



Data: Lab Munich

GeometricalDeepLearning on 3D Models: Classification for Additive
Manufacturing

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Get to know the team

About us



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At Data:Lab Munich we solve real problems with the use of data and AI.

- / Sustainable data driven products.
- / Provide better customers experience.
- / Improve organisations' internal processes.
- / Volkswagen Group DNA.



Paving the way for digital transformation.

With a team of forward looking experts turning the most valuable asset of our entire organisation - data - into business solutions.



EPT Team

3 key business domains

A small and agile structured group of people who research and develop projects primarily for the sake of radical innovations in engineering and production.

Engineering

- / Integrate with development teams
- / Showcase ML in motorsports
- / Get into vehicles

Connected Car

- / Act as a central hub for ML
- / Integral part for all data
- / Data brokerage topics in VW

Production

- / Support novel manufacturing technologies with ML
- / Digital Production Platform

Production

Additive Manufacturing

Additive manufacturing technologies, also known as 3D printing, and their advances have transformed the potential ways in which components are designed, developed, manufactured, and distributed.

/ 3D printing shows its strengths, where conventional manufacturing processes reach their limits. These include...

- ...high geometric freedom of design
- ...functional integration
- ...strong and lightweight parts
- ...low resource consumption
- ...production on demand

/ In the automotive industry 3D printing is mainly used to manufacture...

- ...prototypes
- ...operating equipment
- ...customized parts
- ...components for exhibition models and pre-series vehicles
- ...motorsport parts

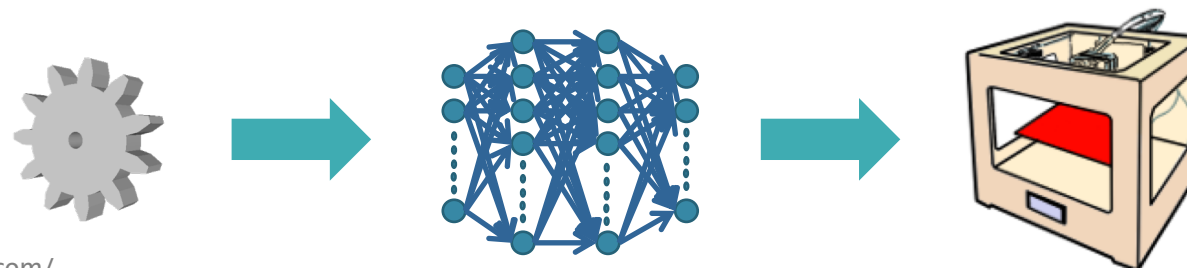
Use-case

Check if specific parts can be produced with a 3D printer

- Status quo:* In order to check whether a part can be produced with a 3D printer, the geometric elements of the parts are usually measured manually in CAD software and it is checked whether they are not below the minimum dimensions specified by the 3D printer manufacturer.



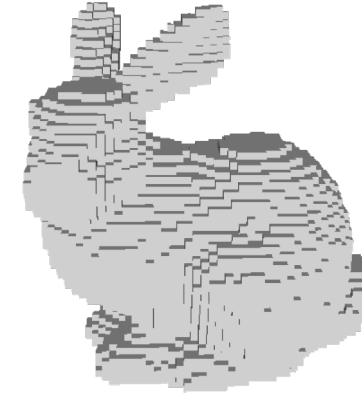
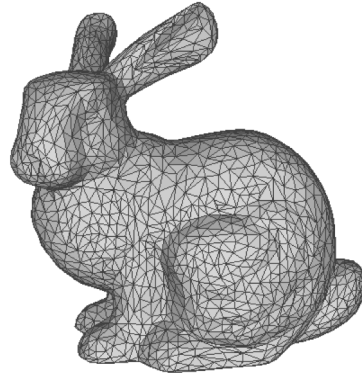
- Problem:* The manual check is very time-consuming due to the many geometric elements a part can consist of
- Our approach:* Train a Machine Learning model that checks if all requirements are fulfilled to produce a part on a 3D printer



1: <https://ten-thousand-models.appspot.com/>

2: <https://www.flickr.com/photos/zmaker/13618450884/>

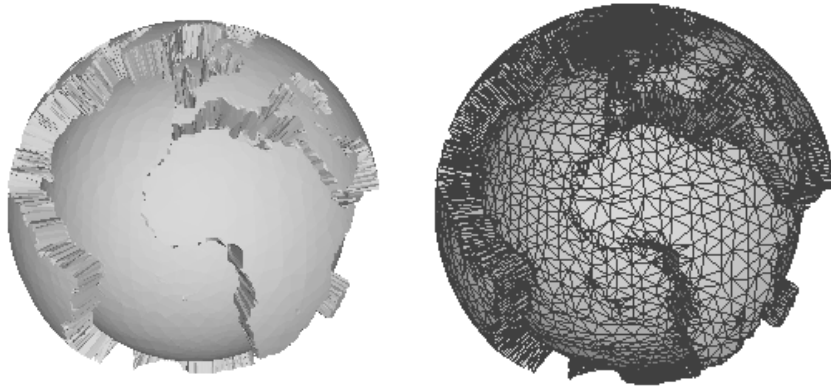
Representations of 3D data



	Mesh grid	Point cloud	Voxel
Textures	++	-	+
Memory	++	+	-
Neural network Functionality available	+	+	++

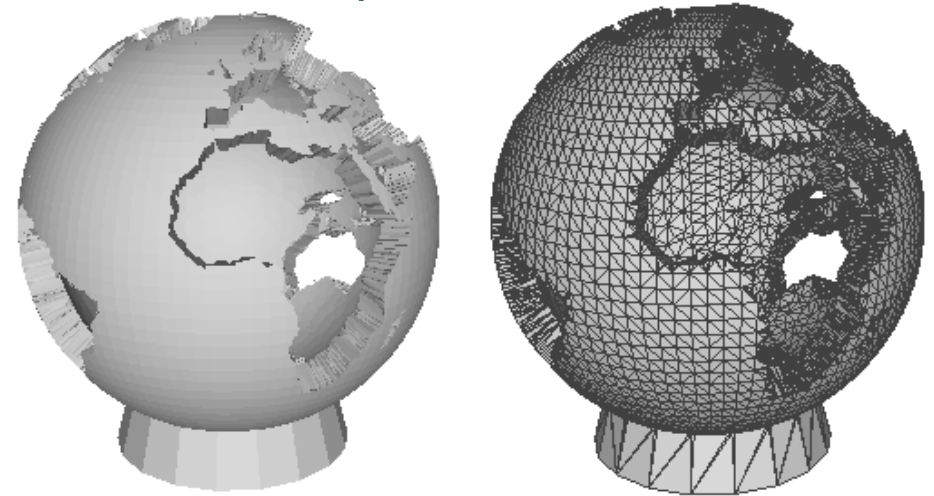
Problem definition

Grid representation



Land

Grid representation



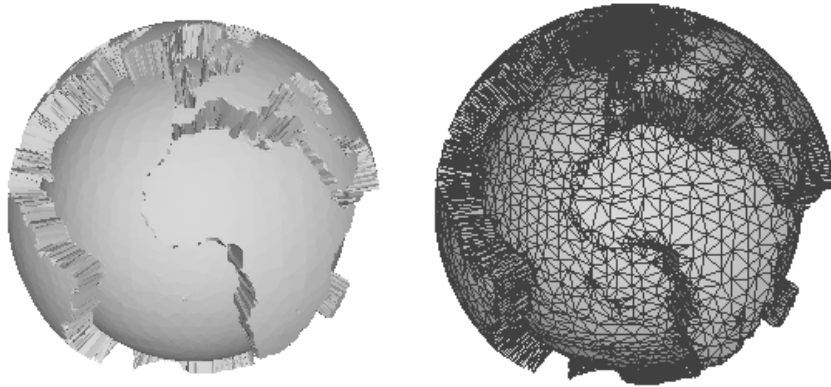
Water



Globe

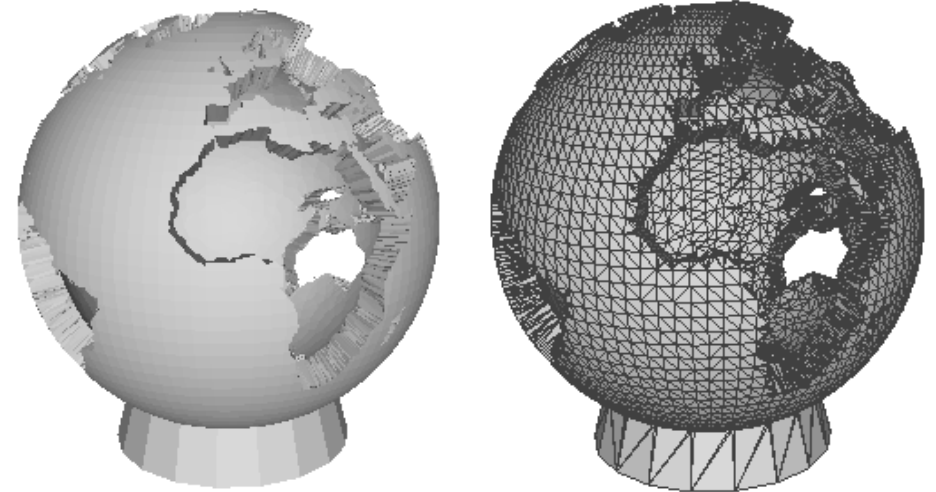
Problem definition

Grid representation



Land

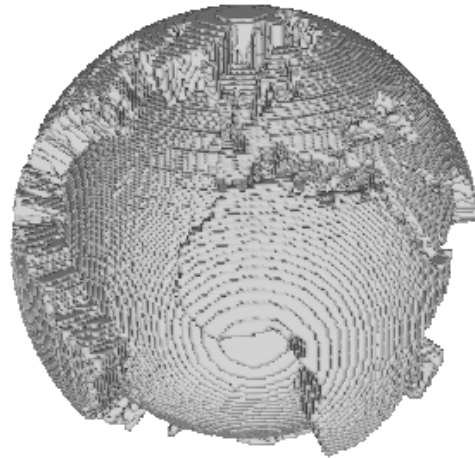
Grid representation



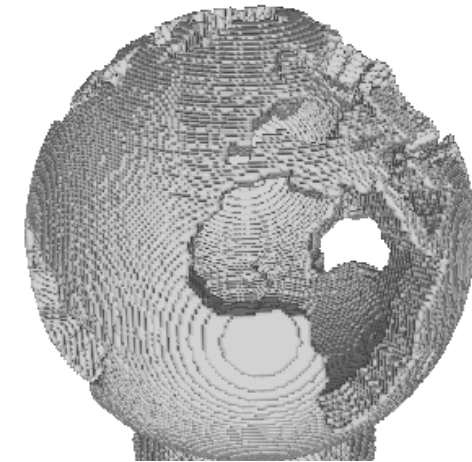
Water



Globe

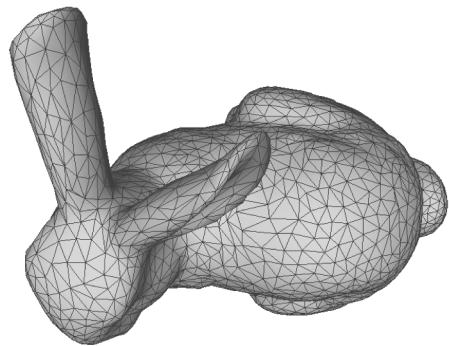


Land Voxel
representation



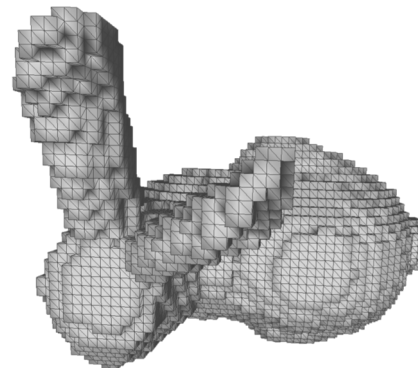
Water Voxel
representation

Data preparation



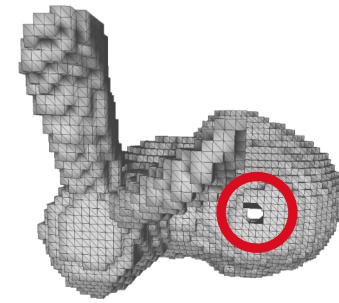
Mesh Grid

standardize

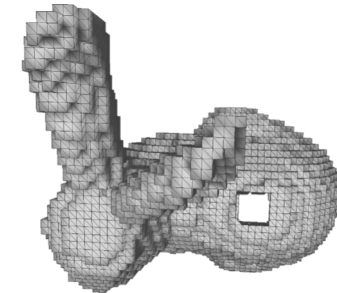


Voxel

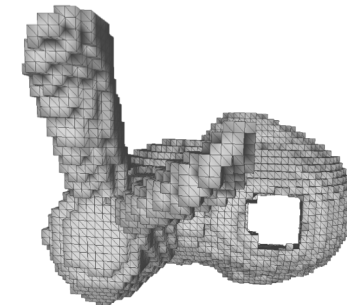
Synthetic
data
generation



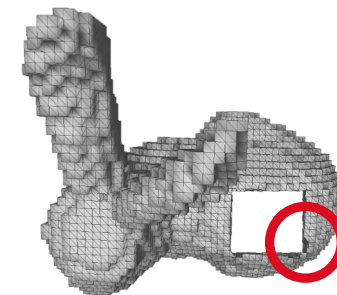
non-printable
too small hole



printable

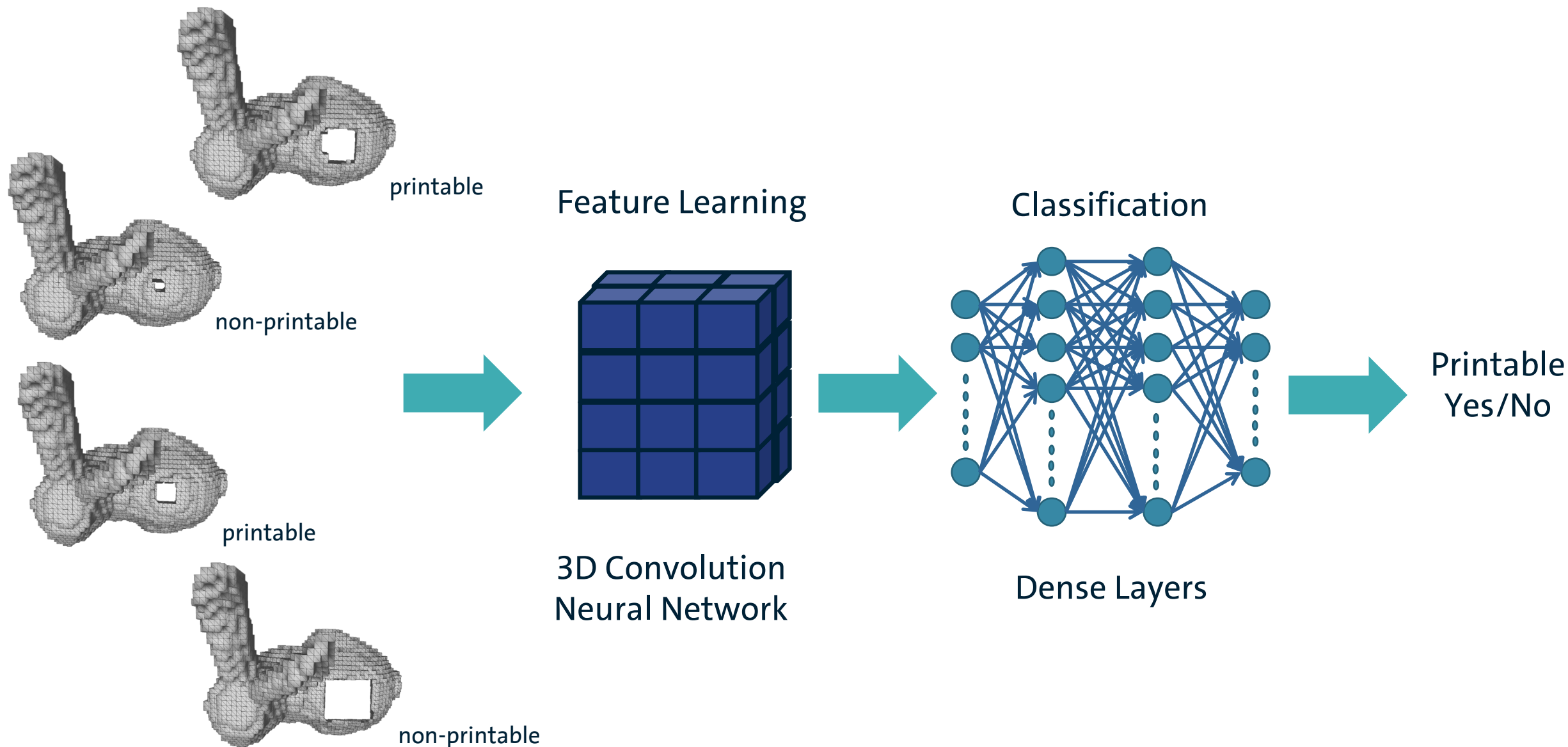


printable



non-printable
too narrow wall

Neural network classifier



Develop data pipeline and machine learning algorithm for classification between printable and non-printable 3D models

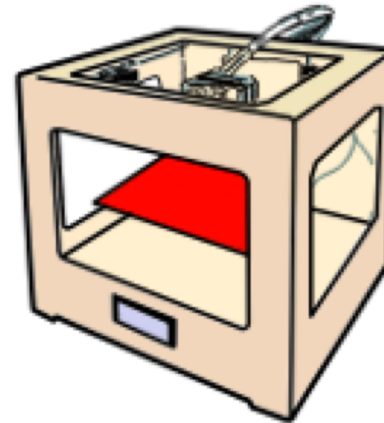
Object Database



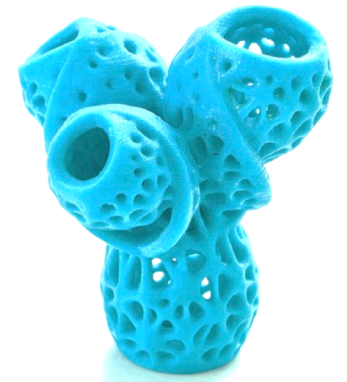
ML pipeline



Automatically
select printable
objects



Print



- 1: <https://ten-thousand-models.appspot.com/>
- 2 <https://www.flickr.com/photos/zmaker/13618450884/>
- 3 <https://www.flickr.com/photos/dizingof/14406296731/>

We are looking forward to welcome **you** on board!



Software Innovation Center
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