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Mathematical Model of Tumor Spheroid with Real-Time Cell Cycle and Physics-Informed Neural Networks

Communication Info

Authors:
Hamza AGUEDJIG[1]
Sidi Mohamed DOUIRI [1]
Imad EL HARRAKI [2]
Mohammed EL HAMMANI [3]

[1] Department of Mathematics, Faculty of sciences, Mohamed V university in Rabat
[2] Industrial engineering Department, ENSMR, Rabat

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Abstract

In this work, we develop a continuous mathematical model aimed at describing the spatiotemporal organization of an avascular tumor spheroid by explicitly integrating experimental information provided by FUCCI imaging. The starting point is our previous model in radial geometry, in which tumor growth was studied under the assumption of spherical symmetry. Although this framework is relevant for idealized spheroids, it becomes insufficient when considering real, often irregular geometries observed experimentally.
In order to eliminate any ambiguity related to the moving boundary and to naturally prepare for the use of imaging data, we adopt a different conceptual framework here: the problem is posed on a fixed spatial domain $\Omega \subset \mathbb{R}^2$. This domain represents a computational region large enough to contain the spheroid during the evolution under consideration. Tumor growth is therefore no longer modeled as an explicit expansion of the domain, but as an internal

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