Object Identification on Micro-CT Scans with GeoDict

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GeoDict

Development of materials by Digital Material Design

Image Analysis ➔ Models of Microstructures ➔ Microstructure Simulation ➔ Macroscopic Material Parameters

Image Acquisition ➔ Change Geometry ➔ Material Property ➔ Experimental Verification

Development of Materials
GeoDict for geometric analysis:

- Existing methods to measure
  - Fiber diameter
  - Fiber orientation
  - Pore size distributions
  - ...

- New approach:
  - Machine Learning based geometric analysis to obtain more measurements out of complex micro structures
Micro CT-Scan of Gas Diffusion Layer

- Micro CT-Scan of a Gas Diffusion Layer
- 1.3µm voxel resolution
- Binder and fibers cannot be directly segmented
Binder identification in Gas Diffusion Layer
Binder identification in Gas Diffusion Layer
Overview: Supervised Deep Learning

- Neural network: Network of artificial neurons
- Input X, Output Y
  - X and Y be anything: values, vectors, images...
- **Supervised** learning means we give many (X,Y) examples
  - The network then learns to predict Y from X
  - Problem: It needs a lot of training examples (> 100000)
Solution: Use GeoDict’s material modelling capabilities to generate training data

- For training we generated 18 structures
- Varying porosity and binder volume fraction
- This corresponds to ~800 million training data points
Binder identification in Gas Diffusion Layer
Binder identification in Gas Diffusion Layer

Fibers: 17%
Binder: 28%
Separating individual fibers allows to get more precise statistics out of micro-CT images

- Fiber length
- Fiber curvature
- Fiber shape

We deploy the same technic as before to identify fiber contact points
Fiber identification in a GFRP
Thank You!

Visit us @ our booth on the ground floor and @ www.geodict.com