Inverse problems arising in biomedical imaging

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In modern medical and industrial remote sensing, images cannot be measured directly but are reconstructed from other, measurable parameters by solving a so-called "inverse problem". Frequently, such a problem consists of finding a spatially varying coefficient of a partial differential equation, from the values of the solution measured at the boundary of a domain. Alternatively, some inverse problems can be formulated in terms of integral geometry.

A researcher working on inverse problems learns and uses a diverse set of mathematical tools. These include partial differential equations, integral geometry, Fourier analysis, and numerical methods. Deep learning techniques also find an ever increasing use in this area.

I will outline some of the simplest, classical inverse problems and indicate how they can be solved. I will also present recent results of my group on mathematics of emerging modalities of biomedical imaging.