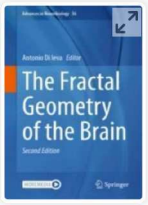

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Fractal Analysis in Clinical Neurosciences: An Overview

Antonio Di Ieva

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Abstract

Over the last years, fractals have entered into the realms of clinical neurosciences. The whole brain and its components (i.e., neurons and astrocytes) have been studied as fractal objects, and even more relevant, the fractal-based quantification of the geometrical complexity of histopathological and neuroradiological images as well as neurophysiopathological time series has suggested the existence of a gradient in the pattern representation of neurological diseases. Computational fractal-based parameters have been suggested as potential diagnostic and prognostic biomarkers in different brain diseases, including brain tumors, neurodegeneration, epilepsy, demyelinating diseases, cerebrovascular malformations, and psychiatric disorders as well. This chapter and the entire third section of this book are focused on practical applications of computational fractal-based analysis into the clinical neurosciences, namely, neurology and neuropsychiatry, neuroradiology and neurosurgery, neuropathology, neuro-

oncology and neurorehabilitation, neuro-ophthalmology, and cognitive neurosciences, with special emphasis on the translation of the fractal dimension and other fractal parameters as clinical biomarkers useful from bench to bedside.

Keywords

Biomarker **Classifier** **Fractal analysis**

Fractal dimension **Brain tumor** **Epilepsy**

Neurodegeneration **Aneurysm**

Arteriovenous malformation **Electroencephalography**

Neuroimaging **Neurology** **Neuro-ophthalmology**

Cognitive neurosciences **Psychiatry**

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