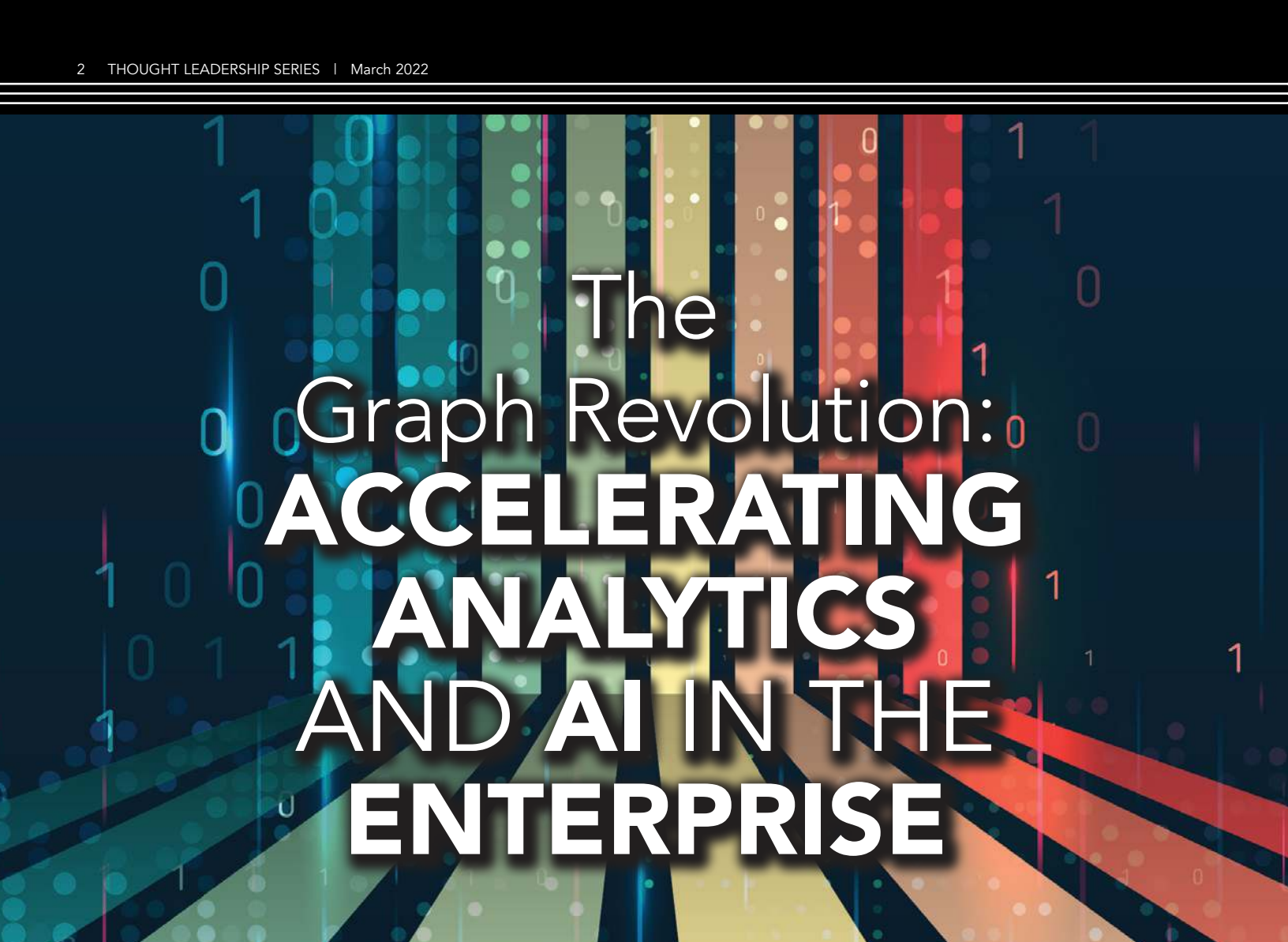


THOUGHT LEADERSHIP SERIES

The
Graph Revolution:
**ACCELERATING
ANALYTICS
AND AI IN THE
ENTERPRISE**



The Graph Revolution: **ACCELERATING ANALYTICS AND AI IN THE ENTERPRISE**

At a time when enterprises are seeking to leverage greater automation and intelligence, many are becoming acquainted with the advantages of using knowledge graphs to power real-time insights and machine learning.

The flexible, semantic nature of knowledge graphs makes them well-suited for managing and storing data from diverse, heterogeneous sources—data pipelines that continuously add new knowledge, connections, context, and inferences.

Beyond the 70% increase in data and analytics innovations fueled by graph technology that Gartner predicts will take place by 2025, the firm also predicts that by 2023 graph technology will play a role in the decision-making process for 30% of organizations worldwide.

Knowledge graphs bring additional value to organizations by providing:

- **Context:** Knowledge graphs provide context to algorithms by integrating various types of information into an

ontology and flexibility to add new derived knowledge on the go. Most traditional knowledge graphs can simultaneously use various types of raw data.

for the issue of understandability by integrating the meaning of entities available within the graph itself. As such, knowledge graphs become intrinsically explainable.

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- **Efficiency:** Once desired entities and relations are available, knowledge graphs offer computational efficiencies for querying stored data resulting in effective use of data for generating insights.
- **Explainability:** Large networks of entities and relations provide solutions

The cardinal benefit knowledge graphs offer organizations is a scalable means of amassing enterprise knowledge that focuses on its relationships. When machine learning and AI are added, organizations can incorporate greater amounts of knowledge that are more profound. One way to do so is by inserting the outputs of machine

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learning model predictions back into the graph.

As well as being a useful format for feeding training data to algorithms, machine learning can quickly build and structure graph databases, drawing connections between data points that would otherwise go unnoticed.

KNOWLEDGE GRAPHS POWER THROUGH THE PANDEMIC

Knowledge graphs power internet search, recommendation systems, and chatbots. For example, an e-commerce site can use knowledge graphs to describe products, schedule delivery, and help customers through virtual assistants.

Gartner analyst Rita Sallam said the research and advisory firm forecasts that 80% of data and analytics innovations will be made using graph technology by 2025. In 2021, just 10% of data and analytics innovations were made with graph technology.

While only a small percentage of organizations used graph technology at the start of the pandemic, and those now using graph technology to inform the decision-making process remain a small minority, Sallam believes the speed-to-insight enabled by graph technology will lead to a significant increase in graph adoption.

Beyond fostering a better understanding of customers and helping uncover fraud, it's now being used in such varied industries as agriculture to optimize crop yield, law enforcement and the Department of Homeland Security to track suspects, and healthcare to assemble COVID-19 research.

HUMANS AND AI WORKING TOGETHER

The human element of AI that knowledge graphs reinforce is pivotal for furnishing responsible AI in which machine

intelligence systems are fair, unbiased, ethical, understandable, and explainable. The rules-based approach of AI's symbolic reasoning not only provides highly traceable explanations of the outcomes of reasoning based on rules but also influences explainability for statistical machine learning models.

Knowledge graphs built upon ontological concepts developed as part of the semantic web but allowed for a more expressive hierarchical system, with a greater emphasis on scale and relationships. This made them well-suited for AI-driven tasks and fueled their adoption within Google, Apple, Uber, and others.

There are three different ways in which knowledge graphs and machine learning are intertwined:

- During construction of a knowledge graph
- To enhance the output of data-driven machine learning models with knowledge from the graph
- To extract new insights from the knowledge graph through learning to classify nodes or clustering nodes and predicting missing connections

Frank van Harmelen, leader of the knowledge representation and reasoning group in the computer science department of the VU University Amsterdam, explained that, "The emphasis in modern AI is less on replacing people with AI systems, and more on AI systems that collaborate with people and support them."

Machine learning can help build and maintain knowledge graphs, and knowledge graphs can provide context to improve machine learning.

"It is no longer true that symbolic knowledge is expensive and we cannot obtain it all. Very large knowledge graphs are witness to the fact that this symbolic

knowledge is very well available, so it is no longer necessary to learn what we already know. We can inject what we already know into our machine learning systems, and by combining these two types of systems produce more robust, more efficient, and more explainable systems," said Van Harmelen.

Knowledge graphs have been used on top of machine learning models to make AI systems more transparent and interpretable. Knowledge graphs also bring in the ability to reason about things, which is vital to develop the ability to answer questions, understand images and retrieve information, according to Tehseen Zia, assistant professor at Comsats University Islamabad.

ASSEMBLING THE BRIDGE BETWEEN HUMANS AND MACHINES

When trying to build out a knowledge graph team, look for adjacent skill sets, advises Bryon Jacob, co-founder and chief technology officer at data.world.

Experience with the standards in the semantic web and knowledge representation space (such as RDF, OWL, and SPARQL) or graph databases (such as Neo4j and Amazon Neptune) is helpful.

A new role has also grown out of this trend—the knowledge scientist. Knowledge scientists come from diverse backgrounds, and include programmers, data scientists, and taxonomists. Ultimately, the key to creating a knowledge graph is freeing the knowledge from human brains and expressing it in formats that machines can take advantage of.

The technology empowers analysts to efficiently analyze the knowledge that has been extracted, adding context and depth to other AI techniques and serving as a bridge between humans and systems. ■

—Stephanie Simone

Developing and Deploying Knowledge Graph Solutions



Underpinning Flexible AI Knowledge Fabrics With AllegroGraph

Ubiquitous AI requires a new data model approach that unifies typical enterprise data with knowledge bases such as taxonomies, ontologies, industry terms, and other domain knowledge.

Franz's Knowledge Graph approach encapsulates a novel Entity-Event Model natively integrated with domain ontologies and metadata, and dynamic ways of setting the analytics focus on all entities in the system (patient, person, devices, transactions, events, operations, etc.) as prime objects that can be the focus of an analytic (AI, ML, DL) process.

The Entity-Event Data Model utilized by [AllegroGraph with FedShard](#) 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." Events represent activities that transpire in a temporal context.

The rich functional and contextual integration of multi-modal, predictive modeling and artificial intelligence is what distinguishes AllegroGraph as a modern, scalable, enterprise analytic platform. AllegroGraph is the first temporal Knowledge Graph technology that

for big data predictive analytics and machine learning across complex knowledge bases in order to discover deep connections, uncover new patterns, and attain explainable results.

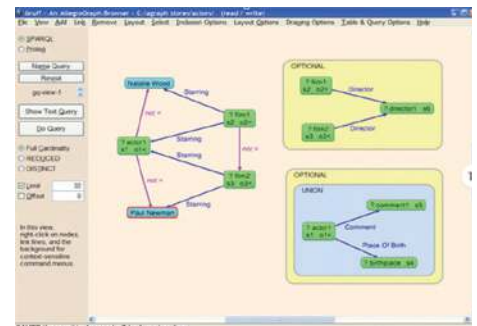
AllegroGraph—Combining Data and Knowledge at Scale

Most 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. However, many large-scale knowledge bases cannot be sharded because they contain highly interconnected data. Franz's patented FedShard uniquely combines data with knowledge bases—providing a novel way to scale applications for enterprise wide solutions.

AllegroGraph 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 hardware resources. 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

users to visualize and explore Knowledge Graphs by displaying data relationships in views that are driven by the user. Ad hoc and exploratory analysis can be performed by simply clicking on different graph nodes to answer questions.

Gruff's unique "Time Machine" feature provides the capability to explore temporal context and connections within data. The no-code visual query builder within Gruff empowers both novice and expert users to



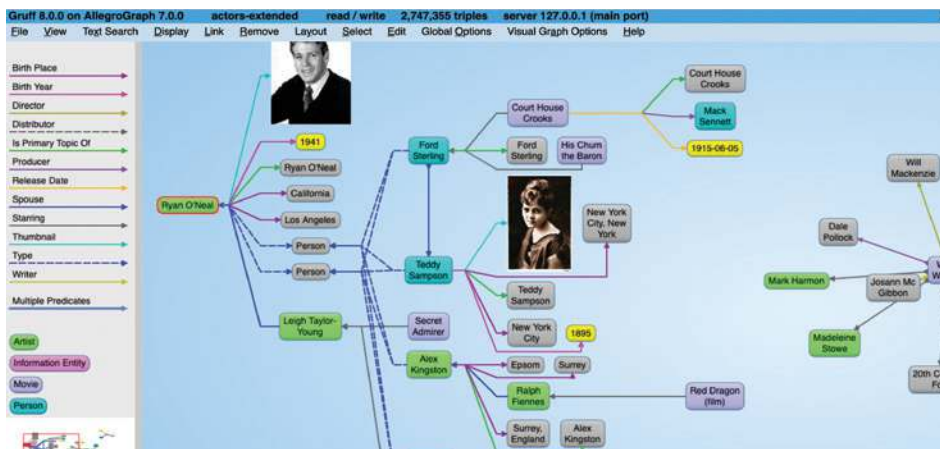
create simple to highly complex queries without writing any code. Gruff is a browser-based application that does not require an additional download or application installation once AllegroGraph is installed. This approach gives users the convenience to access Gruff from anywhere on any type of system, while also simplifying deployment and streamlining updates within enterprise environments.

Gaining Prominence as a Champion in the Knowledge Graph Solutions Market

Franz's technology excellence continues to be recognized by industry experts. Franz Inc. was recently named a Big Data 50 Company "Driving Innovation in 2021" and the company's flagship product, AllegroGraph, has gained prominence as a "Trend Setting Product for 2022" in the knowledge management market.

Industry analysts have recognized Franz as a Champion and AllegroGraph was relied upon for market research in leading analyst reports, including Forrester's "Now Tech: Multimodel Data Platforms" and the Gartner Case Study: "Entity-Event Knowledge Graph for Powering AI Solutions (Montefiore)."

Contact Franz Inc. today to build your [Knowledge Graph solution](#). ■



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.

Financial institutions, healthcare providers, contact centers, manufacturing firms, government agencies, and other data-centric enterprises that use AllegroGraph gain a holistic, future-proofed Knowledge Graph architecture

rich functional and contextual integration of data suitable for large-scale analytics, predictive modeling, and artificial intelligence.

Gruff—Industry-Leading No-Code Graph Visualization and Query Builder

AllegroGraph includes [Gruff](#), the most advanced Knowledge Graph visualization application on the market. Gruff enables