1145-49-611 **Ugur Abdulla**, **Vladislav Bukshtynov** and **Saleheh Seif*** (sseif2014@my.fit.edu), 316 Georgetown avenue, Melbourne, FL 32901. *Breast Cancer Detection through Electrical Impedance Tomography and Optimal Control Theory: Theoretical and Computational Analysis.*

The Inverse Electrical Impedance Tomography (EIT) problem on recovering electrical conductivity tensor and potential in the body based on the measurement of the boundary voltages on the electrodes for a given electrode current is analyzed. A PDE constrained optimal control framework in Besov space is pursued, where the electrical conductivity tensor and boundary voltages are control parameters, and the cost functional is the norm declinations of the boundary electrode current from the given current pattern and boundary electrode voltages from the measurements. The state vector is a solution of the second order elliptic PDE in divergence form with bounded measurable coefficients under mixed Neumann/Robin type boundary condition. Existence of the optimal control and Fréchet differentiability in the Besov space setting is proved. The formula for the Fréchet gradient and optimality condition is derived. Extensive numerical analysis is pursued in the 2D case by implementing the projective gradient method, re-parameterization via principal component analysis (PCA) and Tikhonov regularization. (Received September 11, 2018)