Undersampled MRI reconstruction

Fully sampled MRI(**M**)

Fully sampled k-space(**Y**)
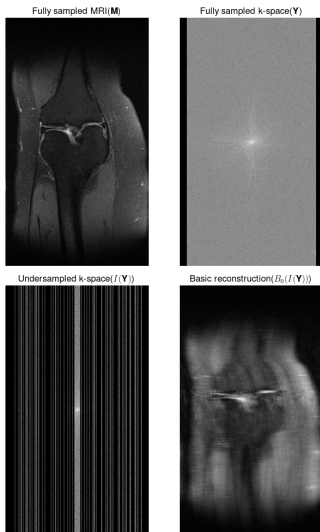
Undersampled k-space($I(\mathbf{Y})$)

Basic reconstruction($B_0(I(\mathbf{Y}))$)

1. $(\mathbf{M}, \mathbf{Y}) \in \mathcal{D}$ – Dataset
2. $\mathbf{M}, \mathbf{Y} \in \mathbb{R}^{k \times k}$, $\mathbf{Y} = \mathcal{F}(\mathbf{M})$ – MRI image and its Fourier transformation
3. $I : \mathbb{R}^{k \times k} \longrightarrow \mathbb{R}^{k \times k}$ – Filter function, which preserves other elements and zeroes other

The goal is to find function $B^* : \mathbb{R}^{k \times k} \longrightarrow \mathbb{R}^{k \times k}$ which minimizes the risk over the image distribution:

$$B^* = argmin_B R(B)$$

where

$$R(B) = \mathbb{E}_{\mathbf{Y}, \mathbf{M}}[L(B(I(\mathbf{Y})), \mathbf{M})]$$