

A stochastic hierarchical model for low grade glioma evolution | Amira Meddah

A stochastic hierarchical model for the evolution of low grade gliomas is proposed. Starting with the description of cell motion using a piecewise diffusion Markov process (PDifMP) at the cellular level, we derive an equation for the density of the transition probability of this Markov process based on the generalised Fokker-Planck equation. Then, a macroscopic model is derived via parabolic limit and Hilbert expansions in the moment equations. After setting up the model, we perform several numerical tests to study the role of the local characteristics and the extended generator of the PDifMP in the process of tumour progression. The main aim focuses on understanding how the variations of the jump rate function of this process at the microscopic scale and the diffusion coefficient at the macroscopic scale are related to the diffusive behaviour of the glioma cells and to the onset of malignancy, i.e., the transition from low-grade to high-grade gliomas.

Evelyn buckwar, Martina Conte, Amira Meddah

INTERNATIONAL CONFERENCE ON
MATHEMATICAL NEUROSCIENCE

June 17 - 20, 2025

PRBB, Barcelona