

## Advancing Alzheimer's Research Through OMOP-Standardized MRI Biomarkers

Edina Timkó<sup>1</sup>, Nuno Barros<sup>5</sup>, Maria Beser Robles<sup>6</sup>, Dominik Hirling<sup>1</sup>, Hongxu Yang<sup>3</sup>, Brice Fernandez<sup>4</sup>, Ha Young Kim<sup>2,7</sup>, Sathvik Guru Rao<sup>8</sup>, Ana Beatriz Solana<sup>2</sup> and the PREDICTOM Consortium

<sup>1</sup>GE HealthCare, Budapest, Hungary, <sup>2</sup>GE HealthCare, Munich, Germany, <sup>3</sup> GE HealthCare, Eindhoven, Netherlands, <sup>4</sup> GE HealthCare, Buc, France, <sup>5</sup> Icometrix, Leuven, Belgium, <sup>6</sup> IIS La Fe, Valencia, Spain, <sup>7</sup>Technical University of Munich, Munich, Germany, <sup>8</sup>Department of Bioinformatics, Fraunhofer Institute for Algorithms and Scientific Computing (SCAI), Schloss Birlinghoven, Sankt Augustin, 53757, Germany



Email: edina.timko@gehealthcare.com

### ● Introduction

- MRI biomarkers support Alzheimer's disease detection, phenotyping and cohort characterization.
- Quantitative outputs remain fragmented across sites, vendors and processing algorithms.
- Fragmentation limits comparison, multimodal OMOP integration and reproducible analytics.
- PREDICTOM organizes MRI biomarkers into clinically interpretable concepts and relationships.

#### Clinical research value

- Query biomarkers by brain region rather than source-column name.
- Preserve scan context: modality, contrast, series and acquisition details.

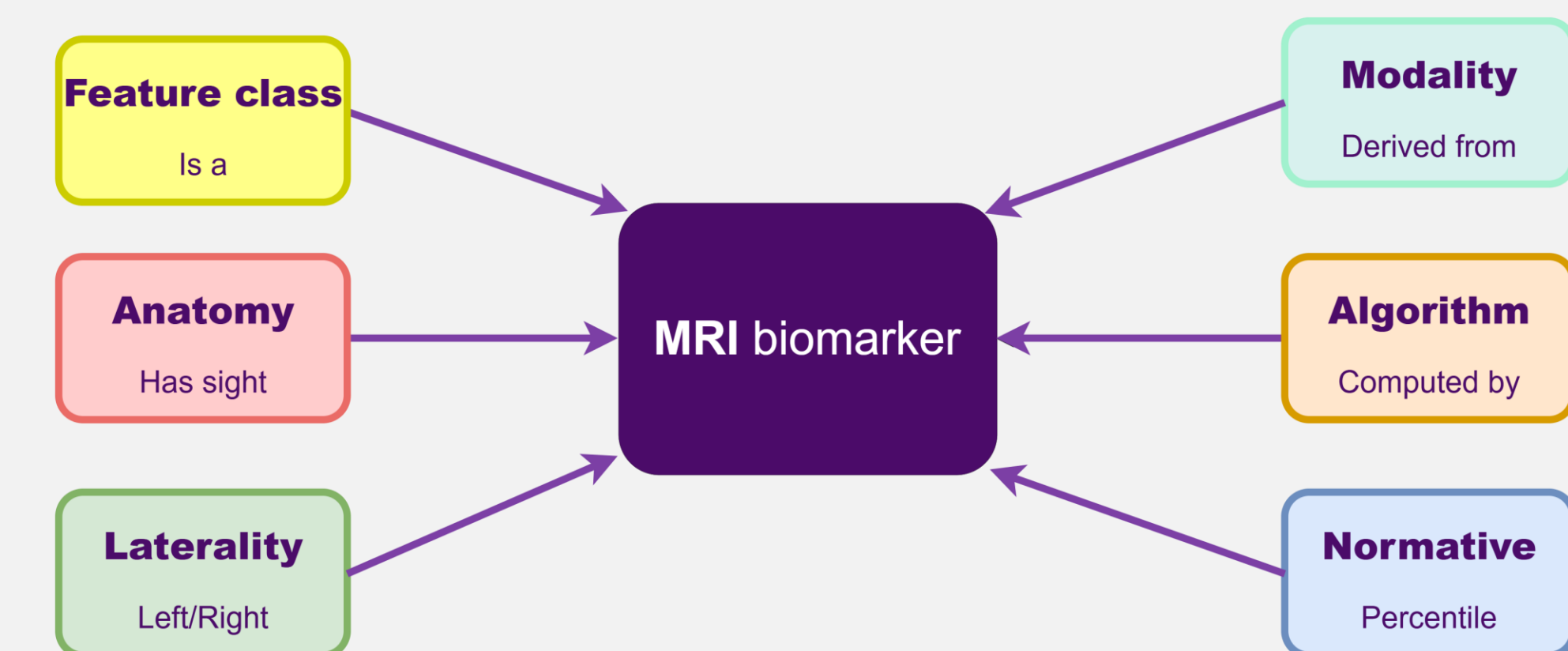
### ● Methods

- **Image Occurrence** captures each MRI series: person, date, UID, modality and contrast.
- **Image Feature** links each biomarker or DICOM attribute to its measurement/observation event.
- Concept mapping **standardizes** names, domains, units and value types.
- Rules add anatomy, laterality, protocol, algorithm and normative context.

|                           |                                                           |
|---------------------------|-----------------------------------------------------------|
| <b>MRI session</b>        | patient, date, series, contrast                           |
| <b>Feature sources</b>    | DICOM + algorithm outputs                                 |
| <b>Concept map</b>        | standard names, domains, units                            |
| <b>Relationship graph</b> | anatomy, laterality, protocol, provenance                 |
| <b>OMOP tables</b>        | Image Occurrence, Image Feature, Measurement, Observation |

### ● Results

#### Relationship-aware biomarker output



#### Query-ready results

**Anatomy-stratified cohorts**

**Protocol-aware comparison**

**Provenance-aware feature selection**

#### Example clinical search query

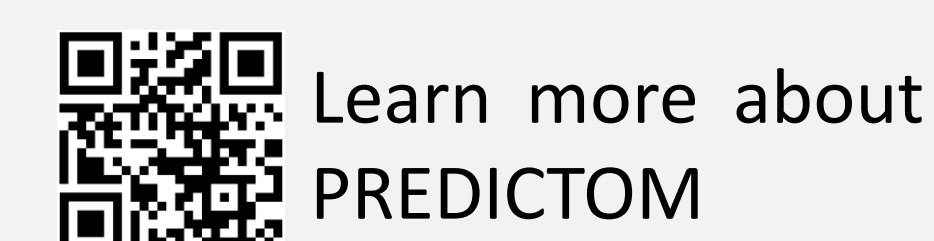
*Identify hippocampal MRI biomarkers across multiple sequences, including T1-derived left and right hippocampal normalized volume and ASL-derived hippocampal cerebral blood flow measurements*

### ● Conclusion

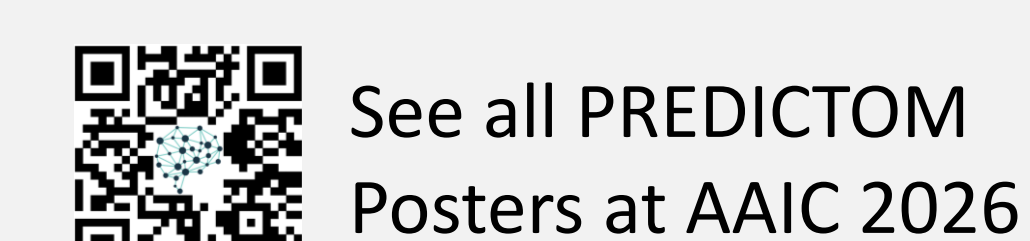
- The prototype converts heterogeneous MRI outputs into a relationship-aware OMOP imaging layer.
- Biomarkers can be stratified by brain region, modality/contrast, algorithm and feature type.
- Cohort screening becomes reproducible with less dependency on raw-image transfer.
- The same structure can connect imaging with other OMOP clinical domains.

### ● References

- Park WY, Jeon K, Schmidt TS, Kondylakis H, Alkasab T, Dewey BE, You SC, Nagy P. Development of Medical Imaging Data Standardization for Imaging-Based Observational Research: OMOP Common Data Model Extension. J Imaging Inform Med. 2024 Apr;37(2):899-908. doi: 10.1007/s10278-024-00982-6. Epub 2024 Feb 5. PMID: 38315345; PMCID: PMC11031512.
- Reich C, Ostropolets A, Ryan P, Rijnbeek P, Schuemie M, Davydov A, Dymshyts D, Hripcsak G. OHDSI Standardized Vocabularies-a large-scale centralized reference ontology for international data harmonization. J Am Med Inform Assoc. 2024 Feb 16;31(3):583-590. doi: 10.1093/jamia/ocad247. PMID: 38175665; PMCID: PMC10873827.
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