

# ROLE OF MATHEMATICAL AND COMPUTATIONAL MODELING IN CANCER RESEARCH

USACM THEMATIC CONFERENCE, JANUARY 10-11, 2022

[SITES.GOOGLE.COM/USACM.ORG/BIO-MCR](https://sites.google.com/usacm.org/bio-mcr)

VIRTUAL EVENT

## ABSTRACT

Cancer is a multiscale phenomenon in both time and space and represents one of the biggest challenges for computational scientists and medical researchers. Disturbance at a small scale, such as dormant genes made active, or damage, mutation, and epigenetic modifications in DNA results in the creation of abnormal cells which can initiate cancer. Subsequently, an increase in the population of these abnormal cells disrupts the equilibrium and usual functioning of tissues, leading to the failure of diseased organs. The data that inform various aspects of the disease and the data that resolves the multiple scales such as sub-cellular, cellular, and tissue scale, are sparse and high dimensional. This makes the extraction of valuable information challenging, and data alone is not sufficient to forecast the progress of the disease. For a complex system with emerging properties like cancer, the whole cannot be broken down into its constituent parts without loss. Hence, quantitative models to link and interpret observations in data across scales – both spatial and temporal – are crucial for the comprehensive understanding of cancer development.

Mathematical and computational models based on general conservation laws and the hallmarks of cancer offer the opportunity to fill the gaps in data. Once calibrated and validated, models provide many advantages, such as i) prediction of the disease evolution, ii) prediction of treatment effects, iii) optimal treatment plans. In addition, new emerging biomedical imaging techniques and advanced image processing allow experts to acquire more details about the tumor and the surrounding microenvironment; this information can be directly integrated with models allowing patient-specific simulation of disease and treatment effects.

This conference seeks to bring leading computational oncology experts together in one platform to share their work and vision for integrating quantitative biological data with mechanistic mathematical models.

## ORGANIZING COMMITTEE

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## TENTATIVE SESSIONS

1. *MATHEMATICAL MODELING OF TUMOR GROWTH – FUNDAMENTAL IDEAS (PART 1 AND PART 2)*
2. *INTEGRATING DATA WITH MODELS – ADVANCES AND CHALLENGES (PART 1 AND PART 2)*
3. *EMERGING OPPORTUNITIES -- ADVANCED MODELING AND IMAGING TECHNIQUES (PART 1 AND PART 2)*
5. *POSTER SESSION*