The Rise of

KNOWLEDGE
GRAPHS

database
TRENDS AND APPLICATIONS

2019 | MAR

MAKING NEW CONNECTIONS WITH KNOWLEDGE GRAPHS

IN TODAY'S BUSINESS WORLD, TIME-TO-INSIGHT AND TIME-TO-ACTION ARE CRITICAL COMPETITIVE DIFFERENTIATORS. THE DEMAND FOR QUICK, EASY ACCESS TO INFORMATION IS GROWING. HOWEVER, THE CHALLENGE OF COMBINING DATA INTO MEANINGFUL INFORMATION IS ALSO MOUNTING—ALONGSIDE THE PROLIFERATION OF DATA SOURCES AND TYPES. WHILE COMPANIES NOWADAYS ARE INVESTING HEAVILY IN INITIATIVES TO INCREASE THE AMOUNT OF DATA AT THEIR DISPOSAL, MOST ARE SPENDING MORE TIME FINDING THAN ANALYZING DATA. DATA SILOS REMAIN A HUGE PROBLEM AT MANY ENTERPRISES, AND LEGACY DATA MANAGEMENT TECHNOLOGIES AND PROCESSES ARE HAVING TROUBLE KEEPING UP WITH THE SPEED, SCALABILITY, AND FLEXIBILITY REQUIREMENTS OF NEW WORKLOADS AND USE CASES.

Data volumes are exploding in organizations and the pressure to exploit that data for faster time to insight is increasing. Along with this data growth, there is a new wave of tools to expand what is possible with the proliferation of data and data types.

While relational databases are still both the biggest source of transactional data in most organizations and the greatest source of growth for transactional data, according to a recent Unisphere Research study ("Emerging Alternatives for Data Management" sponsored by AWS), the use of NoSQL is an emerging trend—the growth of which will be driven by specific applications and increasing expertise. "NoSQL" data management approaches, features, and

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functionality vary widely and in many situations, can provide an attractive and effective solution for non-relational workloads.

Graph databases, a type of NoSQL database that employs structures with nodes, edges, and properties to store data and places a heavy emphasis on relationships, are growing in use. More recently, the term "knowledge graph" in particular has gained popularity with the introduction of several high-profile implementations by tech giants.

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important for extracting value as well as complying with increasingly stringent data privacy regulations. Moreover, with the use of AI expanding across enterprises in all industries, knowledge graphs offer the potential to improve real-time insights and support machine learning.

THE RISE OF KNOWLEDGE GRAPHS

There are many factors contributing to the expansion of technologies that allow people and machines to better understand connections in their datasets so decisions can be made faster. In particular, the ability to combine semantic and graph technologies that process data with contextual and conceptual intelligence is valued since it can enable predictive analytics that can help support better, real-time decisions.

The concept of the enterprise knowledge graph is made possible by machine learning and big data technologies, including automated text analytics and graph engines,

*The use of **knowledge graphs** spans fields such as healthcare, life sciences, financial services, intelligence, telecommunications, and other fields to support fraud detection, recommendation engines, master data management and Customer 360 views, identity and access management, and data compliance for regulatory standards, and other initiatives.*

explains analyst Amy Stapleton in an Opus Research article. "An IA [intelligent assistant] that taps into an EKG can infer the context and intent of questions, generate direct answers, make recommendations, and automatically expand its understanding as the knowledge graph adds new content," she noted.

The use of knowledge graphs spans fields such as healthcare, life sciences, financial services, intelligence, telecommunications, and more to improve the usability of data lakes, and support fraud detection, recommendation engines, master data management and Customer 360 views, identity and access management, and data compliance for regulatory standards and other initiatives.

The rise of knowledge graphs is not going unnoticed by industry experts. In a recent interview with *Big Data Quarterly*, John O'Brien, CEO and principal

advisor, Radiant Advisors, discusses the transformation underway as companies increasingly realize the power of data, and the tools and technologies helping them to expand what is possible. "I think in the next year [2019], we will see more sophistication around data lake management. An exciting area that we are keeping an eye on is the role of the graph databases to apply management to the data. We see some early traction there with the use of the property graph or the knowledge graph to relate everything to the data lake."

Gartner also recently identified knowledge graphs as a key new technology in both its Hype Cycle for Artificial Intelligence and Hype Cycle for Emerging Technologies. Gartner's Hype Cycle for Artificial Intelligence, 2018 states, "The rising role of content and context for delivering insights with AI technologies, as well as recent knowledge graph offerings for AI applications have pulled knowledge graphs to the surface."

KNOWLEDGE GRAPH MILESTONES

Google's launch in 2012 of its own knowledge graph powered in part by its acquisition of Freebase, is viewed by many as having helped focus attention on graph technology. The knowledge graph is being pursued behind the scenes to enhance ▶
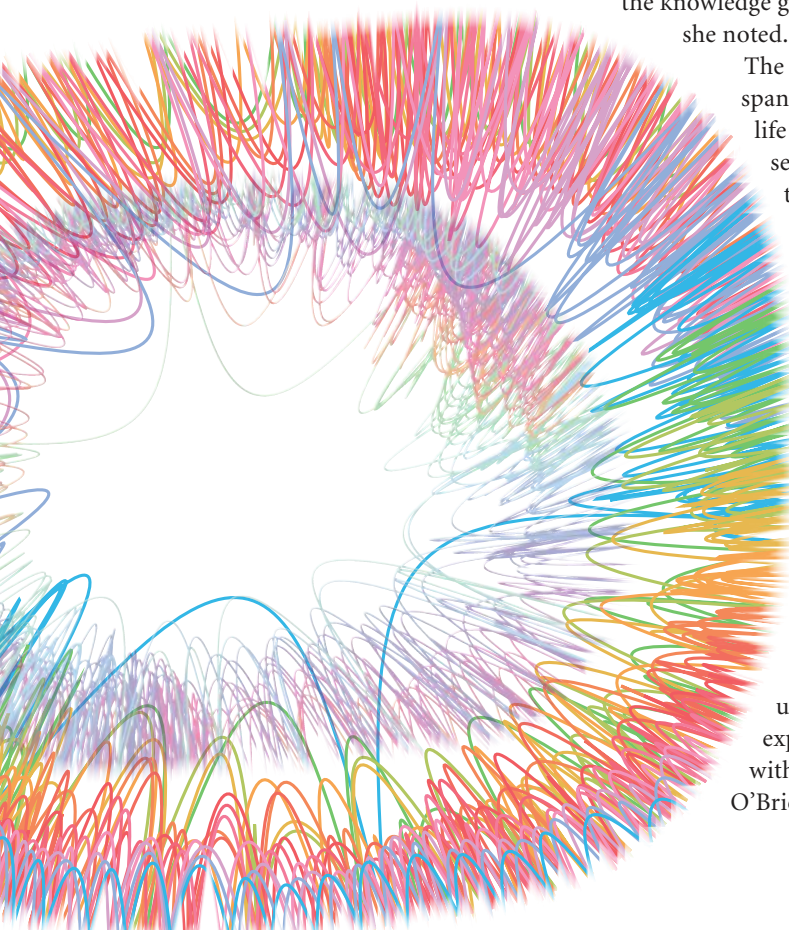
search. Described as "the next frontier in search," the Google knowledge graph collects information about people, places, and things, enhances the value of search results by gather information from sources across the web, including the CIA World Factbook, which provides information on the history, people, government, economy, geography, communications, transportation, military, and transnational issues for 267 world entities; Wikidata, a free and open knowledge base that can be read and edited by both humans and machines; Wikipedia, the free online encyclopedia, and other sources.

The goal of Google's knowledge graph was to not only give users a more complete picture of a topic they were searching, but also to improve the accuracy and speed at which they could find relevant information. Within 7 months of launching, it grew to more than 18 billion facts and is still growing today as the foundation of systems that support AI capabilities in newer robots and smartphones.

In another key milestone for knowledge graphs, Franz, an innovator in AI and supplier of the semantic graph database technology, AllegroGraph, announced in 2018 that it is joining forces with Semantic Web Company, developer of the PoolParty Semantic Suite, to pioneer the first knowledge graph for a public figure. The Noam Chomsky Knowledge Graph semantically links books, interviews, movies, TV programs, and written work from Chomsky, an American linguist, philosopher, cognitive scientist, historian, political activist, and social critic, who is sometimes called "the father of modern linguistics." The content is being made available by searching the knowledge graph for specific titles, related topics, and concepts, and since the project is based on the latest and most advanced technologies, the data is also being made available as machine-readable information in order to be fed into smart applications, intelligent chatbots, and question/answering machines, as well as other AI and data systems.

With the growing range of data sources, and with the increasing speed of data flowing into organizations, the use of knowledge graphs can be expected to play a key role in enterprise data management. In today's fast-paced business world, the speed of information access can mean the difference between timely action and lost opportunity.

Amazon Web Servicesis also enabling knowledge graphs using the metaphactory platform backed by Amazon Neptune. A January 2019 Amazon blog post by Kunal Sengupta points out that "knowledge graphs are gaining prominence in enterprise data management because they offer advantages for data integration. They also help build smarter applications that use machine learning and artificial intelligence (AI) methods." It goes on to explain that Neptune supports open source and open-standard API operations and allows users to take advantage of existing information resources to build their knowledge graphs and host them on a fully managed service.

SPEED OF INSIGHT

With the growing range of data sources, and with the increasing speed of data flowing into organizations, the use of knowledge graphs can be expected to play a key role in enterprise data management. In today's fast-paced business world, the speed of information access can mean the difference between timely action and lost opportunity. The flexible, semantic nature of knowledge graphs makes them well-suited for managing and storing data from diverse sources with context and relevance. ∎
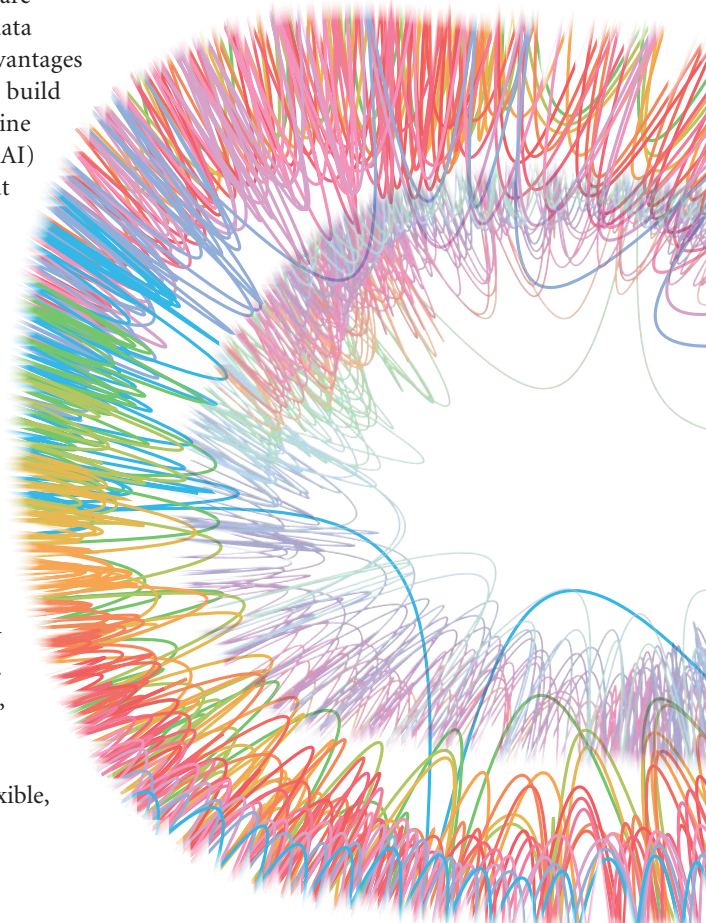
AI Knowledge Graph Solutions: Franz Inc.

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These days, AI is one of the top investment areas for companies looking to improve ROI on operations, products, and create Customer 360 views. Using AI to create "Enterprise Knowledge" and link it across the Enterprise to create a "Knowledge Graph" is a key differentiator for companies in an increasingly competitive landscape. The foundation for Knowledge Graphs and AI lies in the facets of semantic technology provided by Franz's AllegroGraph database. Semantic Graph databases, such as AllegroGraph, provide the core technology environment to enrich and contextualize the understanding of data. The ability to rapidly integrate new knowledge is the crux of the Knowledge Graph and depends entirely on semantic technologies

KNOWLEDGE GRAPHS AND AI

An early innovator in AI, Franz Inc. is a leading supplier of Knowledge Graph solutions. The firm's scalable AI-focused products provide the capabilities for these new Enterprise Knowledge Graph solutions. With the goal of providing infrastructure for a new level of data integration and application interoperability, Franz Inc. is well-positioned to unleash the potential of Knowledge Graphs for a wide range of industries.

ALLEGROGRAPH

AllegroGraph is a multi-model database technology that enables businesses to extract sophisticated decision insights and predictive analytics from highly complex, distributed data that cannot be uncovered with conventional databases. Unlike traditional relational databases or NoSQL document databases, AllegroGraph employs Semantic Graph technologies that process data with contextual and conceptual intelligence. AllegroGraph is able to run queries of unprecedented complexity to support predictive analytics that help organizations make more informed, real-time decisions.

AllegroGraph significantly enhances the document database model with its native support for JSON and JSON-LD. Knowledge Graphs can leverage JSON-LD to swiftly integrate with web-based applications. Organizations can therefore link specific information in their internal Knowledge Graphs (e.g., pertaining to customers or products) to web applications for timely action such as recommendations. JSON-LD provides a way to create a network of standards-based, machine-readable data across web sites.

INDUSTRY-LEADING DATA SECURITY

Semantic Graph databases store their data in the W3C standards-based Resource Description Framework (RDF). These are commonly known as "triples" or "quads." Each node-link-node combination that forms the graph is stored in these standards-compliant "triples." Franz Inc. recently announced an industry-leading security feature, AllegroGraph Triple Attributes. This unique feature provides metadata for each individual triple. Triple Attributes provide the linking and discovery power of Graph Databases with the security of need-to-know access. This approach has the flexibility to implement HIPAA restrictions for the healthcare industry, the privacy rules for the financial industry, and the government models and policies for classified information.

"Triple attributes in AllegroGraph add a significant and complementary dimension to the RDF data model," said Dr. Parsa Mirhaji, Director of Center for Health Data Innovations at the Albert Einstein College of Medicine and Montefiore Medical Center. "It extends property graphs to support an entirely new array of use-cases and functionalities that were not possible before, but most importantly enables implementation of fine grained security built directly into the storage layer."

Originally initiated for government-level data security, the design of the Triple Attributes feature goes well beyond security. Triple Attributes can be implemented for such diverse data analytics domains as AI truth maintenance systems, atmospheric observations to better understand real-world events like crop yields, or storing blockchain hashes and ICO public keys for KYC applications and analytics.

KNOWLEDGE GRAPH CONSULTING

Franz provides a variety of services as part of its Knowledge Graph solution, from architectural consulting and technical seminars to training. The firm's flagship product, AllegroGraph, provides the necessary power and flexibility to address high-security data environments such as HIPAA access controls, privacy rules for banks, and security models for policing, intelligence, and government. If you really want to develop your corporate Knowledge Graph and address complex AI problems, you need a data system that goes beyond just data. You have to create a system that can link to anything outside your own predefined parameters—and that can learn from previous experiences. That is where a Semantic Graph Database, like AllegroGraph, comes into the picture. ∎

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