In the last decade, the concept of parallel MRI (pMRI) has been established in every day clinical routine to accelerate almost any MRI acquisition without compromising contrast and diagnostic value. This acceleration is accomplished by partially replacing time consuming spatial encoding with magnetic field gradients by receiver coil encoding. Before the advent of pMRI, the time to take an image has been restricted by the rate at which gradient encoding can be performed which is mainly limited by hardware restrictions and by biosafety concerns. pMRI overcomes these limits by using coil arrays and their spatially varying sensitivity patterns to accomplish a fraction of spatial encoding normally performed by gradients. Today, 2-3 fold image speed up with pMRI is routinely used in every day clinical practice and speed ups up to 10-fold and more have been demonstrated in selected applications.

The image reconstruction of pMRI accelerated data to form an image can be performed in various ways. Over the years many strategies have been developed and shown to successfully provide high quality diagnostic images accelerated by pMRI. The most prominent methods used today are SENSE and GRAPPA. While all these methods feature different strengths and weaknesses in certain imaging setups they are all subject of the same limitation, namely the loss in signal to noise ratio (SNR) as a consequence of reduced acquisition time and an additional term given by the encoding capabilities of the receiver array known as geometry (g-) factor.

In this presentation a brief history of parallel imaging will be given and the basics concepts of pMRI will be discussed. Traditional views of pMRI reconstructions operating in image space and k-space as well as different strategies for coil calibration (external vs self-calibration) will be subject of the talk. Finally, modern frameworks will be touched allowing to combine the concept of pMRI seamless with other acceleration strategies such as e.g. Compressed Sensing (CS).