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Estimating microvascular leakage in multiple sclerosis lesions from perfusion MRI data

DS applications and challenges in Medicine, Natural Sciences, and Engineering

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Abstract

We present a model to estimate capillary leakage in multiple sclerosis (MS) lesions [1]. It comprises a forward model for flow and mass transport in a one-dimensional microvascular network graph embedded in a three-dimensional porous tissue matrix. This forward model is used to predict the distribution of contrast agent within a single MRI voxel. Bayesian parameter inference is then applied to relate model parameters, such as diffusive capillary wall conductivity, to perfusion MRI data. We will show that diffusive capillary wall conductivity is a good parameter for MS lesion activity.

[1] Koch T., Flemisch B., Helmig R., Wiest R., Obrist D. A multi-scale sub-voxel perfusion model to estimate diffusive capillary wall conductivity in multiple sclerosis lesions from perfusion MRI data, Int J Numer Meth Biomed Engng 36:e3298, doi: 10.1002/cnm.3298, 2019.