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GLACIER: GoLden Angle CartesIan Encoded Randomization

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Motivation & Introduction

Various techniques have been proposed for dynamic contrast-enhanced MRI. Notably, Lebel tried optimized the sparse sampling by extending the Poisson disc (PD) to k_y-k_z-t space [1], and the golden angle (GA) method [2] provided flexible temporal resolution in the reconstruction. We have proposed an undersampling framework GoLden Angle CartesIan Encoded Randomization (GLACIER) [3] with a probability (P) for each phase encode. However, a careful evaluation of their performance of DCE MRI has been lacking.

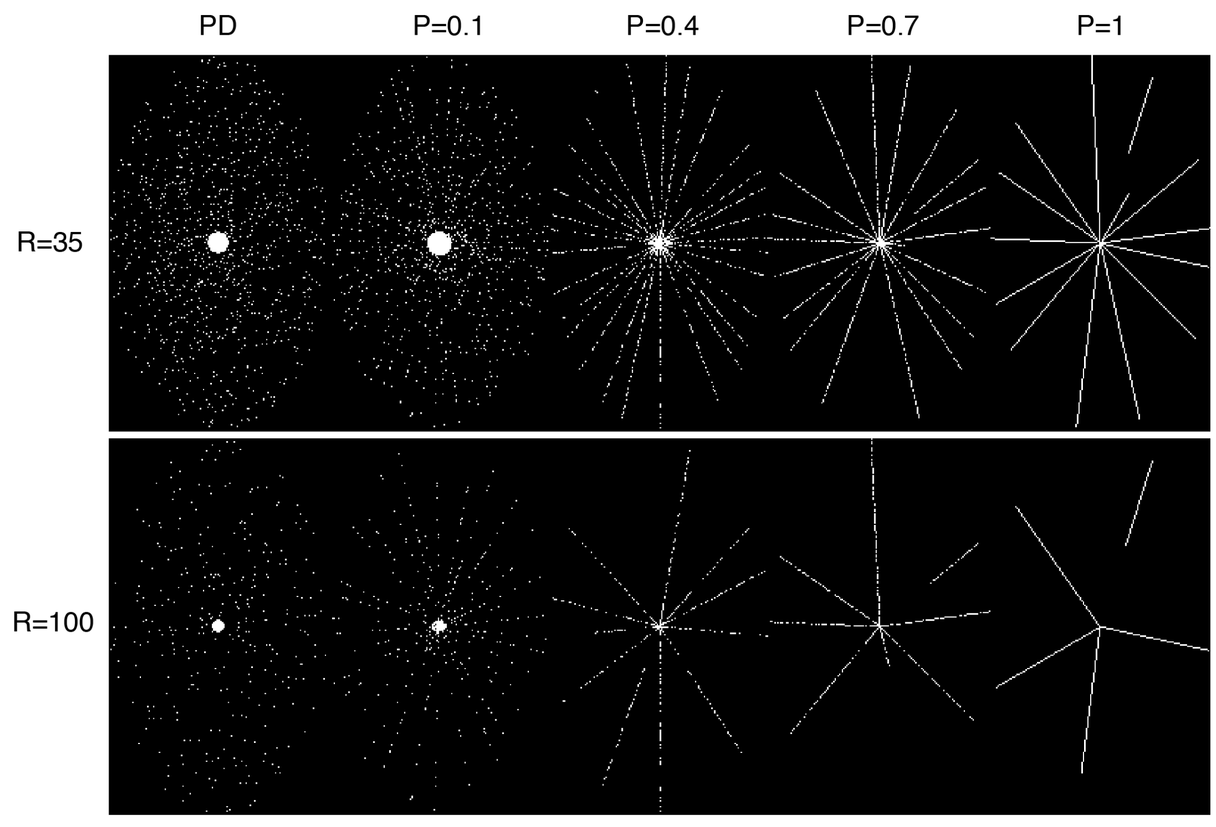

Figure 1. The PE's for single time frames for PD, GLACIER with P equals 0.1, 0.4, 0.7, and 1 (GA), when the reduction factor (R) equals to 35× and 100×.

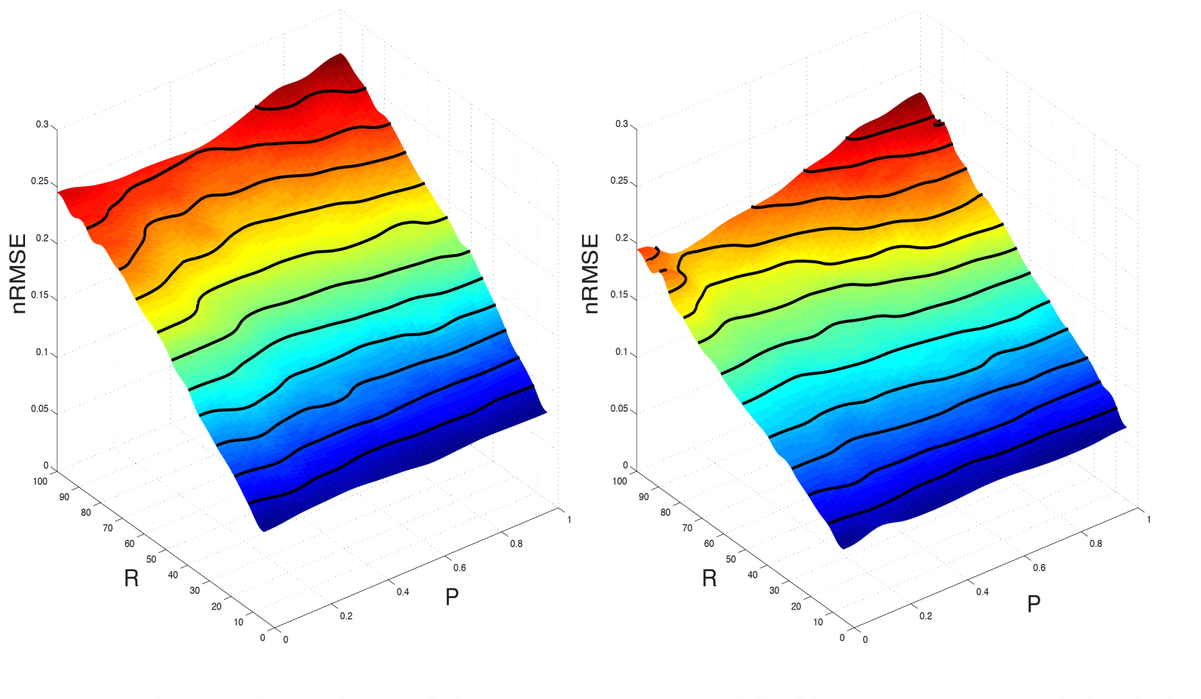

Figure 2. The surface plots of the mean nRMSE of (left) ROI tumor, and (right) ROI vessel. The 3D contours outlining equivalent nRMSE at various levels.

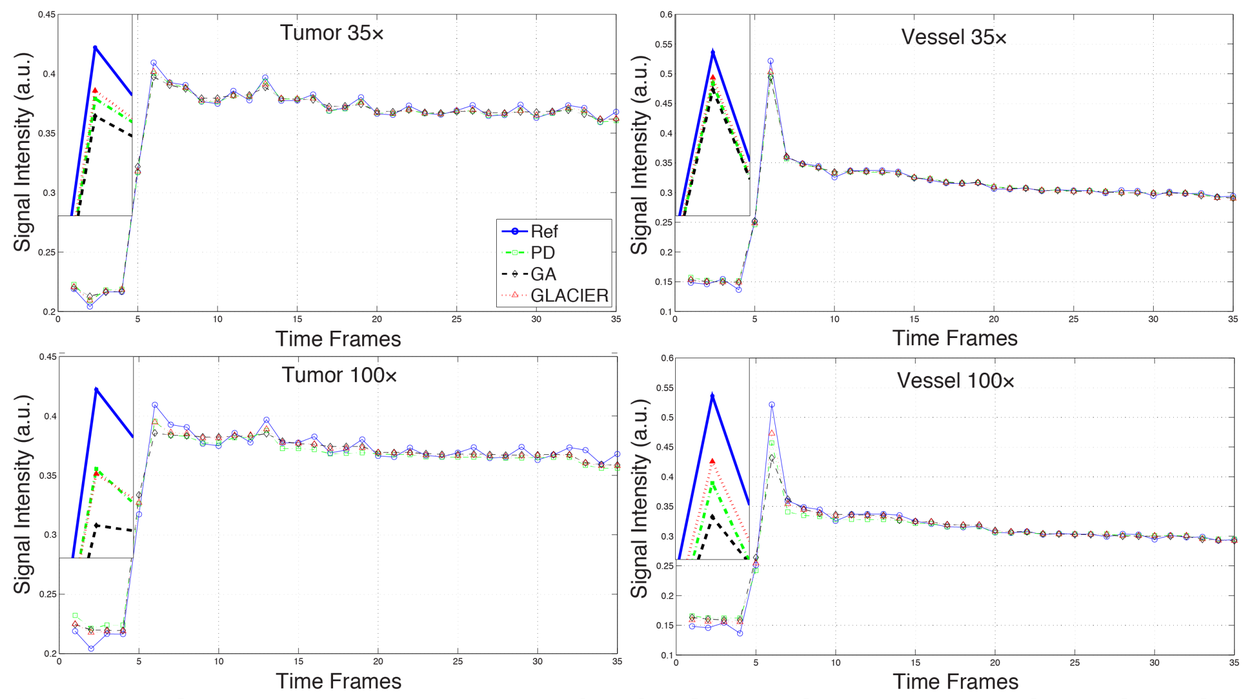

Figure 3. The time-intensity curves (TIC) of typical reconstructed results. The signal peak regions are enlarged on the left.

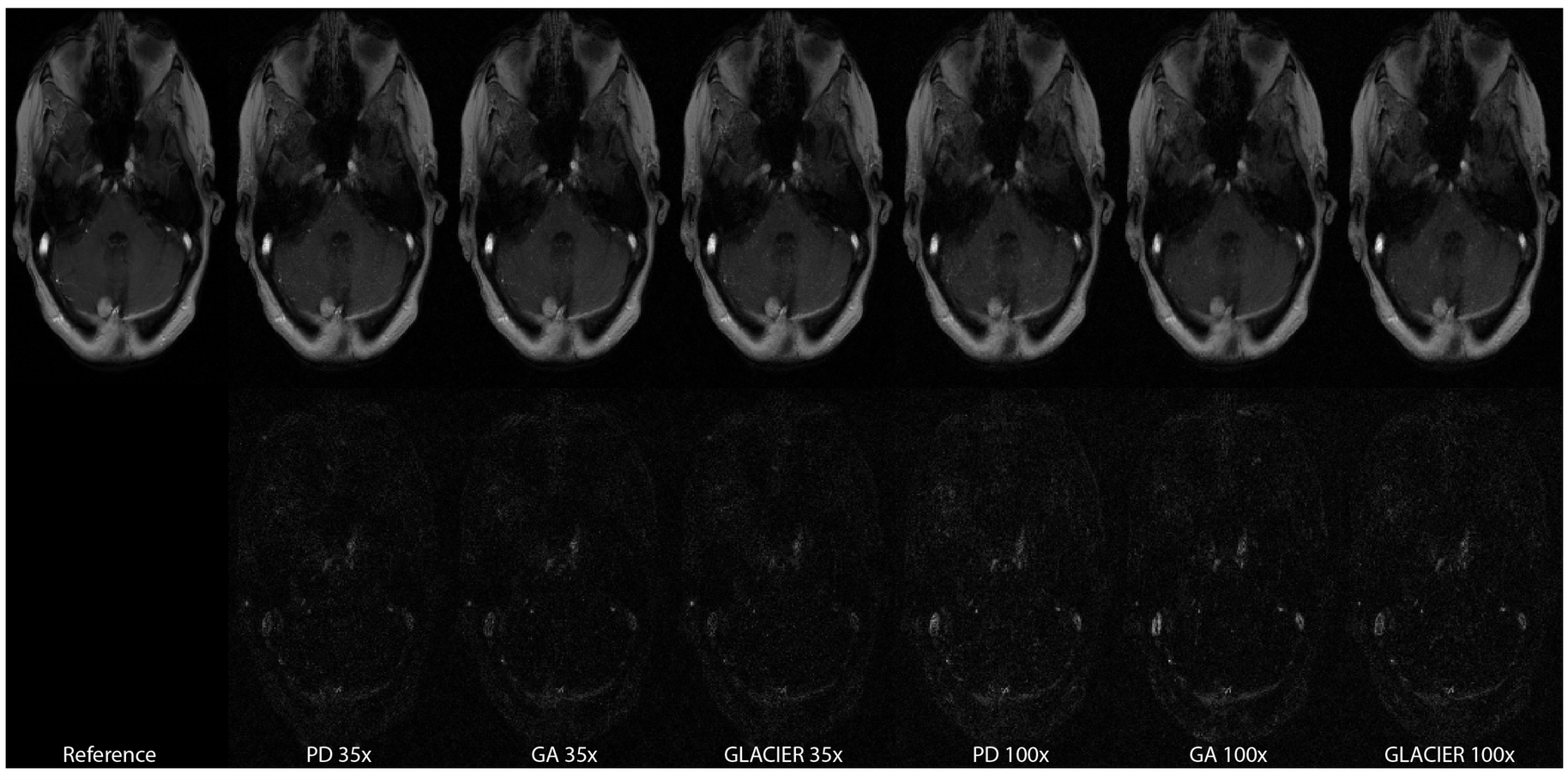

Figure 4. A single time frame of vessel signal peaks arrival from a meningioma patient. Results of PD, GA and GLACIER (P=0.3) are shown at R equals 35× and 100× (as labeled). Second row is the difference images between the reference and reconstructed undersampled images (intensity scaled by 2)..

Reference

[1] Lebel, et al., MRM, 2013; [2] Doneva, et al., ISMRM, p641, 2011; [3] Zhu, et al., ISMRM, p4365, 2014.

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