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Standardized MRSI Data Analysis Platform – M.A.P.S.

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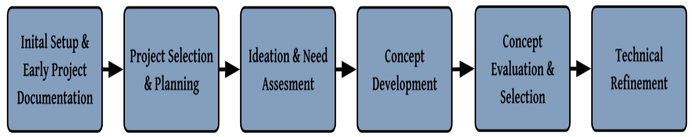
Background

Magnetic Resonance Spectroscopic Imaging (MRSI) provides metabolic information that goes beyond traditional MRI by measuring voxel-level biochemical signatures in the brain. Although over 40 million MRI procedures are performed annually in the U.S., MRSI remains significantly underutilized because there is no standardized, reliable software that can ingest, visualize, and compare spectroscopy data across different scanner manufacturers and file formats. Existing workflows are fragmented, slow, and often require manual conversions, making them inaccessible to clinicians and difficult to integrate into research pipelines. Our project addresses this gap by developing M.A.P.S., a unified, user-friendly platform built in Napari (a modern and widely used software for medical data visualization) complemented by a Command Line Interface (CLI) for efficient data processing and testing. These tools streamline MRSI data loading, quality control, visualization in one unified environment.

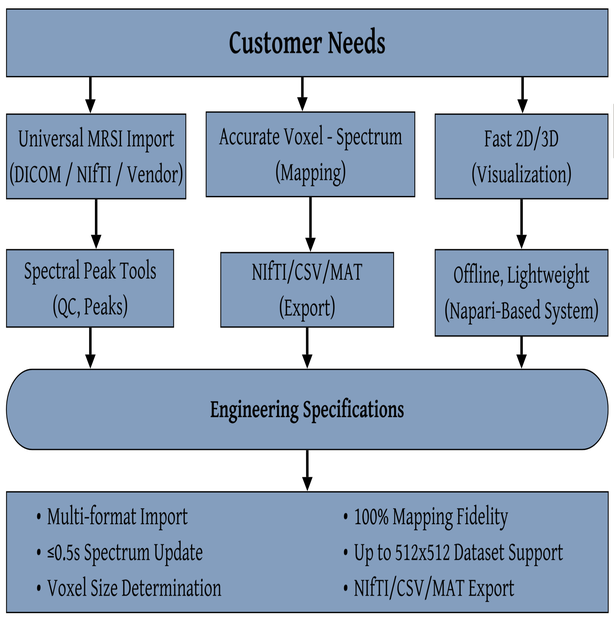
Mission Statement

M.A.P.S. aims to provide a standardized, intuitive, and open-source platform for MRSI data that simplifies file import, visualization, and basic analysis across MRI systems, improving accessibility, consistency, and efficiency for clinicians, students, and researchers.



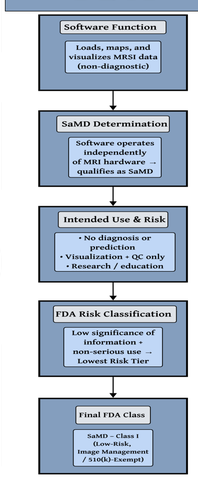
Full Gantt Chart

Design Inputs

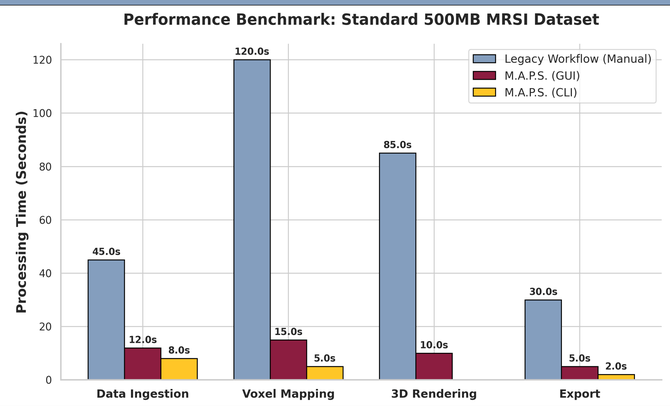


House of Quality

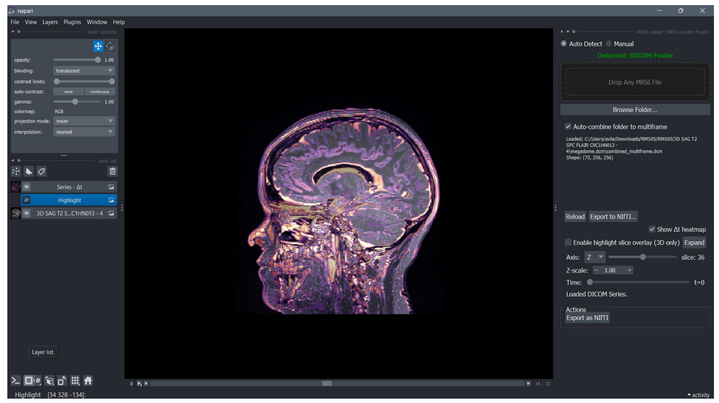
FDA



Final Technical Model



Prototype



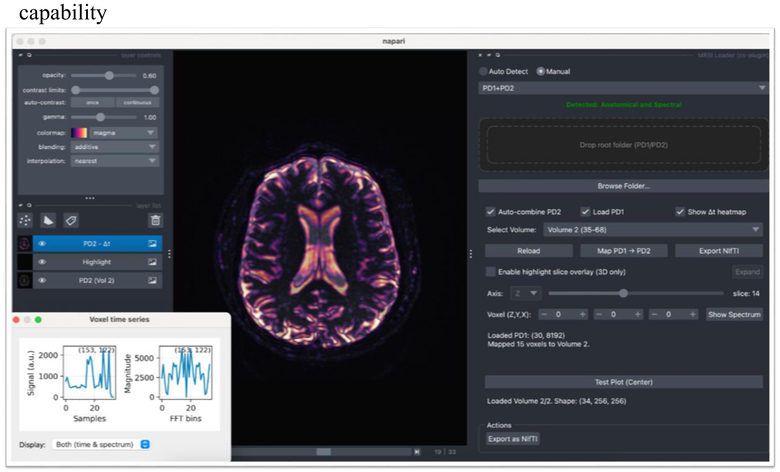
Final Product Specifications

Key Features

- Automatically linked anatomical + spectral views
- Smooth single and group voxel navigation + inspection
- 2D slices with early 3D visualization capability

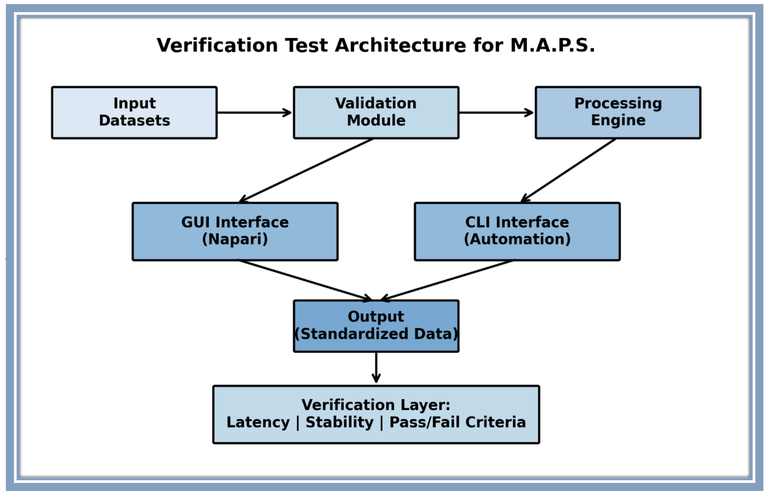
System Architecture

- Modular stages for import, mapping, visualization, and many analysis options
- Components operate independently for security and scalability + speed.



Manufacturing Design

Verification Results

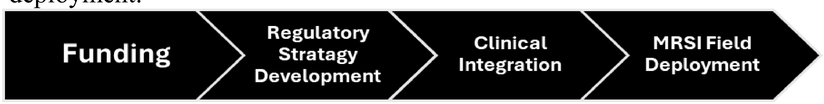


The M.A.P.S. verification workflow, where input data is validated and processed through the system using both GUI and CLI interfaces. The standardized output is then evaluated based on latency, stability, and pass/fail criteria.

YouTube Video

Design Status and Future Steps

M.A.P.S. integrates GUI and CLI workflows for multi-format import, voxel-spectrum mapping, 2D/3D visualization, and streamlined export. Next steps include securing funding, advancing regulatory strategy, enabling clinical integration, and progressing toward MRSI field deployment.



Acknowledgements

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References