LANIKA SOLUTIONS

FEI™

Avizo for Materials Science

Advanced 3D visualization and analysis software

Avizo® software is the advanced 3D visualization and analysis software application for exploring materials science data from tomography, microscopy, MRI, and more techniques. From straightforward visualization and measurement to advanced image processing, quantification and skeletonization, Avizo provides a comprehensive, multimodality digital lab for advanced 2D and 3D visualization, materials characterization, 3D model generation for FEA, and calculation of physical properties.

↑ **Porosity study in ceramic carrier (Sponceram®).** Courtesy of Zellwerk GmbH

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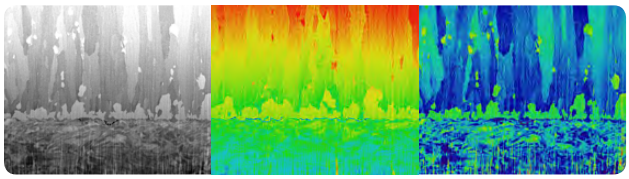
Key Features

Avizo delivers advanced 3D imaging workflows for scientists and engineers who require insight into the details of materials properties on full 3D structures, at any scale and size, in a wide range of materials science research areas and for many types of materials (porous materials, metals and alloys, fibrous materials, and composites).

Import and process

- Handle any modality, at any scale, of any size:
  - X-ray tomography: CT, micro-/nano-CT, synchrotron
  - Microscopy: electron and optical
  - Other acquisition techniques (MRI, radiography, etc.)
- Support for multi-data/multi-view, multi-channel, time series, very large data
- Scaling, calibration, conversion, re-sampling
- Image enhancement, comprehensive filtering and convolution, Fourier frequency transforms
- Image stacks alignment, registration, arithmetic, correlation, fusion



↑ **FIB/SEM imaging of Tin (Sn) Whiskers and Hillocks.** Shadowing correction. Courtesy of M. Williams, K-W. Moon, W. Boettinger - NIST, National Institute for Standards and Technology, Metallurgy Division

Visualize and explore

- Interactive high-quality volume visualization
- Orthogonal, oblique, cylindrical, and curved slicing
- Contouring and iso-surface extraction
- Data features highlighted on-the-fly with image filtering (contrast control, histogram equalization, dynamic colormap and opacity on slices or volumes, etc.)

Segment

- Thresholding and auto-segmentation, object separation, automatic labeling
- Region growing, snakes, interpolation, wrapping, smoothing
- Morphological processing, including watershed and basins
- 3D surface reconstruction and tetrahedral grid generation
- Skeletonization

Analyze and measure

- Built-in measurements, including counts, volumes, areas, perimeters, aspect ratios, and orientations
- User-defined measures
- Results viewer with spreadsheet tool and charting
- Automatic individual feature measurements, 3D localization, and spreadsheet selection
- Automated statistics, distributions graphs
- Feature filtering using any measurement criterion
- Geometry registration, measurements and comparison
- Porosity detection and measurement
- Fiber analysis with Avizo XFiber
- Bridge with Matlab® and LabView
- Pre-processing for structural and flow simulations

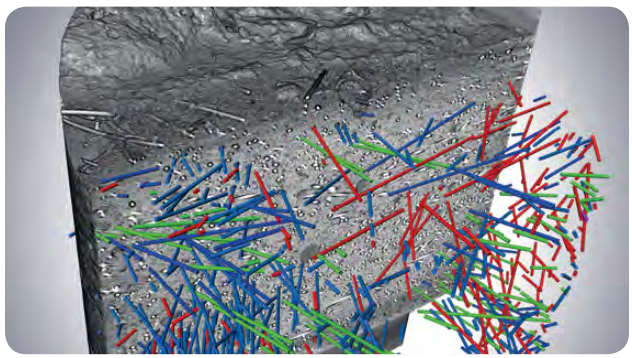
Present

- Video generation
- Advanced key frame and object animation
- Mix images, geometric models, measurements, and simulations
- Annotations, measures legends, histograms, and curves plots
- Export spreadsheets, 3D models, high-quality images

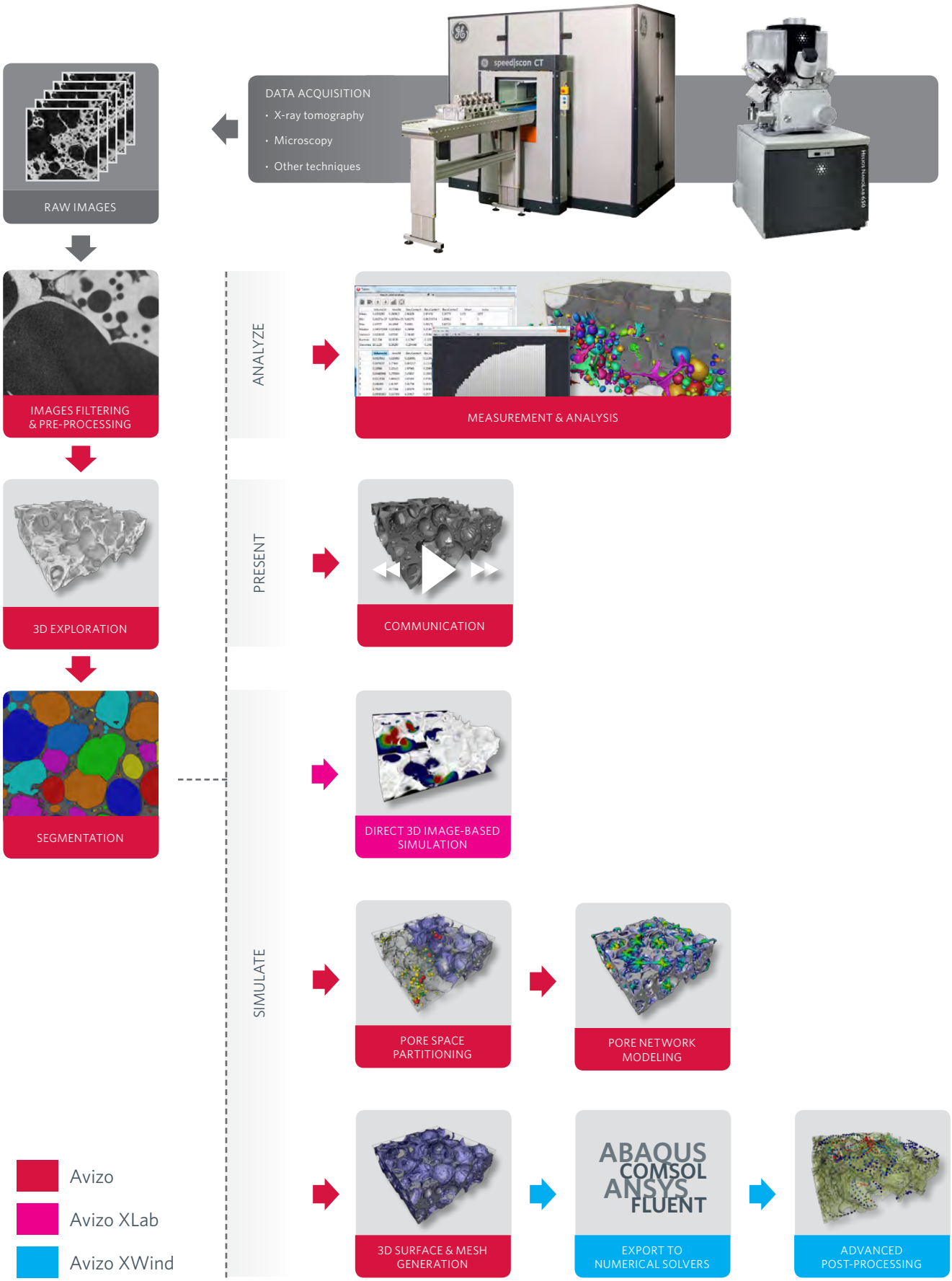
Simulate

Image-to-simulation workflows:

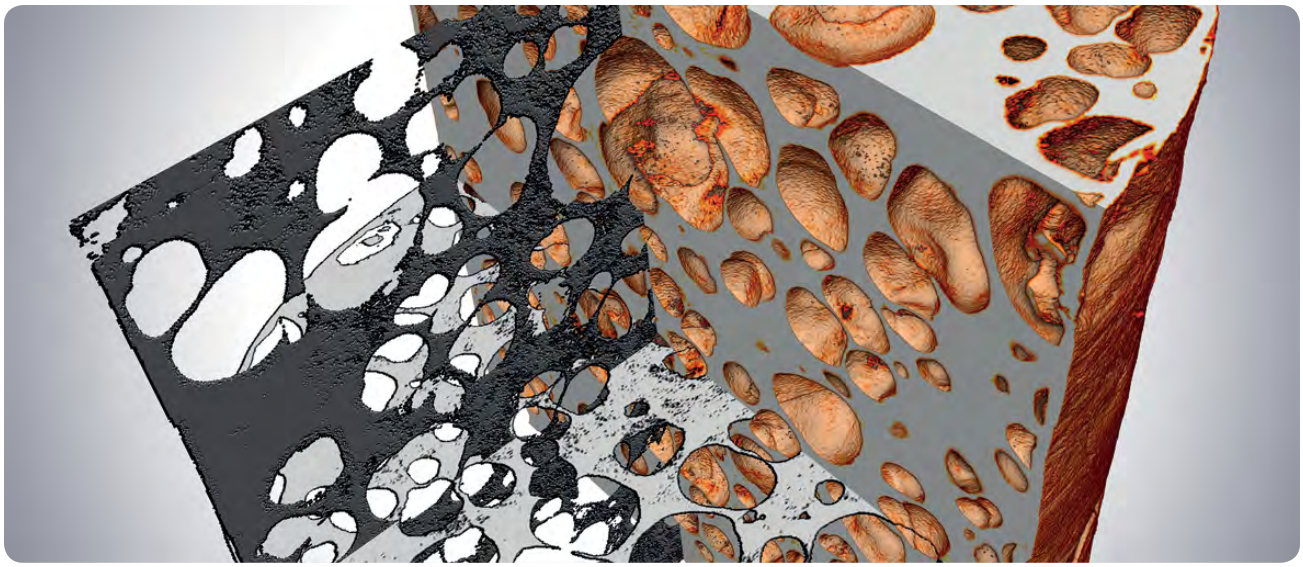
- 3D image-based meshing for Finite Element and CFD simulations, export to FEA/CFD solvers* and advanced post-processing of simulation results* (*with Avizo XWind)
- Porosity/pore connectivity analysis and skeletonization for Pore Network Modeling
- Direct 3D image-based simulation: absolute permeability, molecular diffusivity, electrical resistivity, and thermal conductivity computation with Avizo XLab



↑ **Ultra-High Performance Fiber Reinforced Concrete (UHPFRC).** Fiber separation, orientation calculation, and visualization. Courtesy of Dr. A. Mauko and Dr. A. Sajna - Slovenian National Building and Civil Engineering Institute (ZAG)



↑ **Avizo and extensions.** From 3D-image-to-simulation workflow



↑ **Amorphous metallic foam.**

All-in-one software application

Avizo is a powerful, multifaceted software for visualizing, manipulating, and understanding scientific and industrial data in materials science, natural resources, industrial inspection and electronics.

For materials science, Avizo provides a comprehensive, multimodality digital lab for advanced 2D and 3D visualization, materials characterization, reconstruction of 3D models, pore networks analysis and calculation of physical properties.

For natural resources, industrial inspection and electronics, please read the relevant literature published on our website.

Customize and expand Avizo

Avizo high-end visualization and analysis software offers a flexible, configurable research and analysis studio. More than just a ready-to-use software application, Avizo is the ideal software framework for custom 2D/3D analysis applications.

Avizo's expandability makes it an ideal open framework for organizations that require rapid software customization to address their specific 2D/3D data visualization and analysis needs. Use the built-in scripting language to customize Avizo and easily automate tasks and workflows.

Use the Avizo XPand extension to create new custom components such as file readers and writers, to integrate computation routines, and even to develop new visualization modules.

Powerful extensions for building solutions

- **XLab** enables the computation of material physical properties based on 3D images.
- **XFiber** provides specific support for analyzing fibers, filaments, tunnels, and other networks or tree-like structures.
- **XWind** is dedicated to advanced post-processing of simulation data, ranging from flow to thermal, and stress data.
- **XPand** enables the creation of custom extensions using the C++ Avizo open framework.
- **XLVolume** manages and visualizes up to several terabytes of data, increasing the available system memory.
- **XScreen** and **XTeam** enable collaborative, high-resolution and immersive environments.

Avizo is available for Windows®, Mac OS®, and Linux.

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