

THE FUTURE OF AI:

Machine Learning
and Knowledge
Graphs



THE FUTURE OF AI: MACHINE LEARNING AND KNOWLEDGE GRAPHS



While aiming to enhance the way people search for information, knowledge graphs ease the complex process of searching and exploration as a lot of information is in the form of data, audio, videos, and images about a person, entity, or object.

However, a variety of challenges exist, from gaining access to the right data to identifying outputs that are useful.

The flexibility of the graph model, along with its explicit storage of data relationships, makes it not only easy to

growing popularity, in December 2020 at NeurIPS 2020, one of the world's largest AI conferences, more than 136 papers had the word "graph" in their titles.

Knowledge graphs are arguably both widely available and a well-understood technology for knowledge representation and reasoning.

Besides reaching the peak in Gartner's hype cycle for AI in 2020, knowledge graphs are increasingly being adopted in real-world applications by organizations ranging from industry-leading corporations to mid-market companies.

There is a new use for graphs that has blossomed in 2020: graph machine learning. Graph neural networks operate on the graph structures, as opposed to other types of neural networks that operate on vectors. What this means in practice is that they can leverage additional information.

INTRODUCING GRAPH MACHINE LEARNING

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Right now, nearly half of *Database Trends and Applications* readers are using machine learning to better leverage their data and deliver analytical insights.

manage data coming from diverse sources but also to search and explore that data to reveal new insights that would otherwise be very difficult to discover. As a sign of its

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Graph machine learning also goes by the name of geometrical machine learning, because of its ability to learn from complex data such as graphs and multi-dimensional points.

Its applications in 2020 have been relevant in biochemistry, drug design, and structural biology. Knowledge graphs and graph machine learning can work in tandem, as well.

Despite the global impact of COVID-19, 47% of AI investments were unchanged since the start of the pandemic and 30% of organizations actually planned to increase such investments, according to a Gartner poll. Only 16% had temporarily suspended AI investments, and just 7% had decreased them.

Additional use cases for graphs include the following:

to store information generated from various stages of research which can be used for building accessible models, risk management, and process monitoring.

- **Recommendation systems:** Netflix, for example, uses a knowledge graph to store a vast amount of varied information for its recommendation system which helps in finding relationships between movies, TV shows, persons, etc. Later, these preferences and connections can be used to predict what customers might like to watch next.
- **Supply chain management:** Companies can easily keep track of inventories of different components, the personnel involved, and timing, which allows them to move items more swiftly and cost-effectively.

value of a knowledge graph include the following:

Begin with a single use case, link just a few datasets and reports, and then add data and links to it organically so that it's a dynamic structure.

Once you have a use case, identify the content you'll need and classify it according to a taxonomy. While you can refer to industry-standard taxonomies for ideas, invest the time to make the taxonomy meaningful for your organization and understand how users organize their information. Buying taxonomies out of the box or contracting a consultant to do it for you is bound to lead to problems.

The organizing structure becomes even more powerful—an ontology—when you use semantic indexing to replace users' own words with synonyms to better understand what they mean. The requester doesn't need to know the exact label to retrieve the information they want.

Engage business users in the continuous development of the knowledge graph, along with taxonomists, information architects, and data scientists.

Add descriptive metadata to the knowledge graph, such as the version of the report or data lineage, so that users can decide whether it's the right data and if its quality is acceptable.

MAKING AI MORE RELIABLE

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—Stephanie Simone

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- **Question-answering:** This is one of the most frequently used applications for knowledge graphs. Knowledge graphs contain a wealth of information and question-answering is a good way to help end users to more effectively and more efficiently retrieve information from knowledge graphs.
- **Storing research:** Many companies have been using knowledge graphs recently

THE VALUE OF COMBINING KNOWLEDGE GRAPHS WITH AI

Bringing knowledge graph and machine learning technology together can improve the accuracy of the outcomes and augment the potential of machine learning approaches. According to Andrea Malick, a research director in the Data and Analytics practice at Info-Tech, steps for implementing and maximizing the

Entity-Event Knowledge Graph Solutions: Franz Inc.



ALLEGROGRAPH UNDERPINS FLEXIBLE AI KNOWLEDGE FABRICS

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 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

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 WITH FEDSHARD™

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 technology shards data with any large-scale knowledge base—providing a novel way to shard knowledge bases without duplicating knowledge bases in every shard.

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

GRUFF—INDUSTRY-LEADING GRAPH VISUALIZATION AND QUERY BUILDER

AllegroGraph includes Gruff, the most advanced Knowledge Graph visualization application on the market. Gruff enables users to create visual Knowledge Graphs that display 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 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. All AllegroGraph users need is a web browser and internet connection to login. 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. Work with Gruff at the [Gruff Demo Site](#).

FRANZ'S TECHNOLOGY AND SERVICES

Franz'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.

Franz's technology excellence continues to be recognized by industry experts. Franz was recently named a [Best Database Management Software Company of 2021](#) and the company's flagship product, AllegroGraph, has gained prominence as a [Champion in the Knowledge Graph analytics market](#), which has skyrocketed in the past few years—prompting Forrester to publish its first [Forrester Wave: Graph Data Platforms, Q4 2020](#).

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