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**Title:** Pore Network Modeling and Quantitative Analysis of Volumetric Images: Introduction to OpenPNM and PoreSpy

**Abstract/Description:** In this workshop we will cover the use of volumetric or 3D images of porous materials, typically obtained from X-ray tomograph, to study structural and transport properties of computationally. The first half of this workshop will focus on image analysis using tools such as ImageJ and PoreSpy, the latter of which is a Python package we develop and distribute freely. Topics in this segment will span the entire workflow from discussing typical data formats, processing greyscale images, applying simple filters like dilation/erosion, extracting higher level information such as pore size distributions, to finally performing simulations on images to obtain basic transport properties. The second segment will shift to looking at pore network modeling using OpenPNM, a Python package that is also developed by our group and distributed freely. Topics covered here will include the fundamentals of the pore network framework including network representation and determination of conductance values, generating and importing networks, performing multiphase simulations to estimate complex transport properties such as relative permeability curves, and finally ending with a simulation of dispersion in porous media. The program will be interactive, so attendees should bring a laptop and have ImageJ and the Anaconda distribution of Python installed, which includes precompiled and optimized versions of the main numerical packages. Familiarity the Python would be helpful, but attendees with knowledge of other languages such as Matlab or C/C++ should be able to grasp all the concepts with ease.



**Biography:** Jeff Gostick is the Azzam-Dullien Professor in Chemical Engineering at the University of Waterloo where he runs the Porous Materials Engineering & Analysis Lab. His research is centered around understanding the structure-performance relationship in porous electrodes used in hydrogen fuel cell, redox flow systems, zinc-air cells, Li-ion batteries, and super-capacitors. His group uses a combination experimental characterization, novel production methods, and advanced custom computational tools. He is the lead developer of the open-source pore network modeling project OpenPNM ([openpnm.org](http://openpnm.org)), as well as PoreSpy, a tool for porous media image analysis ([porespy.org](http://porespy.org)). Prof Gostick is a licensed professional engineer, has published over 90 journal articles, and was recently named an Emerging Leader by the Canadian Society for Chemical Engineering.