Magnetic Resonance Fingerprinting: A Flexible Framework for Quantitative MR Imaging

Abstract: Current clinical Magnetic Resonance Imaging (MRI) is practically restricted to a qualitative or ‘weighted’ depiction of a limited set of tissue properties, which has run up against significant limitations on image interpretation, data analysis and diagnostic sensitivity and specificity. We have invented a flexible framework for quantitative MR, named Magnetic Resonance Fingerprinting (MRF), which is a radically different approach for MR image acquisition, post-processing and visualization. MRF is capable of providing multiple quantitative tissue properties simultaneously from a single scan with high robustness and repeatability, and more importantly, a high scan efficiency ready for clinical studies. In combination with advanced statistical and machine learning strategies, the multi-parametric maps of tissue property obtained from the MRF scan will enable more accurate disease diagnosis and treatment evaluation. With the inherent sensitivity to tissue microstructure, MRF maps will also provide better understanding of the disease pathology by multi-scale multi-modality analysis. This talk will introduce the general concepts, physics and implementation of MRF technology, and describe its main advantages that have led to a wide range of new research directions. Finally, I will discuss current and future clinical applications using MRF techniques.

Bio: Dr. Dan Ma is currently a research scientist in the Department of Radiology at Case Western Reserve University. She received her Ph. D degree in Biomedical Engineering department at Case Western Reserve University in 2015. Dr. Ma’s research focuses on developing fast quantitative MRI technologies and translating them into clinical impacts. She is one of the key inventors of Magnetic Resonance Fingerprinting that was published in Nature in 2013.