GeoDict

## The Digital Material Laboratory

Generate Meshes from a µCT-Scan of the Composite

- The microstructure of a composite is revealed in detail from an imported and segmented µCT-scan. Usable statistical data is obtained by analysis, e.g. fiber identification and determination of fiber orientation and diameter.

- The statistical information obtained from the µCT-scan is used to generate 3D models on which to run simulations and assess their mechanical properties. Modifications of the 3D models microstructure in GeoDict lead to changes in their mechanical properties.

- The 3D model from the segmented scan and the 3D models generated from the statistical data of the scan are exported as triangulated mesh and used for simulations.
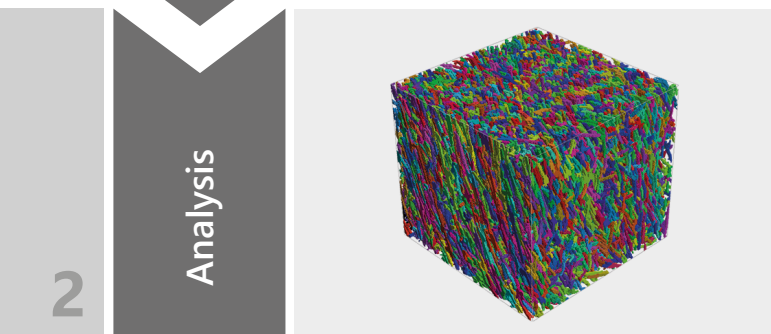
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Import of CT-Scan
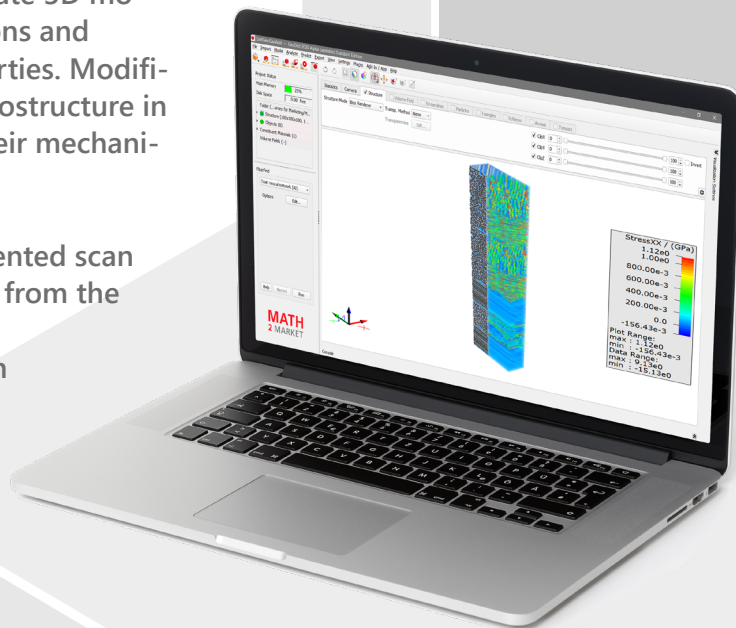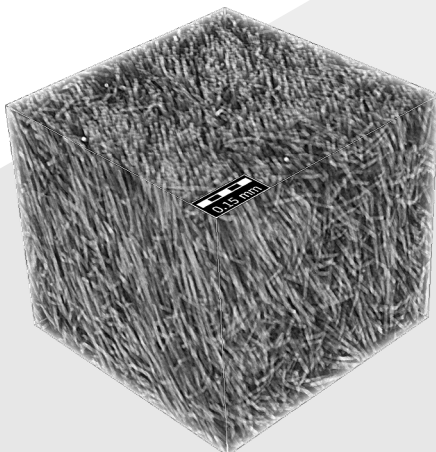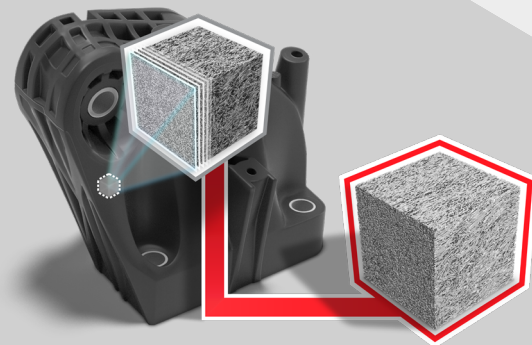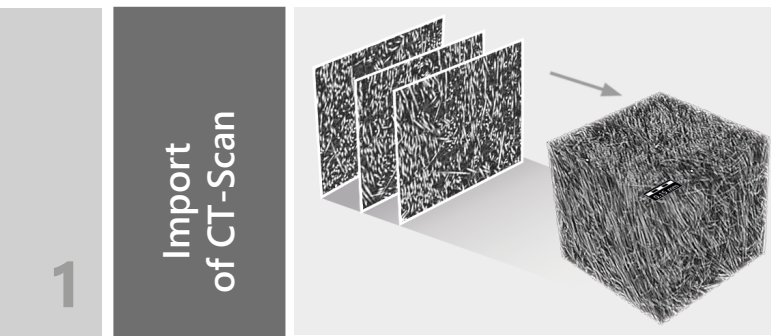
- Take a µCT-scan of the composite and import it into GeoDict
- Apply image filters to enhance contrast, remove artifacts or reduce noise
- Segment imported scan by using manual or OTSU threshold

Modules: **ImportGeo-Vol**

Result: Digital 3D model of the composite

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Analysis

- Every single fiber is identified through Artificial Intelligence
- Analyze fiber length distributions, fiber orientations, fiber curvature, and fiber diameter
- Identify and analyze voids and inclusions
- Extract this statistical data to create a statistical 3D model of the composite with just a few clicks

Modules: **FiberFind-AI**, **PoroDict**, **GrainFind**

Result: Statistical 3D model of the composite

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Design
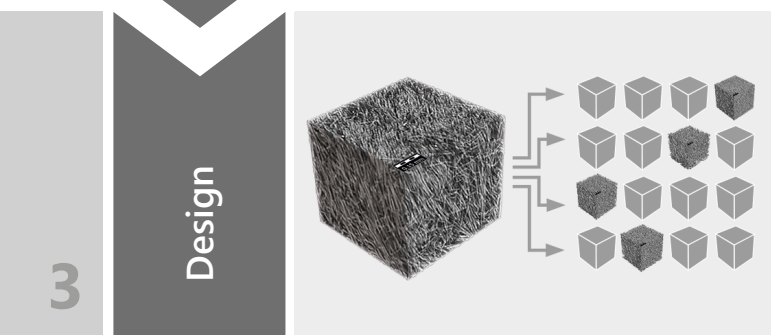
- Generate many digital prototypes with modified fiber parameters using GeoDict's fiber generator module
- Vary individual parameters, such as the fiber volume content.
- Automate the generation of digital prototypes and the variation of parameters through scripts to increase productivity

Modules: **FiberGeo**, **WeaveGeo**, **GrainGeo**

Result: Digital 3D models of modified composites

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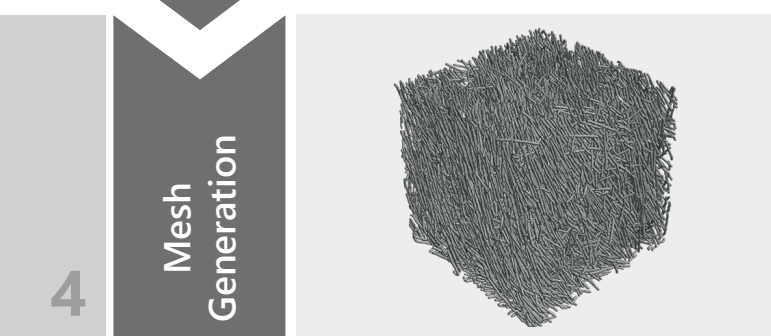
Mesh Generation

- Generate a meshed model of the composite
- Export this mesh to use for further simulations in finite element analysis (FEA) software, such as Ansys, Abaqus, LS Dyna

Modules: **ExportGeo-CAD**

Result: Meshed 3D model of the composite

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