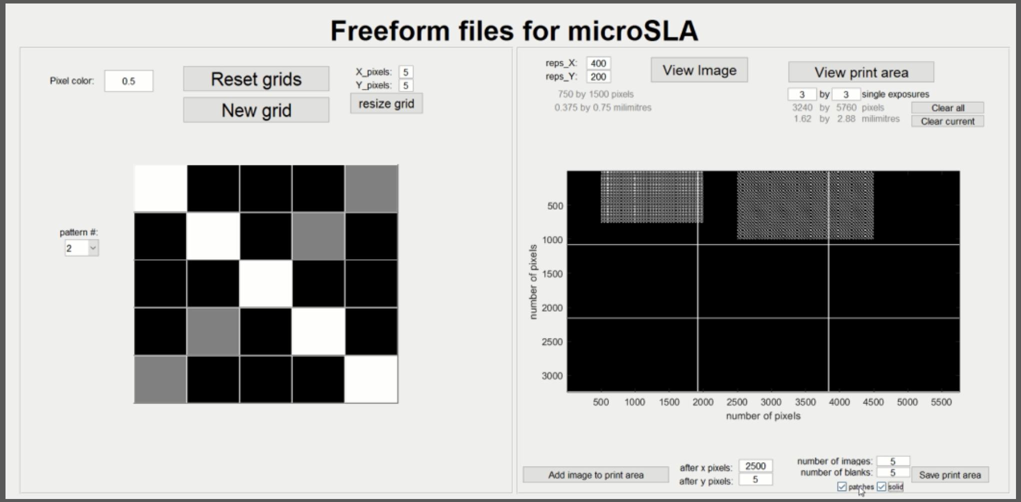
## Cell culture:




## MATLAB TPMS lattices slicing software:




## MATLAB freeform 2D lattice design:

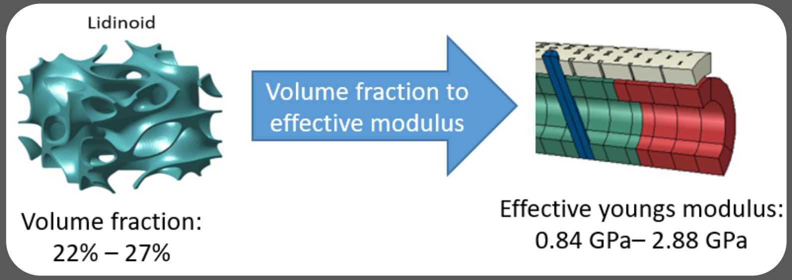


# PhD project 3: Auxetic 3D printed fracture fixation implant

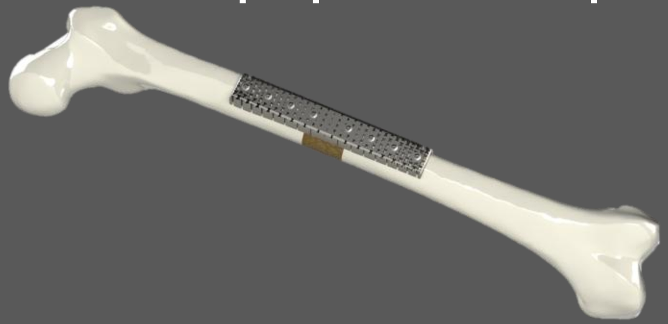
2020-2022
University of Nottingham
(Centre for Additive Manufacturing)

In the third part of my PhD I worked on expanding the framework to include a 3D printed fixation implant as well the scaffold. For this I proposed a novel auxetic graded geometry and optimised it by using a Finite Element Model. I used a combination of MATLAB, Python and ABAQUS for this optimisation routine. As part of this work I also explored patient-specific options. Parts were manufactured via SLS for verification.

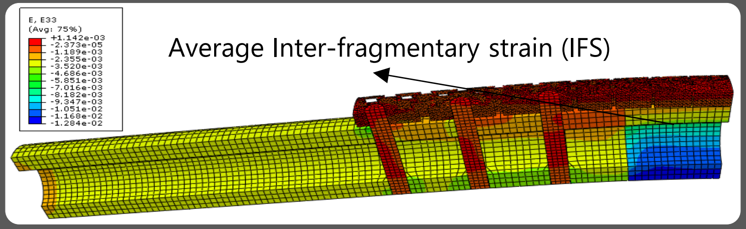
## Mapping scaffold modulus:



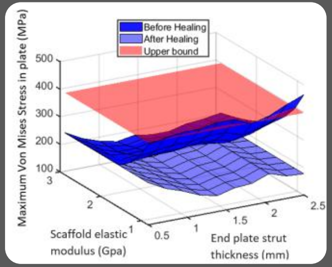

## Render of proposed concept:



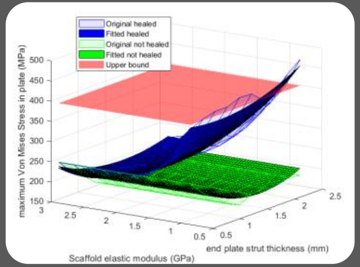
## Finite Element Model:



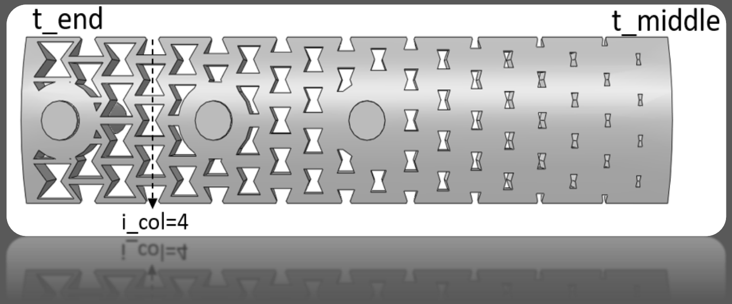

## Von Mises constraint:



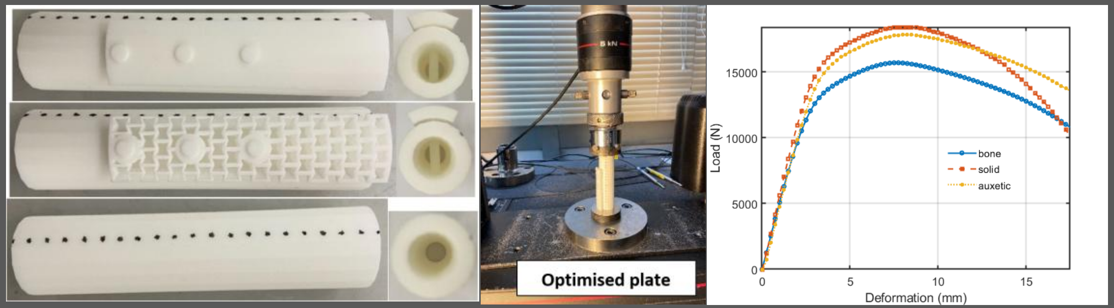

## Surface fitting:



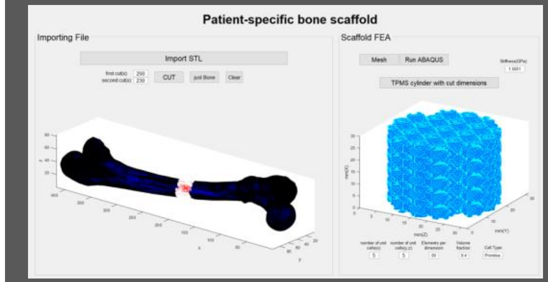

## Auxetic graded design:




## Printing and testing:




## Patient-specific GUI:



# MSc thesis: Optimisation of a stiffness-graded fracture fixation plate

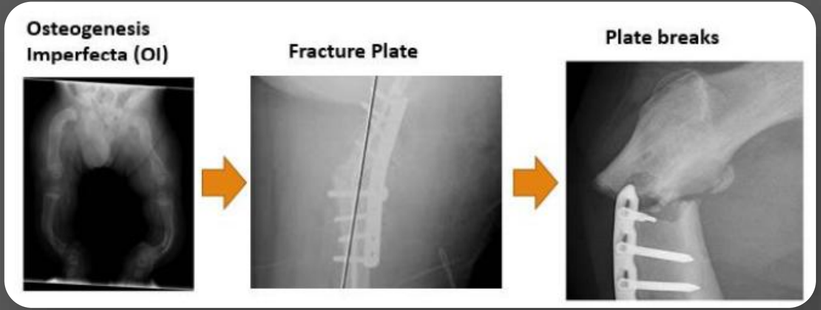
2017-2018
Delft University of Technology
(13th on QS world Engineering ranking)

**Description:** My master thesis consisted of developing a solution for children with osteogenesis imperfecta (OI), whose bones refracture when implanted with fracture fixation plates. Having established a hypothesis via FEA analysis for why the bones fracture, I developed an implant design solution that minimised the risk of failure. This design could only be achieved via Additive Manufacturing.

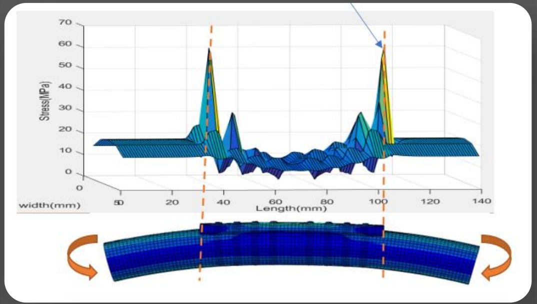
**Role and responsibilities:** I received support from a surgeon, a postdoc and a professor. The meetings with the surgeon were particularly useful to understand the problem. My responsibilities were: literature review, development of a Finite Element Model, development of an optimisation routine, CAD, data analysis and presentations.

I did this thesis project throughout the second and final year of my MSc. Meetings with the surgeon and my professor were at UMC Utrecht hospital every two weeks.

## Refracture of OI bones

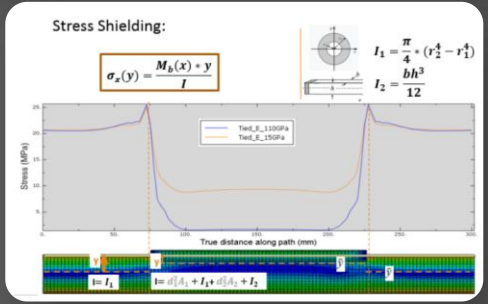



## Hypothesis for explaining fractures

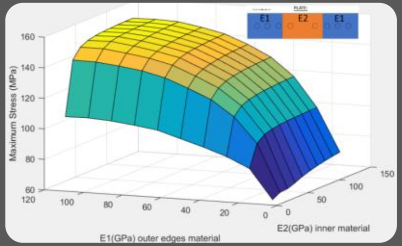



## Taguchi array showing influence of parameters

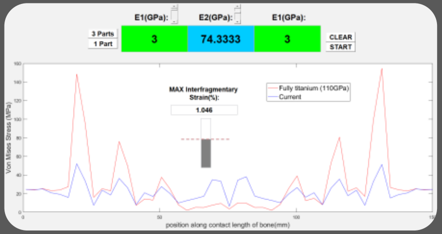
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Max VM stress Influence= | 54.3% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 54.3% |
| Max IFS Influence= | 24.52% | 30.3% | 21.3% | 24.5% | 24.5% | 21.3% | 30.3% | 24.52% |



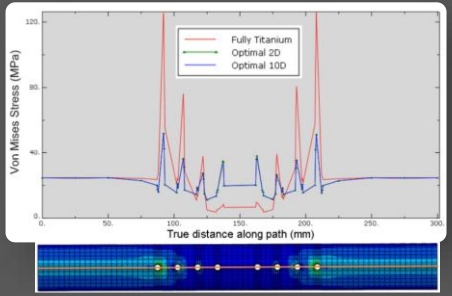

## Visualizing solution space:




## MATLAB test-bench:



## Solutions minimize stress risers




## Optimization approaches include genetic algorithm and topology

# BEng thesis: Air bearings for a turbocharger

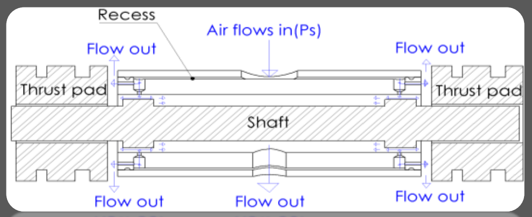
2012-2015
The University of Nottingham

This was my Bachelor Thesis project. The problem addressed was the relatively high friction generated by turbocharger oil bearings. The solution I developed consisted of using a novel multi-purpose air bearing design to replace the oil bearings. The air bearing visibly reduced friction losses and allowed for speeds of up to 10,000 rpm.

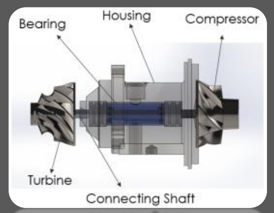
With some guidance from a PhD student, my responsibilities were: concept development including literature review, computational modelling for design selection (pressure distribution, CFD and frequency), CAD, material selection, engineering drawings, assembly and testing, data analysis.

I did this thesis project throughout the final year of my bachelor. I had to meet several deliverables throughout the project length. The turbocharger used for testing was that of a motorcycle.

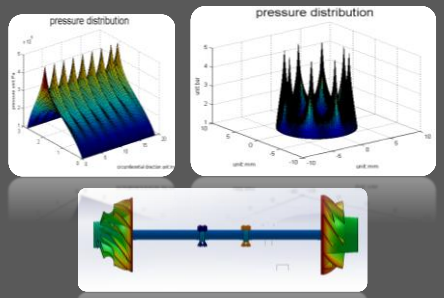
## Concept development:



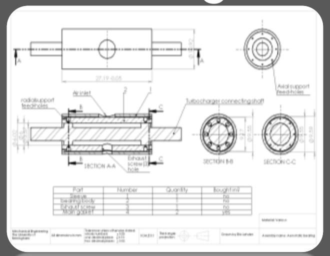

## CAD:




## Modelling:




## Engineering drawings:



## Testing:

## Oil bearings:

## Novel air bearings:

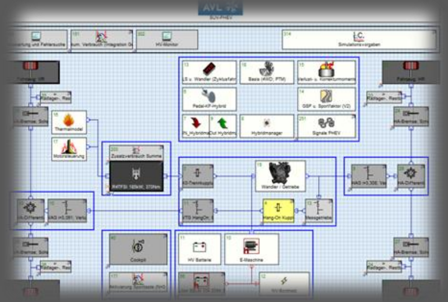
# Internship projects

2015-2016
Porsche Engineering

## Simulink Internal Combustion engine model

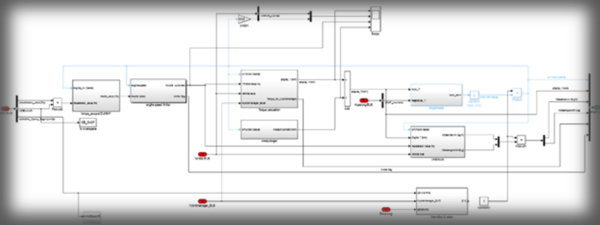
As part of my Internship at Porsche Engineering, I was tasked with replacing a standalone Internal combustion engine (ICE) model with a more user friendly Simulink model and comparing the outputs of both models to ensure they were behaving in the same way.

### Original ICE model:



### Comparing results:

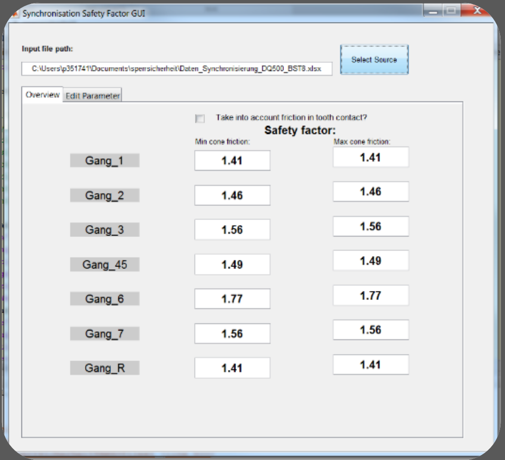

### Simulink ICE model:



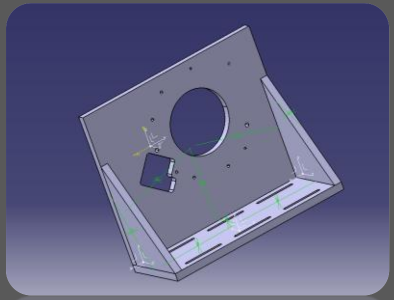
## Gearbox programs

I spent a lot of my time during my Internship working on various gearbox related challenges. For one of them I enhanced a program built to compute the synchroniser safety factor of a gearbox synchroniser ring. I achieved this by employing a multidimensional search routine. On a different project I built a gearbox test bench assembly using CATIA, making use of Design for Manufacturing (DFM) principles.

### Synchroniser GUI:




### Gearbox testbench:



**DFA/DFM concluding results**

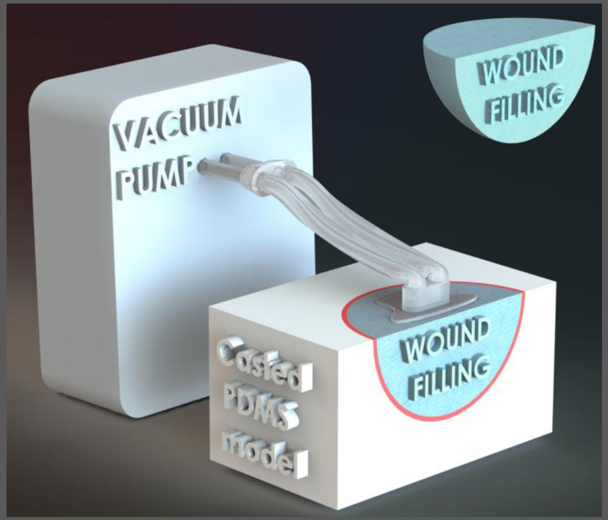
| Concluding properties: | value | Formula | Aim | Error(%) |
|---|---|---|---|---|
| *Functional Efficiency:* | 0,5625 | (A/(A+B)*100)% | 1 | 43,75 |
| *Feeding ratio:* | 2,177777778 | Total Feeding Index/A | 2,50 | 12,89 |
| *Fitting ratio:* | 3,888888889 | | 2,5 | 55,56 |

# Research assistant tasks

2018-2021
University of Nottingham
(Centre for Additive Manufacturing)

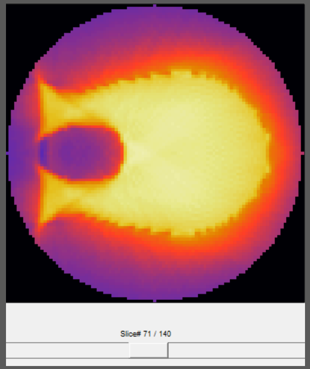
For about three months I worked as a research assistant on a project where the goal was to print a wound healing device using the novel Computed Axial Lithography (CAL) additive manufacturing method. My tasks consisted of adjusting the MATLAB slicing software to accept also larger diameter vials as well as designing the wound healing device for printing and for presentations. Meetings were every two weeks, with targets to meet by every meeting.

## Wound healing device

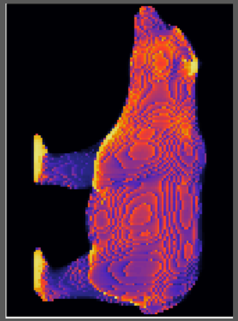



## Larger diameter vials

**50 mm vial**

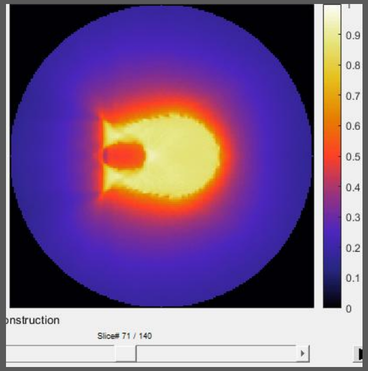



Projec 1:

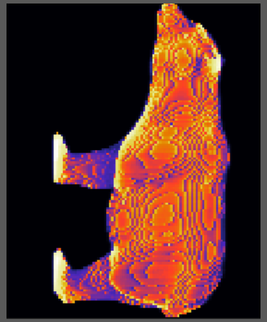


Average intensity of project 1: 0.2204

**100 mm vial**




Projec 1:



Average intensity of projec 1: 0.134

```
% prepare the target
resolution = 140;
stl_filename = loadExStlFilename('bear');
target_obj = CALPrepTarget(stl_filename,resolution,verbose)

% Largest dimension of projections is when the diagonal of the cubic target matrix is perpendicular
Des_D=100;%mm diameter of vial
height=Lz;%mm height of part
mm_per_voxel=height/resolution;
voxels_wanted=ceil(Des_D/mm_per_voxel);%equivalent number of voxels

nR=voxels_wanted;%number of voxels wanted in x and y
  nR = round(sqrt(nX^2+nY^2));
if (mod(nR,2)==0)
    nR = nR+1;
end

voxelized_target = padarray(voxelized_target, [0.5*(nR-nX) 0.5*(nR-nY)], 0, 'both'); % Pad target w
```

# PhD side projects

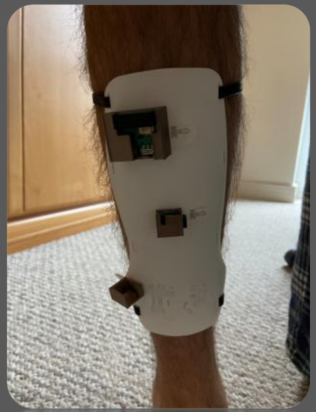
2018-2021
University of Nottingham
(Centre for Additive
Manufacturing)

## Shin guard design

This was a project done in collaboration with a researcher at TUDelft, where the testing was done, and a researcher at Imperial College, where the electronics was developed. My task was to come up with a design which facilitated testing the shin guard sensors and I came up with a modular design. I coordinating with a technician at CfAM, parts designed for Additive Manufacturing were printed via SLS and FDM. The FDM parts I printed myself on a desktop FDM printer.

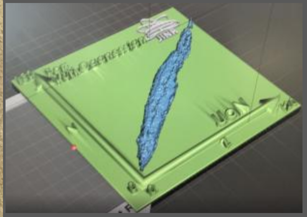
**CAD of shin guard:**

**3D Printed shin guard:**



## Chart of nuclides

For this task at CfAM, I developed a MATLAB code which converted nuclide values into heights and then combined various STL files to create the chart that a CfAM researcher printed using a 2-photon nano stereolithography 3D Printer.



## Nottingham buildings

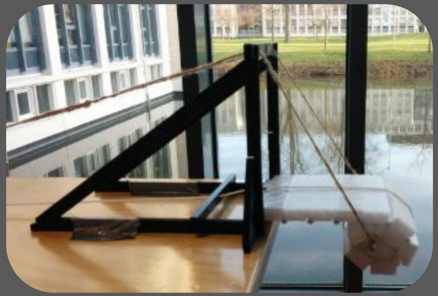
For this short project, I designed some Nottingham buildings to be manufactured via Selective Laser Sintering using Nylon. This was part of an outreach project to promote green energy.

# MSc projects

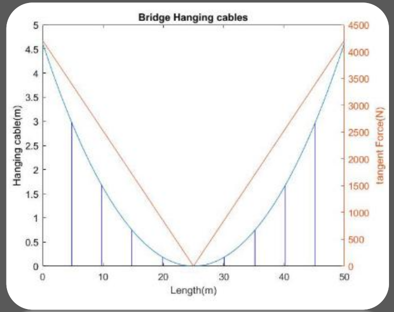
## Bio-Inspired bridge

For the course on Bio-Inspired Design, I worked with a team on developing a deployable bridge for emergency situations. My role was mostly on the CAD and modelling aspects and we all collaborated on the ideation and reporting phases.

**3D Printed bridge:**



**Modeling bridge force:**

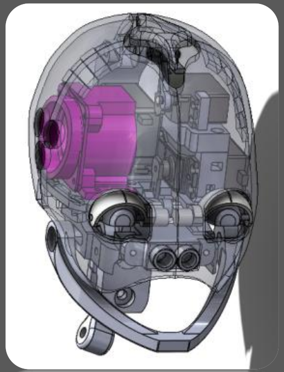



**CAD of bridge:**

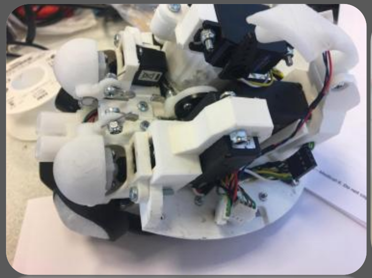
## Newborn robot head

This project consisted of redesigning a previously existing new-born simulator head. I made the design and assembly more efficient by applying principles of Design for Assembly and Manufacturing (DFMA) and Design for Additive Manufacturing (DfAM). I did this work on my own, which involved analysis of existing design, Solidworks redesign, 3D printing, assembly and testing.

**CAD:**



**3D printed assembly:**

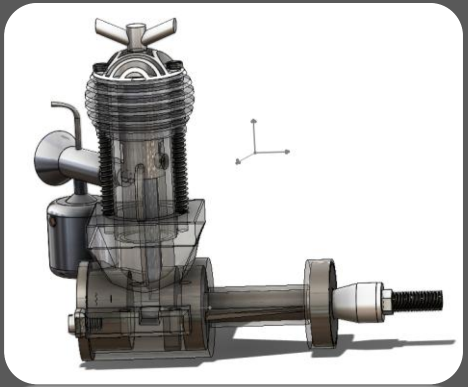


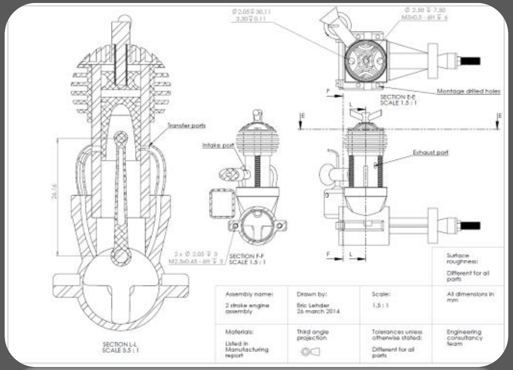
2012-2015
The University of Nottingham

# BEng projects

## 2-Stroke Engine Design

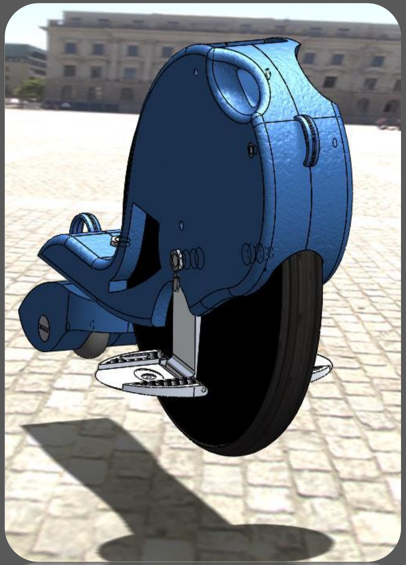
As part of my bachelor I created a 2-Stroke Engine design to meet a given set of specifications. The work involved design calculations, materials selection, engineering drawings and a technical report.

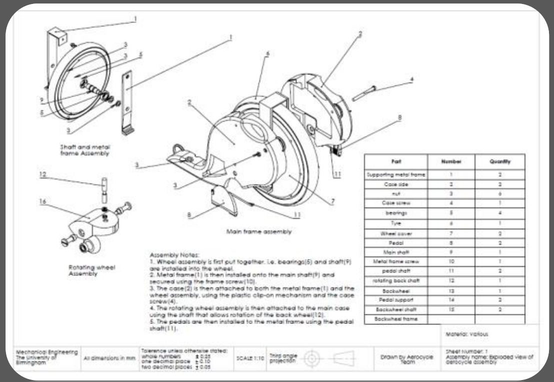




## Electric Unicycle

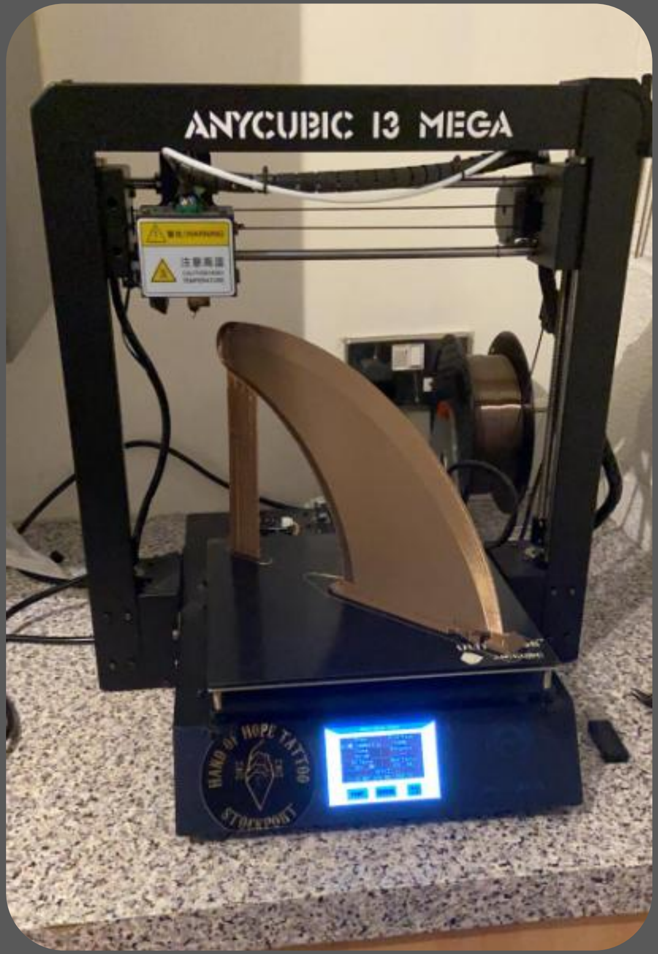
As part of my bachelor I designed an electric unicycle assembly. This involved design calculations and FEA analysis to ensure the pedals could support the weight of an adult. Material selection and user oriented design were also essential in the development.





# Replacement rudder

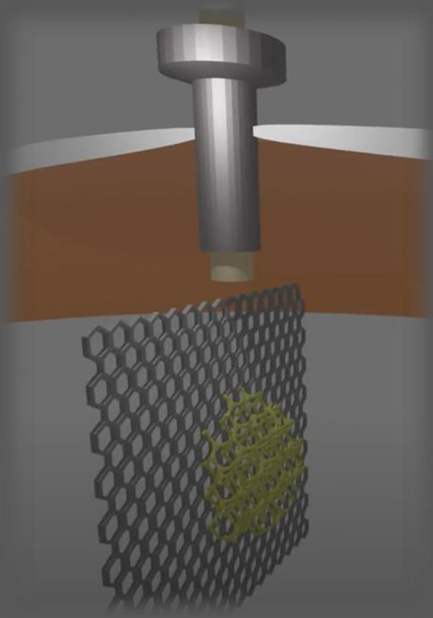
I lost the rudder from my Kayak so decided to print a new one using my FDM printer, which worked quite well.




2022
Nottingham

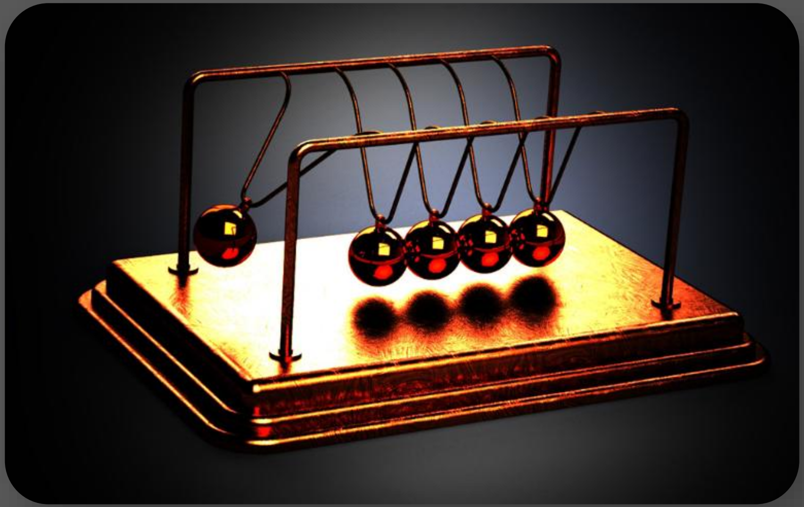
# Blender projects

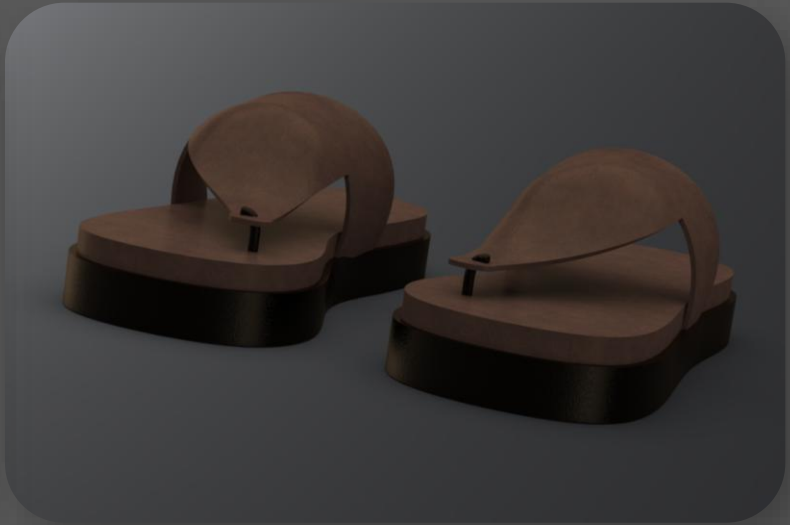
I have done a few things with Blender over the years, mainly creating marketing videos and some renders.

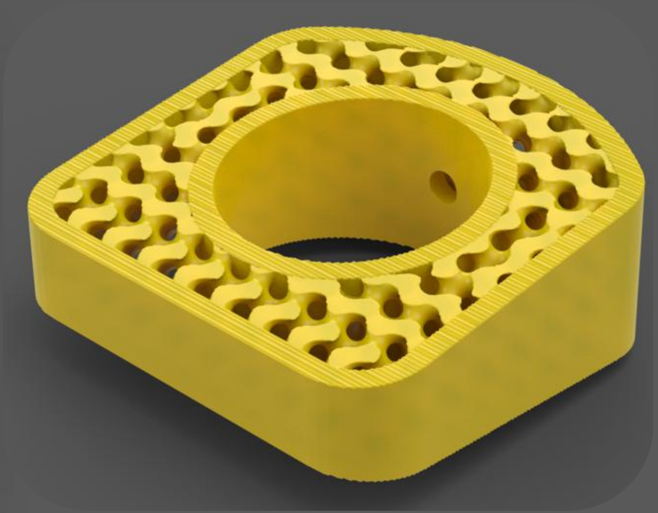


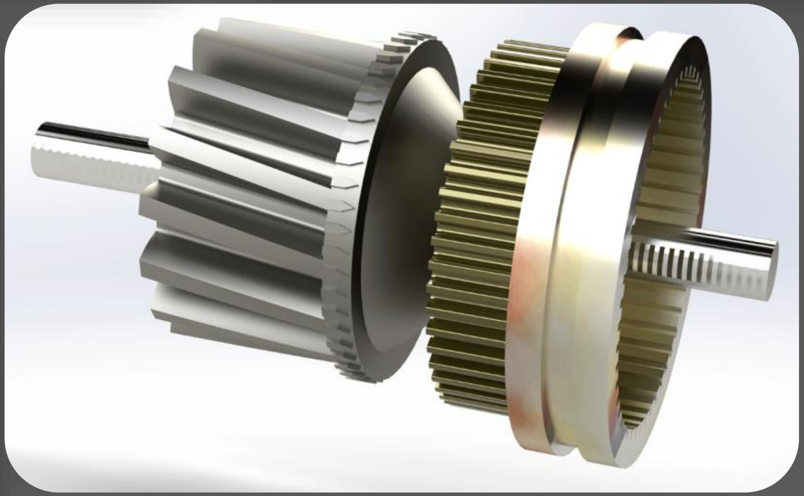
# Visualize renders

**Description:** I've created some renders using Solidworks visualize, some of which I show here.









**Created with nTopology:**