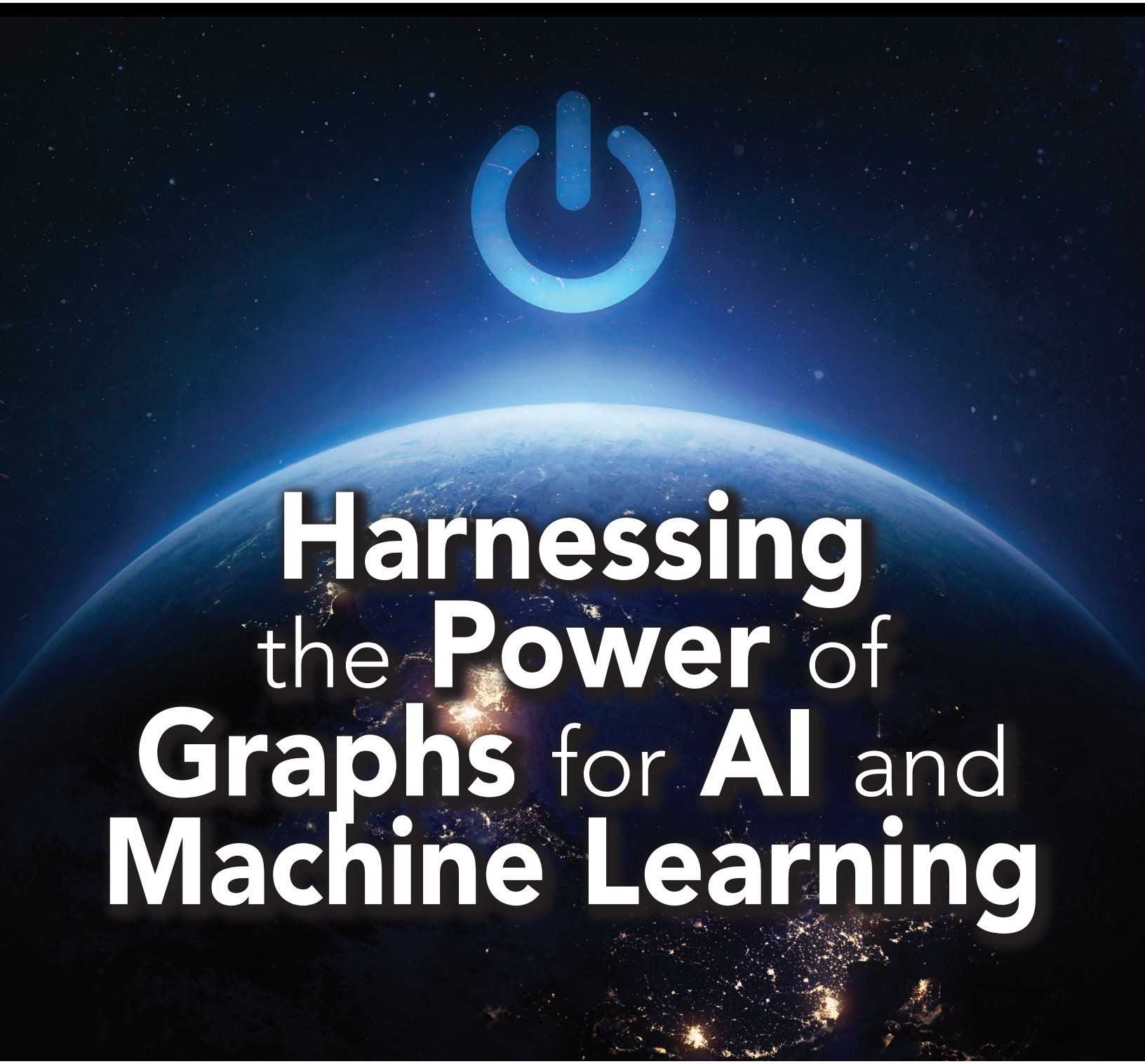
THOUGHT LEADERSHIP SERIES



Harnessing the Power of Graphs for AI and Machine Learning

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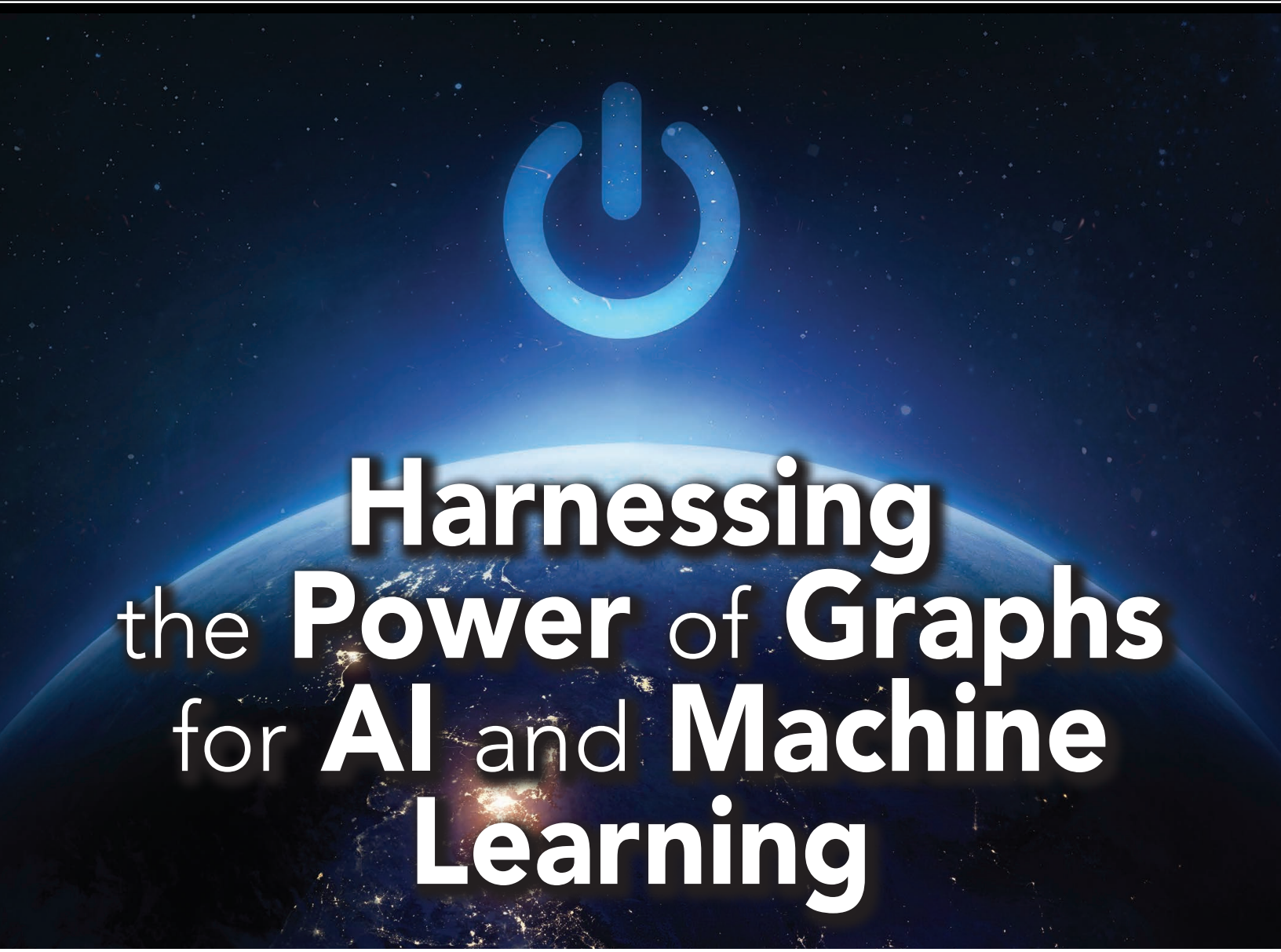
TRENDS AND APPLICATIONS



Harnessing the Power of Graphs for AI and Machine Learning

To navigate today's rapidly changing business landscape, enterprises need to maximize the value of their data to drive efficiency, agility, and innovation.

From accelerating analytics, artificial intelligence (AI), and machine learning projects to supporting next-generation data fabric architectures, knowledge graphs have emerged as a powerful solution for enterprises hungry for greater automation and intelligence.

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.

However, turning data into meaningful information remains a challenge for many organizations.

Data silos are still a huge problem, and legacy data management technologies and processes are not keeping up with the speed, scalability, and flexibility requirements of new workloads and use cases.

A knowledge graph can provide a central place to find data and understand it—offering a single source of truth.

WHAT IS A KNOWLEDGE GRAPH?

A knowledge graph is a way to integrate data coming from a variety of disjointed sources in the network that connects different data entities—objects, people, events, situations, or abstract concepts—and depicts their semantic relationships.

Knowledge graphs put data in context through linking semantic metadata, therefore providing a framework for data integration, unification, analytics, and sharing.

There are numerous applications of knowledge graphs, both in research and industry, as they are one of the best and most flexible ways to represent data. Graphs have great expressive power, meaning that they can be used to represent a plethora of systems, subjects, and objects in various industries.

KNOWLEDGE GRAPHS AND AI

Graph technologies are the basis for creating intelligent applications that allow for more accurate predictions and faster decisions. Graphs are at the heart of a wide range of AI use cases, from drug development to social media friendship recommendations.

According to Khyati Sahu, senior engineer, Fractal, a knowledge graph allows AI systems to deal with complex, interrelated

data. It stores information as a network of data points connected by different types of relations, powering internet search, recommender systems, and chatbots.

AI has become invaluable in storing and organizing large amounts of data using knowledge graphs. Including knowledge, graphs can improve the accuracy of outcomes and augment the potential of machine-learning approaches.

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.

Machine learning is great for answering questions, and knowledge graphs are a step toward enabling machines to more deeply understand data—such as video, audio, and text—that don't fit neatly into the rows and columns of a relational database.

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BUILDING A KNOWLEDGE GRAPH

A knowledge graph is comprised of the following components:

- **Taxonomy:** The classification and categorization of data entities to structure them into data models. From a machine's perspective, taxonomy is the vocabulary associated with a particular dataset that makes the machine understand data in the same way as humans.
- **Ontology:** The formal model of knowledge that maps properties and relationships to data entities. It uses the data categorization from taxonomy to define and associate connections between the entities.
- **Data Sources/Content:** All the data stores that supply information to knowledge graphs act as data sources. These data sources are essential for knowledge graphs as they house information that serves as the content used for building a knowledge graph. A knowledge graph can link different types of data scattered across multiple sources.
- **Graph database:** A centralized repository that stores all the data and their meanings, represented by a knowledge graph. It stores data entities and references to their properties and relationships with other entities. A graph database serves as the foundation on which a knowledge graph is built.

There are many tools available for building knowledge graphs. While their strategies and technologies may differ, the basic steps for creating knowledge graphs are the same. An overview of the main steps that all these tools go through to build a knowledge graph includes:

Graph technologies are the basis for creating intelligent applications that allow for more accurate predictions and faster decisions.

- **Identifying the use case:** The first step is to identify the domain of your interest. Your use case defines the data you need for your knowledge graph.
- **Finding relevant data**: Once you know your domain, you can narrow your search to specific data sources for gathering data.
- **Data organization:** Next comes the organization of unstructured data using business taxonomies that classify and categorize the data.
- **Knowledge extraction:** Once you have a model for structured data, you need to build a knowledge model using ontologies. An ontology model maps the relationships between the data entities.
- **Graph construction:** Next, you combine the data and knowledge models inside a graph database. A graph database stores this knowledge with structure and context that you can use to illustrate a knowledge graph.

THE FUTURE OF KNOWLEDGE GRAPHS

According to Rahul Guhathakurta, strategic management consultant, the future is bright for knowledge graphs. Knowledge graphs are already used in various AI applications, and this trend is likely to continue as AI systems become more advanced.

As knowledge graphs become more widely used, they will need to improve their performance and scalability to efficiently handle large amounts of data and complex queries.

Moving forward, knowledge graphs will need to improve their interoperability with other systems and databases to facilitate data exchange between organizations and domains, Guhathakurta said.

There may be an increase in automated techniques for building and maintaining knowledge graphs, reducing reliance on manual curation, and improving data collection, organization speed, and accuracy.

As knowledge graphs become more widely understood and their capabilities improve, they will likely be adopted in a wider range of domains—including healthcare, finance, and education. ■

—Stephanie Simone

Developing and Deploying Knowledge Graph Solutions—Franz Inc.

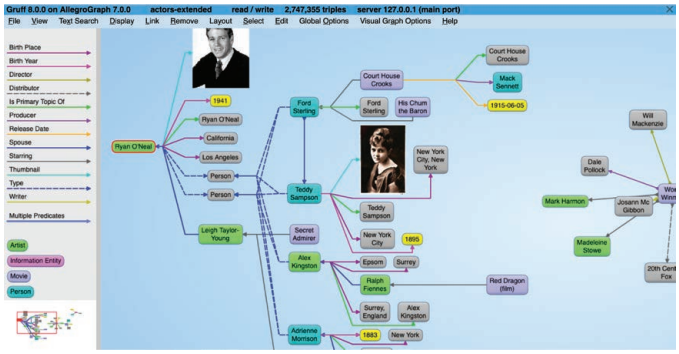
Franz Inc.'s Knowledge Graph Solution includes both technology and services for building industrial-strength Entity-Event Knowledge Graphs based on best-in-class tools, products, knowledge, skills, and experience. Dozens of Fortune 500 companies have chosen Franz Inc. to extract sophisticated decision insights and predictive analytics from highly complex, distributed data that cannot be uncovered with conventional database approaches.

Underpinning Enterprise Semantic Layers with AllegroGraph

Enterprise semantic layers for 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 Event Native 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 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 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 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 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 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 "The Best Knowledge Graph" by KMWorld Reader's Choice voting. Franz's flagship product, AllegroGraph, has gained prominence as a "Trend Setting Product for 2023" in the knowledge management market.

Industry analysts have recognize 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.

Contact Franz Inc. today to build your Knowledge Graph solution. ■

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