REDU

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Driving Innovation and Manufacturing Through Robotic 3D - Printing

Experiences from nearly 3 years LFAM-projects at REDU

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Who we are

- Lapland Education Centre REDU in Rovaniemi
- ~7000 students at four locations across Finnish Lapland
- ~1200 graduates annually across many fields
- using 3D printing in R&D and education since 2007

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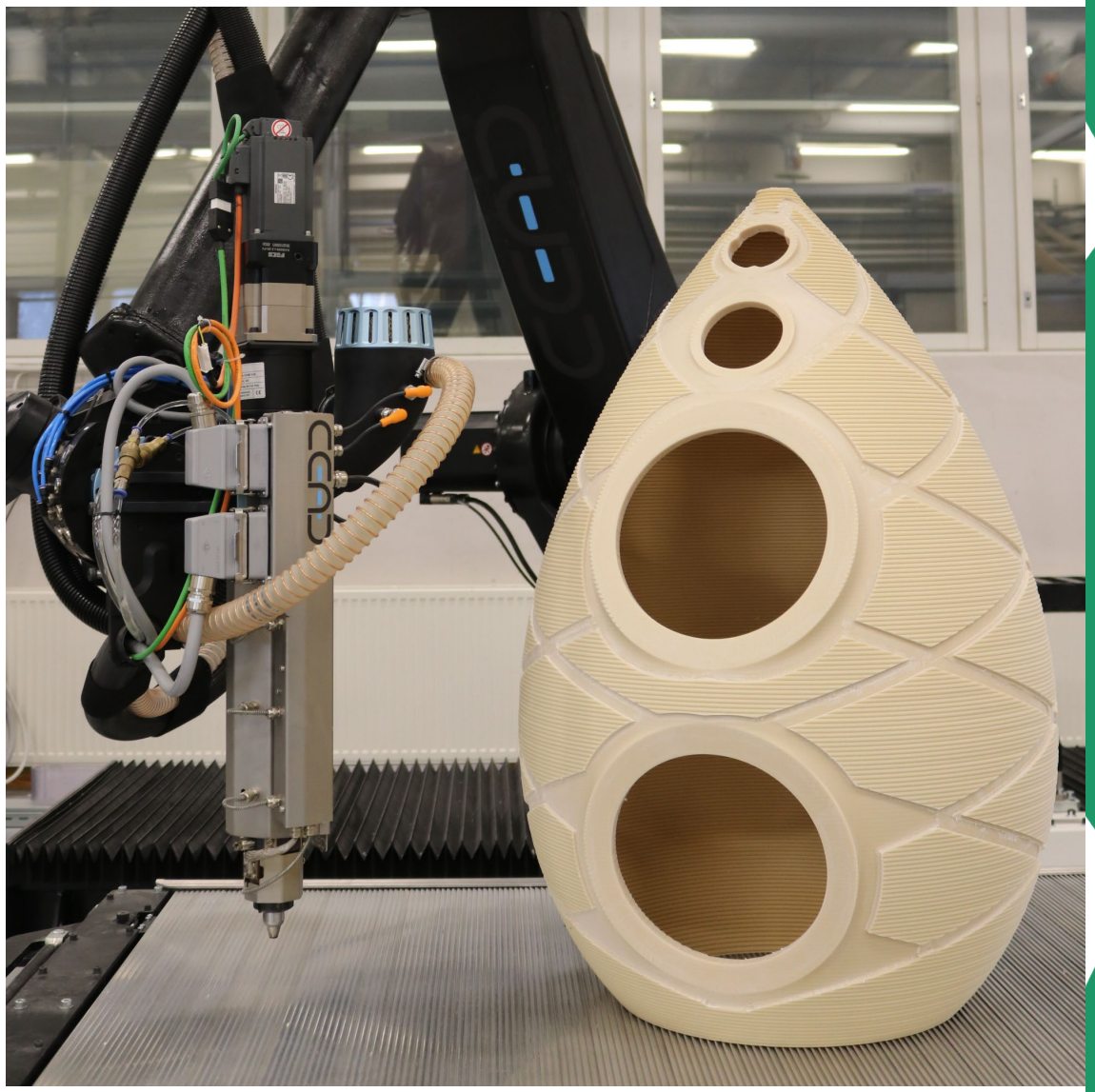
Who we are

- participating in 3DTY-project 2023-2026
- co-funded by the EU
- partners: University of Oulu, Savonia, LUT University; University of Eastern Finland, TAMK, DIMECC
- notable companies: BRP, Ponsse, KCL (UPM), Genelec, Andritz, Gradient



3D-printed and machined speaker

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Our Hardware

- CEAD AM Flexbot with an E25 extruder
  - max. output 12kg/h
  - exchangeable payload
- printing and machining
- build volume of 3000x1200x2000mm (width x length x height)

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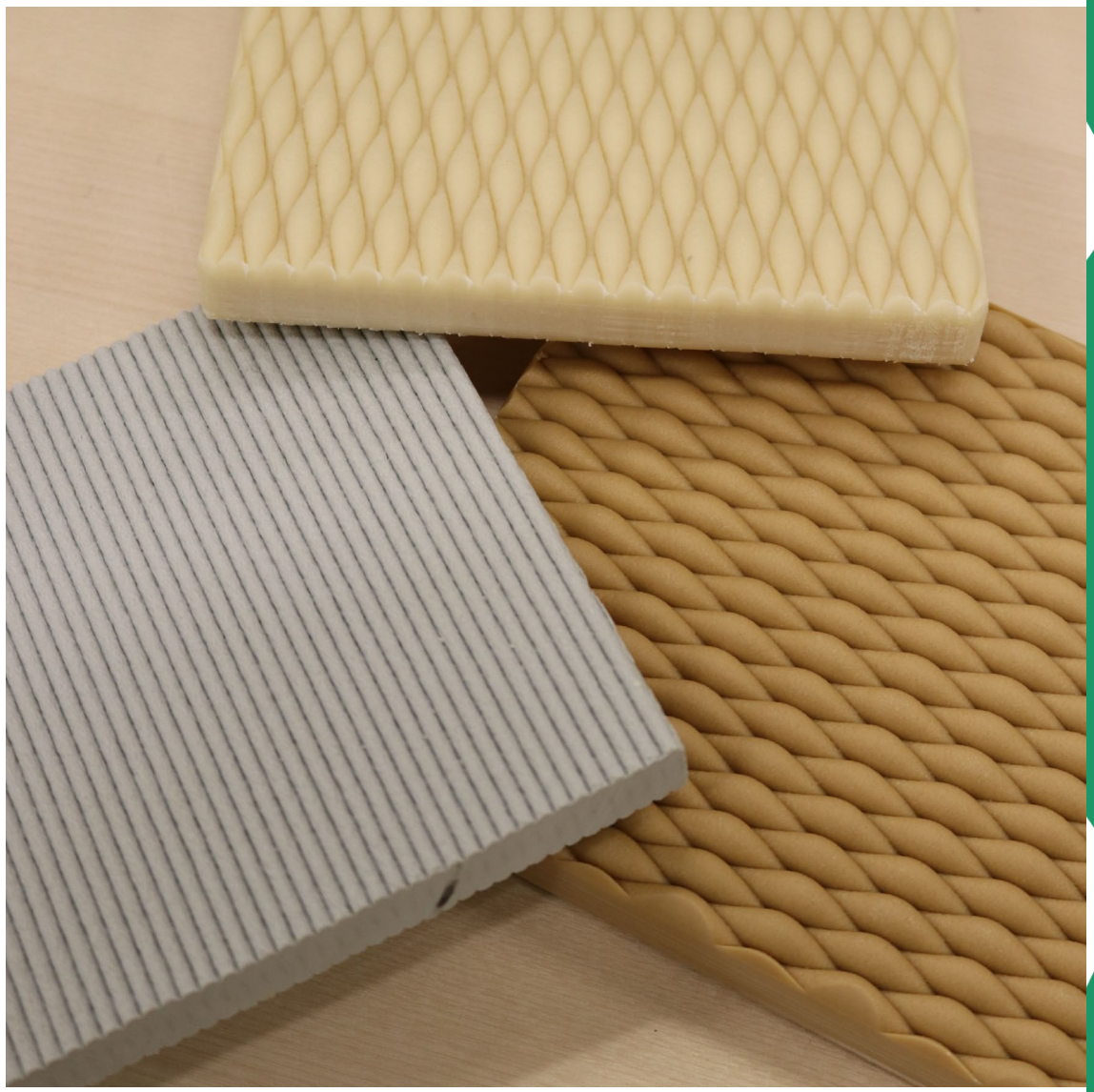
- applications
  - tooling
  - final products

- robotic 3D-printing Software

- challenges when transitioning to LFAM



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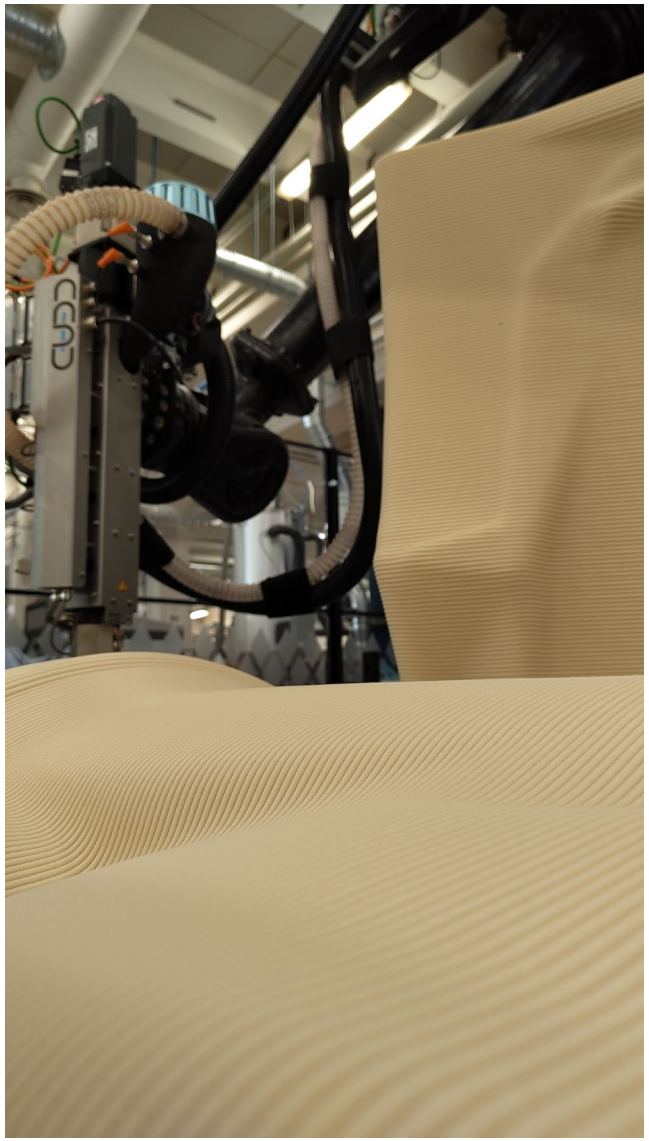
Windshield Mold

- completion of material testing, printing and machining in just one month
- height – 90 cm
- weight ~35 kg/part
- print time ~14 h
- machining time ~60 h
- material – KCL Formi 3D 20/19



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Windshield Mold

- total of 3 design iterations
- 2 different materials tested
- used in validation/prototyping

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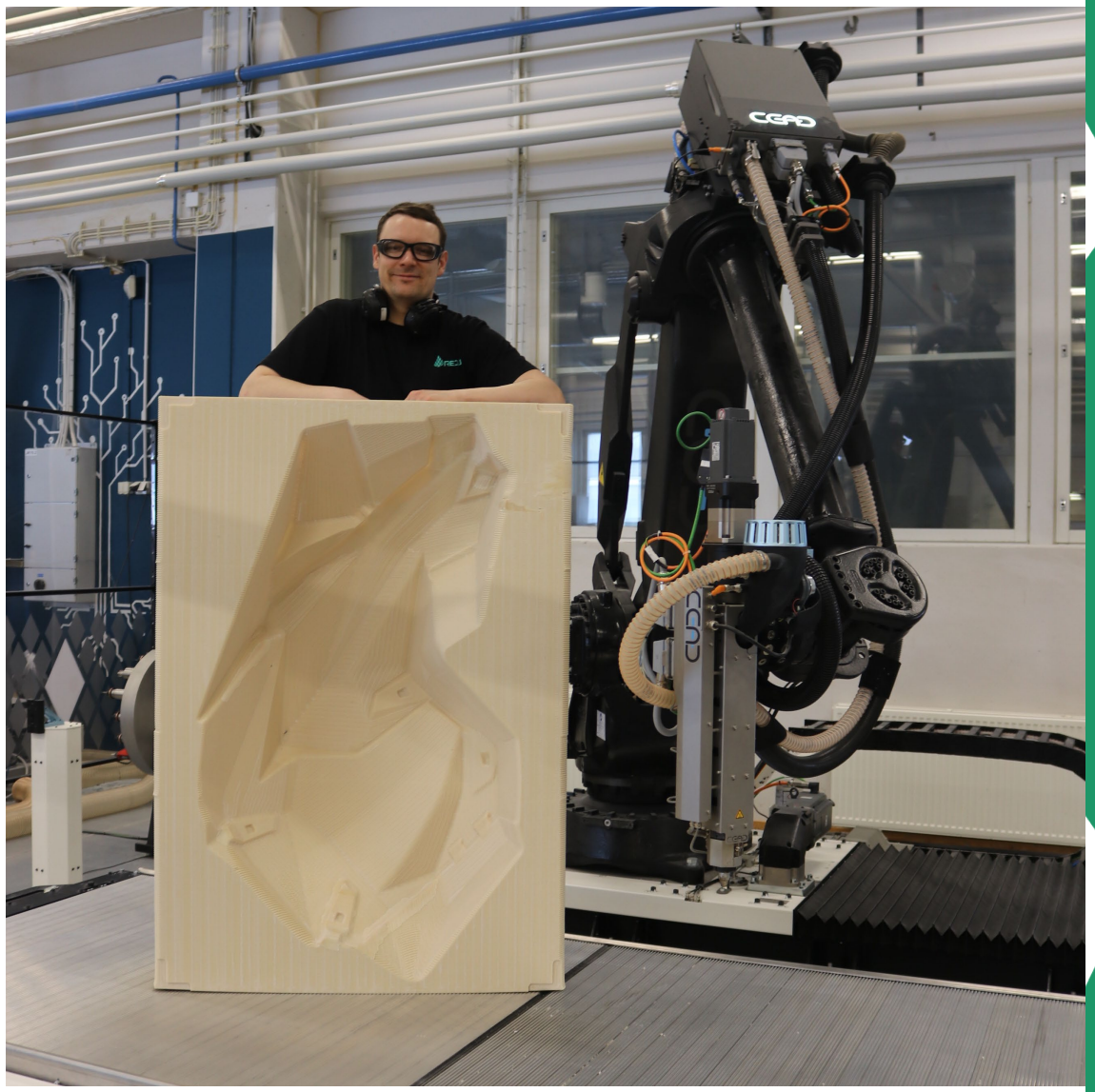
Vacuum Mold

- completion of testing, printing and machining in roughly 3 months
- height – 135 cm
- weight – 110 kg
- print time ~16 h
- machining time – long
- material – KCL Formi 3D 20/19



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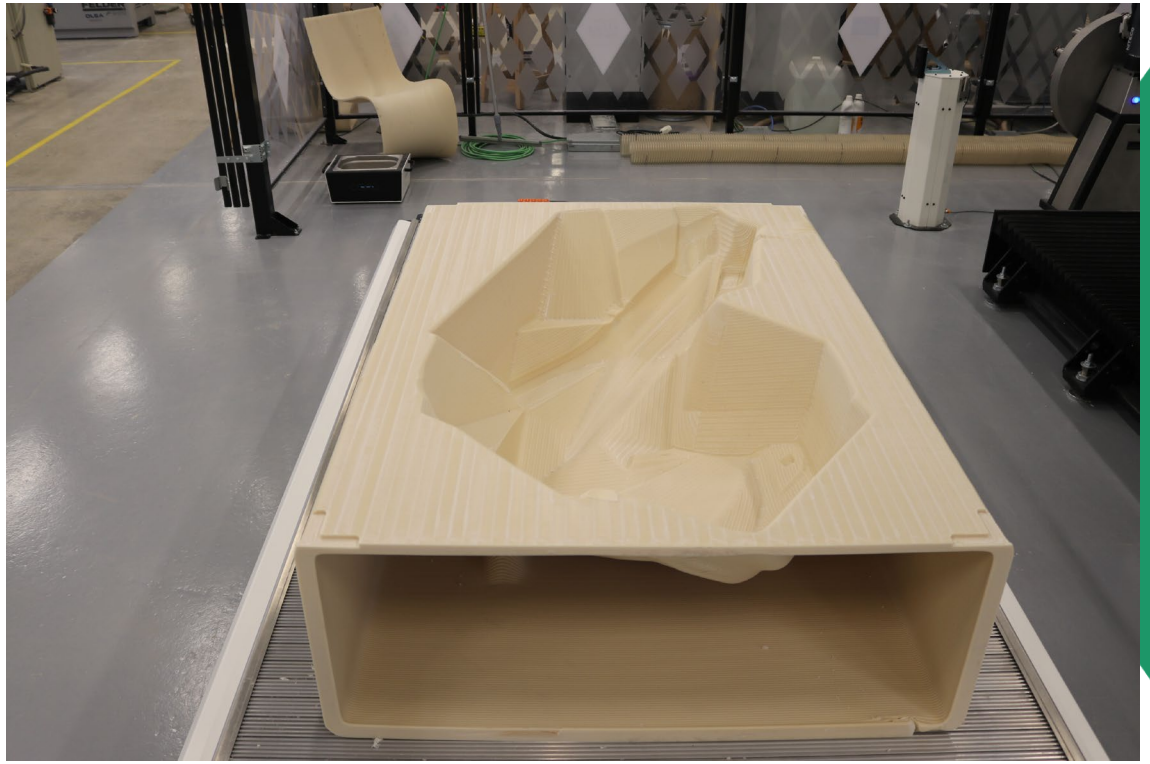
Vacuum Mold

- design flexibility
- easy to repair
- sustainability of material and recyclability



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Concrete Casting Mold

- from request to solution in 1.5 days
- easy to work material
- easy surface treatment

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Maritime Industry

- tooling for thermoforming
- low production runs
- completely custom paneling for boats
    - frequent need for new molds
- printing entire boats
- printing of marine drones

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Consumer End Products

- limited production runs
- customization options
- versatility in available strategies
- printing of consumer end products vs. tooling

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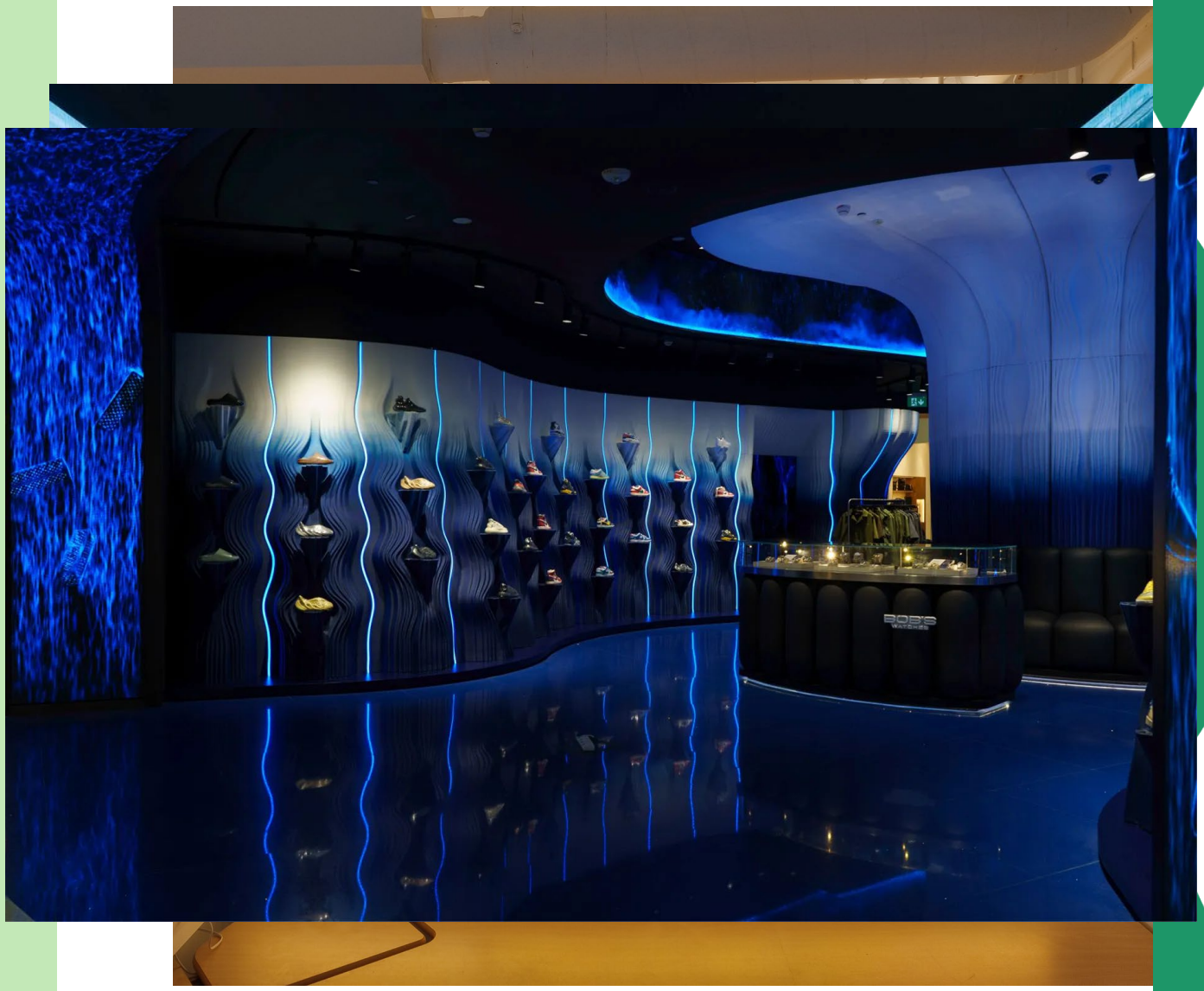
Architecture and Design

- allows for creative and highly customizable solutions
- especially suitable or organic designs and algorithmic modeling
- notable companies:
  - Nagami
  - LAMÁQUINA



picture 2: © Nagami ; picture 3: © LAMÁQUINA

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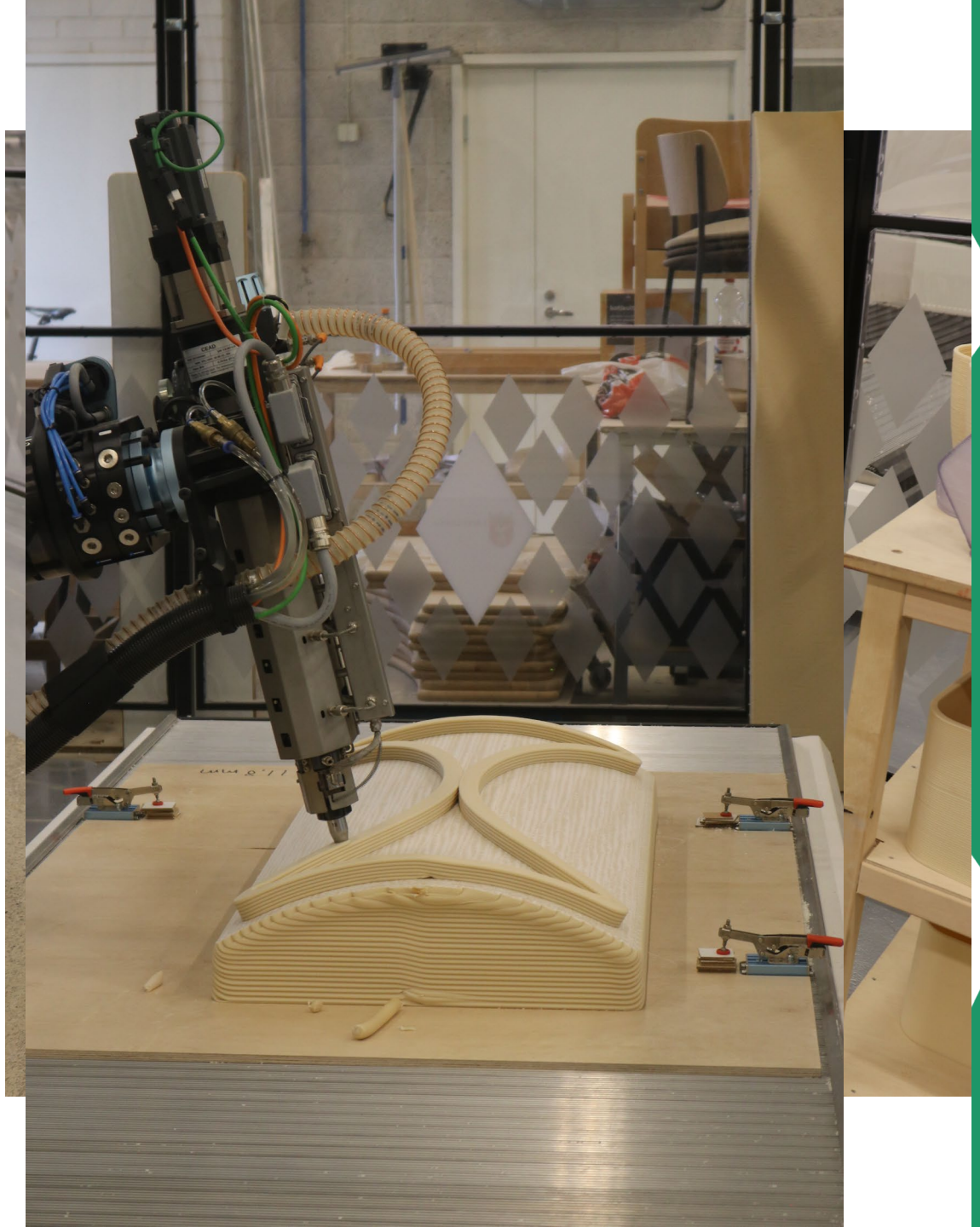
Non-Planar Printing

- picture shows first design iteration of mold
- robotic 3D-printing enables otherwise hard to achieve geometries



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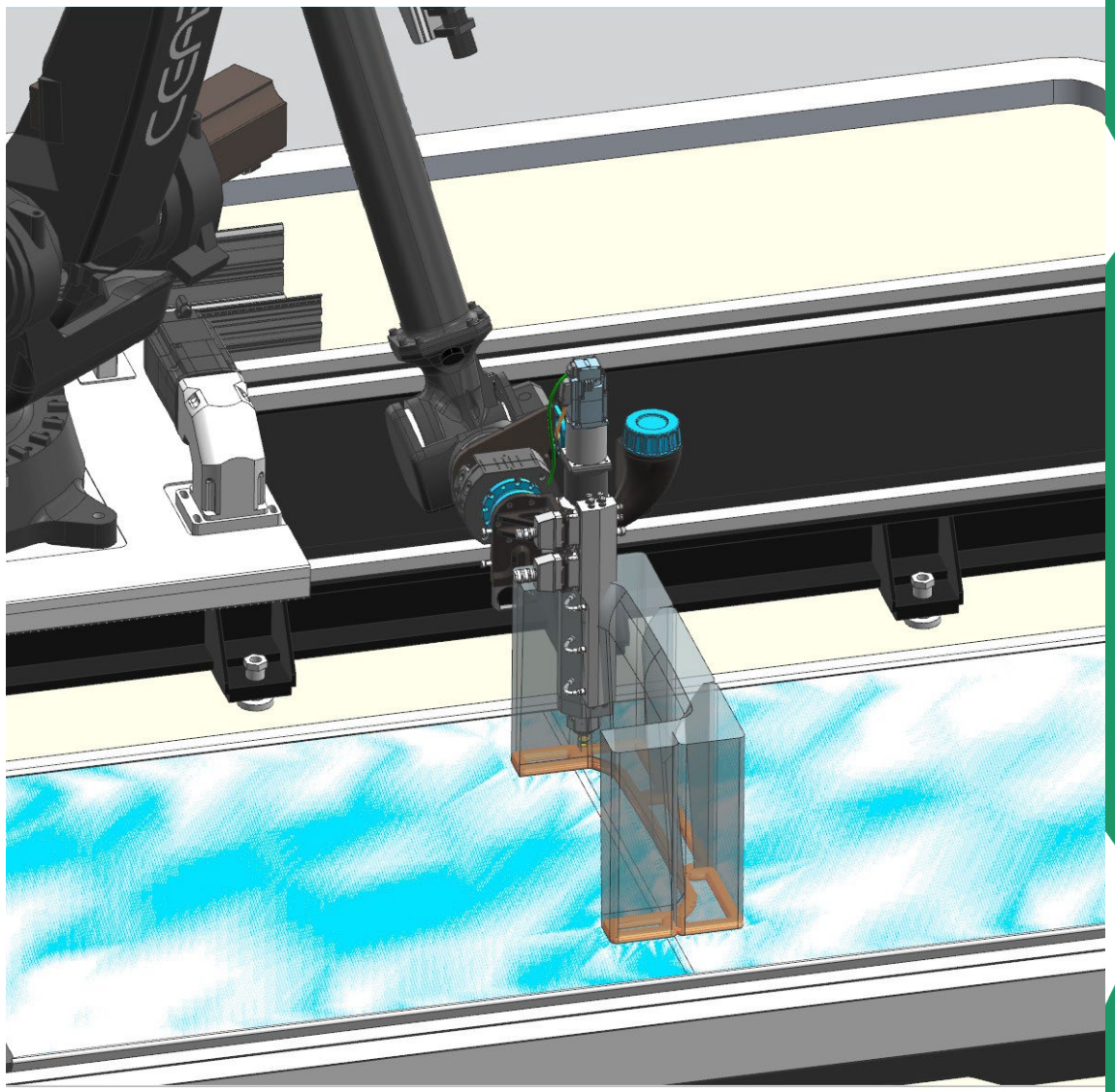
Robotic 3D-Printing Software

- Siemens NX (CAD/CAM)
- Adaxis (CAM)
- AiBuild (CAM)
- Rhino/Grasshopper (whatever you want it to be)



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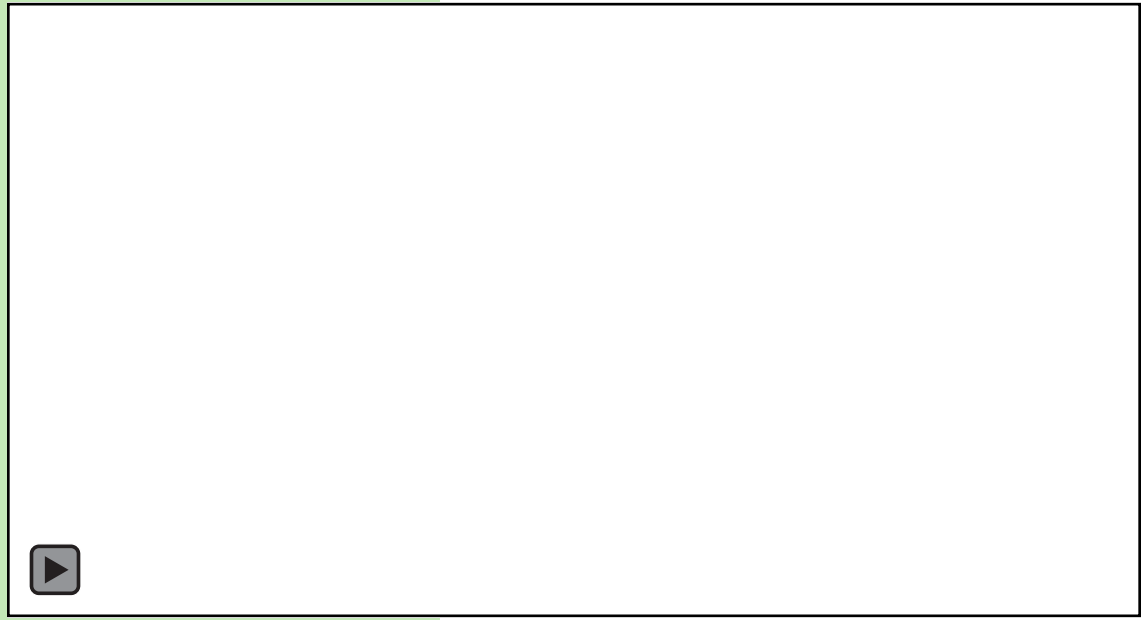

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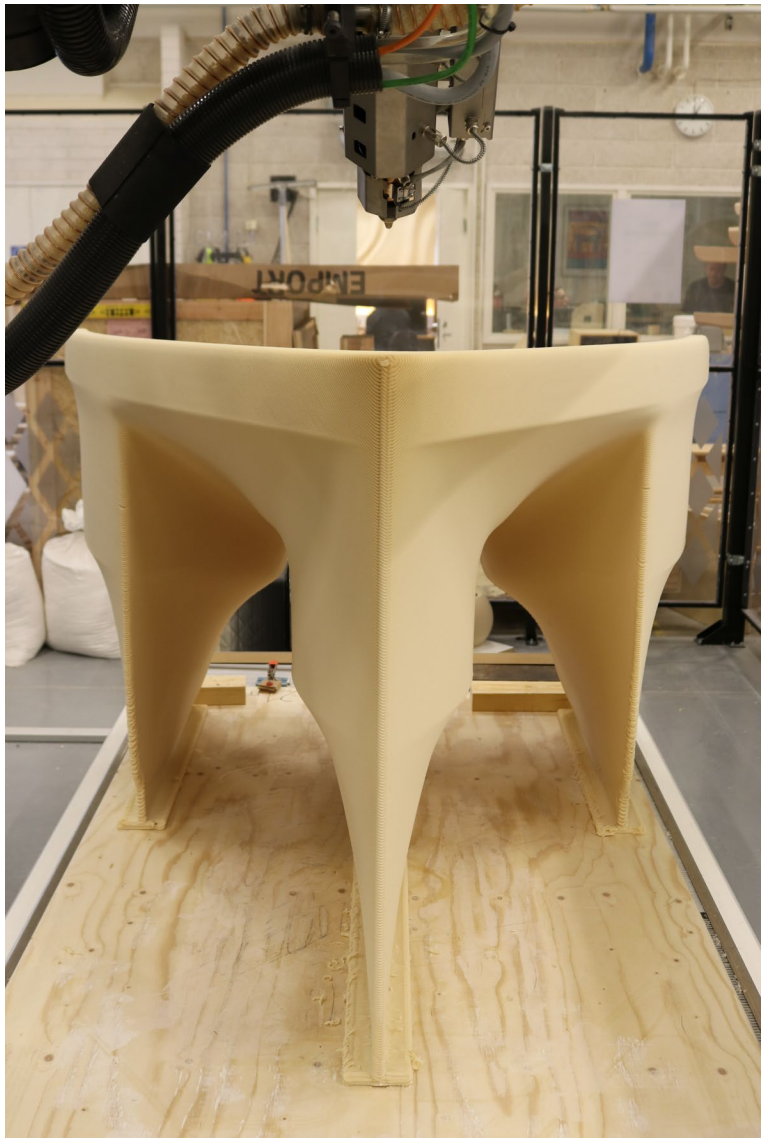
Validation Builds Credibility

- interest in LFAM across industries
  - automotive, maritime, architecture and design
- interest in available solutions
  - printers, materials, slicing
- REDU and 3DTY partners provide application specific validation
  - transparent reporting



3D-printed hull of a trimaran

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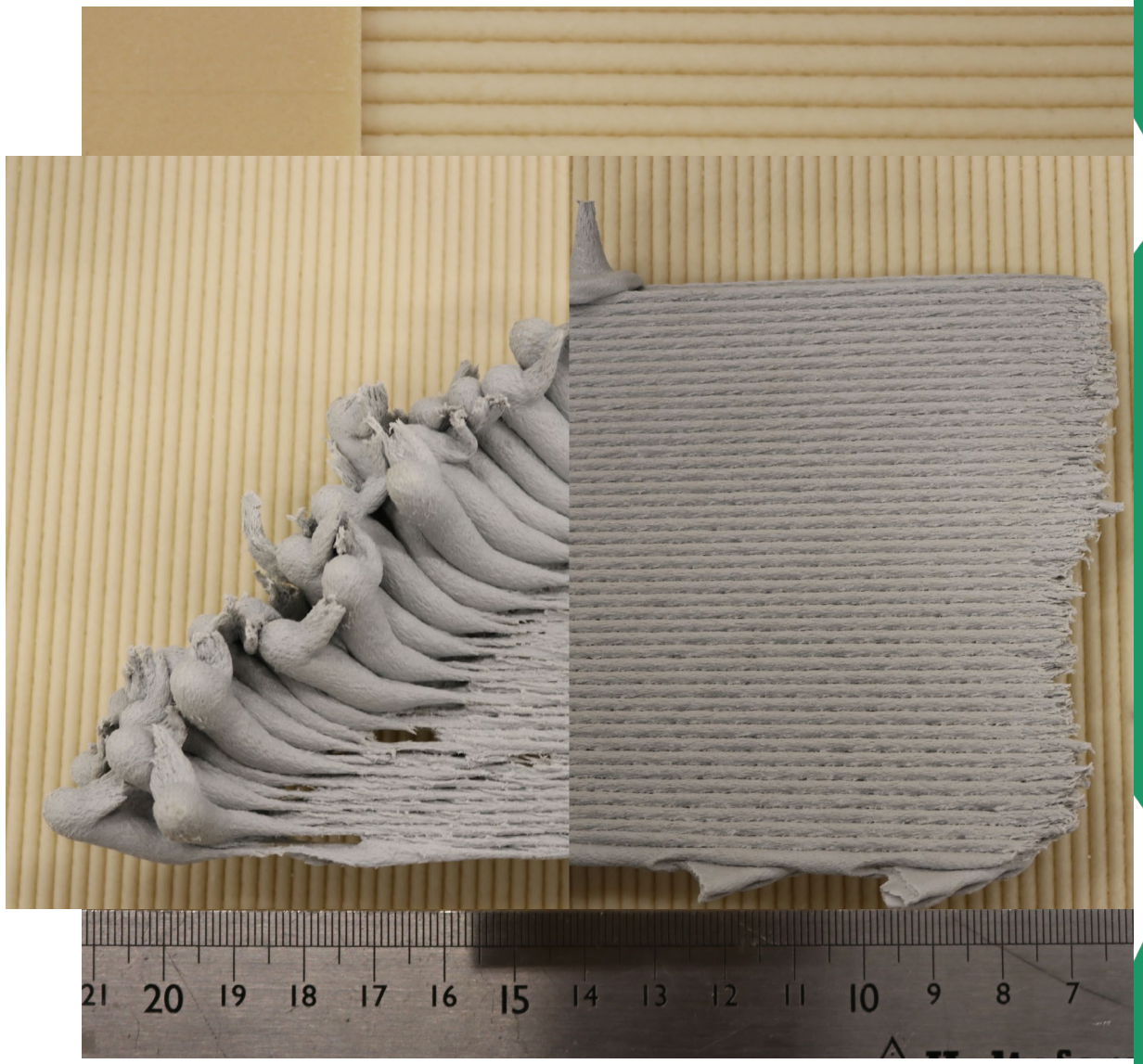
Challenges

- expectations vs. reality
  - scale
  - surface properties
- limits of LFAM
  - travel moves
  - overhangs
  - supports
- root causes
- the future



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Thank You

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