# Reversible skeletonization and applications to the characterization of porous media

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**ABSTRACT:** Pore Network Models (PNM) are often used to compute flow and transport in porous media in order to investigate large volumes while keeping a fair representation of the pore space properties. By definition, PNM are topologically but not geometrically equivalent simplifications of the actual pore network, which therefore cannot be reconstructed from the PNM. An optimal skeletonization algorithm would keep the media relevant geometrical and topological features as well as macroscopic properties.

Here we present a fast and quasi-reversible skeletonization algorithm applied to compute the surface- and curve skeletons of porous media, which leads to two- and one-dimensional reductions of the pore space. Assigning to each point of the skeleton its distance to the interface yields the so-called weighted skeleton, from which the pore space can be reconstructed. Surface- and curve skeletons can be computed for different discrete distances approximating the usual Euclidean distance. Reconstruction of the medium is then performed, making possible to compare critical structural parameters (e.g. tortuosity, surface-to-volume) and macroscopic properties (e.g. porosity, diffusivity, permeability) with those computed from the original three-dimensional representation of the porous medium.