
Characterising fractal Brownian motion clouds with Convolutional Neural Networks

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Abstract

We describe an algorithm for constructing fractal Brownian motion clouds, characterised by three parameters: the fractal dimension, D (which determines the power spectrum of fluctuations), the density scaling parameter, S (which determines the density contrast between large and small structures), and the dynamic range, R (which determines the range of scales over which structure is resolved – due to either observational or numerical limitations). R is always known ab initio for any data set. We show that the other two parameters (D and S) can be estimated very accurately using a well-trained Convolutional Neural Network (CNN). In contrast, Delta Variance can only estimate D , and does so more slowly (in terms of computing overhead) and less accurately than the CNN. We conclude with a discussion of the limitations of this technique.

Keywords: fractal Brownian motion, Convolutional Neural Network

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