Redefining MRI:
From Image to Insight

ICMRI 2026
THE 14th INTERNATIONAL CONGRESS ON MRI
& 37th ANNUAL SCIENTIFIC MEETING OF KSMRM

AUGUST 27 - 28, 2026
Grand Walkerhill Seoul, Seoul, Korea
https://icmri.ksmrm.org/2026m

인공지능의료영상 (AI for Medical Imaging & Applications 2)

SY07-2

Maximizing Metabolic Insights - Revealing Hidden Information in Hyperpolarized ^{13}C MRI through AI-Driven Denoising

Myriam Chaumeil

Head of Research, HP MRI Applied Science, NVision Imaging Technologies GmbH, Germany

Hyperpolarized ^{13}C MRI is an imaging modality that enables real-time, dynamic visualization of *in vivo* energy metabolism. By enhancing the Carbon-13 MR signal by a factor of over 10,000, this technique allows for the rapid tracking of metabolic tracers like pyruvate and its downstream products (e.g., lactate and bicarbonate).

The presentation begins with an introduction to key hyperpolarization techniques, including Dissolution Dynamic Nuclear Polarization (dDNP) and Parahydrogen-Induced Polarization (PHIP). We then review various application examples across oncology, neurology, and cardiology, illustrating how dynamic metabolite tracking enables disease subtyping, and detects early therapeutic responses.

Despite these powerful applications, the broader adoption of hyperpolarized MRI remains constrained, among other reasons, by low signal-to-noise ratios and spatial resolution limits. We will therefore discuss how these bottlenecks can be addressed using AI-driven post-processing techniques.

First, we introduce a super-resolution framework that significantly enhances image quality and region-of-interest delineation. Second, we present a novel phasor pipeline for metabolic segmentation that leverages k-means clustering on the temporal evolution of metabolite maps, successfully aligning functional metabolic data directly with anatomical structures while minimizing partial-volume effects.

Together, this overview demonstrates how AI-driven post-processing can improve both preclinical and clinical research capabilities, ultimately driving the broader adoption and clinical translation of hyperpolarized ^{13}C MRI.

Keywords: *Hyperpolarized ^{13}C MRI, Metabolic MRI, Multinuclear MRI, AI-driven post-processing, Phasor analysis*