

Porous Media: from Experimental Images to Networks, Topology, and Performance

Advisors: Linda Cummings, Jonathan Jaquette & Lou Kondic

This project focuses on connecting the structure and performance of porous media, a problem relevant to numerous applications from secondary oil recovery to the design of better batteries. The project is conducted jointly with experimental researchers from PUC, Brazil, who provide detailed information about the material structure via high-resolution CT scans, with the figure on the right showing an example.. These scans are then analyzed using the tools emerging from computational topology, which allows for quantifying porous material. The quantification is carried out using persistent homology, which is by now an established method used for the quantification of images as well as networks. This interdisciplinary project involves further development of computational methods and image analysis, with extensions to include machine learning and further development in the field of big data, statistical analysis, and data reduction techniques.

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