

Scaling Neuroimaging Databasing for LORIS Multi-modal Integrative Data Platform

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Introduction

LORIS¹ (Loris.ca) is an open-source web-based multi-modal database for neuroscience research, integrating neuroimaging, biobanking, genomic, and clinical/behavioural data within a unified neuroinformatics platform.

Objectives

LORIS scalable data platform enables | RESTful (--) flexible, sustainable, accountable and secure data sharing. Designed for interoperability and alignment with emerging standards, its modular architecture combines performance and compliance with ethical research constraints for open data publishing in neuroscience across modalities and research areas.

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Acknowledgements

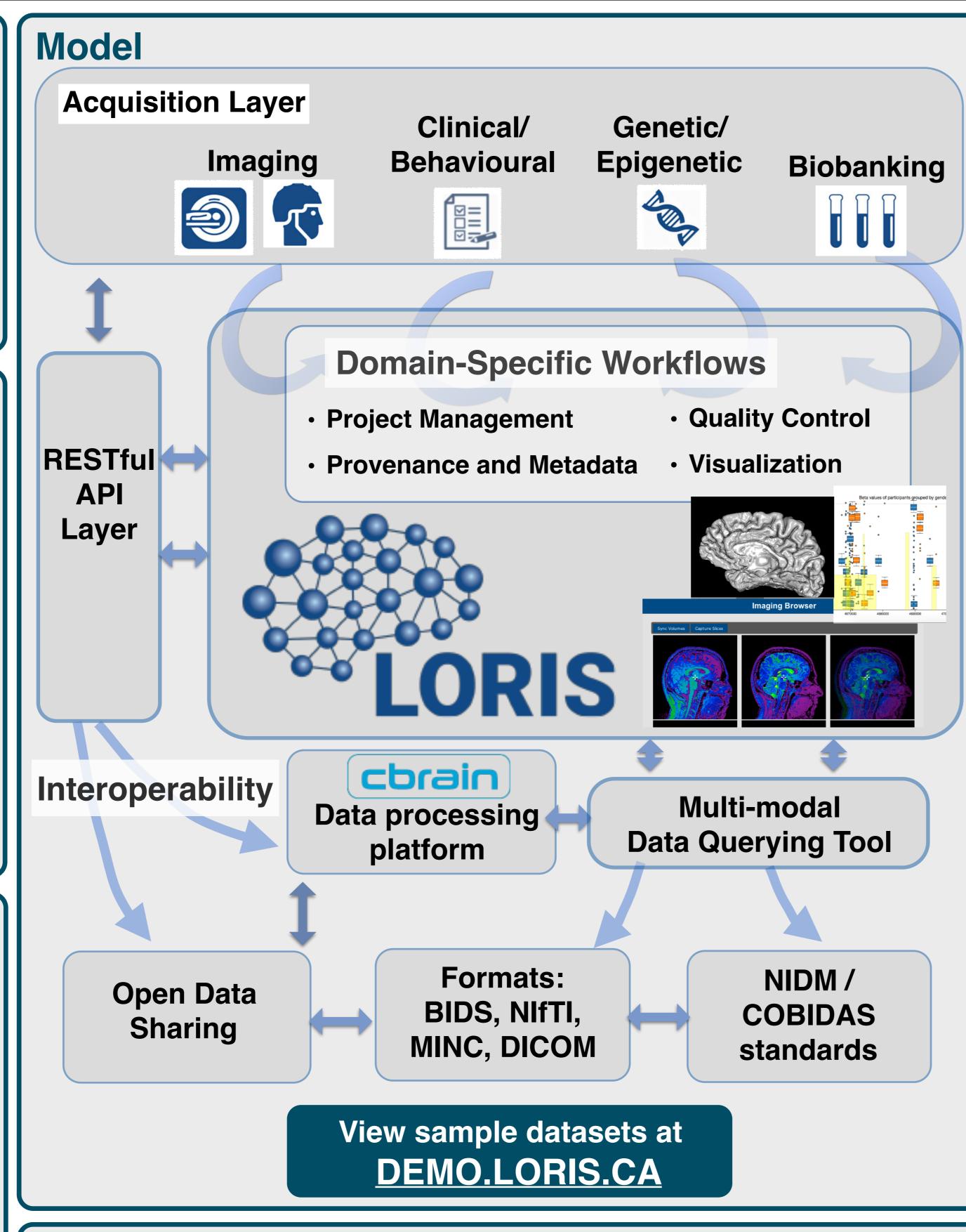
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Global collaborations

as the NIH-funded Fragile X and Infant Brain Imaging Study (IBIS)5,12 MAVAN8, the Canadian Consortium on Neurodegeneration in Aging (CCNA) and all imaging subprojects for NeuroDevNet NCE.



Key Features

Open-Source modality-specific web-based Workflows enable researchers to seamlessly acquire, curate, integrate and disseminate datasets with collaborators and across networks, through purpose-built tools and modules:



Clinical/behavioural **project management** toolkit

Imaging: Automated SNR detection



Extensive multi-tiered data validation and curation

Biobanking: Biospecimen tracking

Interoperability and Data Sharing

- LORIS' NoSQL Data Query Tool allows for rapid dissemination and export to data processing pipelines
- Data selection and export tools can be customized for interoperability with any platform or pipeline including the CBRAIN² high-performance data processing portal
- LORIS' API aims to make multi-modal insertion, querying and export seamless
- Format conversion frameworks target exportable **BIDS** format datasets, as well as NIFTI, MINC, DICOM

Provenance and Metadata capture provide information critical to reproducibility and reliability of results. Data exploration and direct annotation of the data is enabled through pipelines, Quality Control (QC) modules, and Visualization utilities such as LORIS' embedded BrainBrowser9 software.

Privacy and Security protections enable multiple research groups to host and selectively share data within a single repository. Hashed Identifiers (GUIDs) and user-dataset permissions developed for key projects facilitate researcher-controlled sharing and dissemination of de-identified subject information while enabling open dissemination of results.

Results

As of early 2017, national and global research groups are using Loris for:

- over 10,000 subjects
- 75,000 variables
- 200,000 imaging acquisitions
- 500 clinical/behavioural instruments
- 20,000 scanning visits
- > 5,000,000 genomic and epigenomic datapoints

LORIS serves as the technical platform for large-scale projects such | Multi-site longitudinal cohort research using family models, multi-language data collection and harmonization at >150 sites globally, including MRI, PET, EEG, MEG, Spectroscopy.

- Scalable cyberinfrastructure for Open Science dissemination platforms³ at the Montreal Neurological institute, McGill University, and OMEGA MEG portal (Niso 2016).
- Institutional adoption for imaging data management (Canada, UK and China)

Conclusion

As open data publishing and dissemination gains momentum, interoperable multi-modal services for hosting data assets become primary tools for scientific exploration and research. LORIS' scalable capacity to align multi-level -omics data with clinical and neuroimaging data can provide a pivotal platform for identification of novel biological pathways of relevance for neuroscience and the future of data management in research.