Basics of Image Reconstruction in MPI

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In Magnetic Particle Imaging (MPI), image reconstruction is commonly performed using two main approaches: system function reconstruction (SFR) and x-space reconstruction. SFR exploits the linearity of the MPI signal with respect to magnetic nanoparticle (MNP) concentration and formulates image reconstruction as a linear system of equations based on the measured or modeled MNP response at predefined grid locations. X-space reconstruction, on the other hand, assumes both linearity and shift invariance, and describes image formation as the convolution of the MNP distribution with the system point spread function (PSF). This talk will introduce the basic principles underlying these two reconstruction frameworks, highlighting their main assumptions, advantages, and limitations. Recent deep learning-based advances in MPI image reconstruction will also be briefly discussed.