FAU
CHARLES E. SCHMIDT COLLEGE OF SCIENCE
Department of Mathematical Sciences
Florida Atlantic University

The FAU-SIAM student chapter invites you to a talk by

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Traveling Wave Solutions in Some Reaction Diffusion Models of Glioblastoma Growth

Friday February 19th, 2021, 4:00pm EST

Open to all

Live on Zoom (Meeting ID: 829 1824 9336, passcode: Spring2021)

Abstract

Glioblastoma multiforme (GBM) is an aggressive brain cancer that is extremely fatal. It is characterized by both proliferation and large amounts of migration, which contributes to the di difficulty of treatment. Based on the so-called go or grow hypothesis, existing models of GBM growth often include two separate equations to model proliferation or migration processes. Based on a well known in vitro experiment data set of GBM growth, we formulate, validate, simulate, study and compare two plausible models of GBM growth. We propose first a single equation which uses density dependent diffusion to capture the behavior of both proliferation and migration. We analyze the model to determine the existence of traveling wave solutions. To prove the viability of the density-dependent diffusion function chosen, we compare our model with the in vitro experimental data. Our second model is build on the Go or Grow hypothesis since glioma cells tend to exhibit a dichotomous behavior: a cell either primarily proliferates or primarily migrates. We analytically investigate an extreme form of the Go or Grow hypothesis where tumor cell motility and cell proliferation are considered as separate processes. Different solution types are examined via approximate solution of traveling wave equations and we determine conditions for various wave front forms.

About the speaker

Dr. Kuang is a professor of mathematics at ASU since 1988. He received his B.Sc from the University of Science and Technology of China in 1984 and his Ph.D in mathematics in 1988 from the University of Alberta. Dr. Kuang is the author of more than 180 refereed journal publications and 16 books and the founder and editor of Mathematical Biosciences and Engineering. He has directed 23 Ph.D dissertations in mathematical and computational biology and several major multi-disciplinary research projects in the US. He is well known for his efforts in developing practical theories to the study of DDEs models and models incorporating resource quality in biology and medicine. His recent research interests focus on the formulation and validation of scientifically well-grounded and computationally tractable mathematical models to describe the rich and intriguing dynamics of various within-host diseases and their treatments.

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