KNOWLEDGE GURU SOLUTION BRIEF

Generative AI & Anzo Knowledge Graph

CAMBRIDGE SEMANTICS

Introducing the Knowledge Guru

Cambridge Semantics (CSI) has successfully developed a fully functioning Conversational Business Intelligence prototype we are calling the “Knowledge Guru”. Our operating prototype enables Corporate clients to interact with all their data through a natural language interface based on OpenAI’s ChatGPT Large Language Model (LLM) technology connected to CSI’s Anzo Knowledge Graph Platform which serves as its backend data tier. This innovative combination delivers a "Talking to Data" experience, allowing Institutional users to ask any questions and provide instructions in a conversational chat mode with access to all the information in the Knowledge Graph and its powerful analytic tools. The approach reinvents data accessibility and analysis making it effortlessly available to all levels of an organization.

Multiple enterprise customers today are using CSI’s Anzo Knowledge Graph Platform as a means to integrate their data. It enables efficient execution of ad hoc graph queries on custom integrations of broad arrays of enterprise data sources and delivers enterprise knowledge linked together in a form well suited for any query. With Anzo and The Knowledge Guru end users can instantaneously engage with this knowledge store through a completely natural interface. This achievement marks a considerable advancement in the field of data accessibility, opening up a wide range of possibilities for Cambridge Semantics and the broader industry. Businesses can now take advantage of this technology to deliver individually customized information to all stakeholders in the form of their immediately answered questions. The value of data when used to deliver immediate responses is greatly multiplied as it enhances real-time decision-making processes, driving better business outcomes.

Knowledge Guru Breaks Down Barriers

The Knowledge Guru prototype addresses the unreliability concerns some enterprises have raised regarding Large Language Models. This is because it generates concrete, fully explained graph queries backed by data provenance. This ensures that the system's output is verifiably accurate, reliable, and transparent. It side-steps all the concerns about the black-box nature of language models and builds trust in the answers it delivers.

This significant technical advance breaks down all the current barriers that have traditionally existed between business end users and their data. It eliminates all

the processes, making it easier and more efficient for end users to access and analyze the data tailored to their current problem without relying on complex tools or intermediaries, such as expensive reporting systems, customizing BI dashboard tools, and bespoke applications that all require layers of IT expense, development or deployment time, and red tape.

Knowledge Guru Architecture

The Knowledge Guru prototype currently builds on OpenAI's GPT-4 language model in a web app. The app provides a natural language interface for users to interact with CSI's underlying Knowledge Graph platform.

In this setup, users can ask any ad hoc questions of their data and receive accurate, explainable answers, along with BI dashboard-style illustrative charts and visualizations. The system streamlines the process of querying the Knowledge Graph by generating graph queries automatically which immediately answer whatever it is the user wants to know, in any language they choose.

Knowledge Guru Use Cases

Although only the beginning, the world pioneered by LLMs is taking shape. AI tools, much like ChatGPT, will seamlessly integrate into board and other management meetings. The AI tools will actively participate in real-time discussions by processing and analyzing vast amounts of data to answer ad hoc questions. They will track the conversation and provide data-driven insights. This will empower executives to dive deep into issues in the moment, explore different facets of a problem, and ultimately enhance decision-making processes through just-in-time data-centric perspectives. Numerous applications for this approach can be envisioned across various industries.

With Knowledge Guru, boards and teams throughout the organization will be able to ask, in natural language, any ad hoc question of their structured or unstructured data and receive real time, accurate answers-fully compliant with Enterprise data standards. This is a transformative step where users' 'conversations' will generate real time integration of broader data, deeper analyses and deliver faster time to action.

Customer 360

All the siloed information from across a Corporation's many lines of business is swept into and linked together in a knowledge graph. This puts all available information about every customer just a few keystrokes and a question away for all stakeholders.

Banking Example

A '360' in the Banking world will integrate clients' checking accounts & asset management accounts with their corporate high net worth portfolio and identify their employment positions and equity ownership in public and private investments. Account reps will be able to splay new tax laws across their accounts and immediately identify clients' exposures and present new product suggestions for improved investment performance.

Customer Support

The Knowledge Guru could assist by answering customer questions in real-time providing exact answers related to current information on products, services, or troubleshooting steps all customized exactly to each customer's situation and interests. This would improve customer satisfaction, streamline the support process, and reduce the workload on human agents. A record of the customers journey and history will be constantly updated as will specific issues with products or services.. Similarly, simultaneously implementing software identifying customer intent would help sales and marketing teams more accurately qualify leads and close deals more efficiently.

Supply Chain

Supply chain management and resilience are central priorities for global companies. Knowledge Guru and Anzo will enable a digital twin that sits over the end-to-end supply chain enabling stress testing and input from the many steps and logistics handoffs allowing real time visual display of every part at every step in the process. Management can identify potential bottlenecks and evolving risks as well as providing real-time insights would improve decision-making and contingency planning.

Product Lifecycle Management

Closely related to supply chain is overall Product Lifecycle Management which has long been one of the most complex domains for manufacturing companies.

Manufacturing Example

For example, a typical German car manufacturer assembles ~10 cars per minute. Each consists of many thousands of mechanical, electronic and software components produced and supplied by a few thousand suppliers. Each component has its own extended lifecycle starting with the definition of requirements and functions through development, testing and production and on to field usage and service. Each component has various manifestations of versions, release states, region specific and time-dependent certifications, changes in production processes, prices and compatibility rules. Knowledge Guru could answer complex questions like "Show me all parts used in Model A and Model D, used for production in one of the plants in Poland, that have a chrome coating and are not certified for Europe starting from 2023." and for a follow on, "What happens to downstream processes in production, supply chain and services if I change the coating of part X from chrome to nickel?"

Healthcare

Knowledge Guru and Anzo could be used to assist medical professionals in diagnosing illnesses, suggesting treatment plans, and answering patient questions. Second and third opinions will be instantaneous vs. waiting for the next available appointment. Patients will have all their records and Doctor notes centralized; this holistic view of the patient vs. independent specialty reports will be important for integrated treatment plans central for long term health.

Pharmaceutical & Life Science

In the pharmaceutical industry, the R&D and clinical trial process requires the use of hundreds of information systems across the 10-15 year lifecycle of a drug's development. This data can include information such as patient data, genomic data, and clinical trial results. Speeding individualized access to all of this data linked together would allow researchers and executives to shave years and hundreds of millions of dollars off of the process of drug discovery and development, getting important drugs to patients more quickly.

These examples illustrate the potential of context-aware conversational AI coupled with knowledge graphs to revolutionize various industries. It can streamline processes and improve decision-making across a wide range of applications, from boardrooms to customer-facing roles and beyond. By integrating these use cases into a future where Conversational BI is invited to the boardroom, businesses can unlock the full potential of this powerful

technology. It enhances their decision-making capabilities and drives better outcomes.

Underlying Technologies

The secret to the Knowledge Guru's success lies in its effective use of ontologies.

Ontologies are modern-day Rosetta Stones that bridge the gap between human language and machine-readable data structures. The Anzo Knowledge Graph Platform is built on ontologies, making it a powerful tool for organizing and structuring knowledge. Ontologies enable accurate and context-aware understanding of complex data sets because they describe the data that is available in conceptual models that captures how an expert in a domain thinks about those same concepts. They unlock the path between any human-entered question, the human-level description of what information is actually available in the Knowledge Graph, and finally how that is to be mapped into a (machine-readable) graph query that the Anzo engine can execute in order to return the answer.

One of the major advantages of ontologies is their versatility, as they can be applied to any organizational domain or field of information. This makes the ontology-based approach extremely flexible and adaptable to the needs of different industries and organizations. Adhering to W3C standards, ontologies help to provide consistency, interoperability, and seamless integration with the existing data infrastructure all of which is needed to supply the Guru with raw data.

As applications like the Guru demonstrate, Large Language Models like GPT-4, and Semantic Knowledge Graphs are an extremely powerful combination. There are several reasons for this. Firstly, the use of Knowledge Graphs and ontologies allows LLMs to access a rich contextual understanding of and access to the broadest array of enterprise data possible. This results in accurate and meaningful responses to user queries that touch on any of the enterprise's information made available through the Knowledge Graph.

As mentioned earlier, ontologies describing the Knowledge Graph provide a consistent conceptual level representation of knowledge using human readable descriptions well suited to the form of Natural Language Query (NLQ) enabled by LLMs. Other data storage and access technologies, like for example Relational Data Management Systems, lack this consistent conceptual semantic

layer or worse, can present as confusing amalgam of often opaque schema representing a number of additional layers (physical and logical) that make more than simplistic queries against narrow slices of the available data far more difficult to accurately produce.

Another significant element missing from most traditional storage systems is the data provenance provided by a well constructed Knowledge Graph, along with detailed explanations of the workings of the queries generated by the LLM. Together these provide the explainability and transparency of answers and the process of getting to them. This fosters trust in the results and makes it more reasonable to users who may otherwise be skeptical of answers provided by it.

Combining Semantic Knowledge Graphs with LLMs, Conversational BI systems synergistically builds on the strengths of both technologies. This powerful pairing has the potential to revolutionize data-driven decision-making and transform the way people and organizations interact with and analyze their data.

The success of the Knowledge Guru prototype demonstrates that the approach has the potential to significantly disrupt the landscape of software tools and services that currently connect enterprise data with business end users. By reducing the need for the current data analytics processes and making their data accessible as immediate made-to-order answers, the system can transform how organizations interact with and extract insights from their data, revolutionizing the way data-driven decisions are made. A Conversational BI approach eliminates traditional barriers and empowers end users to engage with data directly through a natural language interface, leading to faster insights, improved decision-making, and enhanced business outcomes.

Business Value

Several areas where Conversational BI will have a significant impact on the industry include the democratization of data access, streamlining of reporting and analytics processes, enhanced collaboration and decision-making, accelerated innovation, increased agility and adaptability, and improved user satisfaction and productivity. Improving the speed of moving raw data to integrated information that will elicit actions is a central benefit.

By disrupting the landscape of software tools and services connecting enterprise data to business end users, Conversational BI has the potential to drive significant positive change across industries, unlocking new opportunities for growth and value creation.This is a technology that provides a unique value

proposition for businesses seeking data accessible and user-friendly data analytics. With the growing need for efficient and seamless data analysis solutions, Conversational BI's combination of natural language processing, knowledge graphs, and ontologies positions it ahead of traditional BI tools and services.

The ontology-based approach of Conversational BI makes it highly scalable and adaptable to various industries and business use cases, increasing the potential for widespread adoption and revenue streams. Additionally, Conversational BI can help businesses save on IT expenses, time, and resources by eliminating the need for expensive reporting systems, custom BI dashboard tools, and bespoke applications.

The system's ability to streamline data analysis and provide real-time, accurate insights can help businesses make better decisions, faster, leading to improved business performance. Additionally, the technology's innovative approach opens up opportunities for partnerships and integrations with other software providers and technology platforms, expanding its reach, increasing market share, and enhancing its value proposition for businesses.

Moreover, Conversational BI offers a natural language interface that improves the user experience by enabling end-users to access and analyze data without relying on complex tools or intermediaries. The use of ontologies and Semantic Knowledge Graphs can help improve the explainability and transparency of AI-driven conversational systems' outputs, increasing trust in the technology and making it more accessible to users.

Conclusion

In conclusion, Conversational BI represented by the Knowledge Guru prototype, presents a unique value proposition for businesses seeking an accessible, user-friendly, and efficient data analytics tool that can significantly transform the way organizations interact with and analyze their data. Its innovative approach provides a natural language interface that empowers end-users to engage with data directly, leading to faster insights, immediate answers and improved data driven decision-making, leading to enhanced business outcomes.

With its ontology-based approach, Conversational BI is highly scalable and adaptable to various industries and business use cases, with strong potential for widespread adoption, strategic partnerships, and integrations. Additionally, it

offers cost savings, increased efficiency and productivity, enhanced explainability and transparency, and interoperability, making it a compelling choice for businesses seeking to adopt a disruptive technology that can revolutionize data-driven decision-making. By addressing the market opportunity, competitive advantage, and the potential for strategic partnerships and improved user experience, Conversational BI is poised to reshape the way businesses approach data analytics and unlock new opportunities for growth and value creation.