Tomography Using Photons and Sound

Simon Arridge

Department of Computer Science, University College London, United Kingdom

Email: S.Arridge@cs.ucl.ac.uk

In the last 20 years there has been considerable attention in imaging using optical and near-infrared light. Several different techniques exist for indirectly recovering the optical absorption and/or scattering coefficients of biological objects, and from there to inferring concentrations of chromophores of interest, from observations of transmitted and reflected light at multiple wavelengths; these include diffuse optical tomography, fluorescence optical tomography, and bioluminescence tomography. A fundamental problem with these methods is the high degree of scattering experienced by photons propagating in tissue. Coupled Physics Imaging methods offer a resolution to this problem by detecting the optical contrast with a discontinuity-preserving physical mechanism such as acoustic propagation. In particular, photoacoustic tomography (PAT) combines high multispectral contrast with high spatial resolution; combining acoustic and optical models allows for quantitative inference. IN this talk I will present and overview of progress in this area as well as recent results on accelerating PAT using Compressed Sensing and Machine Learning techniques.

Joint Work with P.Beard, M.Betcke, B.Cox, A. Hauptman, N.Huynh, F.Lucka, A. Pulkkinen, T. Tarvainen, J. Tick.

References:

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