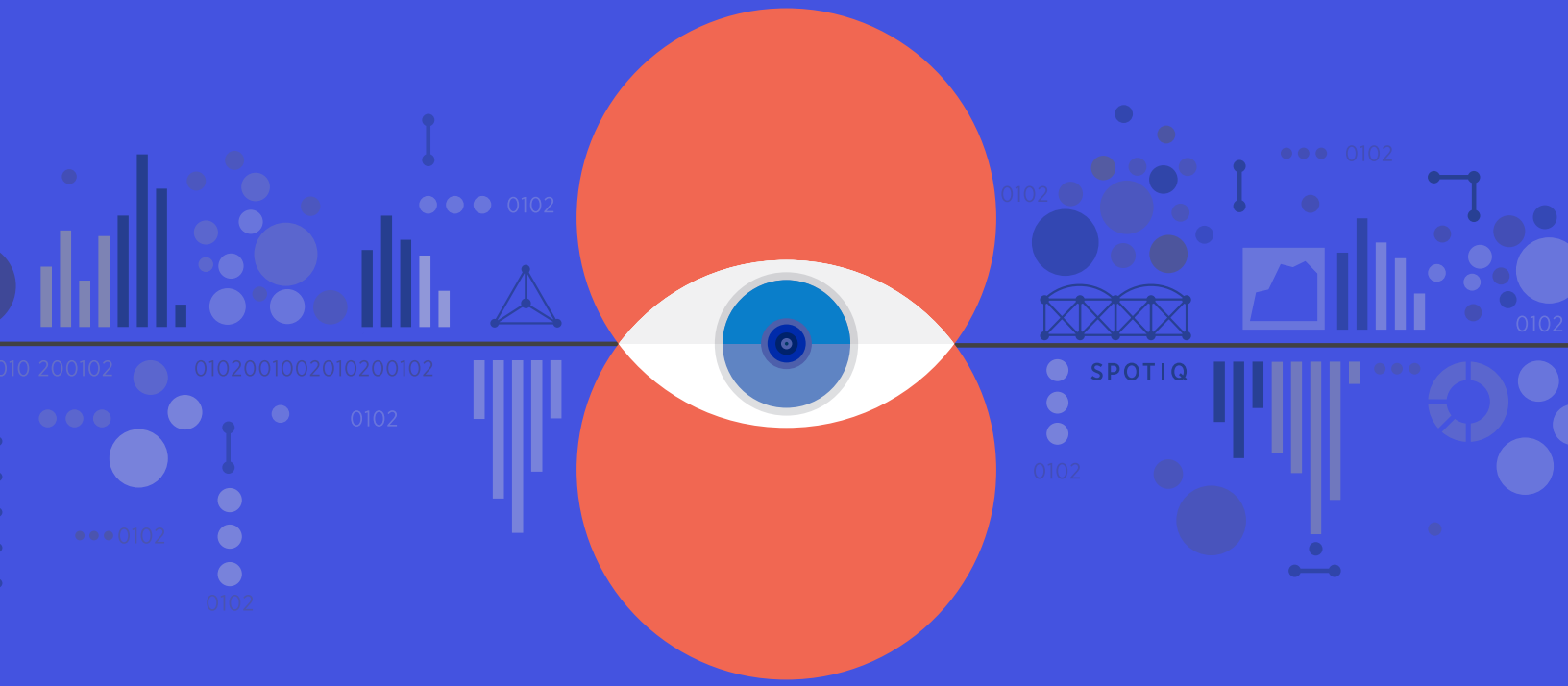
2nd EDITION

ThoughtSpot

WHITE PAPER

SpotIQ AI-Driven Insights

Architecting Automated Insights for the Masses

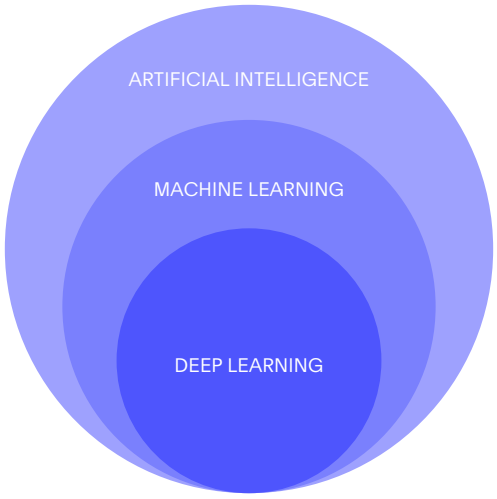


Artificial Intelligence: Beyond the Hype

Artificial intelligence (AI) and machine learning have captured our imaginations for decades. As early as the 1950s, researchers created computer programs that mimicked basic intelligence as they interacted with humans, giving everyone wild optimism that machines would someday be able to perform tasks just like any human would. However, as expectations continued to rise, researchers were unable to achieve any meaningful results. Early computing lacked the processing power, speed, and scale required for machines to adequately mimic human behavior. As a result, the initial euphoria around AI was met with skepticism that the promise was overhyped.

Fast forward to today and we are once again celebrating advances in AI, particularly in the field of machine learning. AI is no longer relegated to science fiction and Hollywood films. AI surrounds us in a variety applications including computer games, autonomous vehicles, and virtual assistants. AI has become as ubiquitous as the enormous amounts of data we create to feed its underlying calculations and machine learning algorithms. With the support of seemingly boundless amounts of compute power, AI is applied in many consumer services and enterprise products today.

CLASSIFYING AI, MACHINE LEARNING, AND DEEP LEARNING



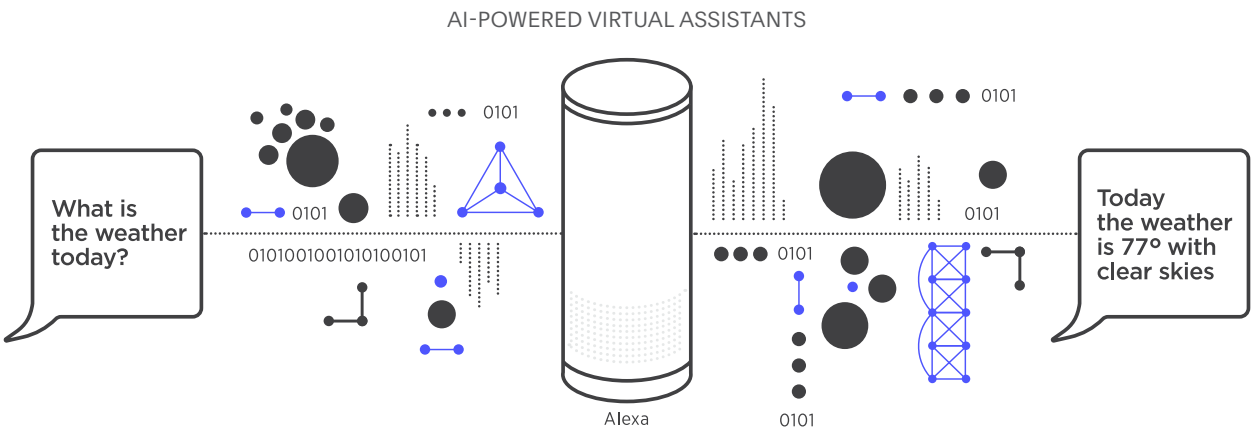
So what exactly are artificial intelligence and machine learning – and how are they different? In short, AI is a broad concept where machines behave and think more like humans. Machine learning is an application of AI that uses statistics and historical data to identify patterns and automatically improve at accomplishing a given set of tasks over time.

Machine learning is commonly classified into three different categories: supervised learning; unsupervised learning, and; reinforcement learning. With supervised learning, humans specify a desired outcome and manually classify a set of training data, and the machine learns how to classify new data to produce the desired outcome. Spam filtering is a good example of supervised learning. Spam filters learn from humans' explicit classification of spam emails vs good emails. With unsupervised learning, the machine automatically determines how to classify data without human intervention, continuously adapting and improving its ability to accomplish a task all on its own. Playlist curation and content recommendations on sites like YouTube are examples of unsupervised learning as the system automatically learns each user's preferences from his/her interaction with the content, without any explicit action from the user. And with reinforcement learning, the machine marches towards a particular goal and its behavior as it navigates down its path is influenced by rewards or punishments such as a user's explicit approval or disapproval via a thumbs up or thumbs down action. All three categories can be interwoven.

Going one layer deeper, deep learning is a machine learning technique that processes data through multi-layered neural networks – processes inspired by the structure of the human brain. Deep learning algorithms are extremely powerful, producing desired outcomes by breaking down a problem into small chunks and crunching through large amounts of data at scale. As an example, in self-driving cars, one part of the algorithm recognizes cars in other lanes, another recognizes pedestrians, and another may even recognize street signs. All these pieces work together to help the car navigate safely to its destination.

Everyday Applications of AI

As consumers, AI is all around us. Consider this example. You roll out of bed in the morning and ask your favorite virtual assistant, "What is the weather today?" Popular devices such as the Amazon Echo and Google Home use AI techniques like far-field voice recognition to isolate your voice in a noisy room and then use natural language processing (NLP) to parse your question. Then, they recognize your location and use weather source APIs to respond back with something like, "It is 77° fahrenheit with clear skies in Memphis today." This is an example of AI and machine learning built into virtual assistants that enable smart devices to act like an intelligent human.

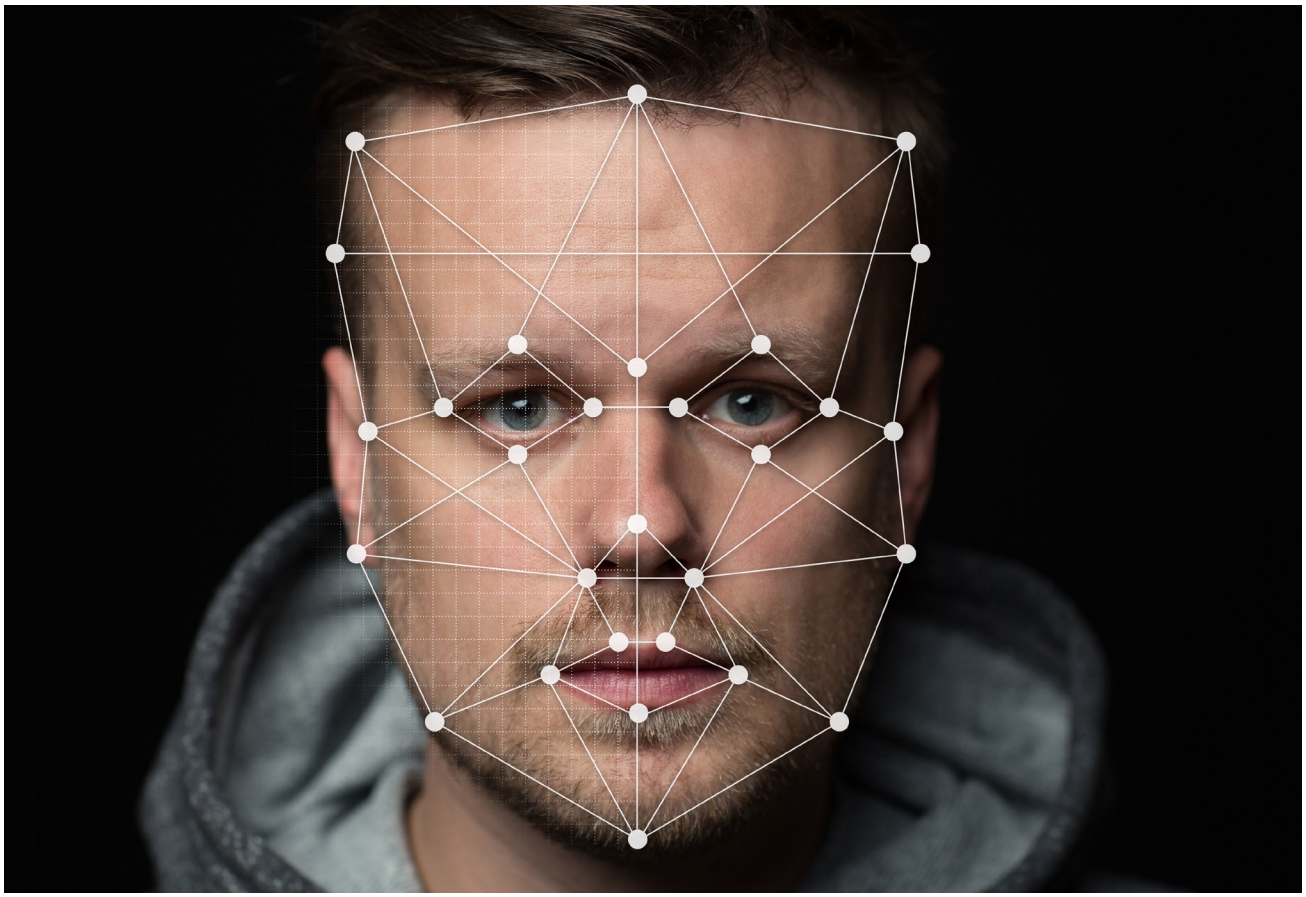


When you open your laptop and fire up a web browser, your initial destination may be your favorite search engine, such as Google. As you type your question in the search box, the search engine returns relevant suggestions in real time based on every character you type. But not all search engines are created equal. Google's search engine has become the gold standard because of the quality of the results it

returns, driven by its sophisticated PageRank machine learning algorithm. PageRank uses the billions of documents on the web and data about the number and quality of links within a webpage to automatically determine how relevant content is based on your search terms.

Every time you upload a photo to Facebook, it uses facial recognition AI to pick out faces in the photo and automatically makes recommendations on who should be tagged in each photo based on patterns found in other photos of that person. In 2015, Facebook researchers rolled out the deep learning image recognition algorithm DeepFace that they claim to be 97% accurate. Similar technologies power Google's image search and Apple's facial recognition software that automatically recognizes your face to unlock your phone.

FACIAL RECOGNITION AI USING DEEP LEARNING



The list of AI-powered consumer experiences doesn't end there, signaling how pervasive and mainstream AI has become. Naturally, there is a real excitement about AI and machine learning in the data and analytics community as this technology makes its way into the enterprise.

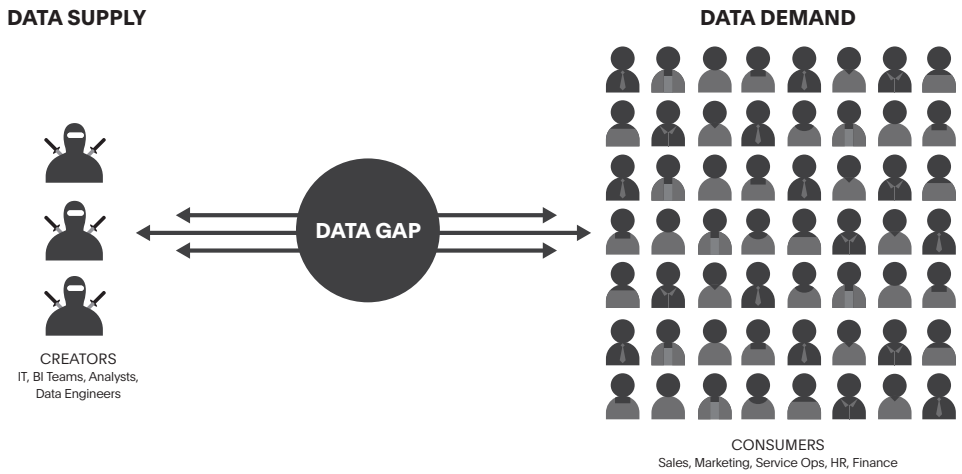
The AI Opportunity in Analytics

IDC forecasts the amount of data created annually at a staggering 175 Zettabytes (or 175 trillion gigabytes) in 2025[1]. Compare that to 33 Zettabytes of data created in 2018. Connected people – 75 percent of the world's population – will interact with data every 18 seconds on average in 2025, according to IDC.

Unfortunately, while data volume is rapidly growing, the volume of insights we're able to extract from it has been fundamentally limited. That's because in today's analytics paradigm there's a huge gap between data supply and data demand. On one end, there are many data consumers across every line of business who crave new insights. On the other end, there are a few data producers – the data experts – who are required to extract value from data. As more and more data is collected, this small group of trained experts is under more pressure.

The amount of data being created annually is forecasted to reach a staggering 180 Zettabytes in 2025

THE DATA ACCESS GAP



That's why AI and machine learning present such a significant opportunity in the world of analytics. By infusing AI into analytics workflows, you can transform your organization and bridge the supplier-consumer divide by giving everyone access to the tools they need to make data-driven decisions. The good news is that AI has already arrived and is changing the way business people – such as marketers and salespeople – interact with the data they have at their disposal. Today, the uses of AI in analytics can be boiled down to three categories of technology: automated data discovery; search and text-based analytics, and; intelligent modeling and recommendations.

[1]https://www.networkworld.com/article/3325397/storage/idc-expect-175-zettabytes-of-data-worldwide-by-2025.html

Automated Data Discovery

Automated data discovery encompasses a class of technologies that automates the process of data analysis and exploration in real-time. This includes everything from selecting data sets to explore, running queries automatically, combing through results for insights, and choosing a best-fit visualization paired with a natural language description of each insight.

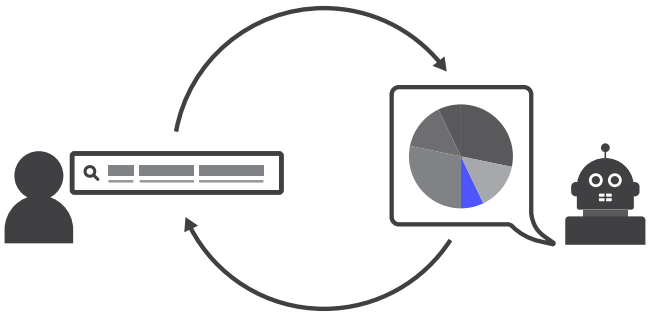
The number of possible questions to ask of data is often too much for any human. With automated data discovery technologies, business people can rely on machine-driven smarts to explore complex datasets with a few clicks and get insights explained to them in natural language. They don't need a trained analyst and hours of time it would otherwise take to explore the data manually and build a report. Instead, data experts can focus on data governance, building bulletproof data models, and preparing new datasets for analysis.

AUTOMATED DATA DISCOVERY USES AI-DRIVEN SMARTS TO AUTOMATICALLY GENERATE INSIGHTS ON COMPLEX DATA

Search and Integrated Text-Based Analytics

AI-driven search is transforming the way business people interact with enterprise information assets. Unlike the search technologies of the past that allowed people to search for content within pre-built reports, AI-driven search makes it possible for business users to ask a question either by typing it into a search bar or via a voice-driven assistant to get answers to net new questions in seconds. Analytical search engines use AI techniques such as NLP to intelligently parse the question and transform it into a query designed for relational databases and machine learning to present personalized, relevant search suggestions in real time.

USING SEARCH AND BOTS TO UNCOVER INSIGHTS

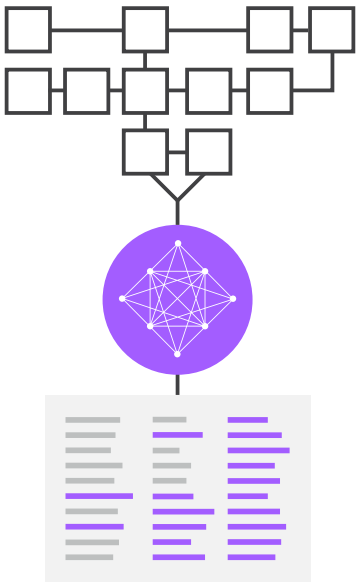


Conversational chatbots for analytics expand on this question-and-answer paradigm by leveraging the virtual assistants and other devices to extend access to data outside of the analytics environment. Bots serve as a virtual liaison between humans and analytics engines and make it possible for business users to query and interact with their data on-the-go. These virtual assistants can be found within modern instant messaging clients like Slack and native mobile apps, helping to provide critical insights and data context anywhere at anytime.

Intelligent Modeling & Recommendations

Data experts spend a significant amount of time profiling data and modeling relationships between data sets to answer specific business questions. In fact, according to a 2017 survey conducted by FigureEight (formerly CrowdFlower), data experts spend 80 percent of their time just cleaning and organizing data for analysis. In the same survey, 60 percent of participants indicated that data preparation was the least enjoyable part of their work, making data preparation prime for disruption by AI.

AI POWERED DATA MODELING



AI-powered data modeling and recommendations can reduce time spent on this kind of work by automatically generating statistics about data sets, inferring data types, identifying hierarchies and relationships within data sets, and dynamically aggregating data at query-time. This enables the new class of citizen data scientists and frees up time for data experts to focus on the work they enjoy most such as data mining and more sophisticated analyses like predictive analytics to help the business stay ahead of the curve.

This covers just a few examples of how AI is fundamentally changing the world of analytics. Applied correctly, artificial intelligence has the potential to substantially impact or predict business outcomes, exponentially improve employee productivity and decision-making, and even create new jobs within the data team by increasing data literacy.

Machine-generated insights also help to minimize errors in analysis and eliminate human bias, bringing to your attention new metrics and business drivers that weren't considered before.

Ultimately, the ease and speed with which new insights are detected enable citizen data professionals to source, prepare, and analyze their own data without the need for trained resources. But what will it take for your organization to adopt these kinds of AI-driven analytics technologies and change the way your business operates?

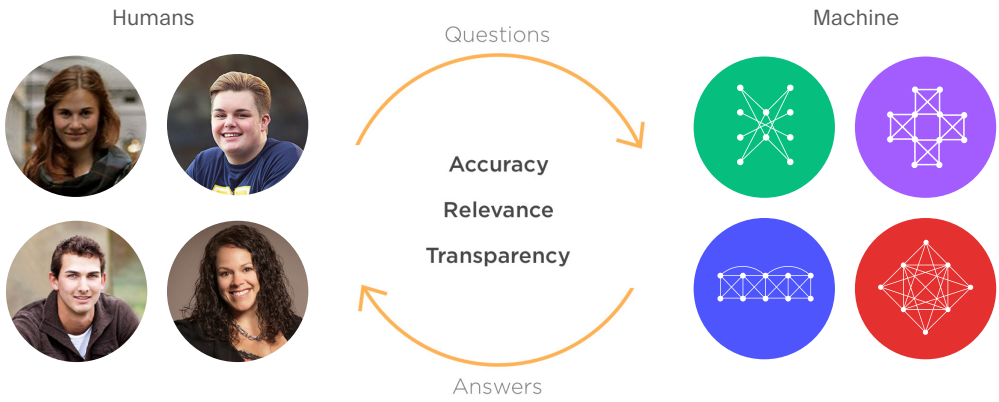
Trust-based AI

There's a problem lurking at the core of AI in today's world. Many understand what innovative AI technologies can accomplish but few know how they work, creating a general feeling of distrust. Business professionals count on analytics technologies to drive their most critical decisions, so they may find it difficult to adopt revolutionary technologies such as AI without understanding what's happening under the hood.

And that's why trust is the key to adoption of AI-infused analytics. When it comes to analytics, trust is created by delivering accurate, relevant, and transparent results. To do this, machines should not rely solely on their own built-in learning algorithms but must work together with humans to ensure every result meets these standards of trust.

This philosophy underlies ThoughtSpot's SpotIQ – an automated data insights engine that makes it easy for any business person to automatically generate trusted insights with a single click.

THE KEY TO AI-INFUSED ANALYTICS IS TRUST



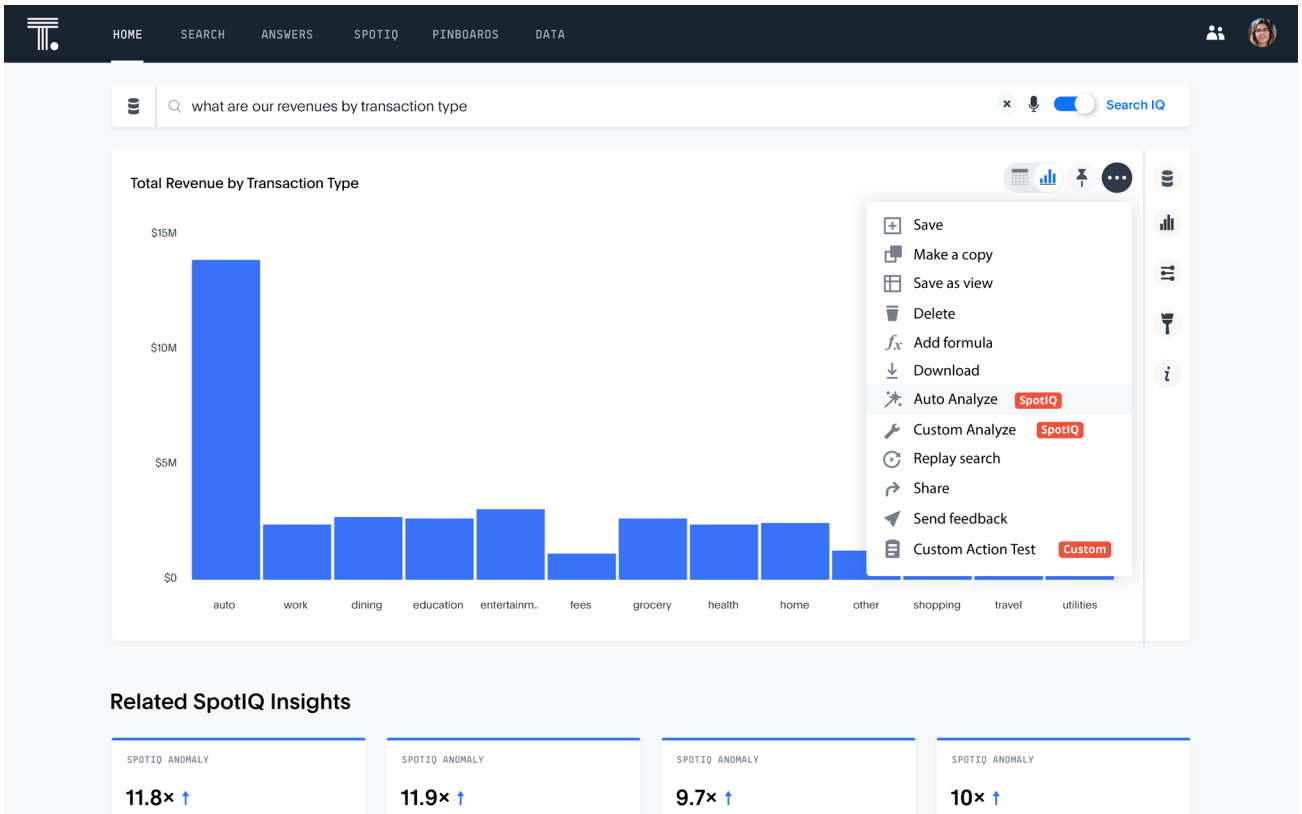
Introducing AI-Driven Analytics from ThoughtSpot

ThoughtSpot's search & AI-driven analytics platform puts the power of a thousand analysts in the hands of every business person. With ThoughtSpot, you can use search to easily analyze your data or automatically get trusted insights pushed to you with a single click via SpotIQ. SpotIQ works hand-in-hand with ThoughtSpot's relational search engine to curate deep and relevant insights for users that they may not have thought to look for on their own. SpotIQ can automatically ask thousands of questions about billions of data points and bring back dozens of insights in seconds. In a traditional BI paradigm, you would have to hire a thousand analysts, tell them exactly what questions you want them to answer, and then wait a week for them to deliver relevant reports and dashboards. With the power of AI, SpotIQ accomplishes in a single click what could take up to 40,000 work-hours – in seconds.

Powered by an analytics platform with massive computing power, SpotIQ learns what matters most to teams based on user behavior, automatically uncovers hidden trends and patterns in the data, and then pushes those insights directly to people when it matters most.

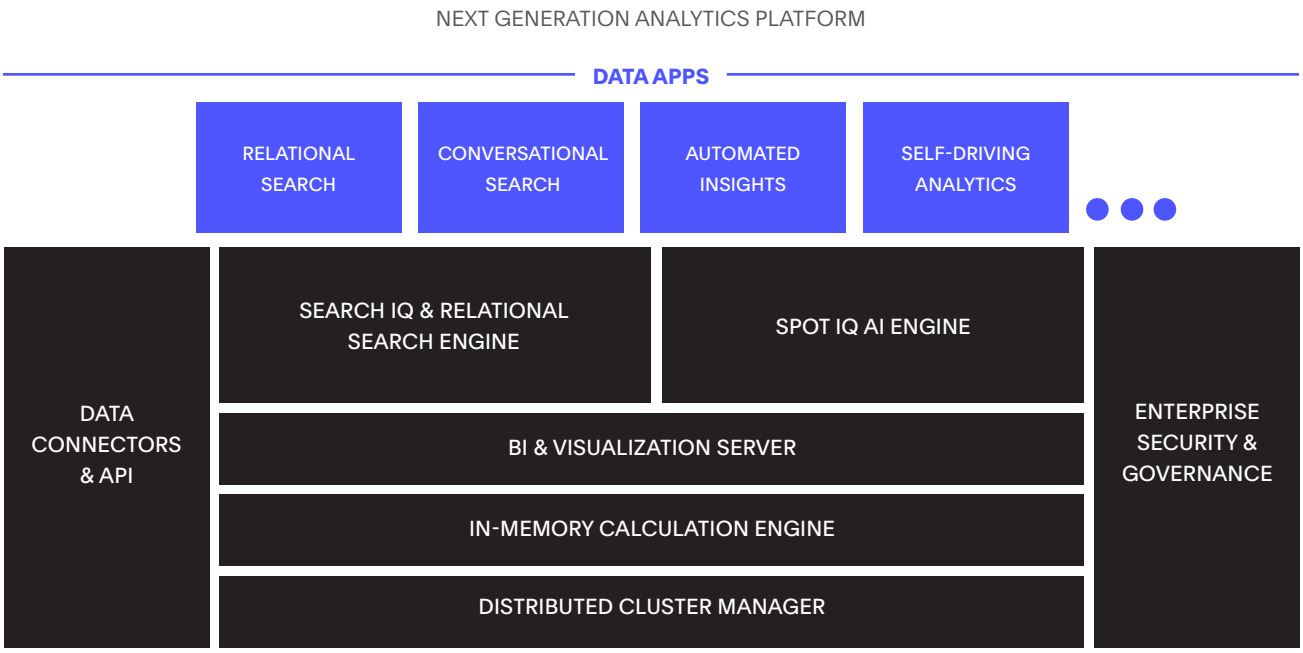
With SpotIQ, there is a huge opportunity to enable millions of business people to make smarter decisions fueled by automated AI-driven automated insights.

SPOTIQ AI-POWERED INSIGHTS ARE PERVASIVE THROUGHOUT THOUGHTSPOT. HERE, RELATED SPOTIQ INSIGHTS APPEAR UNDER THE RESULTS OF A NATURAL LANGUAGE QUERY.



Effective AI Requires a Platform-up Approach

AI requires the ability to perform complex calculations on massive amounts of data at extremely high speeds to deliver on its promise. But how can you provide a simple experience that can handle the user and data scale along with the complexities of the enterprise to make AI accessible to everyone? Traditional disk-based solutions, or even hybrid in-memory and disk-based solutions, are not adequate to meet the performance and scale demands of AI.



Rather, AI-driven analytics require a distributed, massively parallel, in-memory execution engine to provide processing speeds at scale orders of magnitude faster than traditional architectures. Combine that with enterprise-grade requirements like security, governance, high availability, and manageability and the only possible solution is a vertically-aware analytics stack built from the ground-up for AI-driven analytics.

ThoughtSpot's next generation search & AI-driven analytics platform combines the precision of the world's first relational search engine with the smarts of a robust AI engine and the scale of a massively parallel in-memory data cache and calculation engine. As data is cached in ThoughtSpot, the entire data model is indexed, including the raw data, metadata, and relationships. This makes it easy and fast for anyone to perform database joins, drill anywhere in their data model, and change aggregations on the fly. ThoughtSpot eliminates the need for rigid summary structures like cubes and data marts that require hours or months for technical resources to build.

ThoughtSpot is deployed on a cluster of nodes – in the cloud, on-premises, or in private clouds – each of which has its own set of services and processes running in-memory. The Distributed Cluster Manager provides optimal distribution of workload for scale and performance as well as for fault tolerance, redundancy, and failover, while minimizing administrative overhead. ThoughtSpot also supports table sharding across multi-node clusters, massively parallel processing of queries, query caching for frequently used queries, just-in-time query compilation, and compression-aware query execution – all in an in-memory, columnar data cache.

ThoughtSpot can also handle data model complexity with ease. ThoughtSpot's BI & Visualization Server can automatically identify complex data models, like many-to-many relationships found in chasm traps and master-detail relationships found in fan traps. Complex queries are executed against any data model, generate an ordered set of subqueries to execute, and automatically determine the proper grouping and aggregation level to present a 100 percent accurate result.

ThoughtSpot supports automated insight discovery for hundreds of thousands of users who each generate thousands of explorations. These result sets are processed through scalable, custom-built AI algorithms and insights are then ranked and pushed to users automatically. To do this, SpotIQ has a dedicated workload balancer to prioritize user requests, leverages the power of ThoughtSpot's data platform for calculations, and uses home-grown, optimized AI algorithms such as supervised machine learning to process results and pick the best insights for each user.

The result of this integrated, vertically-aware stack is a radically different analytics experience that is lightning fast and scales to terabytes of in-memory data across multiple sources – all with granular security and governance access controls. Thousands of users can execute complex queries on billions of rows of data and receive answers in seconds.

AI Meets Relational Search

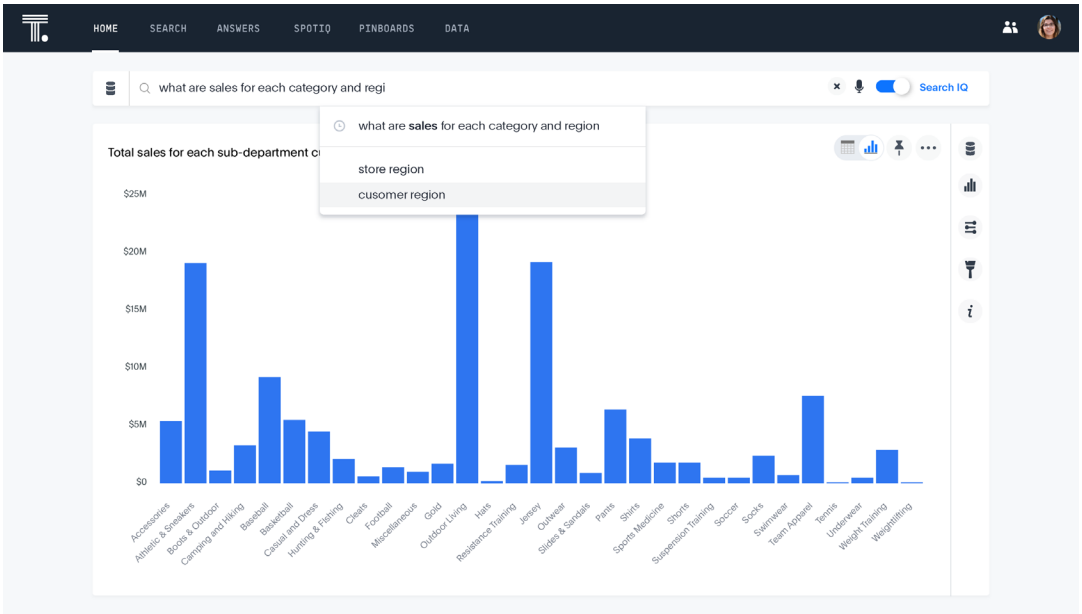
The ThoughtSpot platform provides users with an analytics experience that is easy, precise, and fast. With the power of relational search, ThoughtSpot makes the experience so easy that you simply ask a question for the system to generate an answer, rather than wait days or weeks for an expert to build a custom report or dashboard. With a natural language search experience, ThoughtSpot's search engine is smart enough to understand a user's question, transform it into a query, and calculate answers in real time as you type. It determines relevant relationships and performs aggregations, filtering, and other operations as the query is executed, so you don't need to develop cubes, summary tables, or predefined drill paths.

DataRank, a machine-learning algorithm built into ThoughtSpot's relational search engine, ranks search suggestions as you type. It gets smarter with use as it understands the characteristics of your data, your profile, and usage patterns, and applies granular security rules to help guide you to the right answer with personalized search suggestions. With relational search, ThoughtSpot makes it effortless for non-technical business people to gain valuable insights from company data in seconds.

There's no faster way to get access to information than search, if you know what question you are asking. But what about the questions you don't know to ask? Considering all the different dimensions that business people care about across their business, the universe of possible questions to ask of the data is prohibitively massive. As a result, it is not possible for analytics teams to pre-build reports or dashboards that can answer all possible questions, especially those they may not have known to ask.

Add to this the velocity at which new data of potential value to businesses is created. There simply is no way for humans to crawl through the massive volumes of rapidly growing data to uncover every valuable insight on their own. What value are we leaving on the table?

THE DATARANK MACHINE LEARNING ALGORITHM MAKES SEARCH SUGGESTIONS AS YOU TYPE.

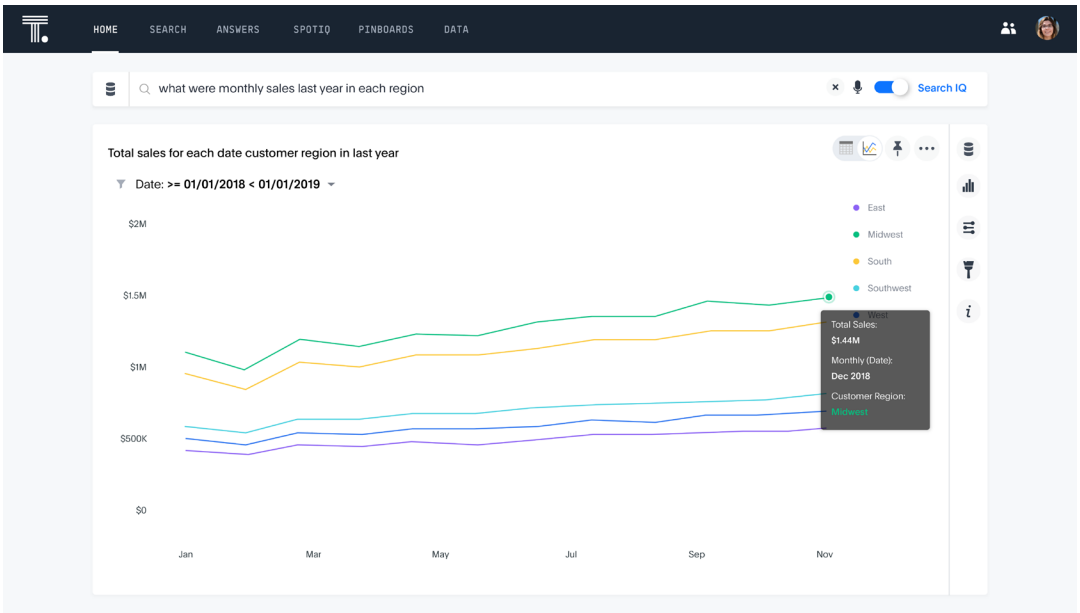


SearchIQ Conversational Analytics

ThoughtSpot builds on its differentiators with relational search and advancements in natural language processing to enhance the broader user experience with SearchIQ, its interface for conversational analytics.

SearchIQ was built for a voice-driven world. You can use it to ask analytics questions of your data in voice and natural language. SearchIQ understands your analytical intent and provides simple, accurate, transparent answers. Users can easily train SearchIQ to understand their lexicon. And SearchIQ leverages the collective intelligence of your organization to improve its responses. For example, if you were to ask "what are my hottest selling products," SearchIQ could translate this to understand in data-speak you are asking for top selling products.

SEARCHIQ USES MACHINE LEARNING TO ENABLE NATURAL LANGUAGE ANALYTICS



SpotIQ – The Power of Automated Insights

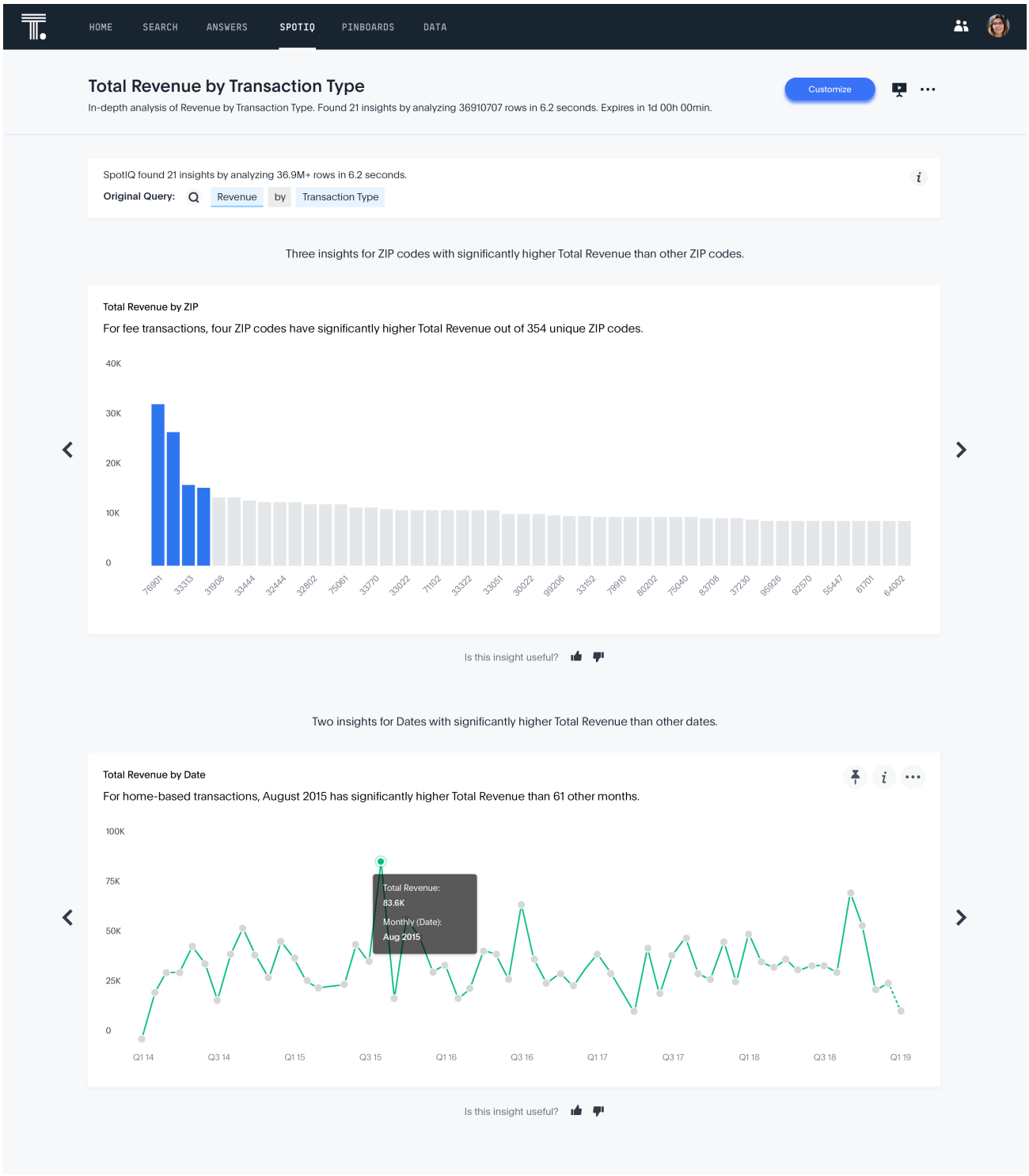
Finding the most relevant answer to your data questions is often a never-ending exercise of trying to find a needle buried deep in a haystack. It is not practical for a human to ask all possible questions on the data, let alone know all the questions to ask. In addition, as you follow your natural intuition to explore the data based on your own hypotheses, this can lead to biases in the types of answers that you receive.

Now imagine if an intelligent and powerful machine could access numerous data sets, generate thousands of questions, analyze billions of data points, spot hidden trends and anomalies, and proactively push relevant and personalized insights to you, all in seconds - with a single click of a button. Imagine that machine could learn as you search and provide feedback on the insights it delivers.That is SpotIQ and the power of automated insights.

Built on the ThoughtSpot next-generation AI-driven analytics platform, SpotIQ leverages ThoughtSpot's massively scalable high-performance computing backend, working with relational search hand-in-hand to curate deep and relevant insights for users that they may not have thought to look for on their own. With a single click, SpotIQ can automatically ask thousands of questions about billions of data points and bring back dozens of insights in seconds. It automatically generates a dashboard full of personalized insights, each accompanied by a smart narrative in natural language explaining what is meaningful in the data.

SpotIQ is pervasive throughout the ThoughtSpot experience. It powers "Did you know?" insights on your smart home page, and Instant Insights on answers and pinboards.

SPOTIQ LEVERAGE RELATIONAL SEARCH ALONGSIDE AI FOR AUTOMATED INSIGHTS.

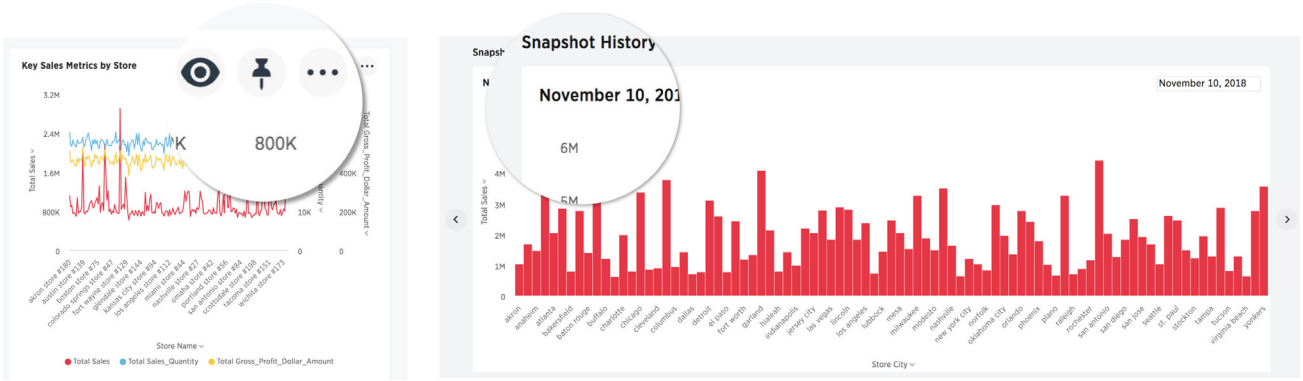


Self-driving Analytics: Less Input, More Output

ThoughtSpot's coupling of relational search and AI-driven analytics makes the business intelligence experience both extremely powerful and incredibly simple. With self-driving analytics, ThoughtSpot takes this experience to another level.

With self-driving analytics, you simply identify what you are interested in following, such as an answer or data point, then click to "watch" the data over time. SpotIQ actively tracks these business-critical metrics with snapshots, regularly analyzes them for important changes, and sends you instant alerts on variations it detects. The goal is to provide you the maximum amount of valuable output with the minimum amount of input.

SELF-DRIVING ANALYTICS WITH SPOTIQ.

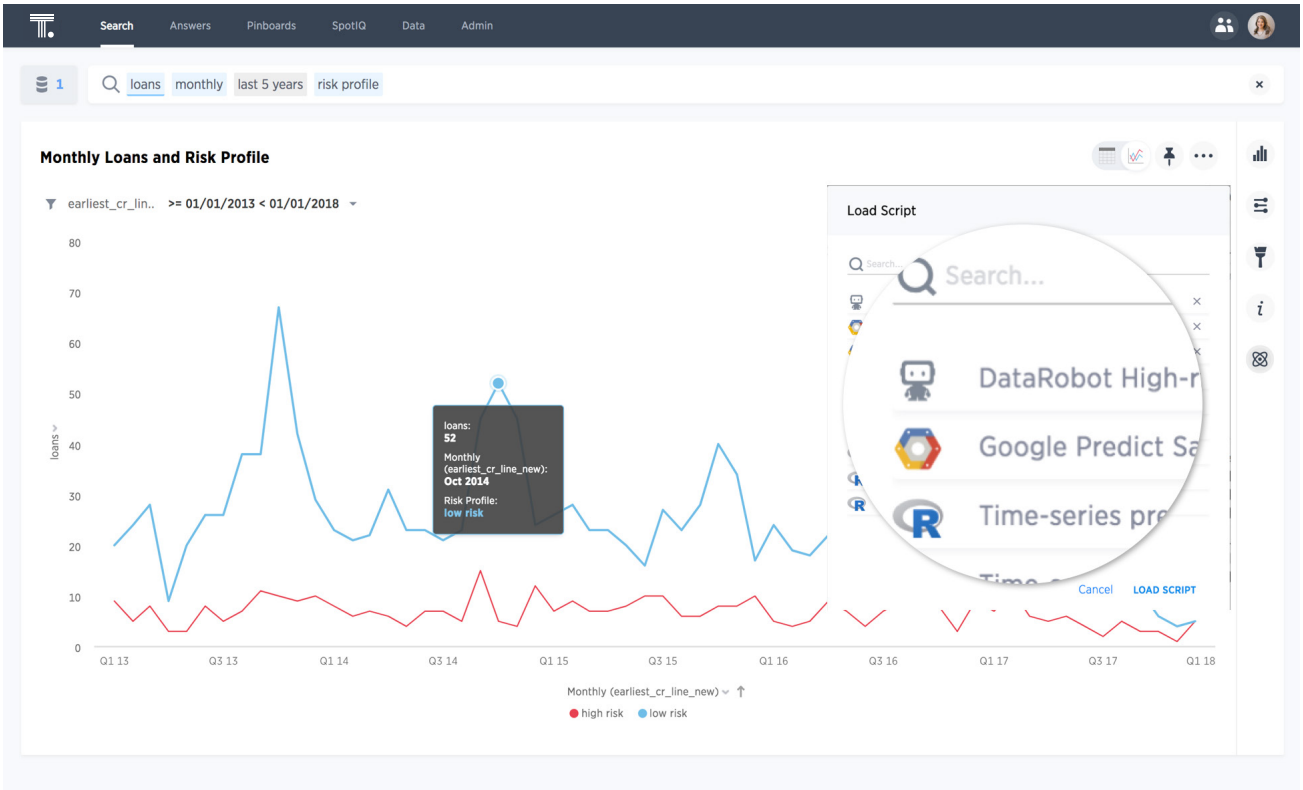


SpotIQ Amp - Bring Data Science Closer to your Business

In addition to all the search & AI-driven analytics capabilities that SpotIQ provides out of the box, ThoughtSpot brings data science closer to your business with SpotIQ Amp.

SpotIQ Amp integrates with the popular statistical computing language R, Google Cloud Machine Learning Engine, and DataRobot's automated machine learning for predictive modeling. SpotIQ Amp accelerates data science workflows and enables you to uncover predictions with search and make more advanced data decisions. You can analyze your existing data with ThoughtSpot, use one of the pre-packaged statistical models or load your own to predict what will happen, and run SpotIQ to ask all the possible questions, uncover valuable insights, and push new insights to you as they are generated.

WITH SPOTIQ AMP, RUN MODELS WITH R, GOOGLE CLOUD MACHINE LEARNING AND DATAROBOT.



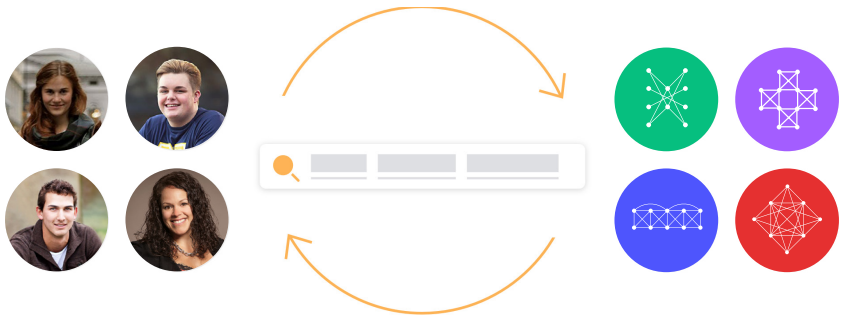
Humans Working Hand-in-Hand with Smart Machines

For AI to be effective in delivering the most accurate, relevant, and trusted insights, machines should not rely solely their built-in learning algorithms. Rather than machines and humans working independently of each other, humans are always in the loop with SpotIQ. As a result, the larger the human and data scale, the smarter the platform.

Get Smarter Insights As You Search

SpotIQ gets smarter with every search and leverages DataRank, the usage-based ranking algorithm from ThoughtSpot's relational search engine, to ensure that every insight is personalized. SpotIQ ranks insights in priority order for each user based on the patterns detected from their search history, profile, and data characteristics. As people search to analyze their data in ThoughtSpot, SpotIQ learns what's important and tunes its algorithms to provide the most relevant insights.

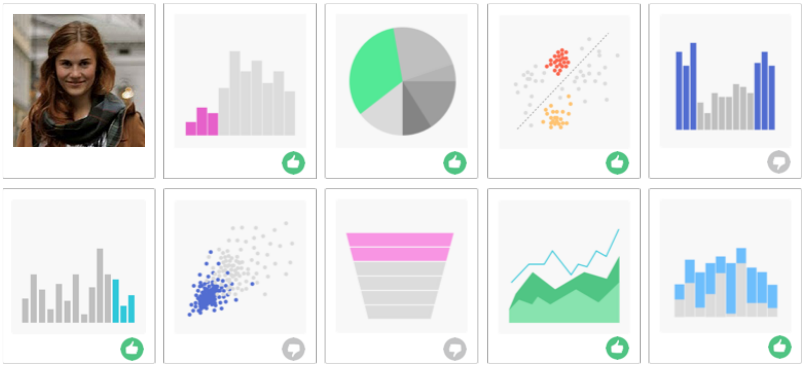
SPOTIQ FINDS THE MOST RELEVANT INSIGHTS BASED ON YOUR SEARCH BEHAVIOR



SpotIQ Learns What You Like

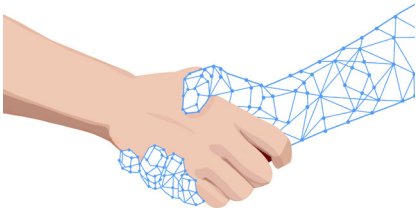
SpotIQ uses supervised learning to understand what types of insights and algorithms a user likes. Each time an insight gets generated, a user can give a “thumbs-up” or a “thumbs-down” vote and SpotIQ factors this into subsequent analyses. With this human input, SpotIQ determines which measures, attributes, and algorithms to use to present the most relevant and personalized insights for each user.

SUPERVISED LEARNING IN THE FORM OF “THUMBS-UP” OR “THUMBS-DOWN” VOTE



Trust Every Insight You Get

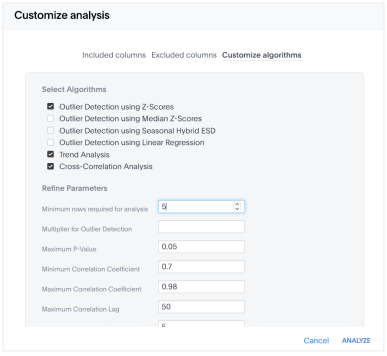
SpotIQ is built on the concept of the user teaching the machine how to learn so as to build in trust as part of the process. As a result, SpotIQ does not behave like a black box. Rather, SpotIQ provides full visibility into what question was asked, which algorithm was used, how answers were calculated and why each insight is deemed relevant and important to the user. Combine that with a relational search engine that performs zero guesswork or interpretation for each query, and you have an accurate, trust-based, transparent interaction model with humans always at the core.



Customize The Analysis

Each analysis can be viewed and modified with ease. You can include and exclude attributes and tweak the parameters of each algorithm for the next analysis. For example, you can make anomaly detection more sensitive by adjusting the z-score threshold, or configure the minimum correlation coefficient the system should use when calculating cross-correlations. You can then execute the customized analysis to generate a brand new pinboard with fine-tuned insights. SpotIQ integrates with R, Google Cloud Machine Learning Engine, and DataRobot’s automated machine learning, giving you access to additional advanced statistical functions you can apply on large data sets.

INFORM THE AI BY CUSTOMIZING YOUR ANALYSIS.



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SpotIQ is built on the concept of the user teaching the machine how to learn so as to build in trust as part of the process. As a result, SpotIQ does not behave like a black box. Rather, SpotIQ provides full visibility into what question was asked, which algorithm was used, how answers were calculated and why each insight is deemed relevant and important to the user. Combine that with a relational search engine that performs zero guesswork or interpretation for each query, and you have an accurate, trust-based, transparent interaction model with humans always at the core.

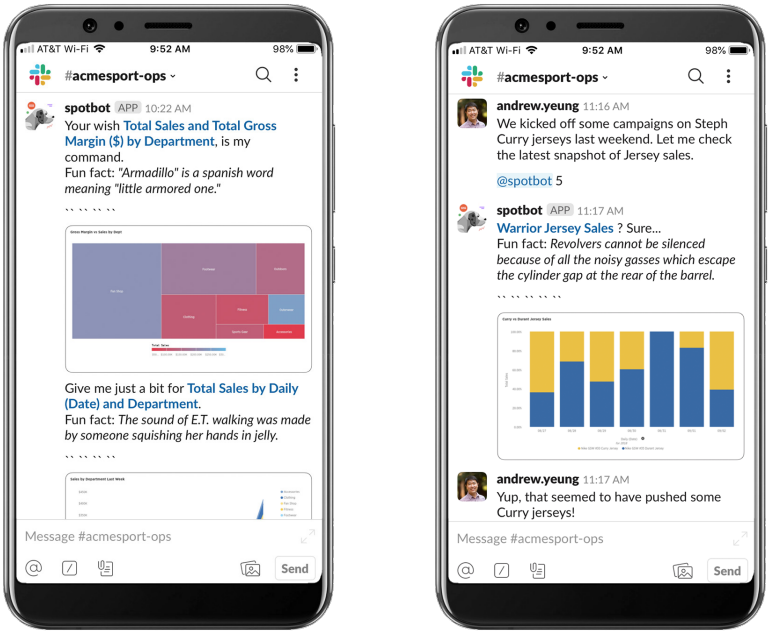
Customize The Analysis

Each analysis can be viewed and modified with ease. You can include and exclude attributes and tweak the parameters of each algorithm for the next analysis. For example, you can make anomaly detection more sensitive by adjusting the z-score threshold, or configure the minimum correlation coefficient the system should use when calculating cross-correlations. You can then execute the customized analysis to generate a brand new pinboard with fine-tuned insights. SpotIQ integrates with R, Google Cloud Machine Learning Engine, and DataRobot’s automated machine learning, giving you access to additional advanced statistical functions you can apply on large data sets.

Get Insights Pushed To You When You Need Them Most

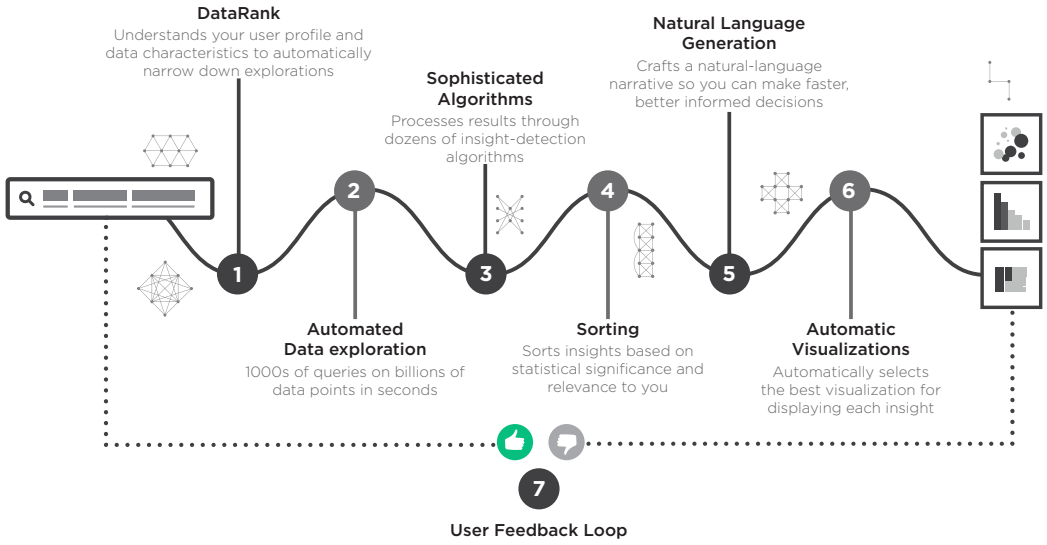
SpotIQ gives users the ability to subscribe to interesting insights or schedule insights to be delivered to you when you need them. Whether it’s via an email or a messaging application such as Slack, SpotIQ pushes insights pushed to you when it matters most, even while you are on the go.

INSIGHTS PUSHED TO YOU VIA MESSAGING APPLICATIONS



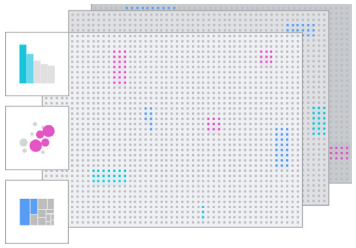
How SpotIQ Works

SpotIQ is integrated directly into ThoughtSpot's search & AI-driven analytics experience. Once a user types in a question, the relational search engine calculates an answer in the form of a best fit visualization. As mentioned previously, SpotIQ is pervasive throughout the ThoughtSpot experience, so you will also see its results in the form of "Did you know?" insights on your home page and Instant Insights on answers and pinboards. Users can auto analyze data and answers throughout ThoughtSpot, and custom analyze to focus on specific aspects of the data. Selecting either of these options will again kick off SpotIQ, which executes the following steps to augment the analysis with automated insights on the data.



1. DataRank machine learning algorithm

First, SpotIQ distills your user profile and usage behavior. It knows who you are, what groups you belong to, and what you've searched on. SpotIQ works hand-in-hand with relational search along with usage-based ranking and knowledge of data characteristics to narrow down the relevant data and questions that you may be interested in to refine its analyses.

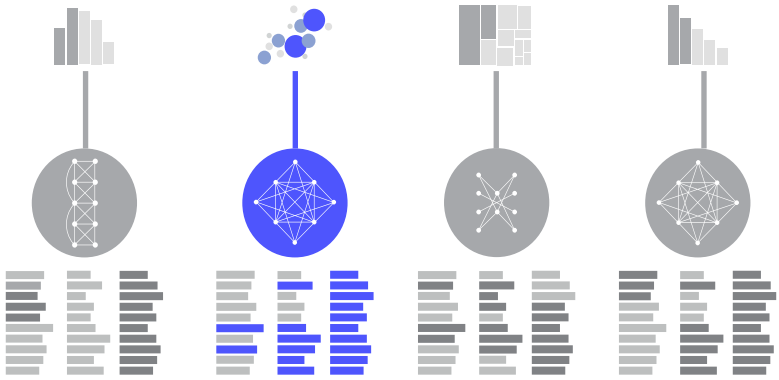


2. Data analysis at massive scale

Once SpotIQ narrows down the universe of possible questions to ask of the data, it leverages ThoughtSpot's massively parallel in-memory calculation engine to execute thousands of queries to uncover interesting insights on billions of data combinations across multiple sources in seconds. Early users of AI resorted to sampling data sets, as they were constrained by available processing power and scale. With SpotIQ, you can use all the data – in its most granular level without restriction – and let the data tell its story.

3. Sophisticated insight-detection algorithms

SpotIQ then processes the results from its queries through a series of built-in insight-detection algorithms. These algorithms help you uncover anomalies and outliers or identify relationships between measures that you didn't know about. They can find upward or downward trends on noisy data. You can even analyze an entire data set or granularly explain differences between two data points.



	TECHNIQUE	DESCRIPTION
Anomaly Detection	Dynamic z-scores	SpotIQ calculates standard distribution measures for a given data set and uses a dynamic z-score threshold to detect anomalies.
Outlier Detection	Seasonal Hybrid ESD	SpotIQ normalizes anomaly detection for seasonality for analyses spanning multiple time periods such as multiple years.
Leading/Lagging Indicators	Cross correlation	SpotIQ analyzes measures with shared time series dimensions to identify the time shift with the greatest correlation.
Trend Lines	Regression analysis	SpotIQ derives a best-fit line for time series data and picks out the positive and negative trends that stand out the most.
Data Segmentation	K-means clustering	SpotIQ recursively separates data points into logical groupings based on a set of local means.

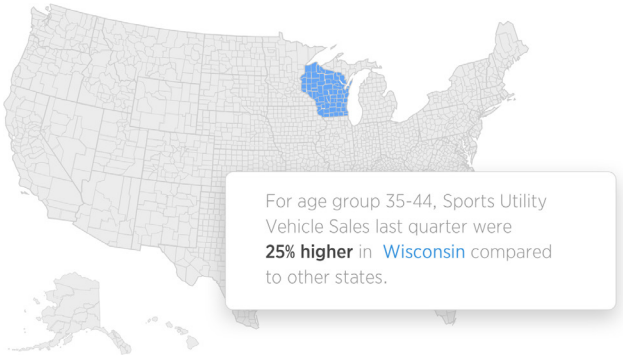
4. Insights sorted by relevance

As SpotIQ generates insights, they are ranked by statistical significance and personalized for each user based on their search history, user and group profiles, and data characteristics.

5. Natural language narratives

Along with each automatically generated insight, SpotIQ includes a smart narrative that identifies what is significant and meaningful about the data. SpotIQ automatically generates the narratives in natural language so you do not need to study the data or rely on data experts to interpret it for you. More consumable analytical insights leads to faster, better informed decisions.

AUTOMATICALLY GENERATED INSIGHTS ARE EXPLAINED IN NATURAL LANGUAGE



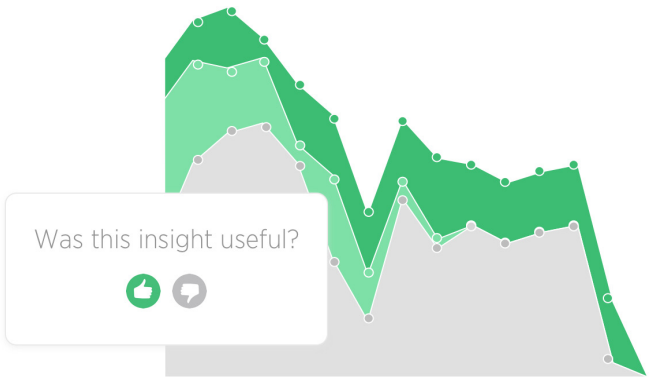
6. Best-fit visualizations

As SpotIQ computes each insight, ThoughtSpot analyzes the characteristics of the resulting dataset, intelligently determines the best-fit visualization for the analysis, then presents an interactive chart to the end user. Each of the charts and pinboards are first class objects in ThoughtSpot, so you can interact with the chart, ask additional ad-hoc questions, or pin it to additional pinboards.

7. Human feedback loop

You can further enhance insights with explicit feedback in the form of a thumbs-up or thumbs-down vote on any of the insights. SpotIQ uses this supervised learning approach to continuously learn and fine tune the automatically generated insights to match your preferences.

SPOTIQ USES SUPERVISED LEARNING TO FINE TUNE THE INSIGHTS



Conclusion: AI for Everybody

Every business person makes multiple data-driven decisions every day. Yet very few have all the information they need to maximize success. They may lack the technical know-how to find insights themselves, don't have access to the analytics talent required to help them, or are simply overwhelmed by the amount of available, applicable data.

ThoughtSpot makes analytics as easy and as trustworthy as your favorite consumer applications. For too long, non-technical business people have been forced to endure the complexity of traditional analytics tools or relied on technical talent. Through search and SpotIQ AI-driven analytics they can uncover insights and even have those insights pushed to them when they matter most.

SpotIQ AI-driven analytics automatically uncovers answers to questions that business people may not have known to ask. SpotIQ is powered by a new breed of analytics architecture and an in-memory calculation engine that was built from the ground up for speed at scale on billions of rows of data across multiple data sources – all while delivering sub-second performance and enterprise-wide governance. Working hand-in-hand with relational search, SpotIQ learns what's most important based on usage behavior, spots hidden trends and patterns in the data, and delivers trusted and personalized insights to any business person. With SpotIQ, you now have the power of a thousand analysts in your hand.

About ThoughtSpot

The world's most innovative enterprises use ThoughtSpot to empower every person in their organization, from C-suite executive to front-line employee, with the ability to quickly uncover data-driven insights. With ThoughtSpot, business people can type a simple Google-like search in natural language to instantly analyze billions of rows of data, and leverage artificial intelligence to get trusted, relevant insights pushed to them as answers to thousands of questions they might not have thought to ask. ThoughtSpot is simple enough for any business person to use, yet powerful enough to handle even the largest, most complex enterprise data without sacrificing speed, security, or governance. That's why customers like 7-11, BT, Celebrity Cruises, Daimler, De Beers, Hulu, Miami Children's Health System, Nationwide Building Society, and Scotiabank have turned to ThoughtSpot transform their decision-making cultures. By making insights a part of every conversation and every decision, ThoughtSpot is reimagining the role of data in creating a more fact-driven world. For more information, please visit **www.thoughtspot.com.**