Inverse Problems Network Meeting 3

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Abstract of Talk

GENERALIZED LINEARIZATION IN ELECTRICAL IMPEDANCE TOMOGRAPHY

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Electrical impedance tomography aims at reconstructing the interior electrical conductivity from surface measurements of currents and voltages. As the current-voltage pairs depend nonlinearly on the conductivity, impedance tomography leads to a nonlinear inverse problem. Often, the forward problem is linearized with respect to the conductivity and the resulting linear inverse problem is regarded as a subproblem in an iterative algorithm or as a simple reconstruction method as such. In this paper, we compare this basic linearization approach to linearizations with respect to the resistivity or the logarithm of the conductivity. It is numerically demonstrated that the conductivity linearization often results in compromised accuracy. Inspired by these observations, we present and analyze a new linearization technique which is based on the logarithm of the Neumann-to-Dirichlet operator. The method is directly applicable to discrete settings, including the complete electrode model. We also consider Frechet derivatives of the logarithmic operators. Numerical examples indicate that the proposed method is an accurate way of linearizing the problem of electrical impedance tomography.