Redefining MRI:
From Image to Insight

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Predicting the Future for Fast Imaging

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MRI plays an indispensable role in modern clinical diagnostics; however, its lengthy data acquisition time remains a fundamental limitation that hinders clinical throughput. To overcome this, various acceleration techniques focused on reconstructing under-sampled data have been extensively explored. In this presentation, we introduce an innovative Generative Prior Framework that transcends the conventional reconstruction-centric approach, shifting towards a novel paradigm of 'proactive predictive imaging.'

The core concept of this research is "Predicting before Reconstruction." Instead of directly reconstructing highly under-sampled data, we leverage advanced generative models to proactively predict the target contrast image. This generative model synthesizes the target image by utilizing diverse data sources, including different contrast images, previous scan records, acquisition parameters, and patient information. The predicted image then serves as a powerful, data-driven informative prior that maximizes MRI acceleration.

Furthermore, we introduce an Image Inversion strategy to correct discrepancies between the predicted guide image and the actual target. This approach successfully integrates image editing techniques—which combine structural similarity modeling with difference correction—into the MRI reconstruction pipeline.

Consequently, the proposed prediction-prior reconstruction method demonstrates significantly superior performance in both image quality and convergence speed compared to zero-prior baselines or conventional alternative-prior methods. Through this presentation, we will explore how cutting-edge Generative AI and image editing technologies can be synergistically fused with MRI reconstruction, presenting a future roadmap for next-generation ultra-fast medical imaging.