1125-92-1838 **Jamie Prezioso*** (jep127@case.edu), **Daniela Calvetti** (dxc57@case.edu) and **Erkki Somersalo** (ejs49@case.edu). *Inverse problem of cerebral hemodynamics with model uncertainty.*

Neuronal activity in brain is accompanied by a concomitant increase in cerebral blood flow, a phenomenon that is at the base of several functional imaging modalities, e.g., BOLD-fMRI and optical absorption and scattering tomography (OAST). Understanding the mechanism behind the neurovascular connection is important for the interpretation of the dynamic imaging results. Mathematical models of the brain hemodynamics assume a ballooning of the vessels to accommodate the additional blood, however many details of the model remain to be explained and several of the key parameters are poorly known. In this talk we address the question of identifying the vascular compartment accommodating the increase in blood volume and estimating the shape of the underlying vasodilatatory stimulus from the cerebral blood flow data. Bayesian hierarchical models are used to find a physiologically meaningful stimulus as the solution of a nested sequence on inverse problems. Moreover, we introduce a statistical modeling error term to account for the uncertainty in the model parameters. Computed examples illustrate the effectiveness of the proposed approach and the need for uncertainty quantification techniques. (Received September 19, 2016)