

# IEEE – Entity Event Knowledge Graph for Powerful Health Informatics

As part of Franz's participation in the IEEE – ICHI conference, our paper has been published and is available from the IEEE Website.



ICH2022 is a premier community forum concerned with the application of computer science, information science, data

science, and informatics principles, as well as information technology, and communication science and technology to address problems and support research in healthcare, medicine, life science, public health, and everyday wellness.

Franz Inc. presented on June 14th – **Entity Event Knowledge Graph for Powerful Health Informatics**

Download Franz's IEEE Publication – Entity Event Knowledge Graph for Powerful Health Informatics.

Conference Website

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# IEEE – ICHI – Healthcare Informatics



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10:30 AM - 12:00 PM @Ballroom

## Industry Session

**S IMI-CDE: an interactive interface for collaborative mapping of study variables to common data elements**

*Shiqiang Tao, Wei-Chun Chou, Jianfu Li, Jingcheng Du, Pritham Ram, Rashmie Abeysinghe, Xiaoqian Jiang, Peter W Rose, Lucile Chen, Michael Hsu, Yu and Guo-Qiang Zhang*

**S Entity Event Knowledge Graph for Powerful Health Informatics**

*Ravi Bajracharya, Richard Wallace, Jans Aasman and Parsa Mirhaji*

**S RWD Analytics Engineering, Bridging the Gap between IT and Data Science**

*Andrew Nguyen*

**S LANN: an integrated online annotation tool for information extraction**

*Jingqi Wang, Yaoyun Zhang, Bin Lin, Huy Anh Pham, Long He, Jingcheng Du and Frank Manion*

**S Improving healthcare workforce efficiency using machine learning and predictive analytics**

*Daniel Quest*

**S RecordTime – An Internally-Developed Web Application to Ease the Pain of Reviewing PDF Medical Records**

*Kevin Peterson*

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# Sharing Ontologies Globally To Speed Science And

# Healthcare Solutions – OntoPortal

## International Ontology Sharing Is Becoming A Reality

A consortium of researchers recently formed an organization dedicated to standardizing how scientists define their ontologies, which are essential for retrieving datasets as well as understanding and reproducing research. The group called OntoPortal Alliance is creating a public repository of internationally shared domain-specific ontologies. All the repositories will be managed with a common OntoPortal appliance that has been tested with AllegroGraph Semantic Knowledge Graph software. This enables any OntoPortal adopter to get all the power, features, maintainability, and support benefits that come from using a widely adopted, state-of-the-art semantic knowledge graph database.

Read the full article at [HealthIT Outcomes](#) –

**As Dr. Jans Aasman, CEO of Franz Inc. explains,** “When building a Knowledge Graph as your enterprise’s single source of truth, it’s critical to include ontologies and taxonomies. AI applications and complex reasoning analytics require information from both databases and knowledge bases that contain domain information, taxonomies, and ontologies to solve complex questions. To make this possible, we developed a novel hybrid sharding technology called FedShard, which facilitates the combination of data and knowledge required by applications like Montefiore’s PALM. But this approach is not unique or specific to Healthcare, it is applicable in many other industries, which is why we are excited about OntoPortal’s plans to bring sharing of domain ontologies to a broad audience.”



BioPortal



OntoPortal

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# Ubiquitous AI Demands A New Type Of Database Sharding

Forbes published the following article by Dr. Jans Aasman, Franz Inc.'s CEO.



The notion of sharding has become increasingly crucial for selecting and optimizing database architectures. In many cases, sharding is a means of horizontally distributing data; if properly implemented, it results in near-infinite scalability. This option

enables database availability for business continuity, allowing organizations to replicate databases among geographic locations. It's equally useful for load balancing, in which computational necessities (like processing) shift between machines to improve IT resource allocation.

However, these use cases fail to actualize sharding's full potential to maximize database performance in today's post-big data landscape. There's an even more powerful form of sharding, called "hybrid sharding," that drastically improves the speed of query results and duly expands the complexity of the questions that can be asked and answered. Hybrid sharding is the ability to combine data that can be partitioned into shards with data that represents knowledge that is usually unshardable.

This hybrid sharding works particularly well with the knowledge graph phenomenon leveraged by the world's top data-driven companies. Hybrid sharding also creates the enterprise scalability to query scores of internal and external sources for nuanced, detailed results, with responsiveness commensurate to that of the contemporary AI age.



Read the full article at [Forbes](#).

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# **NEW! – Franz’s AllegroGraph 7 Powers First Distributed Semantic Knowledge Graph Solution with Federated-Sharding**

***FedShard™, Entity-Event Data Modeling and Browser-based Gruff Drives Infinite Data Integration, Holistic Insights and Complex Reasoning***

Franz Inc., an early innovator in Artificial Intelligence (AI) and leading supplier of Semantic Graph Database technology for Knowledge Graph Solutions, today announced AllegroGraph 7, a breakthrough solution that allows infinite data integration through a patented approach unifying all data and siloed knowledge into an Entity-Event Knowledge Graph solution that can support massive big data analytics. AllegroGraph 7 utilizes unique federated sharding capabilities that drive 360-degree insights and enable complex reasoning across a distributed Knowledge Graph. Hidden connections in data are revealed to AllegroGraph 7 users through a new browser-based version of Gruff, an advanced visualization and graphical query builder.

“Large enterprises have Knowledge Graphs that are so big that no amount of vertical scaling will work,” said Jans Aasman, CEO of Franz Inc. “When these organizations want to conduct new big data analytics, it requires a new effort by the IT department to gather semi-usable data for the data scientists, which can cost millions of dollars, waste valuable time and still not provide a holistic data architecture for querying across all data. ETL, Data Lakes and Property Graphs only exacerbate the problem by creating new data silos.

AllegroGraph 7 takes a holistic approach to mixed data, unifying all enterprise data with domain knowledge, including taxonomies, ontologies and industry knowledge – making queries across all data possible, while simplifying and accelerating feature extraction for machine learning.”

To support ubiquitous AI, a Knowledge Graph system will have to fuse and integrate data, not just in representation, but in context (ontologies, metadata, domain knowledge, terminology systems), and time (temporal relationships between components of data). The rich functional and contextual integration of multi-modal, predictive modeling and artificial intelligence is what distinguishes AllegroGraph 7 as a modern, scalable, enterprise analytic platform. AllegroGraph 7 is the first big temporal knowledge graph technology that encapsulates a novel entity-event model natively integrated with domain ontologies and metadata, and dynamic ways of setting the analytics lens on all entities in the system (patient, person, devices, transactions, events, and operations) as prime objects that can be the focus of an analytic (AI, ML, DL) process.

AI applications and complex reasoning analytics require information from both databases and knowledge bases that contain domain information, taxonomies and ontologies in order to conduct queries. Some large-scale knowledge bases cannot be sharded because they contain highly interconnected data. AllegroGraph 7 federates any shard with any large-scale knowledge base – providing a novel way to shard knowledge bases without duplicating knowledge bases in every shard. This approach creates a modern analytic system that integrates data in context (ontologies, metadata, domain knowledge, terminology systems) and time (temporal relationships between components of data). The result is a rich functional and contextual integration of data suitable for large scale analytics, predictive modeling, and artificial intelligence.

Financial institutions, healthcare providers, contact centers, manufacturing firms, government agencies and other large



enterprises that use AllegroGraph 7 gain a holistic, future-proofed Knowledge Graph architecture for big data predictive analytics and machine learning across complex knowledge bases.

“AllegroGraph 7’s support of Entity-Event Data Modeling is the most welcome innovation and addition to our arsenal in reimagining healthcare and implementing Precision Medicine,” said Dr. Parsa Mirhaji, Director of Center for Health Data Innovations at the Albert Einstein College of Medicine and Montefiore Health System, NY “Precision Medicine is about moving away from statistical averages and broad-based patterns. It is about connecting many dots, from different contexts and throughout time, to support precision diagnosis and to recommend the precision care that can take into account all the subtle differences and nuisances of individuals and their personal experiences throughout their life. This technology is about saving lives, by leveraging data, context and analytics and is what Franz’s Entity-Event Data Modeling brings to the table.”

Dr. Mirhaji and his team at Montefiore Health System have developed the Patient-centered Analytic Learning Machine (PALM) using these capabilities to provide an enterprise platform for Artificial Intelligence and machine learning in healthcare that can support conversational AI, interpret data from EMR, natural language, and radiological images, all centered around life-time experiences of an individual patient. A single system that unifies all analytics and data from heterogeneous sources to manage appointments and prescriptions, triage patients with potential spinal cancer, respiratory failure, or sepsis, and provide just-in-time recommendations and personalized decision support for clinicians to improve patients’ outcomes.

**Key capabilities in AllegroGraph 7 include:**

**Semantic Entity-Event Data Modeling**

Big Data predictive analytics requires a new data model approach that unifies typical enterprise data with knowledge bases such as taxonomies, ontologies, industry terms and other domain knowledge. The Entity-Event Data Model utilized by AllegroGraph 7 puts core ‘entities’ such as customers, patients, students or people of interest at the center and then collects several layers of knowledge related to the entity as ‘events.’ The events represent activities that transpire in a temporal context. Using this novel data model approach, organizations gain a holistic view of customers, patients, students or important entities and the ability to discover deep connections, uncover new patterns and attain explainable results.

### ***FedShard™* Speeds Complex Queries**

Through a patented in-memory federation function, the results from each machine are combined so that the query process appears as if only one database is being accessed, although many different databases and data stores and knowledge bases are actually being accessed and returning results. This unique data federation capability accelerates results for highly complex queries across highly distributed data sets and knowledge bases.

### **Large-scale Mixed Data Processing**

The AllegroGraph 7 big data processing system is able to scale massive amounts of domain knowledge data by efficiently associating domain knowledge with partitioned data through shardable graphs on clusters of machines. AllegroGraph 7 efficiently combines partitioned data with domain knowledge through an innovative process that keeps as much of the data in RAM as possible to speed data access and fully utilize the processors of the query servers.

### **Browser-based Gruff**

Gruff’s powerful query and visualization capabilities are now

available via a web browser and directly integrated in AllegroGraph 7. Gruff is the industry's leading Knowledge Graph visualization tool that dynamically displays visual graphs and related links. Gruff's 'Time Machine' provides users with an important capability to explore temporal connections and see how relationships are created over time. Users can build visual graphs that display the relationships in graph databases, display tables of properties, manage queries, connect to SPARQL Endpoints, and build SPARQL or Prolog queries as visual diagrams. Gruff can be downloaded separately or is included with the AllegroGraph v7 distribution.

## **High Performance Big Data Analytics**

AllegroGraph 7 delivers high performance analytics by overcoming data processing issues related to disk versus memory access, uses processor core efficiency and updates domain knowledge databases across partitioned data systems in a highly efficient manner.

Gartner predicts "the application of graph processing and graph DBMSs will grow at 100 percent annually through 2022 to continuously accelerate data preparation and enable more complex and adaptive data science." In addition, Gartner named graph analytics as a "Top 10 Data and Analytics Trend" to solve critical business priorities." (*Source: Gartner, Top 10 Data and Analytics Trends, November 5, 2019*)

## **AllegroGraph 7 Availability**

AllegroGraph 7 is immediately available directly from Franz Inc. Visit the AllegroGraph YouTube channel to see AllegroGraph in action.

## **Join AllegroGraph 7 Webinar**

Franz Inc. will host a webcast entitled "Scalable Knowledge Graphs Using the New Distributed AllegroGraph 7." Register for the Webinar.

## Knowledge Graph Conference – May 4 – 7, 2020

Dr. Jans Aasman, CEO, Franz Inc., will be presenting a talk at the Knowledge Graph Conference entitled, “The Knowledge Graph that Listens” on May 7<sup>th</sup> at 1PM Eastern. Register for the Conference.

## The Knowledge Graph Cookbook

Released April 22, 2020, this new book directs readers on why and how to build Knowledge Graphs that help enterprises use data to innovate, create value and increase revenue. The book is full of recipes and knowledge on the subject and features an interview with Dr. Jans Aasman, CEO, Franz Inc. in the Expert Opinion section. Get a copy of the book.

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# Venture Beat Features Montefiore's Healthcare project with AllegroGraph

From VentureBeat August 2018

**This article discusses Montefiore's PALM project that uses AllegroGraph:**

*Montefiore is one of the largest employers in New York State. It's also one of the busiest health care complexes – hundreds of thousands of patients pass through its sprawling campuses, which include Montefiore Medical Center, the Albert Einstein*

*College of Medicine, and Montefiore Medical Park.*

*Those logistical challenges catalyzed the development of Montefiore's Patient-centered Analytical Learning Machine (PALM), a machine learning platform built from the ground up to predict and prevent life-threatening medical conditions and minimize wait times.*

*PALM juggles lots of datasets – electronic medical records, insurance billing codes, drug databases, and clinical trial results, to name a few. And its analytical models recently expanded to handle voice, images, and sensor inputs from internet of things devices.*

*Core to the semantic graph model are triplestores, which are a type of database optimized for filing away and retrieving triples. They're an entity composed of subject-predicate-object – "John has tuberculosis," for example – which PALM builds dynamically, as needed. Along the way, the system uses a frame data language, or FDL, to resolve ambiguities, like when some electronic records refer to medication by its brand instead of by its scientific name (e.g., "Advil" or "Motrin" instead of ibuprofen).*

Read the full article over at Venture Beat.

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## **Using AI and Semantic Data Lakes in Healthcare –**

# FeibusTech Research Report



Artificial intelligence has the potential to make huge improvements in just about every aspect of healthcare. Learn how Montefiore Health Systems is using semantic data lakes, architectures, and triplestores to power AI patient-centered learning. With origins in post-9/11 municipal emergency projects, Montefiore Health Systems platform – called PALM, short for patient-centered Analytical Learning Machine – is beginning to prove itself out in the Intensive Care Unit, helping doctors save lives by flagging patients headed toward respiratory failure.

Intel and Montefiore in collaboration with FeibusTech have released a Research Brief covering Montefiore's PALM Platform (aka – The Semantic Data Lake) powered by AllegroGraph.

*“Just atop all the databases is what’s known as a triplestore, or triple, construct. That’s a key piece of any semantic data architecture. A triple is a three-part data series with a common grammar structure: that is, subject-predicate-object. Like, for example, John Smith has hives. Or Jill Martin takes ibuprofen.”*

*“Triples are the heart and soul of graph databases, or graphs, a powerful, labor-saving approach that associates John and Jill to records of humans, hives to definitions of maladies and Ibuprofen to catalogues of drugs. And then it builds databases on the fly for the task at hand based on those associations.”*

Read the full article on Intel's website to learn more about healthcare solutions based on AllegroGraph.

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# Semantic Computing, Predictive Analytics Need Reliable Metadata



**Our Healthcare Partners at Montefiore were interviewed at Health Analytics:**

*Reliable metadata is the key to leveraging semantic computing and predictive analytics for healthcare applications, such as population health management and crisis care.*

*As the healthcare industry reaches the saturation point of electronic health record adoption, and slowly moves past the pain of the implementation process, it may seem like the right time to stop thinking so much about hammering home basic data governance principles for staff members and start looking at the next phase of health IT implementation: the big data analytics environment.*

*After all, most providers are now sitting on an enormous nest egg of patient data, which may be just clean, complete, and standardized enough to start experimenting with population health management, operational analytics, or even a bit of predictive risk stratification. Many healthcare organizations*

*are experimenting with these advanced analytics projects in an effort to prepare themselves for the financial storm that is approaching with the advent of value-based care.*

*The immense pressure to cut costs, meet quality benchmarks, shoulder financial risk, and improve patient outcomes is causing no small degree of anxiety for providers, who are racing to batten down the hatches before the typhoon overtakes them.*

*While it may be tempting to jump into quick-win analytics that use “good enough” datasets to solve a specific pressing use case, providers may be at risk of repeating the same mistakes they made with slapdash EHR implementations: creating data siloes, orphaned reports, and poor quality datasets that cannot be used in a reliable, repeatable way for meaningful quality improvements.*

Read the full article at [Health Analytics](#)

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## **Montefiore Semantic Data Lake Tackles Predictive Analytics**

Montefiore Medical Center is preparing to launch a sophisticated predictive analytics program for crisis patients, which is rooted in its real-time semantic data lake technology.

Semantic computing is becoming a hot topic in the healthcare industry as the first wave of big data analytics leaders looks



to move beyond the basics of population health management, predictive analytics, and risk stratification.

This new approach to analytics eschews the rigid, limited capabilities of the traditional relational database and instead focuses on creating a fluid pool of standardized data elements that can be mixed and matched on the fly to answer a large number of unique queries.

Montefiore Medical Center, in partnership with Franz Inc., is among the first healthcare organizations to invest in a robust semantic data lake as the foundation for advanced clinical decision support and predictive analytics capabilities.

Read the full article at [Health IT Analytics](#)

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# **Semantic Big Data Lakes Can Support Better Population Health**

From HealthIT Analytics –

As healthcare providers navigate the treacherous transitional waters of Stage 2 and try to predict how future regulations will shape their actions, the need to lay the groundwork for advanced population health management and accountable care is only becoming clearer.

No matter what the outcome of debates about the future course of the EHR Incentive Programs, one thing remains abundantly clear for organizations of all shapes and sizes: advancements in healthcare big data analytics will not be driven solely by rules and mandates, but by the pressing financial need to

collect, corral, understand, and leverage information in order to refine and expand population health management techniques.

Developing the underlying architecture for value-based reimbursement, namely a strong framework for population health management, data governance, and big data analytics, is becoming a top priority for a growing number of providers looking to get a head start on the new realities of healthcare reform.

These organizations, like Montefiore Medical Center, are looking for cutting edge analytics tools which won't just help them meet the clinical and financial stresses of today's environment, but will also prepare them for the uncertain paths ahead.

[Read the Full Article](#)