***Variational models and partial differential equations for mathematical imaging***

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Images are a rich source of beautiful mathematical formalism and analysis. Associated mathematical problems arise in functional and non-smooth analysis, the theory and numerical analysis of partial differential equations, harmonic, stochastic and statistical analysis, and optimisation. Starting with a discussion on the intrinsic structure of images and their mathematical representation, in this talk we will learn about variational models for image analysis and their connection to partial differential equations, and go all the way to the challenges of their mathematical analysis as well as the hurdles for solving these - typically non-smooth - models computationally. The talk is furnished with applications of the introduced models to image de-noising, motion estimation and segmentation, as well as their use in biomedical image reconstruction such as it appears in magnetic resonance imaging.