Which AI Do We Trust? NeuroSymbolic AI in Healthcare

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Abstract

As a graph database provider, we define Neuro-Symbolic AI (NSAI) as the seamless integration of logical reasoning, data-driven machine learning, generative AI, and knowledge graphs. We firmly believe that the amalgamation of these diverse AI methodologies significantly enhances data trustworthiness. Our deployment of NSAI spans various distinct applications, including healthcare, call center analytics, and contract compliance. In each scenario, NSAI has demonstrated superior performance compared to the utilization of a singular AI approach.

This industry presentation explores the application of NSAI to PatientGraph[1,2,3], a knowledge graph modeled using an entity-event framework. PatientGraph encompasses electronic medical records (EMR) data, FDA clinical trial data, selected PubMed data, the Vaccine Adverse Event Reporting System (VAERS) database, and a comprehensive collection of taxonomies and ontologies from the Unified Medical Language System (UMLS).

Within PatientGraph, patients are represented both as sequences of events and as traditional graphs. This dual representation facilitates versatile analytics and predictive capabilities. Specifically, we employ event data and event streams in three distinct methodologies: (1) training a recurrent neural network (RNN) model using event streams; (2) encoding established medical rules into Prolog and/or SPARQL; and (3) presenting an individual patient's event stream to a large language model (LLM). Each approach yields risk scores or predictions regarding potential patient outcomes within a specified timeframe. We will present risk assessments for a particular condition, namely Atrial Fibrillation, and discuss the strategies employed to reconcile the varying risk scores generated by the different AI methodologies.

Keywords

Knowledge Graph, Neuro-Symbolic AI, LLM, UMLS

References

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