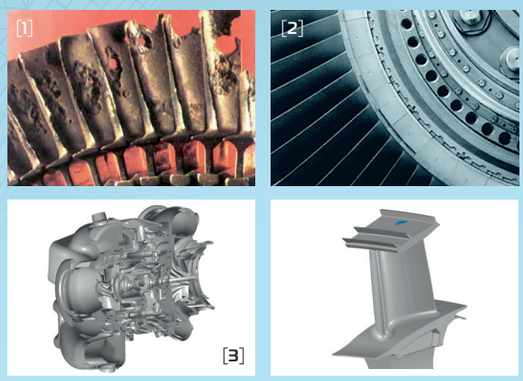
BOXERgeom supporting AI

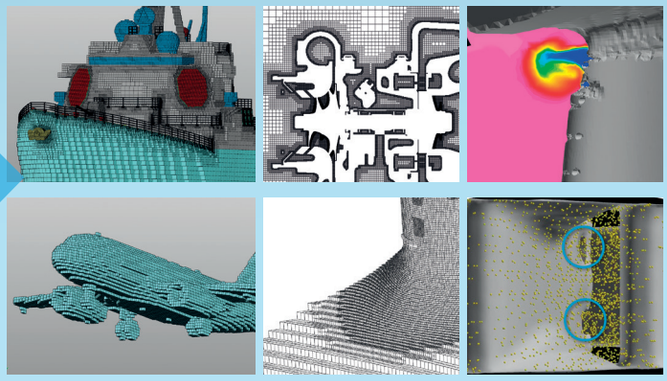
AI & Machine Learning efficiently consumes **geometry in voxelised** form – a 3D "image". The geometry is derived from design intent CAD and through-life PointCloud scans

GEOMETRY



Database of CAD Models or Scans
For training or testing

BOXERgeom

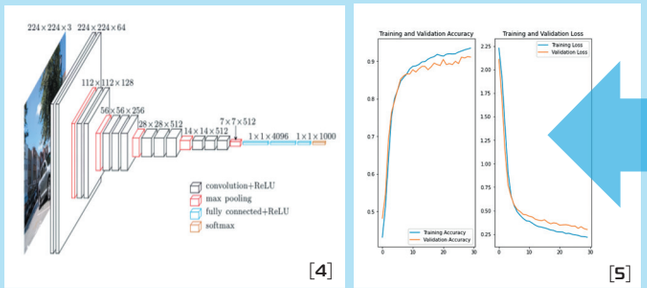


Create voxelated model from input geometry
Create physics-based degradation as training data
Export 3D greyscale image

[1] Wing RG & McGill IR "The protection of gas turbine blades" Platinum Metals Review, 25, (3), 94-105, 1981

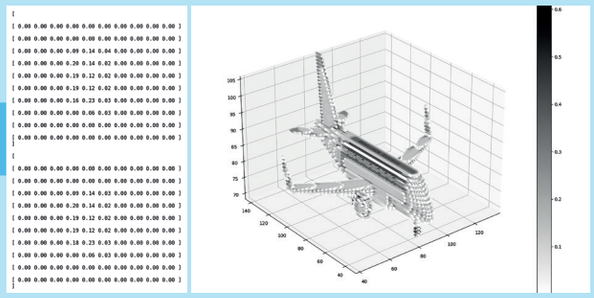
[2] Image from https://www.mhi.com/products
[3] We are grateful to Cummins Turbo Technologies Ltd for permission to use this geometry

TensorFlow



Open source library for numerical computation and large-scale machine learning
www.tensorflow.org
Create model with specific layers to convert 3D input into 1D

Python

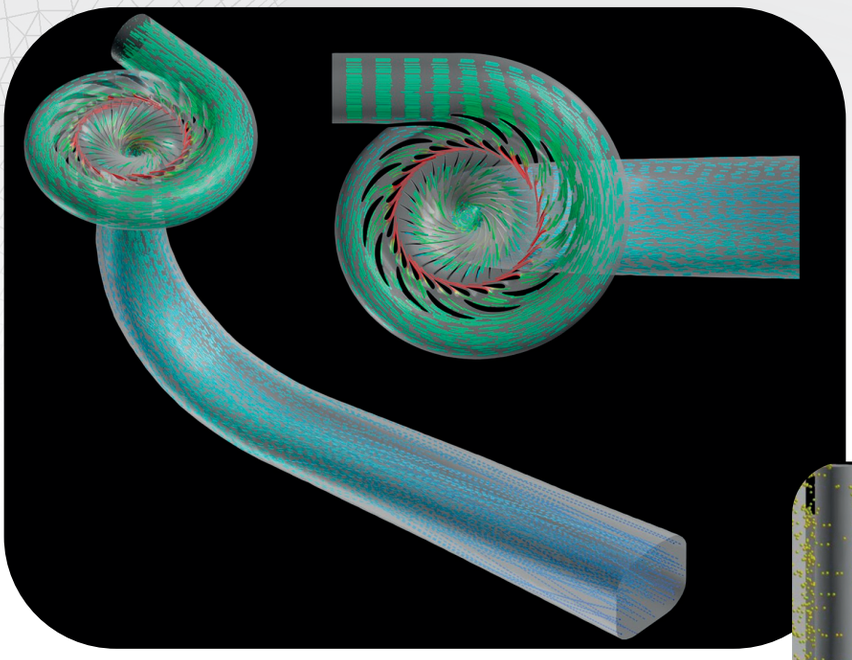


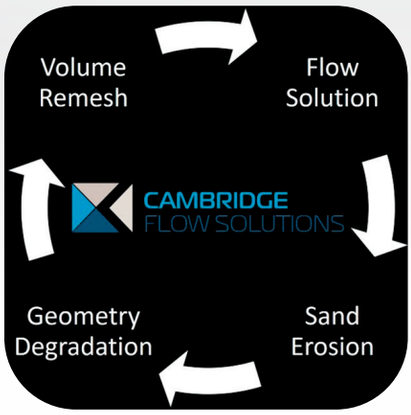
Read octree data format into a NumPy array
Visualize the incoming data for each geometry
Create compressed data format

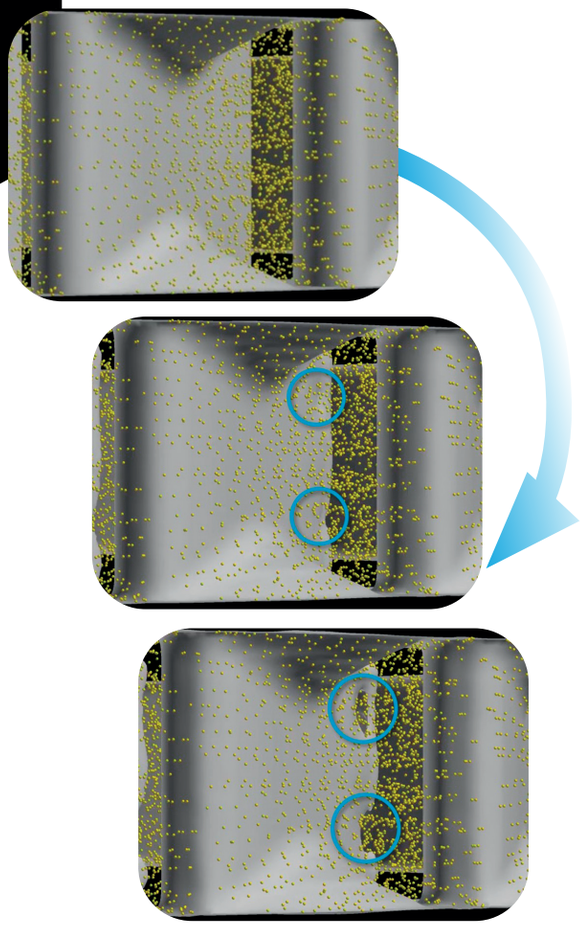
[4] CNN image from https://www.cs.toronto.edu/~frossard/post/vgg16/
[5] Generated by CFS using http://modelnet.cs.princeton.edu/# ref: Z. Wu, S. Song, A. Khosla, F. Yu, L. Zhang, X. Tang and J. Xiao 3D ShapeNets: A Deep Representation for Volumetric Shapes

BOXERgeom supporting MRO

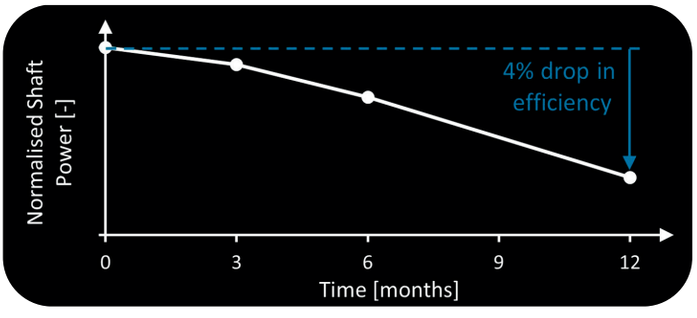
Manufacturing **geometry** is derived from design intent CAD. Through-life, in-service geometry is derived from scans in the form of tessellated PointClouds or from **physics-based simulation of degradation & wear**







Example: simulated particulate erosion of a Francis Turbine using **BOXERgeom's** geometry editing capabilities supported by **BOXERmesh**



[We are grateful to the NTNU, the Norwegian University of Science & Technology for the geometry used for the Francis-99 Workshop]

CAMBRIDGE FLOW SOLUTIONS
Proprietary and customised CFD