Comparative investigation of mathematical models describing tumor-microenvironment interactions with application on a certain problem

Background and Motivation:
A tumour can be seen as an expanding population of transformed cells. The growth of this population can be supported by its surrounding microenvironment. The entire process is a complex topic, which remains to date largely unknown. Different aspects of these interactions have been investigated experimentally. Mathematical modelling has been used to describe the experimental data, in order to understand the underlying interactions between the tumour and its microenvironment. The models are based on different modelling approaches (discrete or continuous, stochastic or deterministic) in relation to the data given and the physical assumptions. Different approaches are combined in hybrid models; for example a continuum model can be used in regions with a high tumour density and a discrete model in regions with a lower cell density. Furthermore, multiscaling models are used to include different spatial and temporal scales into one model in a controlled manner.

Aim of the Project:
First, different mathematical modelling approaches are to be investigated comprehensively in terms of the mathematical background. Afterwards the modelling is applied to a certain problem of tumor-microenvironment interactions.