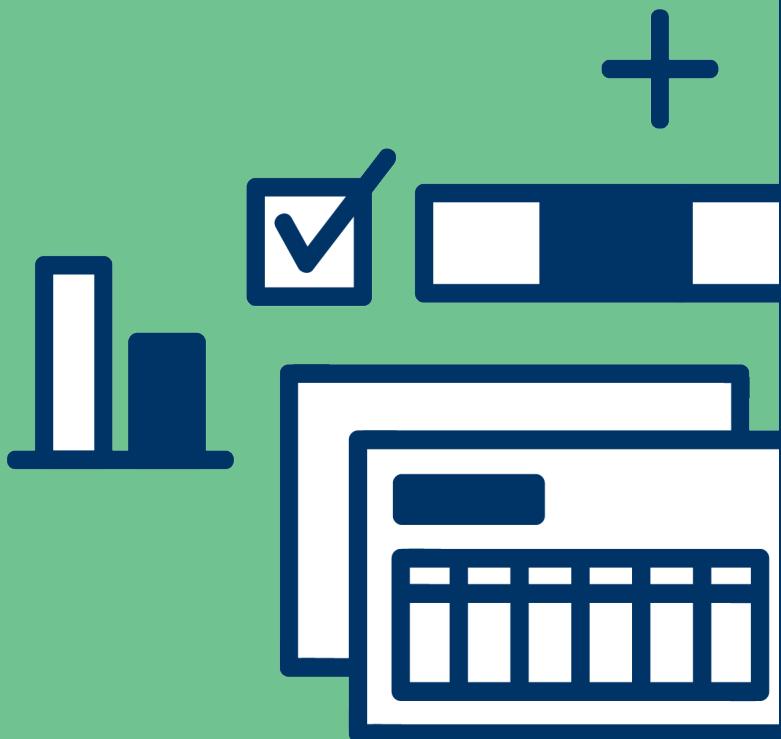


Enterprise AI Trends To Watch In 2021



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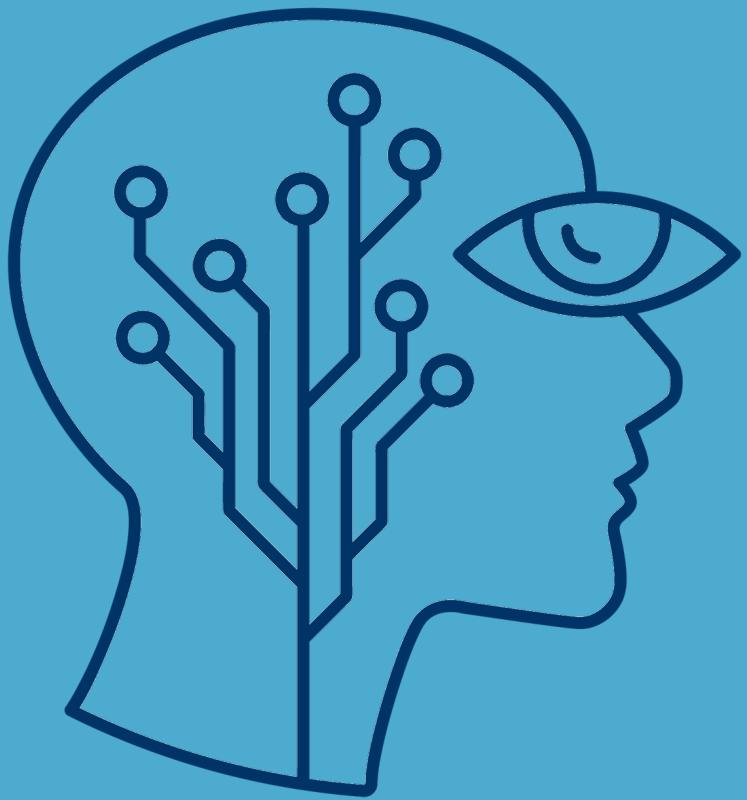
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“CB Insights helps us compress our time-to-decision when gathering and analyzing data and getting an external view on what's happening in the market so we can quickly take action.”

Meraj Mohammad
Vice President, Ventures Group, ADP





ENTERPRISE AI

We break down no-code AI, stream processing, data governance, and other top trends in the space.

AI companies raised a record \$33B in equity funding in 2020.

As commercial applications of AI scale rapidly, enterprises are looking to overhaul existing data management practices to become “AI-first.” Organizations are seeking best practices for sourcing and storing big data in different formats, deploying AI models, monitoring their performance, and developing ethical solutions that are compliant with new regulations.

In this report, we look at trends in enterprise data management in the context of AI, automation in IT and DevOps, no-code solutions to enable non-experts to develop AI models, and more.

Published  Artificial Intelligence Expert Collection  SHARE

Recommended Companies > + SHEET

This collection includes startups selling AI SaaS, using AI algorithms to develop their core products, and those developing hardware to support AI workloads.

Showing 1347 of 6488 rows 

 Table  Map  DOSSIER

Companies	URL	Primary focus	Country	Description
 Aquarium Lear	aquariumlearning.com	Data mgmnt (AutoML, model development, governance, etc)	United States	Aquarium democratizes access to machine learning by giving practitioners everywhere
 Electric AI	electric.ai	IT, DevOps & AIOps	United States	Electric is reinventing how businesses manage their IT. Providing real-time IT support to 20,000 ...
 PerimeterX	perimeterx.com	Cybersecurity	United States	PerimeterX provides behavior-based threat protection technology for the web, cloud and
 VirtAI Tech	virtai.tech	Data mgmnt (AutoML, model development, governance, etc)	China	VirtAI Tech develops Orion AI computing platform and provides a virtual AI accelerator and shared...
 ScienceLogic	scienelogic.com	IT, DevOps & AIOps	United States	ScienceLogic engages in IT Operations Management, providing IT operations with
 Cyble	cyble.io	Cybersecurity	United States	Cyble provides real-time and holistic visibility of supplier cyber threats and risks through
 MindBehind	mindbehind.com	Sales & Customer Support	Turkey	MindBehind is an enterprise conversation platform, powering the intersection of AI with
 Peak	peak.ai	Data mgmnt (AutoML, model development, governance, etc)	United Kingdom	Peak is a data analytics-as-a-service company that helps businesses of all sizes do great things...
 inPact.ai	inpact.ai	RPA and document analysis (industry agnostic)	Singapore	inPact.ai provides state-of-the-art business intelligence software that uses AI to turn
 Remi AI	remi.ai	BI & operational intelligence (cross-industry)	Australia	Remi AI specializes in helping users make business decisions using artificial intelligence-
 PI.Exchange	pi.exchange	Data mgmnt (AutoML, model development, governance, etc)	Australia	PI.Exchange specializes in the development of Artificial Intelligence/Machine Learning (AI/ML) ...

Track the latest private enterprise AI companies and deals using the CB Insights AI Collection.

Contents

No-code AI platforms take off	7	Analytics vendors increase support for unstructured data types	40
AIOps: IT and DevOps automation gains traction	15	Transformers, multilingual models improve enterprise NLP	48
Graph neural nets find mainstream enterprise applications	23	Data governance and explainable AI	56
Stream processing: Capturing real-time IoT data for AI applications	31		

No-code AI platforms take off

What is no-code AI?

Low-code and no-code solutions allow users without coding expertise to build applications. While these have been around for decades, no-code AI platforms are relatively nascent.

Companies that offer no-code AI solutions allow enterprise users to build and deploy AI models through a “drag-and-drop” interface.

No-code AI enables teams without IT or data engineering experience to integrate machine learning (ML) applications into enterprise workflows, automate data pre-processing, reduce time-to-deployment, and narrow the skills gap in machine learning.

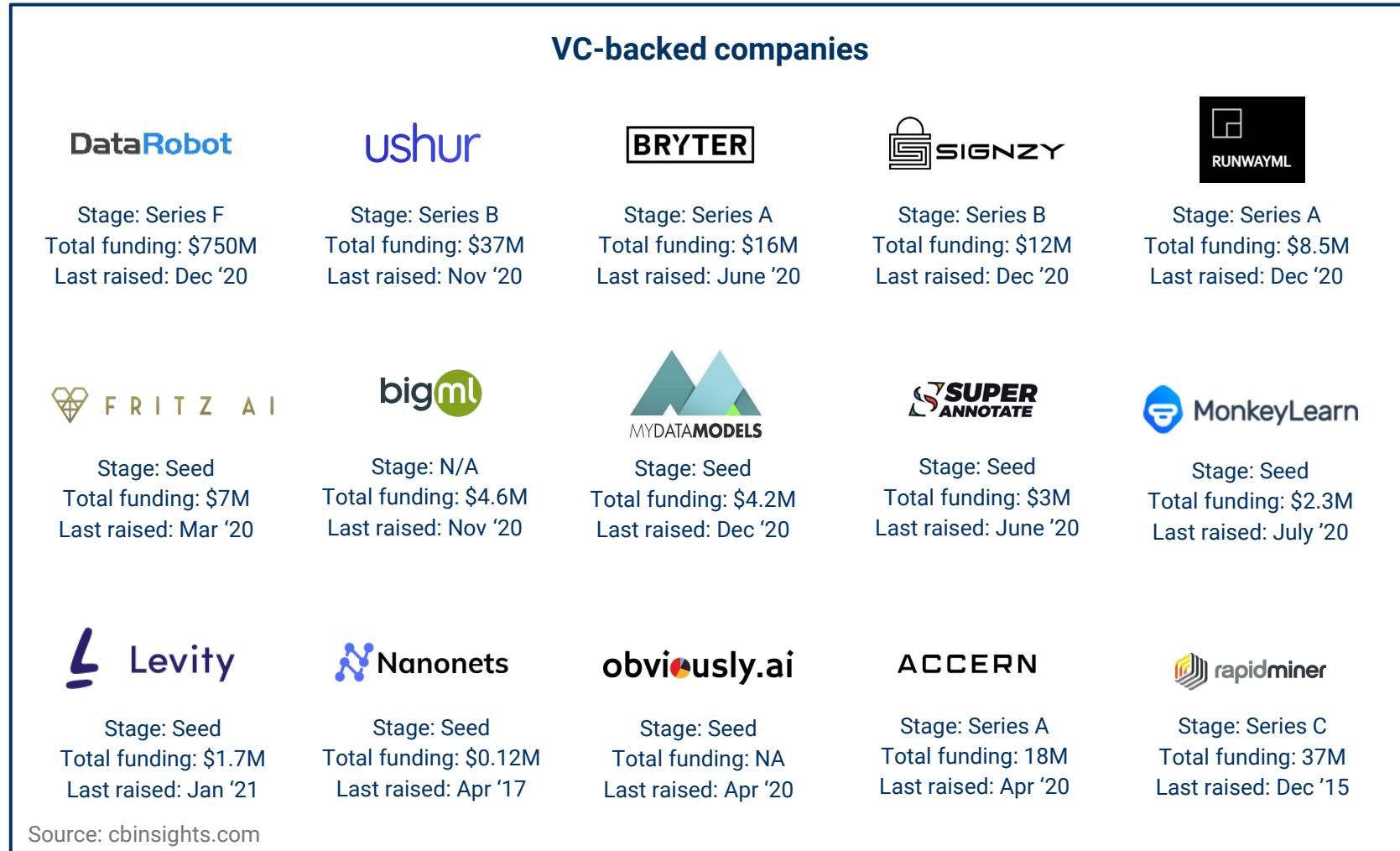
WHAT EXECUTIVES ARE SAYING

“Covid-19 has accelerated the urgent need for every business to create no-code, low-code apps and workflows **in hours or days, not weeks or months.** Power Platform [Microsoft’s AI-powered BI platform] is already used by more than 3.4M citizen developers and business decision-makers.”



Satya Nadella, Microsoft CEO,
[Q3'20 earnings call](#)

The emerging no-code AI ecosystem



What big tech companies are doing in no-code AI

Key highlights and product launches from Google, Microsoft, Apple, and Amazon

Google AutoML Vision, Teachable Machine

For computer vision
applications and in-browser ML
experiments

Microsoft's Lobe.ai M&A

Lobe.ai is a no-code tool for
image classification

Apple CreateML

Apple introduces no-code model
development

Microsoft AI Builder

No-code tools for business
intelligence applications on
Microsoft's Power Platform

Amazon SageMaker Autopilot

Automatically chooses the right
algorithm and fine-tunes the AI
model

Google AppSheet

Google acquires no-code
solution for app developers

2017

2018

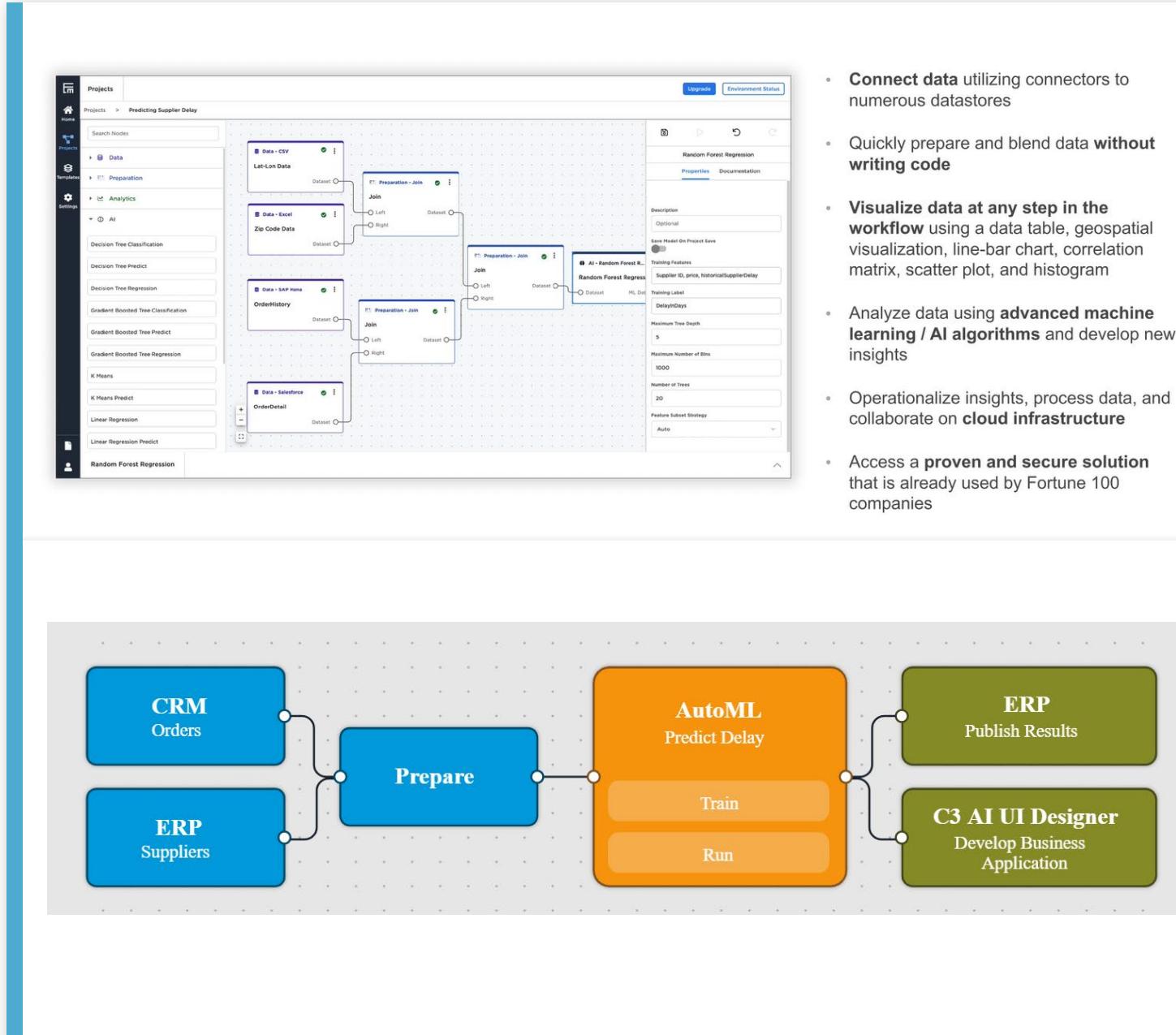
2019

2020

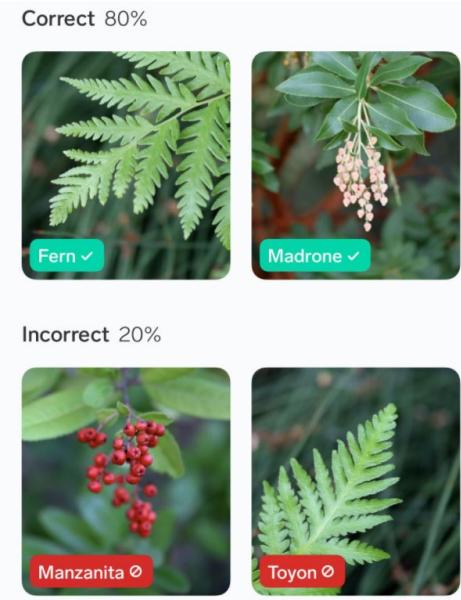
C3.ai launches Ex Machina

C3.ai went public with a \$4B valuation in December 2020. Around the same time, it launched Ex Machina, a no-code platform with support for data preparation, model development, and integration with C3.ai's business intelligence suite.

C3.ai's initial client list spans energy & utility – where the company has an established presence – as well as banking, manufacturing, and government agencies.



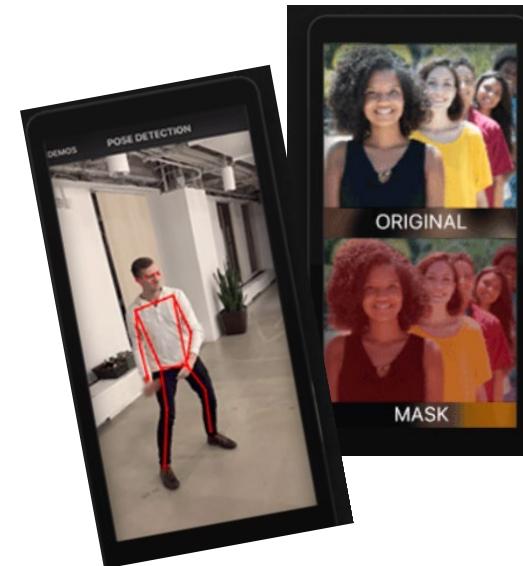
No-code computer vision lowers barrier to entry for app developers



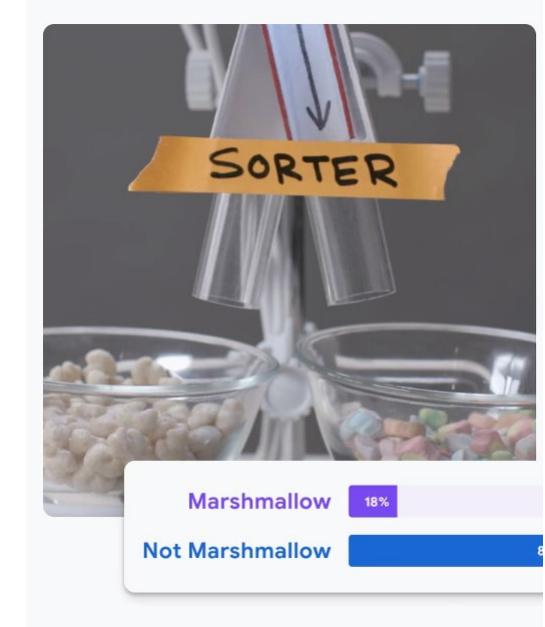
Lobe.ai: Computer vision tasks including gesture, pose, color, and emotion recognition



Superannotate: Image annotation platform for training AI models



Fritz AI: Augmented reality applications and ML model development for Snapchat Lens and mobile app developers



Teachable Machine: Pose, sound, and image recognition

Mastercard, Lux Capital, and others are backing industry-specific solutions

BANKING



[Signzy](#) is developing no-code AI for customer verification and onboarding solutions for banks and financial institutions. These include document and ID verification, as well as risk intelligence.

Select investors: Mastercard, Vertex Ventures; previously incubated in the Facebook India Innovation Hub and Google for Startups Accelerator

MEDIA



[RunwayML](#) is building an AI-based photo and video editing toolkit for content creators, including options to create synthetic media using generating adversarial networks (GANs).

Select investors: Lux Capital

INSURANCE



[Ushur](#) creates end-to-end automation solutions for customer engagement, such as virtual assistant tech and automated email processing. Ushur works with companies including Cigna, Aetna, HealthSpire, and others.

Select investors: Plug and Play Accelerator, 8VC, Plug and Play Ventures, Third Point Ventures, Iron Pillar, Aflac Corporate Ventures

AIOps: IT and DevOps automation gains traction

What is AIOps, or AI for IT operations?

Enterprise IT infrastructure is becoming more complex with hybrid cloud technology, on-prem, distributed databases, containerization, and microservices architecture. As a result, AIOps – using machine learning to automate IT and DevOps functions – is gaining traction.

AIOps can help enterprises detect anomalies in traffic based on historic data, monitor logs to pinpoint the source of performance issues, monitor applications across multi-cloud and on-prem environments, and find security vulnerabilities in code.

Cloud and software services vendors are adding the tech to their offerings as enterprises face increasing costs incurred from IT outages.

WHAT EXECUTIVES ARE SAYING

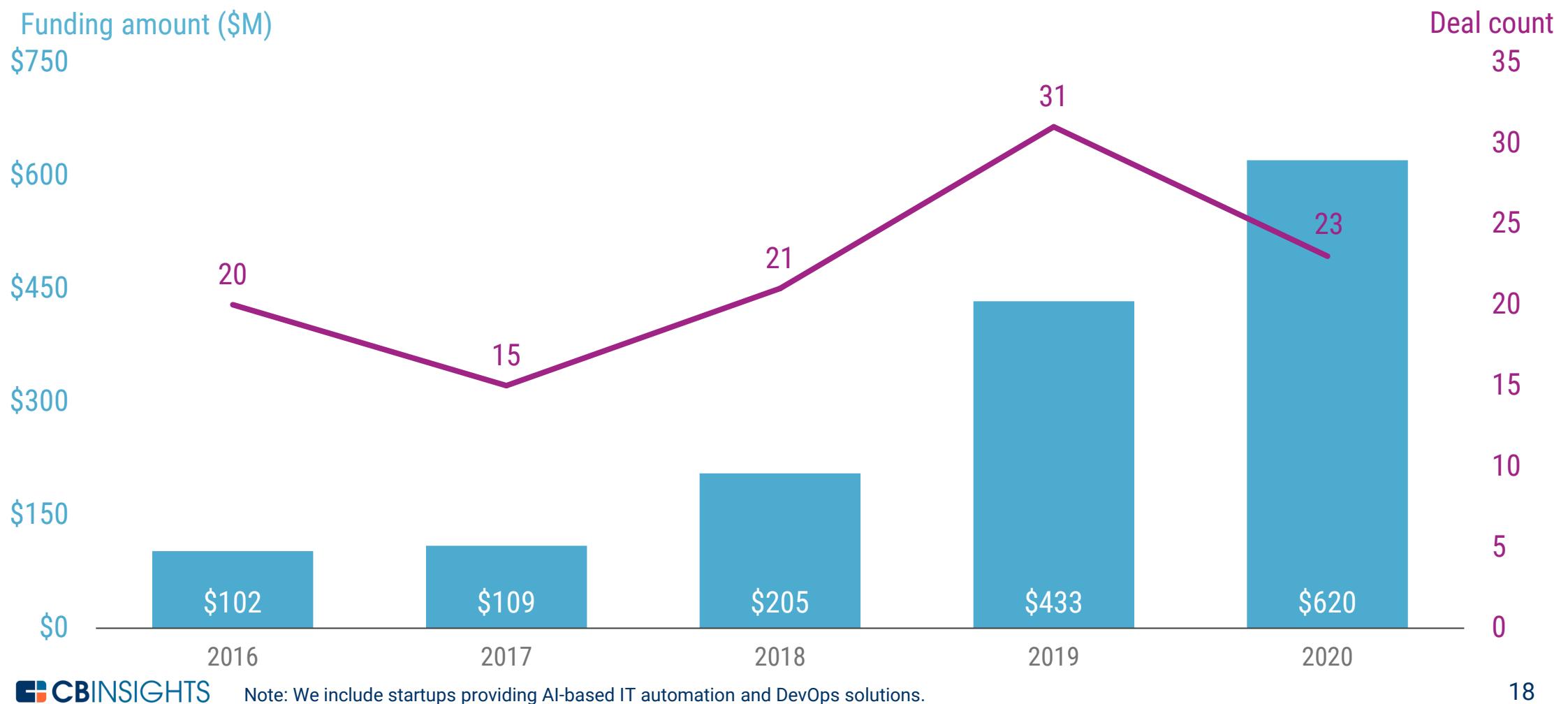
"Our real-time analytics and monitoring offerings are mission-critical for our customers as they face a **growing complex application environment**. To simplify and automate their IT operations, we recently launched AIOps, leveraging AI machine learning and automation..."



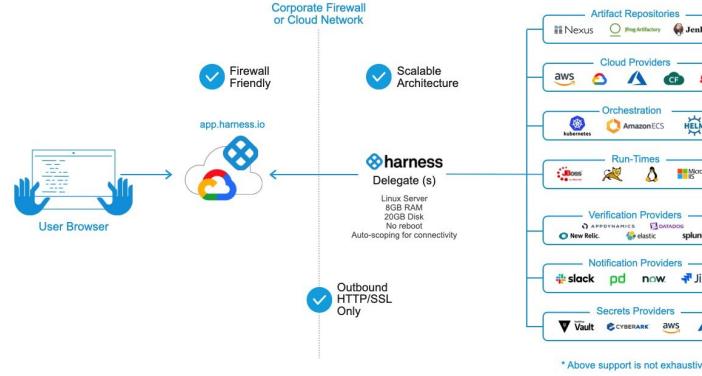
Chuck Robbins, Cisco CEO,
marking the first-ever mention of AIOps on an [earnings call](#)

AIOps companies attracted record funding in 2020

Deals and equity funding (\$M), 2016 – 2020



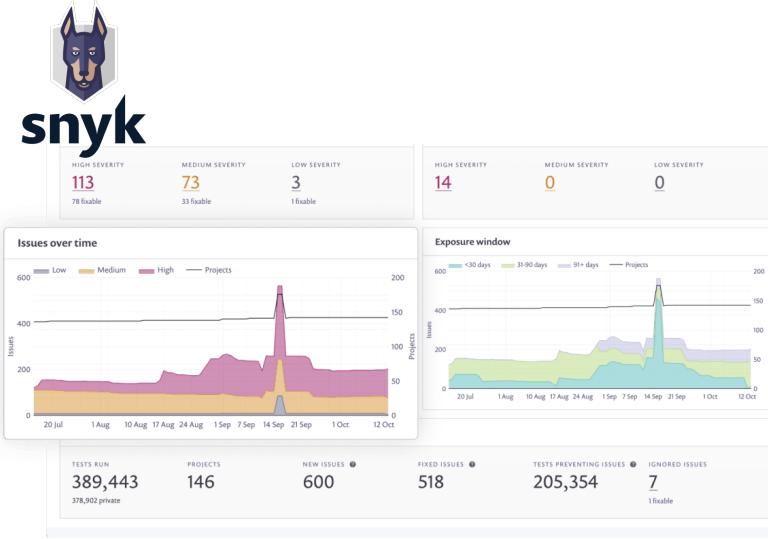
New unicorns: DevOps vendors raise significant funding



[Harness](#) uses machine learning to automate CI/CD (continuous integration and continuous delivery, or the handling of frequent code changes to applications). SoulCycle reportedly used Harness to reduce its deployment times from 60 minutes to 10-15 minutes.

Latest round: \$115M Series C in Q1'20 at \$1.7B valuation

Select investors: Norwest Venture Partners, Battery Ventures, Citi Ventures



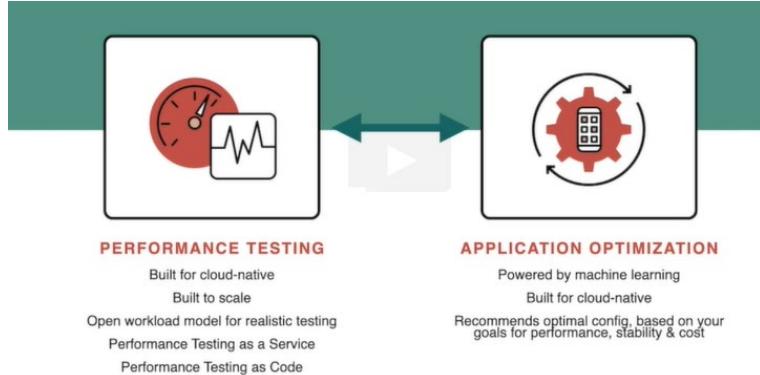
[Snyk](#) is an applications security company that uses AI to find and fix vulnerabilities in code. It supports open-source, container, and infrastructure-as-a-code security. In Q3'20, Snyk acquired DeepCode, an ETH Zurich spin-off that helps software developers with real-time analysis of their code as they write it.

Latest round: \$175M Series E in Q1'20 at \$4.7B valuation

Select investors: Google Ventures, Accel, Salesforce Ventures, Canaan Partners

Notable deals in testing and anomaly detection

StormForge



logz.io



Log management

Based on the ELK Stack



Quickly investigate log data to resolve issues faster with high-performance search and machine learning that automatically surfaces production issues.

In Q4'20, [Carbon Relay](#), which automates Kubernetes app deployment, acquired automated performance testing platform [StormForger](#) and rebranded as StormForge to offer AI-based container application testing and performance optimization.

Latest round: \$63M Series B in Q1'20

Select investors: Foxconn Technology Ventures, Insight Partners

[Logz.io](#) detects anomalies in logs data. By cross-referencing with crowdsourced data from forums like Stack Overflow and GitHub, it surfaces relevant logs associated with a production issue.

Latest round: \$23M Series E in Q4'20

Select investors: Giza Venture Capital, 83North, OpenView Venture Partners, Vintage Investment Partners, General Catalyst, next47

ScienceLogic raises \$105M from Intel, Goldman Sachs

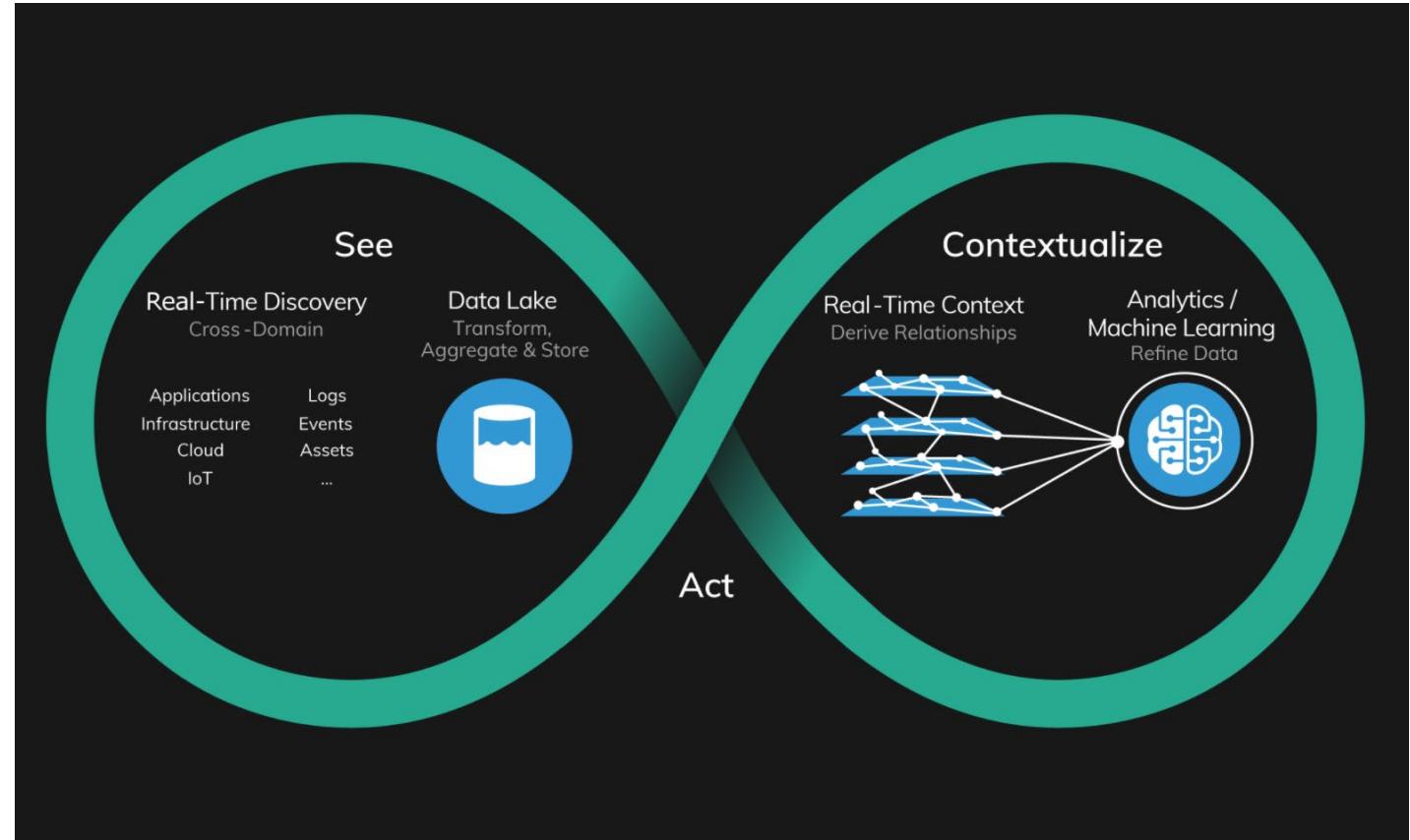


Total funding: 214M **Latest round:** \$105M Series E in Q1'21

ScienceLogic develops automated troubleshooting, hybrid cloud monitoring, network monitoring, and other IT automation solutions. The company was granted 2 US patents in 2020, including one for a “self-configuring network management system.”

Select investors: Intel Capital, Goldman Sachs, Silver Lake, NewView Capital, New Enterprise Associates

Select clients: HCL, Kellogg, BlackBerry, Cisco, JPL



Corporates are acquiring for AIOps

APPLICATION MONITORING



IBM acquired [Instana](#) in Q4'20 to bolster Watson AIOps (a product announced earlier in 2020). Instana builds application monitoring tools with AI-based 3D performance visualization and automated notifications for DevOps teams.

LOG ANALYTICS



ServiceNow acquired Israel-based log analytics startup [Loom Systems](#) in Q1'20. ServiceNow made 4 AI acquisitions last year, including [Sweagle](#), an AI-based configuration management tool. It also struck a partnership with IBM for AIOps and IT management.

OPERATIONAL INSIGHTS



In its [earnings call in Q3'20](#), HP announced the launch of Aruba Edge Services Platform (Aruba ESP), combining AIOps and security features to “unify, automate, and secure the edge.” Additionally, to strengthen its AIOps platform HPE Infosight, HP acquired IT infrastructure monitoring software [CloudPhysics](#) in Q1'21.

Graph neural nets find mainstream enterprise applications

What are graph neural nets?

Most machine learning techniques are designed to work on tabular data or relational databases. But the rise of graph databases such as Amazon Neptune, Neo4j, and TigerGraph has created a need for machine learning techniques tailor-made for graphs.

Graph databases consist of nodes (individuals/entities) and edges (the relations between them). A graph-based approach works well for applications like advanced material discovery, drug R&D (where atoms are nodes, and the interactions between them are the edges), anti-money laundering, anti-fraud, and enterprise recommendation systems.

This has given rise to interest in graph neural networks (GNNs), or applying machine learning and neural nets to a graph database.

WHAT EXECUTIVES ARE SAYING

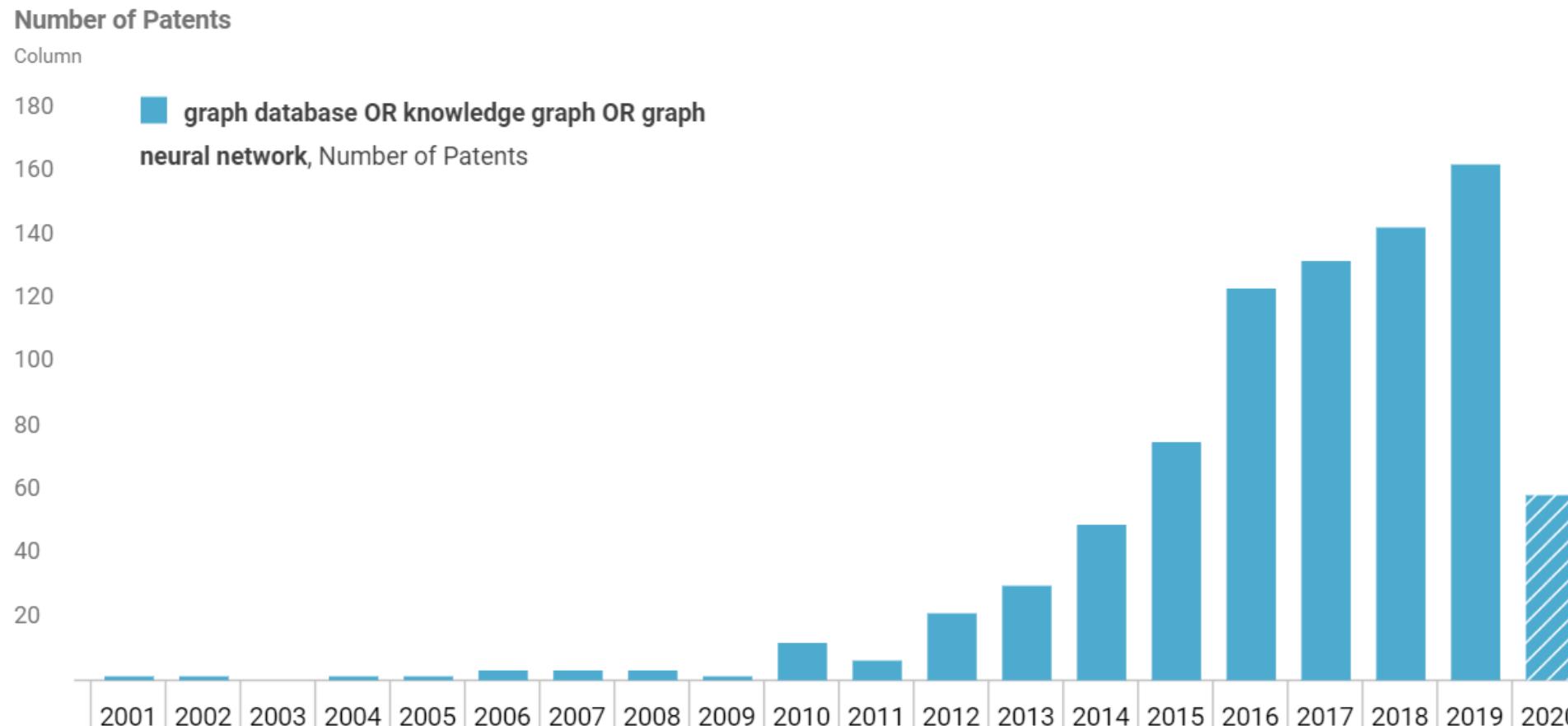
“Applications of graph-based ML at Twitter are abundant and exciting. Graphs in different forms are the core data assets generated by people using our platform... Developing ML methods capable of taking advantage of these data assets is important for making Twitter a better place for public conversation.”



Michael Bronstein, head of graph learning research, Twitter

Graph database patents trend up over last decade

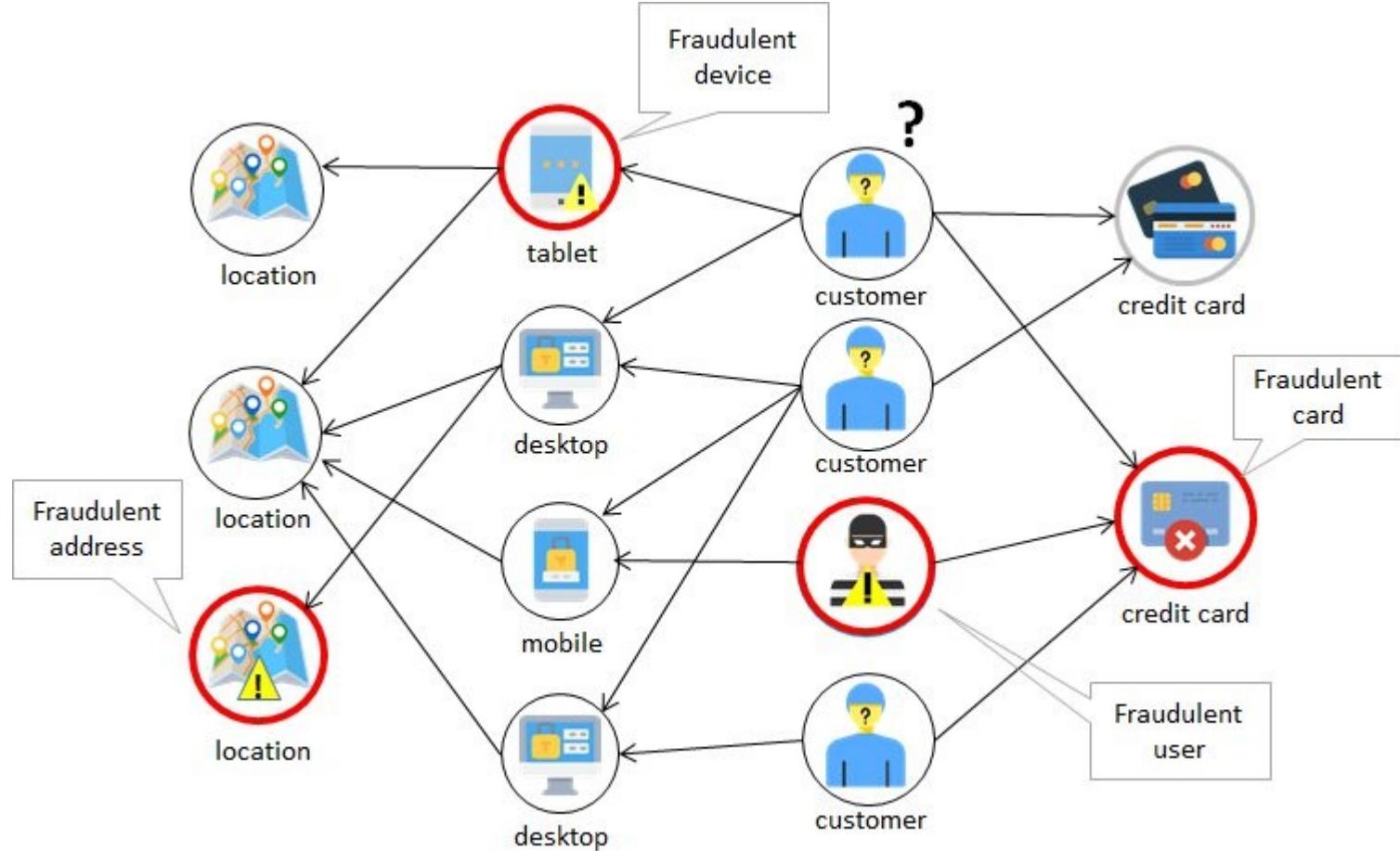
Patent activity related to graph databases, 2001 – 2020



Amazon launches Neptune ML for customer retention, fraud detection, and more

Amazon launched its own graph database called Neptune in 2017. Three years later, the tech giant launched Neptune ML, machine learning specifically built for graphs. The solution provides the database and analytics support for enterprise customers.

Neptune ML is built on the **Deep Graph Library**, an open-source graph neural network library with contributions from Intel, Nvidia, and others.



Graph neural nets power recommendation systems

SOCIAL NETWORKS



In 2019, Twitter acquired [Fabula AI](#), a company building GNNs to detect social network manipulation.

In 2021, Twitter published research on applications of deep learning on dynamic graphs which “evolve over time, with prominent examples including social networks, financial transactions, and recommender systems.”

E-COMMERCE



In 2019, Alibaba published a paper on AliGraph, a graph neural net system already deployed internally to power personalized search and e-commerce recommendations.

The tech was also used during 2020 Singles Day in China to generate 3D models of items like furniture on Alibaba's e-commerce site Taobao.

ON-DEMAND DELIVERY

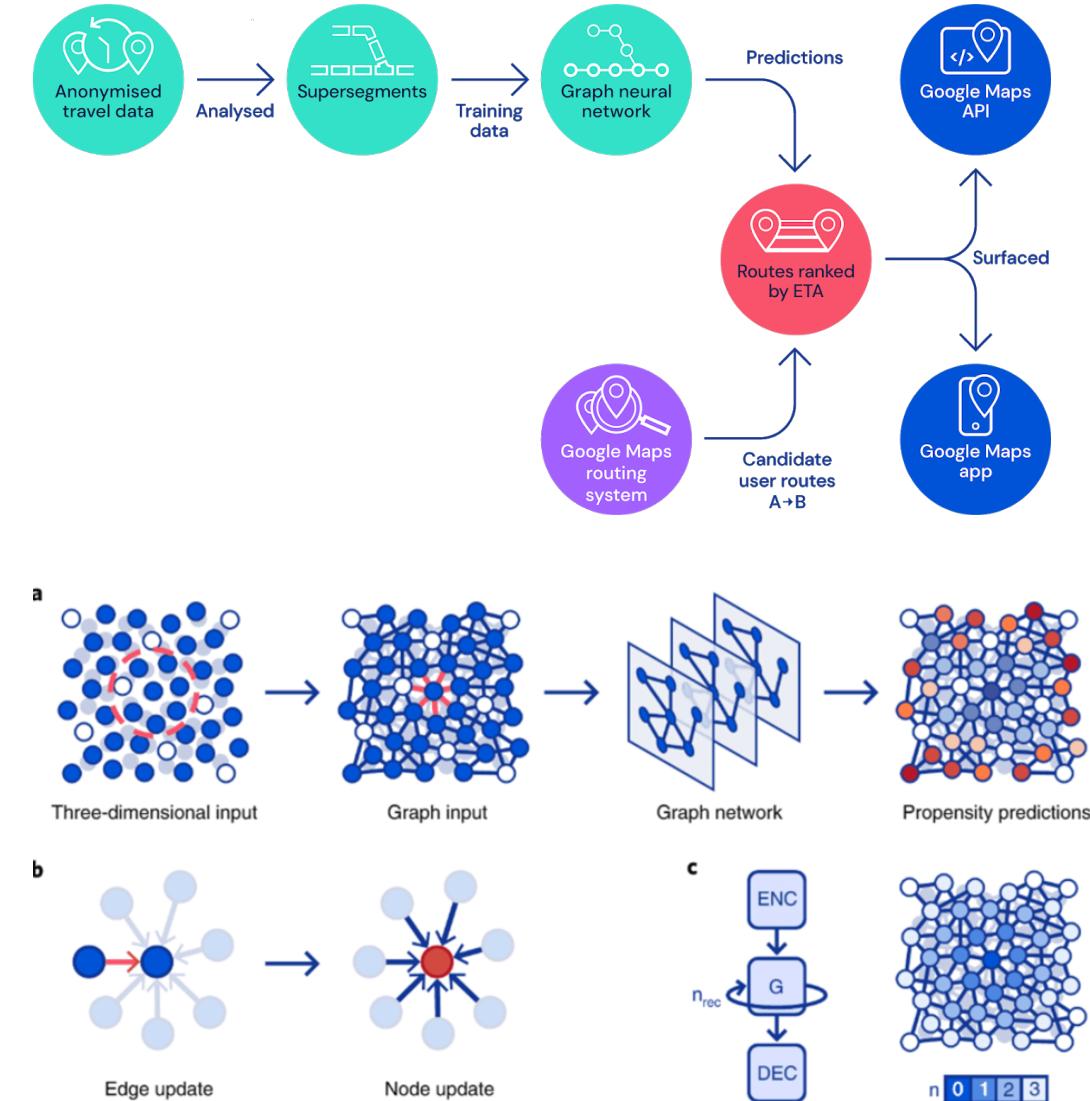


Uber Eats uses GraphSAGE, a framework developed by Stanford, to recommend dishes and restaurants to users. The company reports “significant improvements in recommendation quality and relevancy.”

Google improves Maps, advanced materials research

The Google Maps team has partnered with Alphabet subsidiary DeepMind to use GNNs to improve the service's ETA predictions.

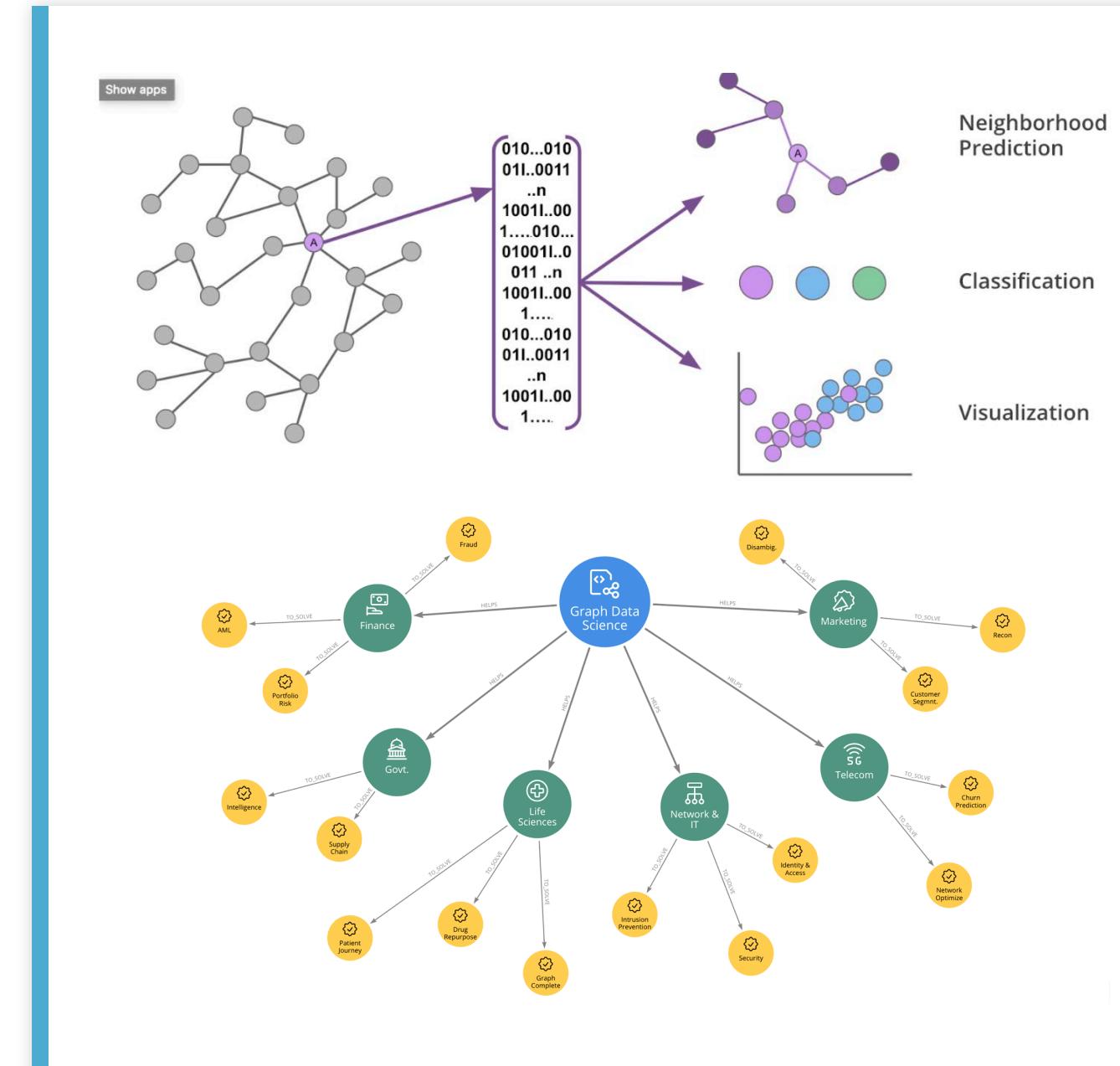
In Q2'20, DeepMind published research on using GNNs to understand the formation of glass, with implications for manufacturing and other sectors. In the project, the nodes and edges were particles and the interactions between them, respectively. AI was used to predict the movement of molecules as they transitioned between solid and liquid states.



Integrating ML analysis with graph database-as-a-service offerings

The graph databases market is expected to grow at a 17.7% CAGR to reach \$4.6B by 2027, fueling a need for machine learning techniques tailor-made for graphs.

[Neo4j](#), a popular graph database vendor, announced graph machine learning tools for enterprises in Q4'20. It raised \$30M that quarter, reaching a valuation of \$532M.



Stream processing: Capturing real-time IoT data for AI applications

What is stream processing?

As the number of real-time data sources grows with the proliferation of IoT, traditional batch processing methods – which store data and retrospectively analyze it in batches – can result in missed opportunities for enterprises.

Organizations increasingly want instantaneous analysis and decision-making capabilities. This has raised interest in stream processing technologies, where data is viewed as a “stream of events” that is constantly generated.

Stream processing powers AI apps that are responsive in real time. Meanwhile, the streaming process itself can benefit from the use of machine learning.

WHAT EXECUTIVES ARE SAYING

“We're seeing a lot more interest in terms of real-time data analytics, especially with 5G and IoT use cases... We have streaming capabilities in the product just now, but we're also investing to develop more streaming capabilities as we go through 2021.”



Mark Culhane, CFO, Teradata

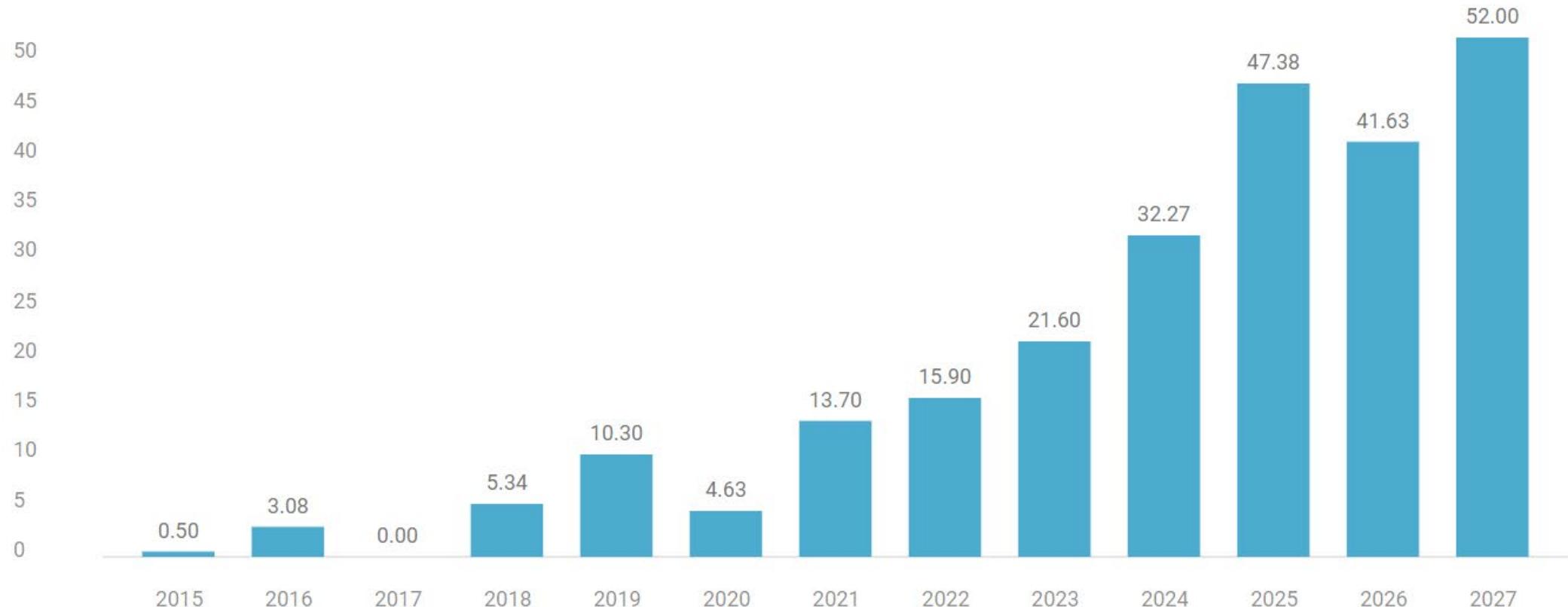
[Q4'20 earnings call](#)

MARKET SIZE

The streaming analytics market is a \$52B opportunity

Analyst Consensus (\$B)

CAGR ⚡ 24.90% (2021 - 2027)^{*}



Technologies enabling the streaming ecosystem

OPEN-SOURCE TOOLS

Stream processing technology has benefited from the availability of open-source tools. Apache has several distributed streaming platforms under its umbrella, lowering the barrier to entry for developers who want to integrate streaming analytics into their enterprise workflows.

Kafka, which LinkedIn contributed to developing, is one of the most popular services currently used today.



IN-MEMORY COMPUTING

In-memory computing pools together parallel distributed random access memory (RAM) from multiple computers to store and process data at high speeds, making analysis thousands of magnitudes faster than traditional memory.

The advantages of in-memory computing make it a natural enabler of stream processing.

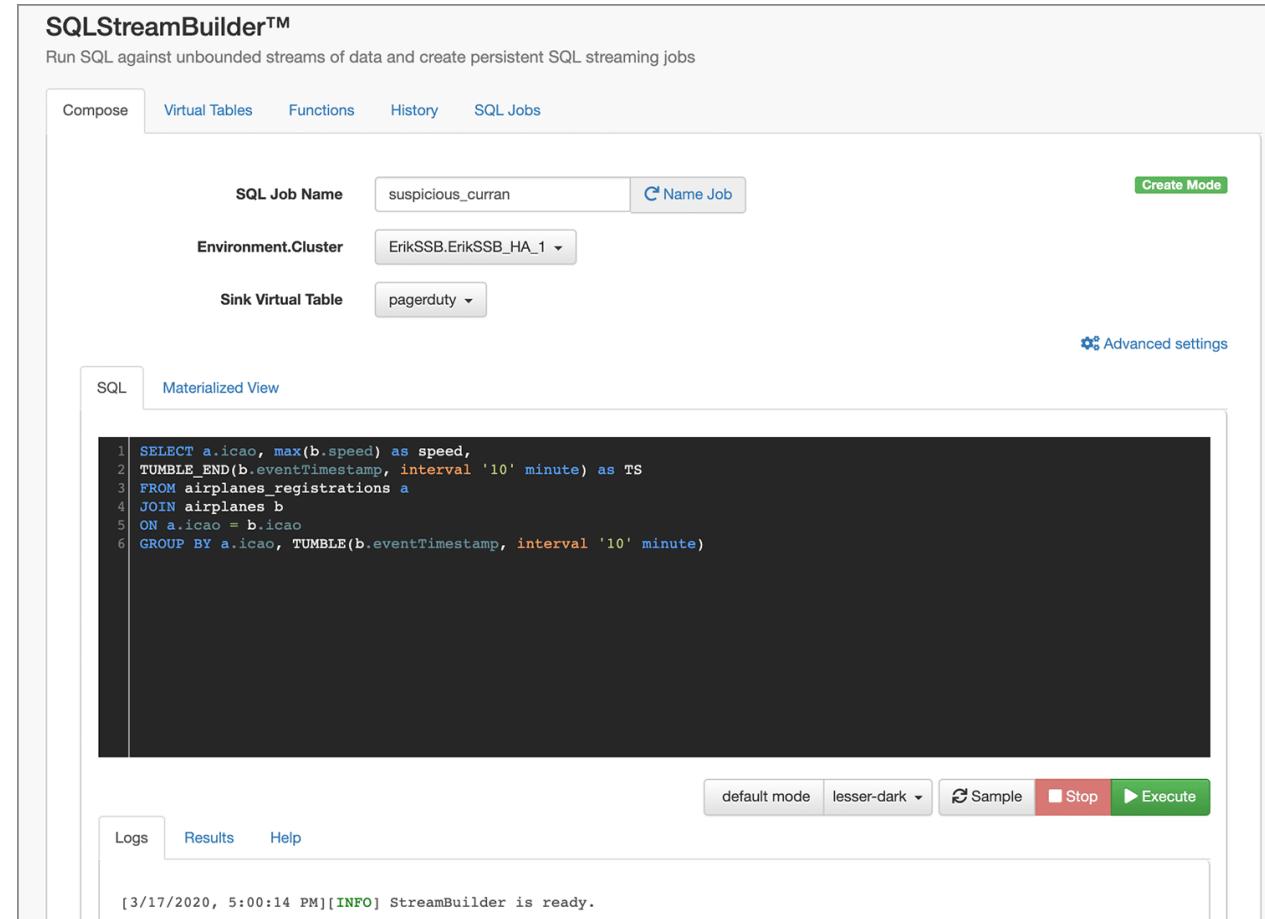


Cloudera acquires streaming analytics vendor Eventador

Cloudera acquired Texas-based seed-stage stream processing company [Eventador](#) in Q4'20.

Eventador has introduced several features to improve machine learning pipelines for data science teams, including introducing SQL queries for use on streaming data.

Cloudera CEO Rob Bearden said during the company's [Q3'21 earnings call](#) that it will be increasingly focused on solutions like **real-time analytics for streaming data**.



The screenshot shows the SQLStreamBuilder™ interface. At the top, it says "SQLStreamBuilder™" and "Run SQL against unbounded streams of data and create persistent SQL streaming jobs". Below that is a navigation bar with tabs: Compose (which is selected), Virtual Tables, Functions, History, and SQL Jobs. Under "Compose", there are fields for "SQL Job Name" (set to "suspicious_curran"), "Environment.Cluster" (set to "ErikSSB.ErikSSB_HA_1"), and "Sink Virtual Table" (set to "pagerduty"). A "Create Mode" button is also present. In the main area, there are two tabs: "SQL" (selected) and "Materialized View". The SQL tab contains the following code:

```
1 SELECT a.icao, max(b.speed) as speed,
2 TUMBLE_END(b.eventTimestamp, interval '10' minute) as TS
3 FROM airplanes_registrations a
4 JOIN airplanes b
5 ON a.icao = b.icao
6 GROUP BY a.icao, TUMBLE(b.eventTimestamp, interval '10' minute)
```

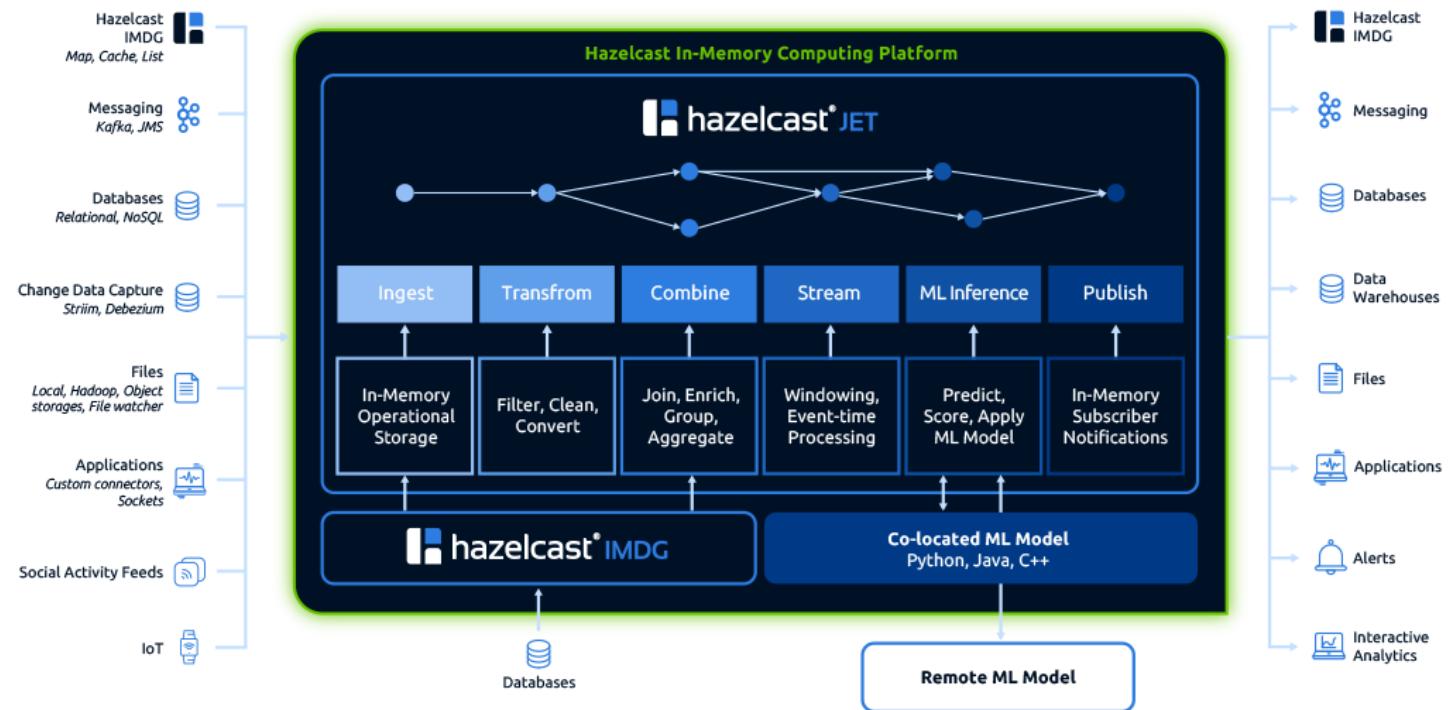
At the bottom of the interface, there are buttons for "default mode", "lesser-dark", "Sample", "Stop", and "Execute". The status bar at the bottom says "[3/17/2020, 5:00:14 PM][INFO] StreamBuilder is ready."

Vendors are expanding to offer solutions for the entire streaming ecosystem

Hazelcast is one of the most popular vendors in the in-memory computing space, with \$88M in funding from Bain Capital Ventures, Earlybird Venture Capital, and others.

Hazelcast has been iteratively building more stream processing capabilities by introducing Hazelcast Jet, which works in tandem with its in-memory tech Hazelcast IMDG (in-memory data grid).

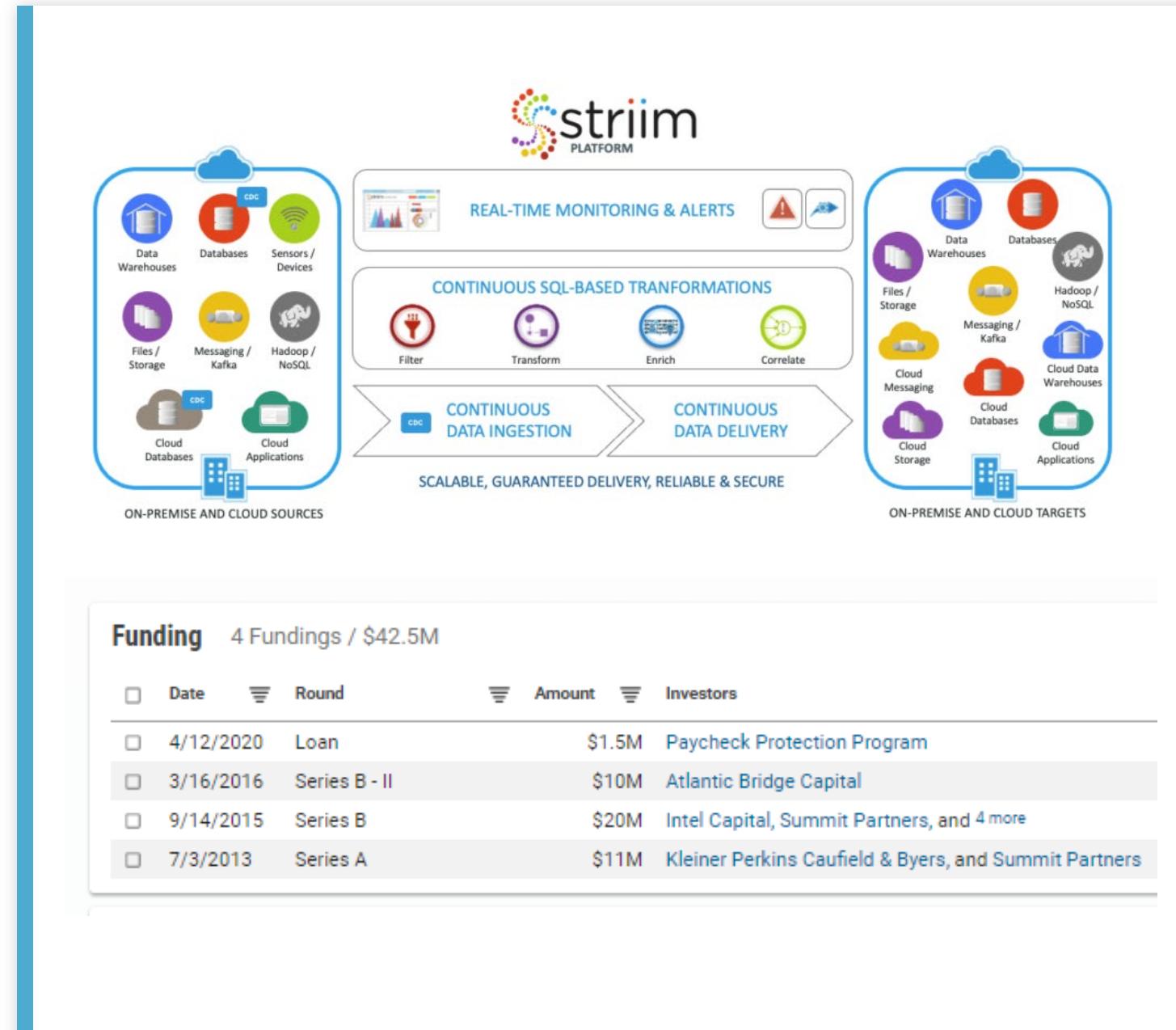
In 2020, Hazelcast announced support for machine learning inference in Jet.



Striim positions itself as an end-to-end solutions provider

Striim, which raised its first round of funding in 2013, is positioning itself as a “one-stop shop” for building and deploying streaming infrastructure, including:

- Log-based change data capture, with support for multiple source and target types
- In-memory stream processing
- Streaming SQL (a SQL-like programming language for interacting with streaming data)
- Edge processing and cloud integration capabilities



AI can help parse data from various sources automatically

Data streams can originate from IoT sensors, social media, or real-time changes to relational databases. In the image to the right, leading data integration vendor Informatica's CLAIRE AI engine automatically recognizes the structure of incoming data and parses it.

To strengthen CLAIRE's capabilities, Informatica acquired data management company [GreenBay Technologies](#) in Q3'20.

The image displays three panels illustrating the Informatica CLAIRE AI engine's capabilities:

- Automatic Structure Detection:** Shows a screenshot of the software interface with a tree diagram representing the detected file structure. A callout lists:
 - Machine learning algorithm recognizes the file structure
 - Relational structure generated on the fly
- Automatic Model Development:** Shows another screenshot of the software interface with a tree diagram. A callout lists:
 - View data in a visual structure
 - Clearly see which elements are connected to real data
 - Refine data:
 - Normalize
 - Exclude
 - Rename element
- Deploy on Cloud or on-premise:** Shows a screenshot of the software interface with a grid of data. A callout lists:
 - Parser is automatically created
 - Intelligent Parsers can be used in run-time to transform similar data files for continuous processing

Analytics vendors increase support for unstructured data types

What is unstructured data analysis?

Around 80% of big data today is unstructured, meaning it is without a predefined format and is not searchable by organizations.

The commercialization of AI in recent years has enabled enterprises to mine unstructured data and unlock information that was previously inaccessible. The number of alternative data sources has also increased and includes IoT sensors, images, social media posts, and surveillance videos.

Support for unstructured data formats and pipeline management solutions has become a necessity for cloud data management and business intelligence vendors.

WHAT EXECUTIVES ARE SAYING

“...it's why we're implementing Project Ascent, for us to bring on more than 100 alternative data sources over the next couple years... being able to bring new and unstructured sources of data in and connecting it to a D-U-N-S Number to a specific client...”



Anthony Jabbour, Dun & Bradstreet CEO,
[Q2'20 earnings call](#)

Alt and unstructured data become commonplace in business intel

ENVIRONMENT & ECONOMIC FORECASTING

OUTBREAK MONITORING

OCEAN DATA



SATELLITE IMAGE ANALYTICS

 Orbital Insight  PlanetWatchers 

 Descartes Labs  SPACEKNOW 

 GEOSPIN spatial intelligence  azavea  Ecopia  urthecast

 Picterra  Rezatec  URSA 

WEATHER INTELLIGENCE

 CLIMACELL Weather Revealed  EARTH NETWORKS™  PLANETIQ  athenium analytics

 THE CLIMATE CORPORATION  JUPITER Predicting risk in a changing climate  UNDERSTORY

SUPPLY CHAIN RISK PREDICTION

 interos  Riskpulse
 resilinc POWERING THE RESILIENT SUPPLY CHAIN  OVERHAUL  Dataminr
 riskmethods

SMART CITY AND TRAFFIC DATA

 waycare  nexar 

ALT DATA FOR PROPERTY DAMAGE ASSESSMENT

 Betterview  TRACTABLE 

AIR QUALITY DATA

 aclima  plume labs
 OIZOM REDEFINING RESOURCES

CUSTOMER & BRAND DATA

MEDIA AND CUSTOMER SENTIMENT ANALYSIS

 NETBASE™ LEADER IN SOCIAL ANALYTICS  Talkwalker  Onclusive 
 SIGNAL  LEXALYTICS  auris  Meltwater  netowl Outside Insight

 MonkeyLearn  Crowd Analyzer 

EMOTIONAL INTELLIGENCE

 :) Affectiva  EMOTIBOT  Empath  genesis lab

GEO-LOCATION DATA

 FOURSQUARE 
 PlaceIQ  Placer.ai  esri 

ALT CREDIT SCORING/LENDING

 zest finance  Lenddo™
 AVANT 

CUSTOMER FEEDBACK AND VOICE DATA (SALES & CRM)

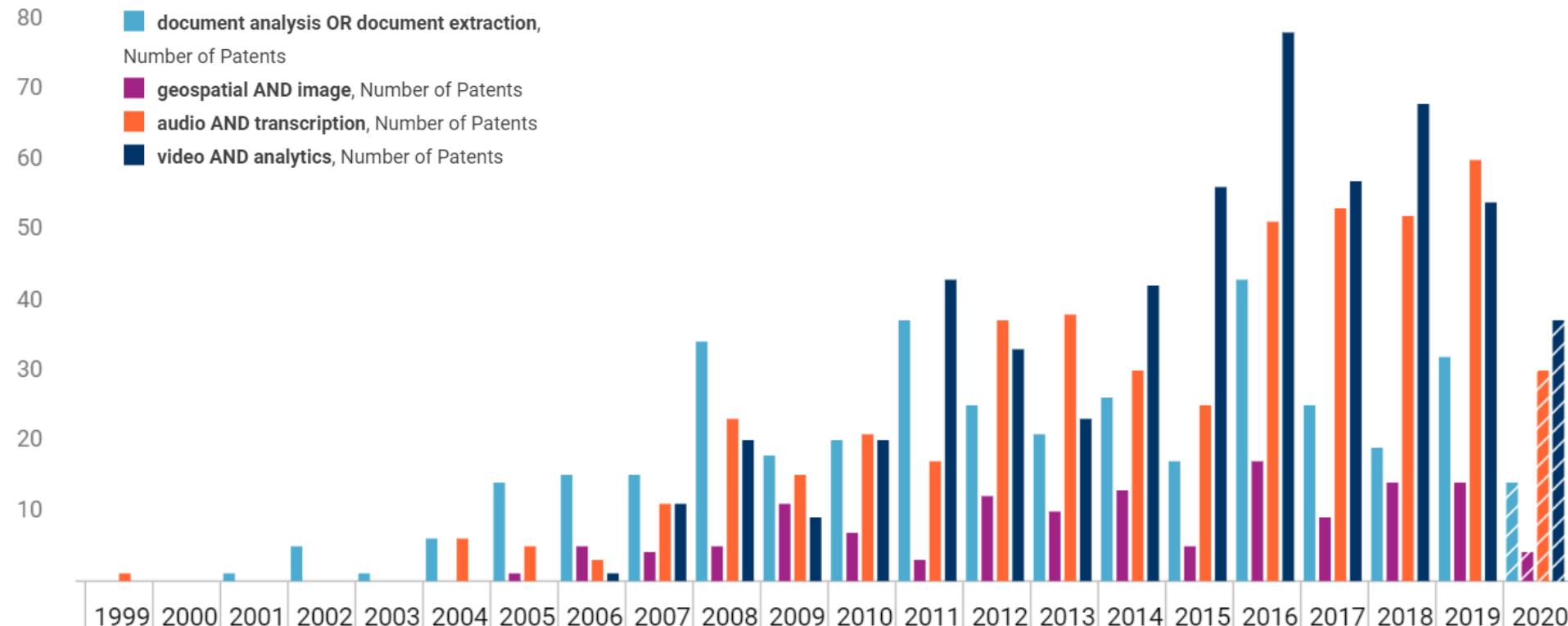
 OBserve.AI 
 RANK MINER PREDICTIVE ANALYTICS  Chattermill  CallMiner®  Tethr®

Audio transcription patents trend up

Patent activity related to unstructured data types, 1999 – 2020

Number of Patents

Column



Venture capital firms back unstructured document analysis vendors



Latest round: \$22M
Series B in Q4'20

Select investors:
.406 Ventures, Jump Capital, Osage Venture Partners, Sandbox Insurtech Ventures



Latest round: 80M
Series D in Q4'20

Select investors:
Bessemer Venture Partners, Battery Ventures, FirstMark Capital, Tiger Global Management



Latest round: \$13M
Series B in Q3'20

Select investors:
QED Investors, Bullpen Capital, FinTech Collective, RiverPark Ventures



Latest round: \$12M
Series B in Q3'20

Select investors:
Grazia Equity, Plug and Play Ventures, BlackFin Capital Partners



Latest round:
Series C in Q1'21 for undisclosed amount

Select investors:
Insight Partners, Oak HC/FT Partners

Corporates mine audio data, climate risk scores, and more

AUDIO TRANSCRIPTION

S&P Global

S&P Global acquired analytics company [Kensho](#) in 2018, which launched a transcription feature called Scribe to extract unstructured audio data. Kensho has created other AI solutions including ProSpread, which supports data extraction in 9 languages using optical character recognition and natural language processing.

In 2018, S&P also acquired [Panjiva](#), a company that analyzes unstructured shipping and trade data.

VIDEO, AUDIO ANALYTICS



Microsoft

In a [Q2'21 earnings call](#), Microsoft CEO Satya Nadella reported strong growth in the company's analytics business. He added that FedEx, Grab, P&G, and others use Microsoft's Synapse "to generate immediate insights from massive amounts of structured and unstructured data." In June 2020 alone, over 9M hours of speech were transcribed using Azure Cognitive Services.

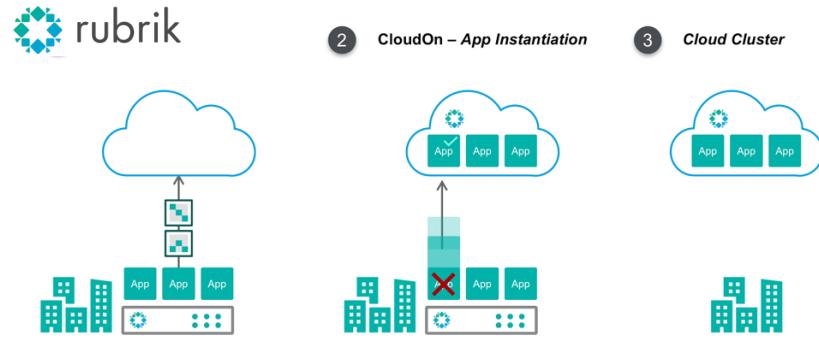
In Q3'20, Microsoft acquired [Orions Systems](#) to tag and manage unstructured data in video feeds.

FINANCIAL RISK MANAGEMENT

Moody's

Moody's launched DataHub in Q1'21, combining structured and unstructured datasets for financial risk management with billions of data points, including climate risk scores and ESG (environmental, social, and corporate governance) assessments.

Rubrik and Snowflake add unstructured data support



CLOUD DATA MANAGEMENT

[Rubrik](#) expanded its unstructured data management capabilities with the acquisition of [Igneous](#) in Q4'20. Igneous initially built hardware for on-prem storage of unstructured data and later expanded to cloud data management.

Total funding: \$553M

Valuation: \$3.3B

Select investors: Lightspeed Venture Partners, Khosla Ventures, Bain Capital Ventures, Greylock Partners



DATA WAREHOUSING

[Snowflake](#) added support for unstructured data management – including for images, PDFs, and video files – in addition to structured and semi-structured data types. The feature was released in private preview in Q4'20.

Exit date: Sep '20 (IPO)

Exit valuation: \$33.3B valuation

Select clients: Siemens, Comcast, Instacart, Logitech

**Transformers, multilingual models improve
enterprise NLP**

What are Transformer models?

Google introduced a language model called Transformer in 2017. The following year, it launched BERT, another model based on Transformer. With these models, Google delivered breakthrough improvements in natural language processing (NLP) and understanding. Around the same time, OpenAI launched its now-popular Generative Pre-trained Transformer (GPT) AI series.

Transformer-based models, or Transformers, are “pre-trained” without the need for labeled datasets, removing a huge bottleneck in NLP progress. In pre-training, an AI model is trained on an enormous amount of text readily available on the internet. This way, the model understands context of words and relations between sentences.

Transformers are leading to breakthroughs in sentiment analysis, translation, reading comprehension, gaming, and more.

WHAT EXECUTIVES ARE SAYING

“And just as AlexNet 7 years ago kind of was the watershed event for a lot of computer vision-oriented AI work, now the Transformer-based natural language understanding model and **the work that Google did with BERT really is a watershed event also for natural language understanding... that breakthrough is really quite significant.**”



Jensen Huang, Nvidia CEO,

[Q3'20 earnings call](#)

Recent breakthroughs in natural language processing

Key research highlights from Google and OpenAI

Google's Transformers

New neural net architecture for language understanding outperforms older approaches

OpenAI's GPT

Transformer-based unidirectional contextual AI model, where a word is taken in the context of words preceding it in a sentence

Google's BERT

Transformer-based bi-directional AI pre-trained with Wikipedia text, where a word is taken in the context of preceding & succeeding words

OpenAI's GPT-2

AI pre-trained with 8M pages of internet text

GPT-3 produces human-like text

Larger and more compute-intensive than GPT-2; OpenAI releases an API integration

2017

2018

2019

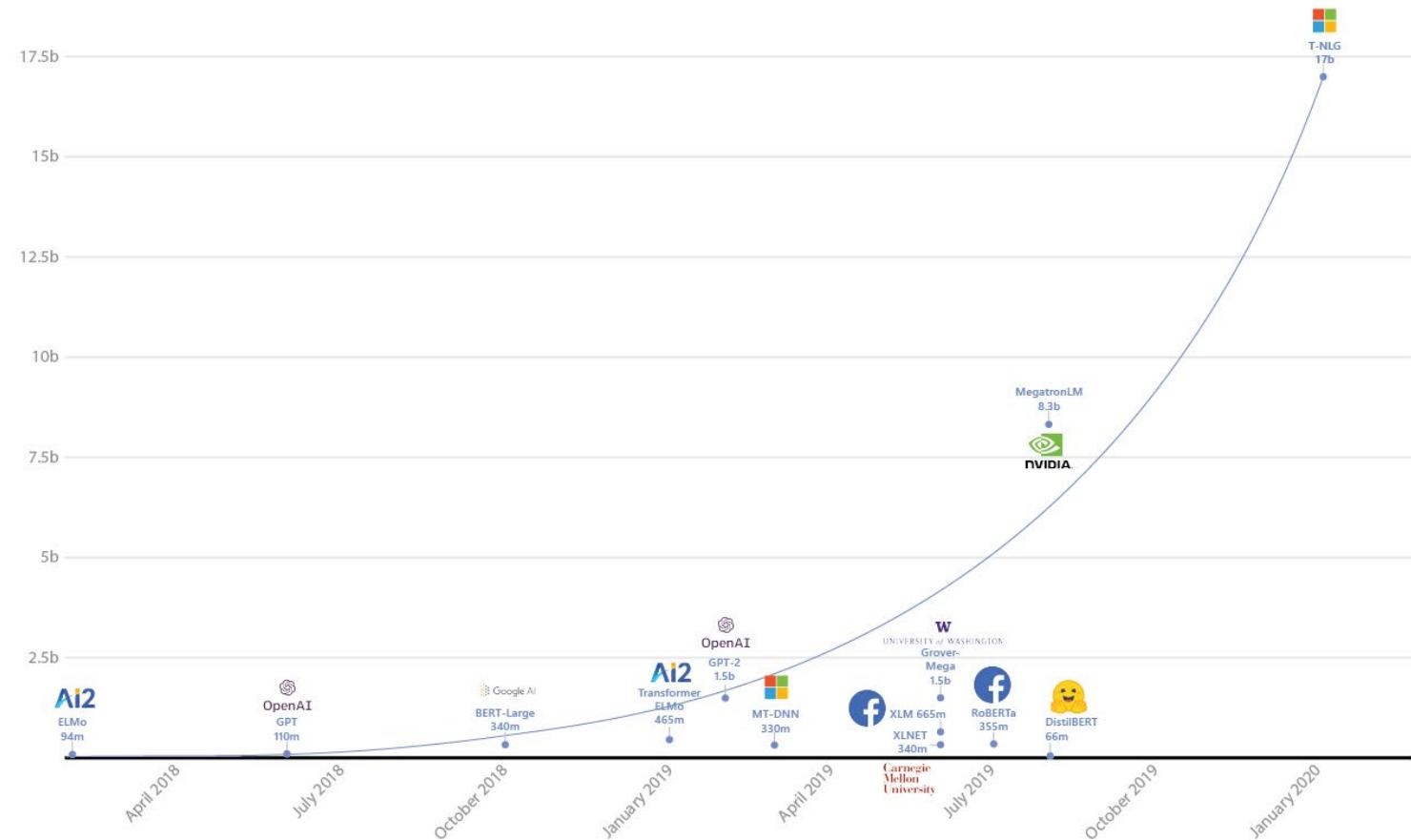
2020

NLP models get bigger and better

Published in Q1'20, Microsoft claimed its Turing Natural Language Generation (T-NLG) model, with 17B parameters, outperformed others in tasks like question answering and summarization.

In Q2'20, OpenAI beat this record with its GPT-3, with 100B+ parameters. Google took the lead in Q1'21, releasing a model with 1T+ parameters.

The number of parameters in AI language models over time, Q1'18 – Q1'20



APIs make advanced NLP tech accessible to enterprises

In Q2'20, OpenAI released GPT-3, larger and even more compute-intensive than its predecessor GPT-2.

Due to potential for misuse, OpenAI initially didn't release the entire source code of GPT-3, but later licensed the tech to Microsoft and made it available via a limited beta API.

"Unlike most AI systems which are designed for one use-case, OpenAI's API today provides a general-purpose 'text in, text out' interface, allowing users to try it on virtually any English language task." – OpenAI blog

A "whatpu" is a small, furry animal native to Tanzania. An example of a sentence that uses the word whatpu is:
We were traveling in Africa and we saw these very cute whatpus.

To do a "farduddle" means to jump up and down really fast. An example of a sentence that uses the word farduddle is:
One day when I was playing tag with my little sister, she got really excited and she started doing these crazy farduckles.

A "yalubalu" is a type of vegetable that looks like a big pumpkin. An example of a sentence that uses the word yalubalu is:
I was on a trip to Africa and I tried this yalubalu vegetable that was grown in a garden there. It was delicious.

A "Burringo" is a car with very fast acceleration. An example of a sentence that uses the word Burringo is:
In our garage we have a Burringo that my father drives to work every day.

A "Gigamuru" is a type of Japanese musical instrument. An example of a sentence that uses the word Gigamuru is:
I have a Gigamuru that my uncle gave me as a gift. I love to play it at home.

To "screeg" something is to swing a sword at it. An example of a sentence that uses the word screeg is:
We screeghed at each other for several minutes and then we went outside and ate ice cream.

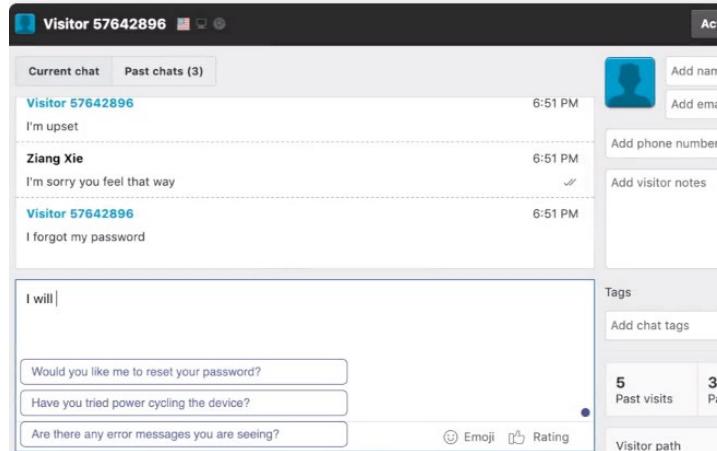
Figure 3.16: Representative GPT-3 completions for the few-shot task of using a new word in a sentence. Boldface is GPT-3's completions, plain text is human prompts. In the first example both the prompt and the completion are provided by a human; this then serves as conditioning for subsequent examples where GPT-3 receives successive additional prompts and provides the completions. Nothing task-specific is provided to GPT-3 other than the conditioning shown here.

Early applications of GPT-3's language generation

```
Adventurer@AIDungeon:~$ ./EnterDungeon

You enter a dungeon with your trusty sword and
necromancer who killed your family. You've been
guarded by legions of the undead. You enter
asking you to 'Go back to what you walked through'
trick to get up to 150 magic points. Other than that
time (600 magic points is a lot!

Options:
0) You attack them and have your party use their
1) You use this magic weapon/shield heavy, and
2) You tell your friends).
3) You go through the second door, you think
Which action do you choose?
```



GAMING

Utah-based [AI Dungeon](#) is developing a text-based adventure game where an AI model generates open-ended storylines based on GPT-3. The game reportedly attracts 1.5M active users per month.

CUSTOMER SERVICE

[Sapling](#) uses GPT-3 to compose personalized responses to assist sales and customer support teams with customer response. Features include autocomplete and spelling and grammar checks.

VR/GAMING

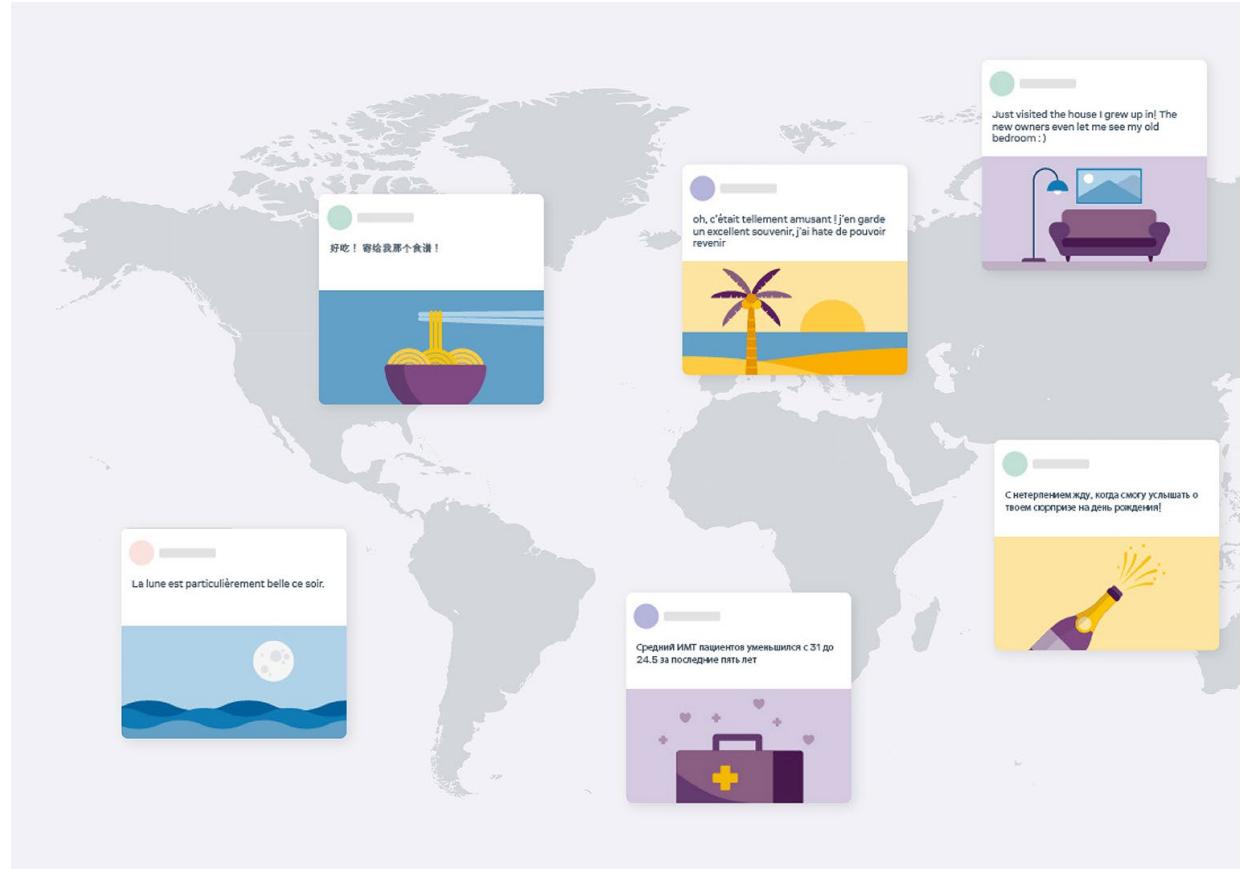
In Q1'21, Modbox, a sandbox for PC/AR/VR multiplayer games, released a demo of an AI-driven NPC (non-player character) using GPT-3 and Replica software for natural language understanding and speech synthesis.

Facebook AI's milestone in language translation

In Q4'20, Facebook open-sourced a multilingual machine translation model, M2M-100, that can translate between 100 languages “without relying on only English-centric data.” The model relies on a dataset with 7.5B sentences.

Earlier, in Q3'19, Facebook developed its own version of BERT, called RoBERTa, to moderate hate speech on its platform.

That same quarter, FB open-sourced a speech recognition model that bypasses the need for manually annotated transcripts. Called wav2vec, it is particularly useful for speech recognition in non-English languages, where annotated training data is sparse.



Data governance and explainable AI

What are data governance and explainable AI?

Establishing protocols for sourcing, handling, and using data is crucial for developing ethical AI solutions and preventing algorithmic bias in outcomes.

Strong governance is the foundation of AI explainability. Enterprises may not know what an algorithm is “seeing” in the input data or why it arrives at a certain conclusion. For example, in lending, where consumers are protected against discrimination, banks need visibility into the inner workings of an algorithm.

To comply with regulations like GDPR and CCPA, vendors are increasingly focusing on explainability, bias monitoring, and strong governance.

WHAT EXECUTIVES ARE SAYING

“Data governance is top of mind for every business leader and will grow into an important category on its own as critical as any AI or analytics category today. We are investing to participate in this growth...Azure Purview provides an end-to-end view of an organization's data state across on-premise, multi-cloud, and SaaS apps that previously was impossible.”



Satya Nadella, Microsoft CEO,
[Q2'21 earnings calls](#)

AI regulation and ethics in focus

Recent news mentions

Ethical concerns mount as AI takes bigger decision-making role in more industries

Oct '20

The Harvard Gazette

[Global] alliance aims to accelerate the adoption of inclusive, trusted and transparent AI worldwide

Jan '21



Why companies are thinking twice about using artificial intelligence

Jan '21

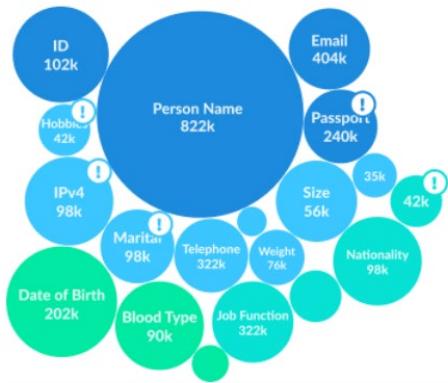
FORTUNE

Why this is the year for regulation that finally reins in AI

Feb '21

FAST COMPANY

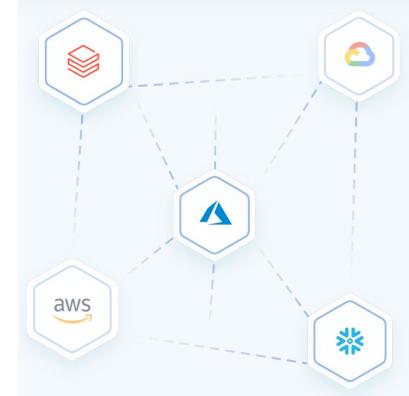
Companies are using AI for data governance, which is key for ethical AI



[Dathena](#) is an AI-enabled data privacy and security vendor that monitors on-prem and cloud data. Dathena has a co-sell partnership with Microsoft.

Latest round: \$12M Series A in Q2'20

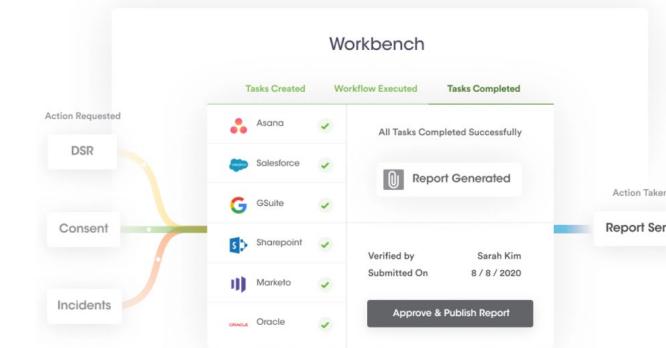
Select investors: Jungle Ventures, CapHorn Invest, CerraCap Ventures; previously participated in Microsoft AI Factory and Nvidia Inception



[Privacera](#) develops software-as-a-service for cataloging sensitive data across multi-cloud environments.

Latest round: \$50M Series B in Q1'21

Select investors: Accel, Point72 Ventures, Cervin Ventures, Alchemist Accelerator



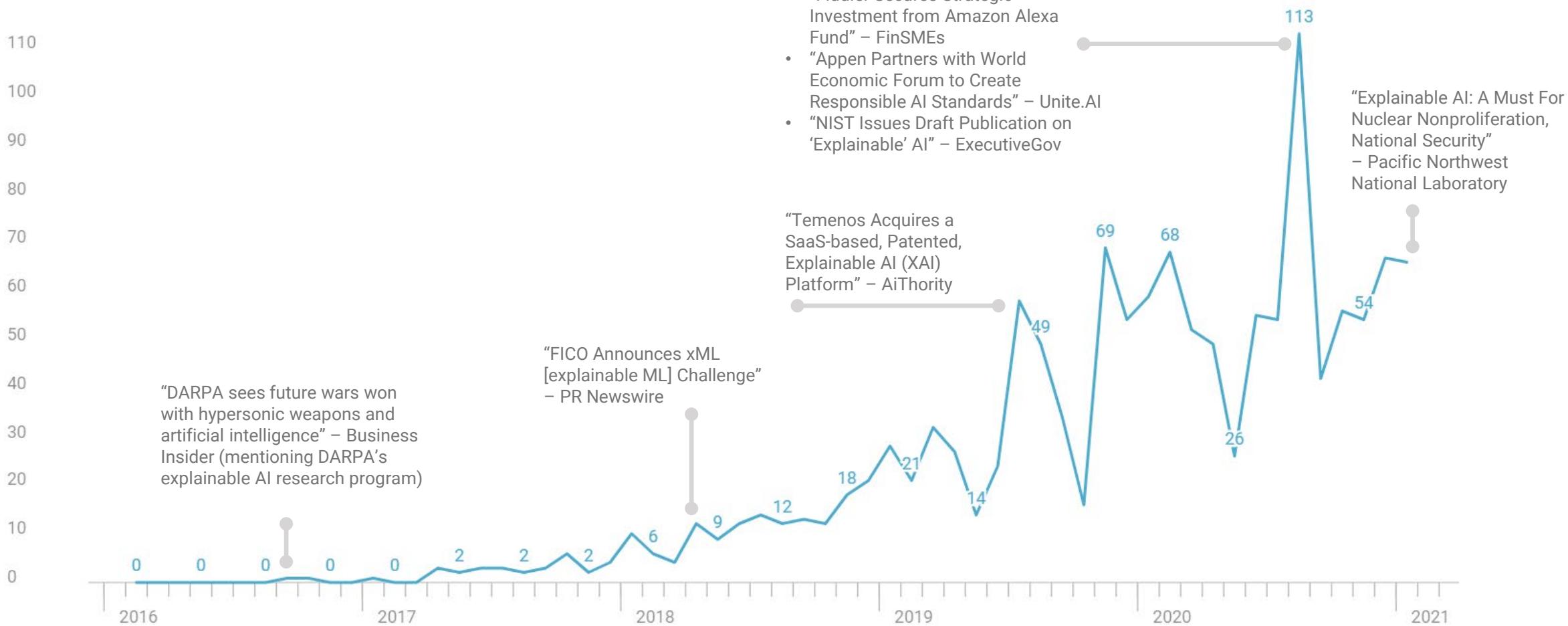
[Securiti](#) builds an AI-powered PrivacyOps platform, RPA solutions, and tech to automatically link personal data to users.

Latest round: \$50M Series B in Q1'20

Select investors: Mayfield Fund, General Catalyst

Media mentions of explainable AI peak in 2020

Articles



Alexa Fund, Lockheed Martin back explainable AI company



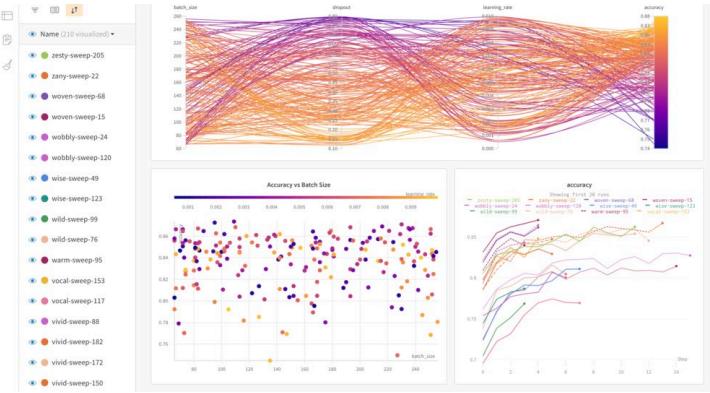
Total funding: 13M **Valuation:** \$31M

[Fiddler](#) develops a platform for enterprises to build explainable AI models. Lockheed Martin recently partnered with Fiddler, calling explainable AI tech key to building successful AI solutions.

Select investors: Amazon Alexa Fund, Lockheed Martin Ventures, Lux Capital, Lightspeed Venture Partners, Haystack Ventures, Bloomberg Beta



Risk management: Monitoring AI performance and bias



ML EXPERIMENT TRACKING

[Weights & Biases](#) develops tools to track model performance and ensure AI experiments are reproducible. Its tech is used by companies including OpenAI and John Deere.

Latest round: \$45M Series B in Q1'20

Select investors: Insight Partners, Trinity Ventures, Bloomberg Beta, Coatue Management



MODEL MONITORING

[ArthurAI](#)'s platform tackles model monitoring and performance optimization, bias detection, and explainability.

Latest round: \$15M Series A in Q4'20

Select investors: Index Ventures, Homebrew, Work-Bench, AME Ventures, Plexo Capital, Acrew Capital