



Online
seminar

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Hosted on: [Zoom](#)

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Mathematical models for glioma migration and invasion in the brain

Prof. Preziosi introduces the seminar.

Abstract

Gliomas are the most prevalent, aggressive, and invasive subtype of primary brain tumors, characterized by rapid cell proliferation and great infiltration capacity. Glioma migration and invasion is a complex phenomenon and little is still known about the underlying mechanisms that lead to tumor progression. Exploiting the inherently multi-scale nature of tumor evolution, in this talk, we present several mathematical models studying various aspects of glioma progression in relation to the microscopic and macroscopic scales characterizing this process.

Based on a kinetic approach, we propose a multiscale mathematical model to analyze the influence of the anisotropic fiber structures on tumor cell migration, showing how the fiber network directs cell migration along preferential paths. We extend this study to include the role of microenvironmental acidity and vasculature in tumor progression. This extension defines a model capable of reproducing the influence of these elements on the emergence of phenotypic heterogeneity and hypoxia-related features, which are hallmarks of glioma progression. Moreover, we investigate the role of cell protrusions from a non-local perspective, analyzing the emergence of collaborative or competitive effects between different cues driving cell migration. From a macroscopic viewpoint, we develop an integrated mathematical approach, where the mathematical model incorporates experimental data of protein distributions in gliomas. We evaluate the emergence of tumor propagation fronts and their dynamical and heterogenous evolution in relation to changes in the microenvironment.

Biography

Martina Conte received her B.Sc. and M.Sc. degree in Mathematics from the University of Parma in 2015 and 2017, respectively. In 2017, she joined the Basque Center for Applied Mathematics (BCAM) as a Ph.D. student in the framework of the INPhNIT "laCaixa" / Marie Skłodowska-Curie Doctoral Fellowship Programme within the Mathematical and Theoretical Biology research line. She received her Ph.D. from the University of the Basque Country in January 2021.

Her research interests include multiscale modeling of biological and medical problems, valuing both the modeling and the numerical aspects, kinetic equations, macroscopic limits, nonlinear dynamics, data analysis and their integration in the modeling.