Looks into the Heart — with Mathematics

Martin Burger (Univ. Münster)

The prevention, diagnosis, and therapy of cardiovascular diseases is an important issue in modern medicine, with an increasing demand on interdisciplinary investigations and mathematical In this talk we discuss mathematical aspects of noninvasive cardiovascular imaging in humans and small animals. We shall focus in particular on functional techniques such as PET and electrocardiographic reconstructions from body surface potential maps. All these problems re ill-posed inverse problems, characterized by an unstable dependence of the solution on the measured (noisy) data. Therefore regularization methods incorporating prior knowledge on cardiovascular physiology are of essential importance. We shall highlight the success and future potential of nonlinear inversion schemes based on nonsmooth variational models or / and nonlinear physiological models, and discuss the related mathematical issues.