

2022 Emerging Technology Outlook

PitchBook is a Morningstar company. Comprehensive, accurate, and hard-to-find data for professionals doing business in the private markets.

Credits & contact

PitchBook Data, Inc.

John Gabbert Founder, CEO
Nizar Tarhuni Senior Director,
 Institutional Research & Editorial
Paul Condra Head of Emerging Technology
 Research

Institutional Research Group

Analysis

Brendan Burke Senior Analyst
Alex Frederick Senior Analyst
Asad Hussain Senior Analyst
Robert Le Senior Analyst
Kaia Colban Analyst
Svenja Telle Analyst

Data

Matthew Nacionales Data Analyst

Publishing

Designed by **Drew Sanders**

Published on December 21, 2021

Contents

Agtech	2-5
Artificial intelligence & machine learning	6-8
Climate tech	9-11
Enterprise healthtech	12-14
Foodtech	15-19
Information security	20-21
Insurtech	22-23
Internet of Things	24-25
Mobility tech	26-27
Retail healthtech	28-30
Supply chain tech	31-32

2022 predictions

- **Agtech:** The precision ag sector will experience record M&A activity in 2022.
- **Artificial intelligence & machine learning:** VC funding for data preparation platforms will exceed that of model development tools.
- **Climate tech:** Carbon-negative technologies, especially direct air capture, represent a long-term mega-trend that will drive significant VC investments in 2022.
- **Enterprise healthtech:** Personalized medicine startups will receive a record level of VC investment in 2022.
- **Foodtech:** Record VC funding will fuel significant widespread adoption gains in fermented protein in 2022, with a concentration on animal-free dairy products.
- **Information security:** Security incumbents will drive M&A in passwordless authentication.
- **Insurtech:** Incumbent acquisitions will drive a strong increase in insurtech M&A activity.
- **Internet of Things:** IoT/OT security will produce a public listing with over \$1 billion in exit value.
- **Mobility tech:** Mobility-sector-focused VC and PE firms will raise outsized funds in 2022.
- **Retail healthtech:** Retail healthtech startups will focus on building technology that can increase the frequency of low-touch interactions between patients and providers.
- **Supply chain tech:** Commercial delivery vehicles will shift to electric in 2022.

ALEX FREDERICK Senior Analyst,
Emerging Tech
alex.frederick@pitchbook.com

Agtech

Prediction: The precision ag sector will experience record M&A activity in 2022.

Rationale: The precision agriculture sector is maturing, with software providers coalescing around models that combine various farm management tools into unified software suites that are less complex to manage and can unlock synergies by tapping into diverse datasets. Over the past decade, M&A activity has been on the rise, and a funding shift to fewer larger deals is concentrating capital among key providers, thus priming the industry for increased acquisition activity.

Caveat: Incumbents and key venture capital (VC)-backed providers may decide to build new tech in-house instead of acquiring it.

Over the past decade, the precision ag sector has proliferated, with many new entrants launching targeted solutions addressing a spectrum of pain points across the agriculture industry. Precision ag solutions offer farmers and agronomists the ability to track and measure multiple variables affecting plant health, yield, and farm management. However, managing various tools can be overly complex and therefore untenable.

Juggling a multitude of targeted solutions is expensive and time consuming for farmers. Datasets are often siloed across software providers, thereby complicating efforts to apply Big Data and artificial intelligence (AI) technologies that have the potential to reduce farm costs, improve crop yields and quality, and lower risk. Over the past decade, we have observed an emergence of one-stop-shop agtech platforms that provide farmers with a suite of farm management tools.

Examples include:

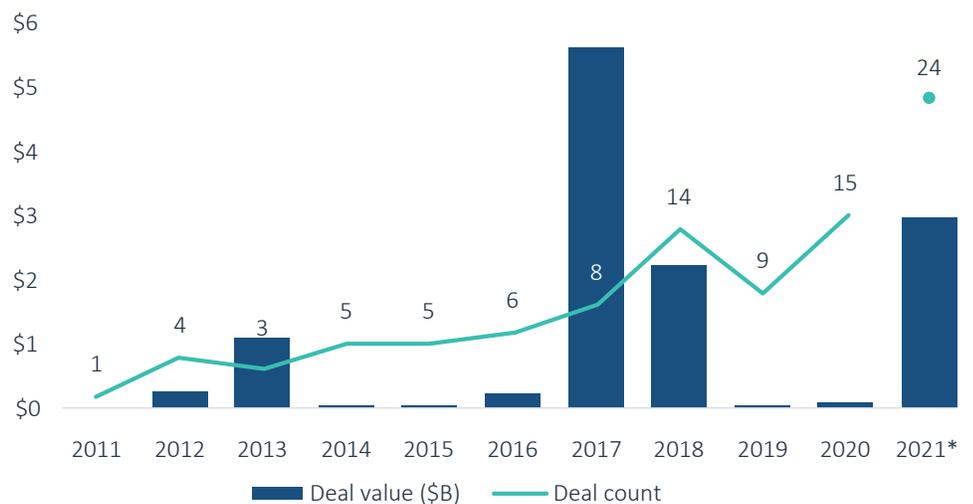
- Agriculture platform DeHaat includes a growing suite of farm management tools—from yield forecasting to weather-based decision analytics, as well as agriculture marketplaces and logistics services.
- Semios is a crop and pest management platform that combines sensors, machine learning, and Big Data tools to enable growers to manage insects, irrigation, frost, disease, and other agricultural challenges.

The precision ag sector has experienced rapid growth, with over 450 companies founded over the past decade. While aggregate deal value has continued to grow, deal volume peaked in 2019, then declined over the following two years. The concentration of VC funding in fewer yet larger deals in agtech startups signals consolidation.

M&A activity has been on the rise among incumbents and well-funded startups seeking to accelerate growth and expand offerings. In December 2021, digital ag platform xFarm merged with Farm Technologies to combine the former's in-field sensors and analytics software with the latter's irrigation platform. In August 2021, crop and pest management platform Semios acquired farm management platform Agworld, thus adding farm planning and scheduling to its product offering.

Agriculture incumbents such as John Deere (NYSE: DE) have been steadily acquiring agriculture technologies. Recent deals include tractor automation startup Bear Flag Robotics in August 2021 and farm management platform Harvest Profit in November 2020. Large agriculture incumbents benefit from a competitive moat of existing business relationship ties that provide farmers and agronomists with other products and services. Deere has been leveraging its extensive network to monetize new products, including sensors, drones, and telematics. While we see consolidation as a more likely near-term trend, it is possible incumbents will seek to develop new technologies in-house.

Precision agriculture M&A deal activity



Source: PitchBook | Geography: Global
*As of December 10, 2021

Top agtech M&A investors (2011-2021*)

Investor	HQ country	Primary investor type	Investment count
Deere	US	Corporation	7
Telus	Canada	Corporation	4
Climate FieldView	US	Corporation	4
CNH Industrial	UK	Corporation	3
AgEagle Aerial Systems	US	Corporation	3
Raven Industries	US	Corporation	2
CropX	US	VC-backed company	2
Syngenta	Switzerland	Corporation	2
Monsanto	US	Corporation	2
Parrot Drones	France	Corporation	2
Yara International	Norway	Corporation	2
Indigo Agriculture	US	VC-backed company	2

Source: PitchBook | Geography: Global
*As of December 10, 2021

Seed- and early-stage VC agtech startups to watch (\$M)*

Company	Segment	Category	Post-money valuation	Total VC raised	Reason to watch
Monarch Tractor	Precision agriculture	Robotics & smart field equipment	Undisclosed	\$81.0	Monarch designs automated and electrified tractors and other agricultural machinery. The company recently signed a multiyear licensing agreement with CNH Industrial to provide CNH with an electrification platform for launching a product line of electrified tractors.
Carbon Robotics	Precision agriculture	Robotics & smart field equipment	\$77.0	\$36.3	Carbon Robotics is developing an autonomous weeding machine that uses eight lasers instead of synthetic chemicals to nullify weeds. The machine addresses two major agricultural concerns: labor constraints and soil health.
Beewise	Animal agriculture	Pollination tech	\$102.1	\$34.8	Beewise develops robotic beehives that monitor and protect honeybees, which are critical to plant pollination.

Source: PitchBook | Geography: Global
*As of December 11, 2021

Late-stage VC agtech startups to watch (\$M)*

Company	Segment	Category	Post-money valuation	Total VC raised	Reason to watch
Farmers Business Network	Agrifinance & e-commerce	Agribusiness marketplaces	\$3,800.0	\$929.3	FBN is a candidate for a potential IPO in 2022. In November 2021, the company raised a \$300 million Series G at a \$3.5 billion pre-money valuation. The round included participation from Fidelity Investment, among other global investors. Archer-Daniels-Midland (ADM) also participated in the round, which included a letter of intent to partner with FBN to help grow its Gradable platform. Gradable measures the carbon footprint of crops and provides a marketplace for farmers to sell sustainable crops at a premium.
Pivot Bio	Agricultural biotech	Plant biotech	\$1,700.0	\$691.7	Pivot Bio is one of the leading VC-backed providers of microbial biological alternatives to synthetic chemical fertilizers. The company recently expanded into CPG, launching snack products produced with crops grown using Pivot Bio's biological fertilizers.
N2 Applied	Agricultural biotech	Plant biotech	Undisclosed	\$23.3	N2 Applied converts livestock slurry into crop fertilizer—recycling nitrogen before it can pollute the environment by leaching into waterways or converting into ammonia and greenhouse gases.

Source: PitchBook | Geography: Global
*As of December 11, 2021

BRENDAN BURKE Senior Analyst,
Emerging Tech
brendan.burke@pitchbook.com

Artificial intelligence & machine learning

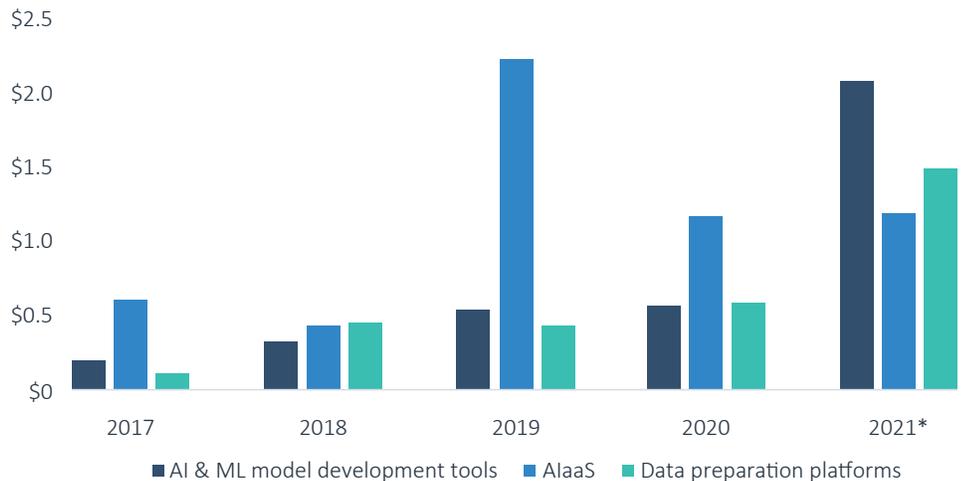
Prediction: VC funding for data preparation platforms will exceed that of model development tools.

Rationale: In 2021, the artificial intelligence & machine learning (AI & ML) industry accepted the need for data-centric AI processes. Historically, platforms enabling model selection and training have led VC funding. Bundled AI-as-a-service (AlaaS) platforms led funding in 2019 and 2020, and model development tools have led funding in 2021. Given the lack of quality training data and the commoditized nature of leading model architectures, data-focused solutions are growing in demand. The raft of training-focused ML solutions competes with open-source solutions from hyperscalers, thus limiting growth opportunities. Data preparation passed AlaaS platforms in 2020, and we believe the category will surpass model development tools in 2021.

Caveat: Late-stage AlaaS and model development tool companies include IPO candidates such as Dataiku and DataRobot. These companies may raise pre-IPO rounds to skew their categories' totals higher. Furthermore, some bundled AlaaS companies have emphasized data preparation in their product development, meaning a shift toward data-centric AI may benefit these platforms as well. We believe that the long-term outlook for low-code AlaaS remains strong.

The commoditization of AI model training has put pressure on model development startups. Based on recent research from tech giants including Meta Platforms (NASDAQ: FB), formerly known as Facebook, and Google (NASDAQ: GOOGL), open-source transformer models can increasingly be used across domains including language, voice, and computer vision. These models have been proven to achieve outstanding results across a range of tasks, thus reducing the need for data scientists to experiment with multiple types of models. Functional models can be trained using basic data science tools such as RStudio and Python, as well as common training frameworks such as Pytorch and AWS Sagemaker. Even so, in 2021, VC investment in model development has exceeded investment in data preparation. VC investment in bundled AI platforms has fallen over the past two years, and leaders in this niche—including Dataiku and DataRobot—are approaching IPOs. We believe that horizontal AI platforms will be unbundled into point solutions such as data annotation and dataset engineering.

Horizontal AI platform VC deal value (\$B) by product category



Source: PitchBook | Geography: Global
*As of September 30, 2021

Data-centric AI is emerging as an innovation theme in AI & ML. To publicize the research of his startup, Landing AI, AI pioneer Andrew Ng has promoted the concept of data-centric AI. Landing AI found that data quality makes a larger impact than model optimization on AI model accuracy—a finding consistent with academic research. Following this theme, activity in data-centric AI is picking up from both investors and founders. Leading language processing startup Snorkel AI is marketing itself as a data-centric startup. Former ML engineers from Google AI, Uber (NYSE: UBER), Stanford's AI Lab, and Carnegie Mellon recently founded Galileo, a dataset engineering startup that remains in private alpha. These founders have observed that data scientists spend 70% to 80% of their time on data quality and draw upon Google Research papers on data-centric AI. VC investors are developing these around data-centric AI, including a notable thesis by OpenView Venture Partners.¹ Landing AI's approach has been validated by a \$57.0 million Series A led by McRock Capital, with participation from Insight Partners and Intel Capital, thus suggesting that leading investors see value in improved data quality.

Data preparation startups are achieving high valuation growth in 2021, which could fuel mega-deals in 2022. In Q3, data labeling startup Sama raised a \$71.0 million Series B from Caisse de dépôt et placement du Québec at a 4.5x valuation step-up. This step-up exceeded the valuation growth of any data preparation, model development, or AlaaS company recorded in H2 2021. Other companies in this space to achieve rapid valuation growth over the past two years include Scale AI and Defined.ai, formerly known as DefinedCrowd. As we covered in our [Q1 2021 AI & ML VC update](#), data preparation has emerged as the enabling technology best served by startups, and we believe there is a pipeline of companies poised to raise large rounds. The data-centric AI theme will likely encourage further entrepreneurship to automate data labeling and supply synthetic datasets to supplement human-labeled data.

¹: "The Data-Centric AI Movement and Opportunities for the MLOps Ecosystem," OpenView Partners, September 14, 2021.

Key recent AI & ML data preparation platform VC deals (\$M)*

Company	Close date	Deal size	Post-money valuation	Series	Lead investor(s)	Valuation step-up (post to pre)
Scale AI	April 13, 2021	\$325.0	\$7,300.0	Series E	Dragoneer Investment Group, Greenoaks Capital Partners, Tiger Global Management	2.0x
Cognite	June 3, 2021	\$150.0	\$1,600.0	Series B	TCV	2.6x
Sama	October 1, 2021	\$71.0	\$226.0	Series B	Caisse de dépôt et placement du Québec	4.5x
Superconductive	July 1, 2021	\$40.0	\$365.0	Series B	Fourth Realm	3.4x
Labelbox	February 11, 2021	\$40.0	\$270.0	Series C	B Capital Group	1.7x
Superconductive	May 20, 2021	\$21.0	\$96.0	Series A	CRV, Index Ventures	5.8x
SuperAnnotate	June 22, 2021	\$14.5	\$59.5	Series A	Base10 Partners	3.6x

Source: PitchBook | Geography: Global
*As of December 8, 2021

SVENJA TELLE Analyst,
Emerging Tech
svenja.telle@pitchbook.com

Climate tech

Prediction: Carbon-negative technologies, especially direct air capture, represent a long-term mega-trend that will drive significant VC investments in 2022.

Rationale: The 2021 UN Climate Change Conference in Glasgow highlighted the need for greater carbon tech advancement, as the world fails to align with the Paris Agreement trajectory. Climate models now show that decarbonizing society alone will be insufficient in reducing emissions to limit global warming to 1.5 degrees Celsius. To close the emission gap, “negative emissions” capacity will be required. Direct air capture (DAC) refers to emerging technologies that can pull CO₂ from the atmosphere; these will be essential in reaching a net-zero economy wherein the CO₂ released is equivalent to the amount being removed. The voluntary market for DAC-based CO₂ removal is growing fast, with companies such as Microsoft (NASDAQ: MSFT), Stripe, Shopify (NYSE: SHOP), and Swiss Re (PINX: SSREY) committed to investing in DAC removal to offset CO₂ emissions. Increased attention and investment from the private and public sectors for DAC continues to highlight the technology as a necessary tool to combat climate change.

Caveat: DAC is currently an expensive technology to operate, as atmospheric CO₂ is more diluted than CO₂ that emanates from flue gas, resulting in DAC’s higher energy needs and cost in comparison with other CO₂ capture technologies. Several pilot projects have been completed and operated, but DAC has not yet reached markets at a large scale. Currently, numerous small pilot-scale DAC plants are operating around the world; these plants incorporate commercial facilities that sell the captured CO₂.

2021 may be viewed as a pivotal year for technologies related to carbon capture, utilization, and storage (CCUS). Efforts to facilitate the transition to a net-zero global energy system by producing essential negative emissions will likely focus on bioenergy with carbon capture and storage, as well as DAC. Startups in this category address the issue of reducing existing carbon in the atmosphere via capture and permanent storage. DAC technologies remove the atmosphere’s CO₂, which can then be permanently stored or utilized in downstream applications such as food processing, or it can be mixed with hydrogen to produce synthetic fuels. Startups are working on two approaches to capture CO₂ from the air: liquid and solid DAC.

Currently, 19 DAC plants operate worldwide, and over 100 CCUS facilities have been announced in 2021. CO₂ capture capacity will likely grow exponentially following the significant investments made into research & development (R&D) over the past two years.²

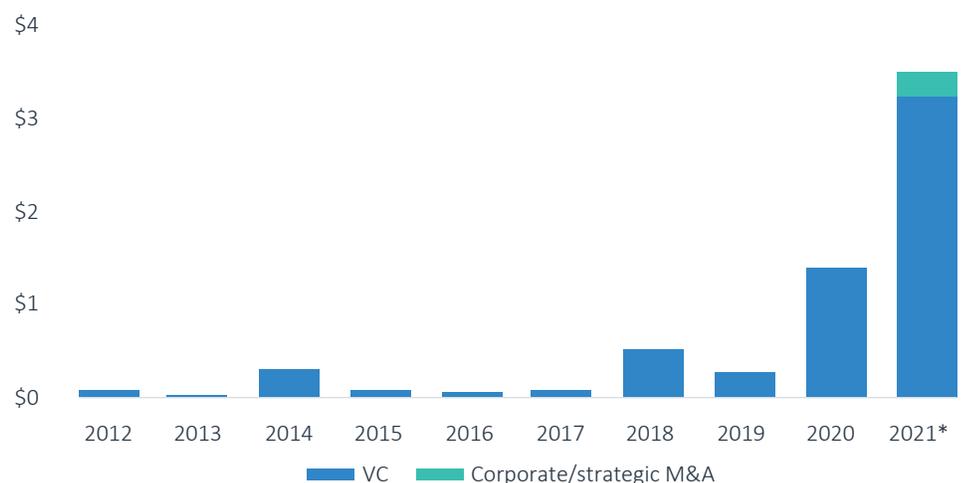
²: “Carbon Capture in 2021: Off and Running or Another False Start?” IEA, Samantha McCulloch, November 24, 2021.

Carbon capture companies have attracted significant investor interest over the past year. Globally, these companies raised \$5.3 billion from 2018 to 2021 YTD. Through the first three quarters of 2021, carbon tech startups raised \$3.2 billion, already far surpassing 2020's full-year record of \$1.3 billion.

DAC specifically has received greater attention and investment from both the private and public sectors, and the voluntary market for DAC-based CO₂ removal is expanding—mainly through corporations. Further investments and backing for mature DAC technologies were announced from Breakthrough Energy's Catalyst Program and initiatives such as XPRIZE, the pool of \$400 million devoted to promising carbon removal projects. Private investments have been growing as well. The largest DAC deal on record closed in August 2020 when Climeworks raised \$107.4 million, followed by a smaller late-stage deal in February 2021 led by Microsoft Climate Fund for an undisclosed amount. Following these funding rounds, Climeworks launched Orca, the world's first and largest climate-positive DAC and storage plant, in September 2021. The facility can capture 4,000 tons annually and makes DAC and storage a reality.

AirCapture, an early-stage startup to watch, develops a decentralized ecosystem for DAC through smaller machines that can capture carbon from industrial and manufacturing processes on-site. The startup integrates carbon into downstream applications, thereby tapping into vast market opportunities across many industries. So far, AirCapture has raised a seed round for an undisclosed amount and has unofficially announced it will be raising a Series A in 2022.

Carbon tech deal value (\$B)



Source: PitchBook | Geography: Global
*As of December 13, 2021

Early-stage VC climate tech startups to watch (\$M)*

Company	Last financing size	Total VC raised	HQ country	Reason to watch
Carbon Capture	\$35.0	\$43.6	US	Carbon Capture reduces the cost of DAC through sorbent technology.
AirCapture	Undisclosed	Undisclosed	US	AirCapture utilizes a decentralized capture of carbon for downstream applications.
1PointFive	Undisclosed	Undisclosed	US	1PointFive uses industrial-scale air-capture technology.

Source: PitchBook | Geography: Global
*As of December 13, 2021

Late-stage VC climate tech startups to watch (\$M)*

Company	Last financing size	Total VC raised	HQ country	Reason to watch
LanzaTech	\$30.0	\$579.5	US	LanzaTech uses industrial-source carbon recycling technology.
Climeworks	Undisclosed	\$155.9	Switzerland	Climeworks uses sorbent-based DAC technologies.
Svante	\$100.0	\$154.2	Canada	Svante utilizes carbon capture from industrial sources at 50% the capital cost.

Source: PitchBook | Geography: Global
*As of December 13, 2021

KAIA COLBAN Analyst,
Emerging Tech
kaia.colban@pitchbook.com

Enterprise healthtech

Prediction: Personalized medicine startups will receive a record level of VC investment in 2022.

Rationale: While precision medicine has been a talking point for several years now, gaps in technology and inefficiencies in harnessing Big Data have prevented it from becoming a reality. However, a confluence of technologies—including sensors, remote patient monitoring devices, the Internet of Things (IoT), electronic health records (EHRs), genetic databases, ML, and cloud computing—is helping advance the state of precision medicine applications. While personalized medicine may yet take several years to become fully commercialized, we expect VC interest to ramp up in 2022 due to strong market drivers and the potential for a large addressable market.

Caveat: Technical, ethical, and legal concerns may delay the uptake of precision medicine, which requires AI- and ML-based Big Data platforms to transform data into actionable insights. Precision medicine also requires advanced technological systems to store, process, exchange, and curate data. Despite the massive market opportunity of \$4.8 trillion in annual US healthcare spending,³ a lack of provider training regarding genetics and precision medicine, coupled with the initial high cost of precision medicine, may hinder market adoption. Data analysis that results in incorrect or incidental findings could also slow adoption. For example, the discovery of untreatable diseases could cause mental health issues among patients, while incorrect findings could result in unnecessary healthcare expenses or other unintended psychological effects. Personalized medicine also introduces “medicolegal” issues, or laws relating to healthcare and medicine, which currently differ among nations and complicate universal application and use. Furthermore, legal issues such as informed consent, privacy and confidentiality, and discrimination require further analysis. We expect current healthcare-related regulation laws will ultimately be reassessed and adapted.

Precision medicine encompasses individualized treatments customized to a patient’s genes, environment, and lifestyle. It relies on complex algorithms to analyze an individual’s health and wellness profile, synthesize the various data points, and transform datasets into personalized health plans. To recognize patterns that could help craft effective treatments, precision medicine can be derived only via computational techniques, given the complexity of analyzing a person’s entire genome, metabolic profile, microbiome composition, food intake, exercise schedule, sleep regimen, and so on.

³: “NHE Fact Sheet,” Centers for Medicare & Medicaid Services, December 1, 2021.

Well-funded companies developing precision medicine technologies include Tempus Labs, Syapse, and GNS Healthcare. Tempus has built the world's largest library of clinical and molecular data; it uses an AI-based operating system to make insights accessible and useful for patients, physicians, and researchers. In December 2020, Tempus raised the largest deal by a precision medicine startup, a \$450.0 million Series G. It is now exploring a US IPO. Similar to Tempus, Syapse aims to aggregate fragmented clinical, molecular, treatment, and health outcomes data. However, rather than performing the sequencing itself, the company collaborates with various labs and focuses on the software component. GNS Healthcare leverages causal AI technology to exploit multiomics and clinical data to create virtual (in silico) patients in the fields of oncology, neurodegeneration, and immunology to reveal hidden circuitry of disease. GNS collaborated with Tempus to develop and launch an in-silico model for prostate cancer.

Seed- and early-stage VC enterprise healthtech startups to watch (\$M)*

Company	Segment	Category	Post-money valuation	Total VC raised	Reason to watch
Nym	Insurance tech	Operations tech	\$97.3	\$47.1	Nym's AI-based medical billing coding software is 98% accurate compared with the 70% accuracy rate of human coding.
Stork Club	Customer acquisition tools	Corporate distribution	\$114.5	\$32.5	Stork Club is benefiting from the increasing demand for family planning-focused corporate benefit solutions.
Mendel	Clinical trial tech	Healthcare analytics and Big Data	NA	\$24.0	Mendel develops promising natural language processing to structure the rapidly growing quantity of healthcare data.

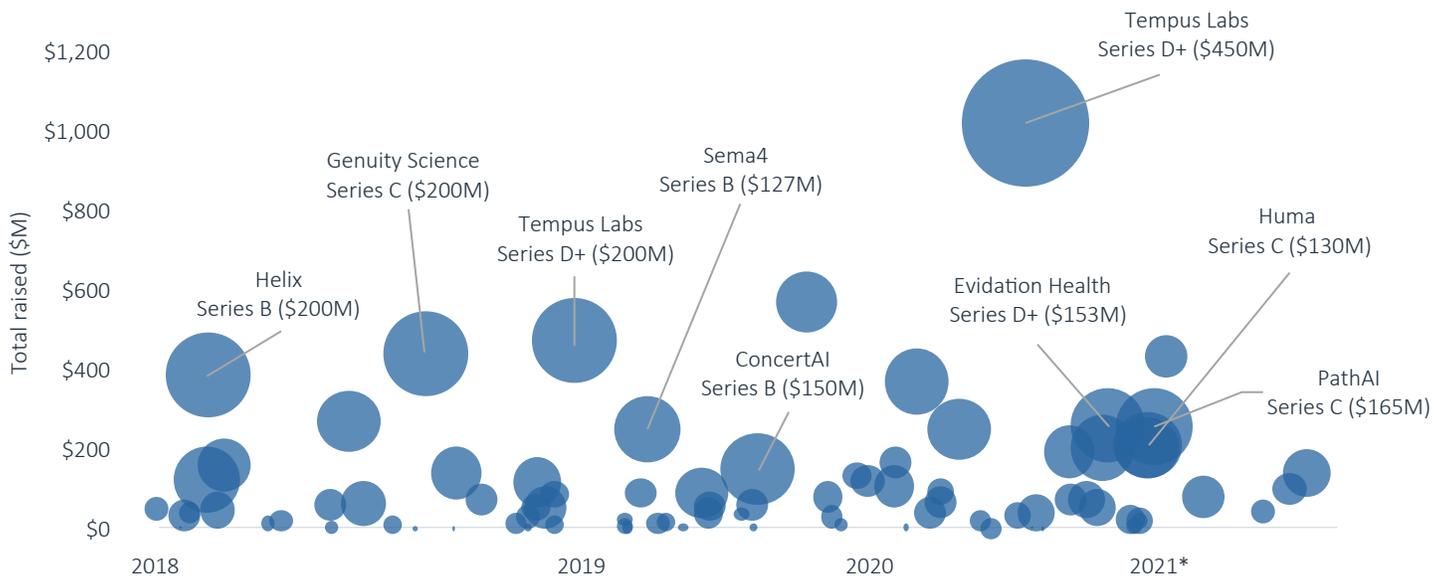
Source: PitchBook | Geography: Global
*As of December 15, 2021

Late-stage VC enterprise healthtech startups to watch*

Company	Segment	Category	Post-money valuation (\$B)	Total VC raised (\$M)	Reason to watch
Olive	Operations & care management	Hospital management	\$4.0	\$857.8	Olive is a leader in healthcare-focused robotic process automation technology and a likely IPO candidate for 2022.
Gusto	Customer acquisition tools	Corporate distribution	\$9.5	\$696.4	Gusto is a leader in HR and payroll software and a likely IPO candidate for 2022.
Spring Health	Customer acquisition tools	Corporate distribution	\$2.0	\$297.5	Spring Health is a leading corporate benefits provider focused on the rapidly growing market of mental health.

Source: PitchBook | Geography: Global
*As of December 15, 2021

Recent deal sizes of VC-backed enterprise healthtech companies by total capital raised



Source: PitchBook | Geography: Global
*As of December 1, 2021

ALEX FREDERICK Senior Analyst,
Emerging Tech
alex.frederick@pitchbook.com

Foodtech

Prediction: Record VC funding will fuel significant widespread adoption gains in fermented protein, with a concentration on animal-free dairy products.

Rationale: Companies developing precision fermented alternative proteins (alt-proteins) logged record VC funding in 2021 to launch new products and scale operations. Early innovators of fermented protein technologies launched initial consumer foods and beverages in restaurants, cafes, and grocery and convenience stores. Partnerships with leading food and beverage incumbents promise to scale production and leverage sales and marketing efforts to accelerate market penetration. A growing pipeline of announced products scheduled to launch in 2022 and beyond leads us to expect a banner year for fermented protein products.

Caveat: In many countries, novel food ingredients, such as those derived from microorganisms, require government review to be approved for commercialization and ensure safety for human consumption. Several early fermented proteins have already received approval. However, the variety of sources and manufacturing techniques for fermented proteins in development means that most, if not all, will need to go through review processes in each country, which could delay the launch and expansion of new products. The timeline to regulatory approval can take months—and, in some cases, years. In addition to regulatory hurdles, early-stage precision protein companies face significant challenges as they seek to transition from bench to commercial scale, especially as they lack commercial-scale infrastructure.

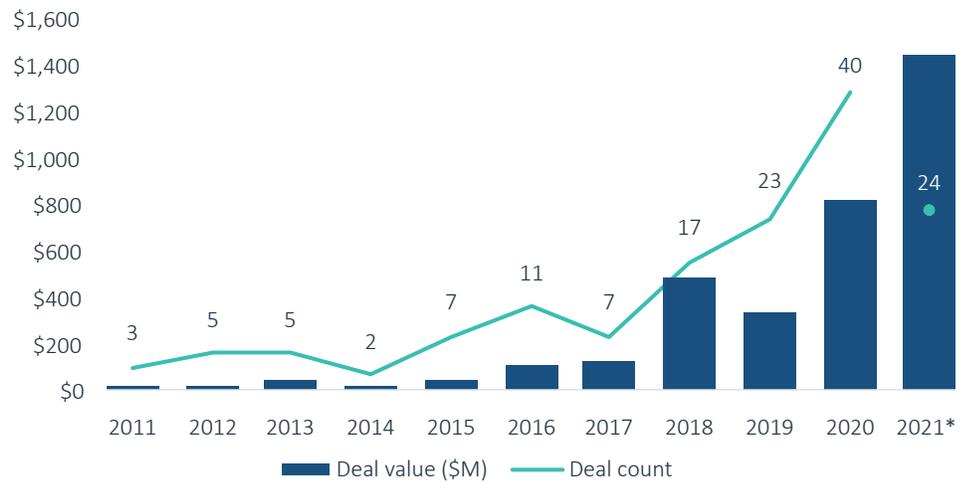
In 2021, a handful of early foodtech companies launched consumer packaged goods (CPG) such as ice cream, burgers, and cream cheese made with fermented proteins. With a growing number of products on the horizon and an even longer list of VC-backed companies with products yet unannounced, we expect 2022 will be the year when fermented protein products become mainstream.

Consumer preferences for animal-free and environmentally friendly manufacturing processes are driving interest in fermented proteins. Sensory characteristics and nutrition profiles of fermented proteins can be superior to other alt-proteins and can achieve taste, texture, and digestibility superior to current plant-based and cultivated protein products. Although fermented dairy proteins do not come from animals, they are real dairy proteins that provide the same creamy texture consumers want and expect. We anticipate precision fermented dairy products will have a larger market opportunity than fermented meat analogs and will see more significant VC investment in the medium term.

The environmental drawbacks of conventional industrial meat and dairy production have been well documented. Precision fermentation is significantly more efficient in energy, water, and land use. One provider, ENOUGH Food, states that its production method uses 97% less water, 97% less feed, and produces 97% less CO₂ than traditional methods.⁴ Precision fermentation also creates much less waste. In 2019, a consortium of fermented protein startups including 3F BIO received €17.0 million to develop zero-waste fermentation technology in a project named Plenitude.

Over the past two years, the fermented protein category has experienced a surge in VC funding. 2020 annual deal values totaled \$805.8 million across 40 deals, with deal values up 142.6% YoY. In 2021, deal values reached \$1.4 billion as of Q3, up 78.4% from 2020 year-end totals. Two companies, Nature’s Fynd and Perfect Day, drew 48.7% of the VC in 2021, each logging \$350.0 million deals. Both companies are leaders in the category, with multiple products in the market or ready for market, pending FDA approval.

Fermented protein VC deal activity



Source: PitchBook | Geography: Global
*As of September 30, 2021

4: “ENOUGH,” ENOUGH Food, 2021.

Several fermented protein brands have already received notable traction in 2021:

- As of December 2021, fermented protein ice cream brand Brave Robot is sold in 5,000+ grocery stores in the US.
- Fermented protein provider MycoTechnology recently partnered with plant-based JBS (BVMF: JBSS3) subsidiary Planterra Foods to supply fermented ingredients for its plant-based meat products, now available throughout the US.
- Fermented protein provider Nature's Fynd raised \$350.0 million in July 2021, with plans to scale production and grow its product portfolio. The company received generally recognized as safe (GRAS) approval from the FDA in June 2021. It announced an initial launch in select stores in California, New York, and Chicago in 2021, followed by national and global expansion starting in 2022.
- In early December 2021, General Mills (NYSE: GIS) launched a new line of animal-free dairy products made with fermented proteins under the brand name Bold Cultr. The company launched a limited-release cream cheese product with plans to expand its release in 2022.

The following fermented protein products are scheduled for release in 2022:

- The Urgent Company is rolling out animal-free dairy products, starting with cream cheese.
- Following a successful pilot, NextFerm Technologies plans to launch a fermented, yeast-based sports nutrition product.
- In September 2021, ENOUGH Food broke ground on one of the world's largest fermented protein manufacturing facilities. It will be able to produce 50,000 tons of mycoprotein annually. The facility is expected to be operational by 2022. The protein can be used in various alt-protein products, including dairy, meat, and seafood. A partnership with Cargill may accelerate commercialization efforts.
- Superbrewed Food came out of stealth in early 2021 and announced animal-free milk, cheese, and protein powder. The company's latest target launch date is 2022, pending FDA approval.
- Aqua Cultured Foods uses microbial fermentation to develop animal-free whole cut seafood analogs. It plans to launch as early as 2022.

Top VC- and PE-backed fermented protein companies by total VC raised (\$M)*

Company	Total VC raised	Most recent post-money valuation	Most recent deal type	HQ country
Perfect Day	\$711.5	\$1,585.3	Series D1	US
Nature's Fynd	\$463.0	\$1,750.0	Series C	US
Motif	\$343.5	\$1,226.0	Series B	US
Calysta	\$172.8	\$284.0	Series D1	US
MycoTechnology	\$130.9	\$521.8	Series E	US
Geltor	\$117.3	\$394.3	Series B	US
Meati Foods	\$83.0	\$325.0	Series B	US
The EVERY Company	\$71.9	\$125.2	Series C	US
ENOUGH	\$60.2	\$17.3	Series B	UK
Formo	\$54.5	\$13.8	Series A	Germany

Source: PitchBook | Geography: Global
*As of September 30, 2021

Seed- and early-stage VC foodtech startups to watch (\$M)*

Company	Segment	Category	Post-money valuation	Total VC raised	Reason to watch
Wonder	Food suppliers	Ghost kitchens	Undisclosed	\$500.0	Wonder is the next startup of Jet.com founder Marc Lore. The Wonder app evolves the ghost kitchen model by leveraging celebrity chef partnerships and a logistics network to deliver buzzworthy meals within 30 to 40 minutes.
Zepto	Food suppliers	Online grocers	\$225.00	\$60.6	Zepto has first-mover advantage in the ultrafast grocery model in India. It uses a series of dark stores to achieve 10-minute delivery. Online grocery is a massive market opportunity in India, but most grocers rely on gig workers and fulfill orders from brick-and-mortar supermarkets, which add costly minutes to order fulfillment.
Formo	Bio-engineered foods	Fermented protein	\$13.81	\$54.5	Formo's precision-fermented dairy products strike a balance of being both animal free and lactose and cholesterol free, while achieving the same taste, consistency, and nutritional performance as dairy.

Source: PitchBook | Geography: Global
*As of December 11, 2021

Late-stage VC foodtech startups to watch (\$M)*

Company	Segment	Category	Post-money valuation	Total VC raised	Reason to watch
Getir	Food suppliers	Online grocers	\$7,500.0	\$1,053.0	Getir, the Turkey-based ultrafast grocery and convenience store provider, has rapidly expanded across Europe and recently entered the US market. The company is operating in Chicago and New York City, with plans to launch in Boston by the end of 2021.
All Day Kitchens	Food suppliers	Ghost kitchens	\$375.0	\$102.5	All Day Kitchens utilizes a microfulfillment model that can shorten order fulfillment time to under 30 minutes, which is critical to meal integrity and customer satisfaction.
Hazel Technologies	Industrial & consumer tech	Food waste & traceability	\$234.0	\$87.1	Hazel Technologies develops shelf-life extension products that reduce food waste by delaying the perishability of fresh produce throughout the supply chain. Since its 2015 founding, the company has been piloting shelf-life-extension products with major food companies. It recently broke ground on a new research and customer support hub in Fresno, CA; when complete, this will allow it to perform commercial-scale studies on-site with customers.

Source: PitchBook | Geography: Global
*As of December 11, 2021

BRENDAN BURKE Senior Analyst,
Emerging Tech
brendan.burke@pitchbook.com

Information security

Prediction: Security incumbents will drive M&A in passwordless authentication.

Rationale: Passwordless authentication is rapidly growing in adoption and strategic value given the prevalence of zero trust product strategies—which refers to default denial of access. The first three pure-play acquisitions of passwordless startups were made in 2021 by fraud prevention unicorn Sift, passwordless unicorn Stytch, and biometric identification vendor TrustStamp (PINX: IDAI). Given the rapid growth in this niche sector, we believe that a range of security incumbents will find value in adding passwordless access controls to their product suites. Startups in this space face long deployment timelines and competition from information technology (IT) leaders such as Microsoft. As such, we believe acquirers will be able to identify promising technology at reasonable prices.

Caveat: Emerging companies may opt to stay private, given the large opportunity in identity governance. Transmit Security achieved scale in passwordless authentication without outside funding and has built a self-sustaining business, thereby decreasing the likelihood that a market leader will opt for an exit. VC investors have dedicated significant funding to some passwordless startups at an early stage and can support these companies through late-stage rounds.

Passwordless authentication has rapidly shifted up the S-curve of adoption, thus accelerating its timeline for mass adoption to 2023. According to a recent vendor-sponsored survey, 61% of security leaders have adopted passwordless multi-factor authentication (MFA), which may include facial recognition or physical access tokens.⁵ 66% of non-adopters plan to do so over the next two years.⁶ These results suggest that passwordless authentication is reaching critical mass sooner than we expected. Over 20% of these organizations have suffered from man-in-the-middle and keylogging attacks, both of which can be solved by eliminating manual password entry. In Microsoft's Q1 2022 earnings call, CEO Satya Nadella declared that the "future of security is passwordless," and "Nearly 240 million users have adopted passwordless login to date."⁷

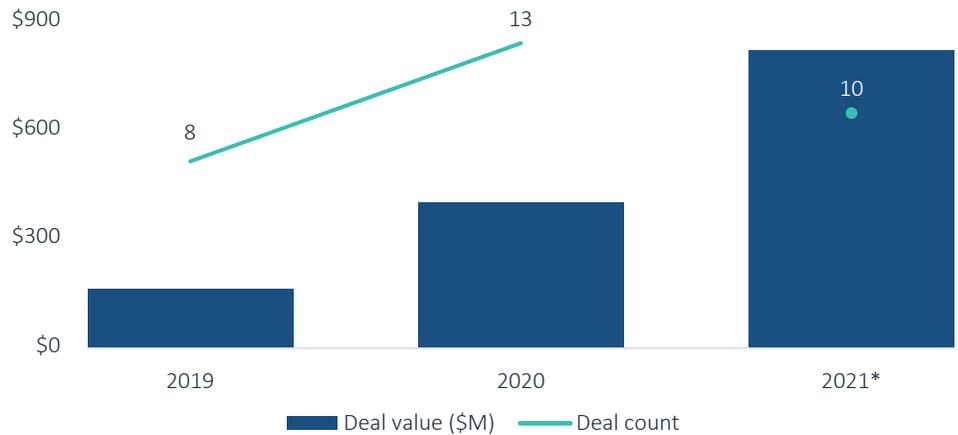
VC investors have made concentrated investments in early-stage passwordless startups that signal the promise of the technology. We have tracked \$819.2 million in deal value in 2021—more than doubling 2020's \$396.1 million. 2020's total includes a mega-deal for passwordless-adjacent access management company Auth0, indicating that pure-play companies are only beginning to achieve outstanding investments. Leading VC investors Coatue, Insight Partners, and Tiger Global, among others, have all made bets in the space in 2021. In Q4 2021, Stytch raised a \$90.0 million Series B, achieving a unicorn valuation at an elevated revenue multiple. The company is bringing API access to the emerging WebAuthn protocol. Innovation in the space promises to create a new category of access management, as MFA did before.

5: "The State of Workforce Passwordless Authentication," Ponemon Institute, October 2021.

6: Ibid.

7: "Microsoft Fiscal Year 2022 First Quarter Earning Conference Call," Microsoft, Brett Iversen, Satya Nadella, and Amy Hood, October 26, 2021.

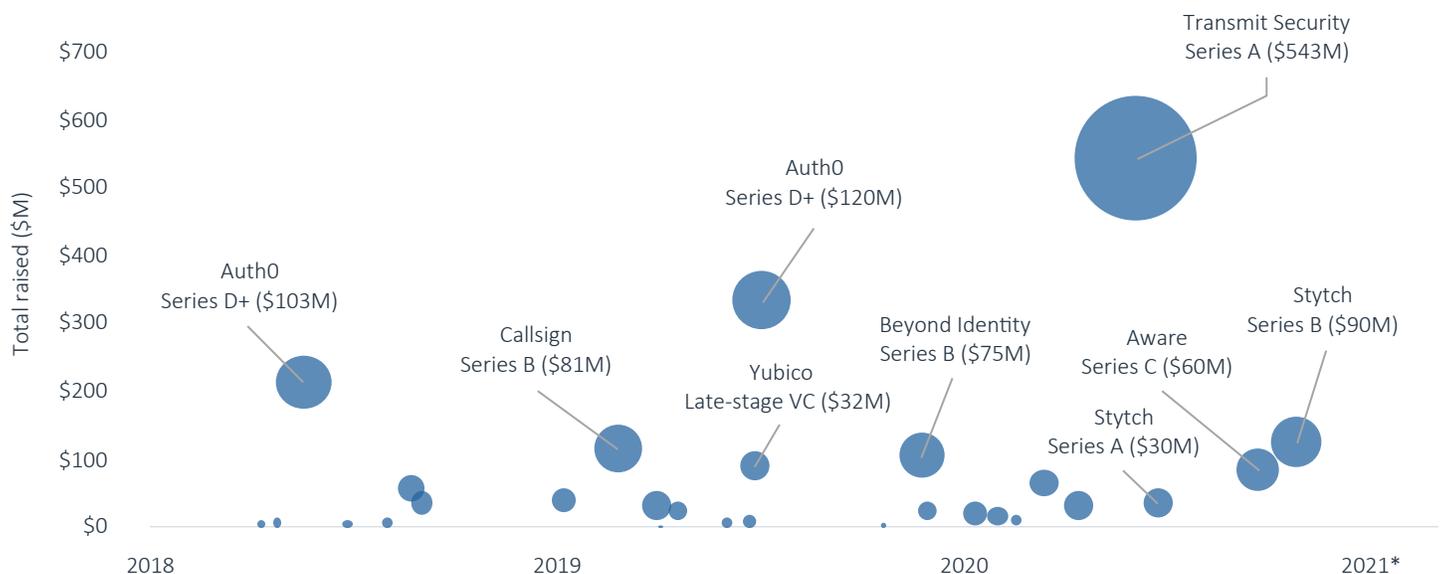
Passwordless authentication VC deal activity



Source: PitchBook | Geography: North America & Europe
*As of December 8, 2021

Identity & access management has driven exits in information security (infosec). The scale of MFA leader Duo Security’s \$2.4 billion exit to Cisco (NASDAQ: CSCO) and the \$6.5 billion exit of access management disruptor Auth0 to Okta (NASDAQ: OKTA) demonstrate the value of identity governance & administration (IGA) to incumbents. We estimate IGA will produce a \$7.9 billion market in 2021. Given the size of this market, we believe that IGA-adjacent security incumbents will seek to expand their access management strategies—particularly their zero trust capabilities. Passwordless authentication is a powerful implementation of zero trust capabilities, given some implementations’ ability to continuously authenticate users. Security incumbents have aggressively pursued expansion in mega-trends including extended detection & response (XDR) and secure access service edge (SASE). For this reason, we believe that incumbents such as CrowdStrike (NASDAQ: CRWD) and Palo Alto Networks (NASDAQ: PANW), along with IGA leaders SailPoint (NYSE: SAIL) and Saviynt, may consider entry into this space.

Recent deal sizes of VC-backed passwordless authentication companies by total capital raised



Source: PitchBook | Geography: North America & Europe
*As of December 8, 2021

ROBERT LE Senior Analyst,
Emerging Tech
robert.le@pitchbook.com

Insurtech

Prediction: Incumbent acquisitions will drive a strong increase in insurtech M&A activity.

Rationale: In recent years, insurance incumbents have increased their participation in tech investments and partnerships. As insurance technologies continue to mature and incumbents gain a greater understanding of the space through minority investments, more M&A activity is expected to fully bring these technologies in-house.

Caveat: 2021 has been a rough year for recently publicly listed insurtech companies such as Lemonade (NYSE: LMND), GoHealth (NASDAQ: GOCO), Root Insurance (NASDAQ: ROOT), Metromile (NASDAQ: MILE), and Hippo (NYSE: HIPO). Dampened public market valuations can spill over into the private markets, wherein incumbents might slow M&A activity to see how the market pans out.

While the insurance industry has been slow to adopt new technologies and embrace digital transformation compared with other industries, increased competition, evolving risks, heightened customer expectations, and diminishing investment income have driven innovation and technology adoption. The COVID-19 pandemic has served as an important catalyst for incumbents to accelerate digital initiatives to improve how they sell products, serve customers, underwrite assets, and adjust claims via remote technologies. Incumbent insurance companies such as brokers, carriers, and reinsurers have contemplated the buy-versus-build decision for years, and many have determined that the buy route is the viable one.

We expect VC investment into insurtech companies will reach \$15 billion for full-year 2021. This amount will far exceed the previous record of \$7.2 billion in 2018. This trend is driven partly by participation from traditional insurance providers. While nontraditional venture investors have pulled back investment activity in the past, especially during volatile market conditions or downturns, incumbents and their corporate venture capital (CVC) units have remained committed to insurtech investments in recent years. Insurance CVC investment in insurtech companies reached \$2.7 billion in 2021, up from \$1.5 billion in 2020. Notable deals include pet insurtech Many Group's \$350.0 million Series D (Munich Re Ventures), e-commerce embedded insurance provider Extend's \$260.0 million Series C (Nationwide Ventures), and auto insurtech Clearcover's \$200.0 million Series D (American Family Ventures).

Increasing capital commitments from incumbents illustrates their growing willingness to view startup involvement as central to innovation and will likely drive consolidation in the next year. Insurtech companies developing enablement technologies that facilitate distribution, underwriting, or claims are likely M&A targets, given their potential to provide near-term strategic benefits. Evidence of this trend includes the recent acquisitions of auto claims software GT Motive by Allianz X, auto telematics provider TrueMotion by State Farm, and quoting-and-binding platform Bold Penguin by American Family.

Key recent insurtech acquisitions (\$M)*

Company	Close date	Acquisition size	Acquirer(s)
CoverWallet	January 1, 2020	\$300.00	Aon
CoverHound	November 1, 2020	Unknown (raised \$114.2)	Brown & Brown Insurance
TrueMotion	June 1, 2021	Unknown (raised \$88.0)	Cambridge Mobile Telematics, Raptor Group, State Farm Ventures, Tarsadia Investments
Bold Penguin	January 1, 2021	Unknown (raised \$51.8)	American Family Insurance Group
GT Motive	September 1, 2021	Unknown (raised \$10.6)	Allianz X
ControlExpert	March 1, 2020	Unknown	Allianz X
CyberPolicy	November 1, 2020	Unknown	Brown & Brown Insurance

Source: PitchBook | Geography: Global
*As of December 9, 2021

BRENDAN BURKE Senior Analyst,
Emerging Tech
brendan.burke@pitchbook.com

Internet of Things

Prediction: IoT/OT security will produce a public listing with over \$1 billion in exit value.

Rationale: Pure-play Internet of Things/operational technology (IoT/OT) security unicorns, including Dragos, Armis, and Claroty, have scaled to become some of the largest private software companies in IoT. IoT/OT security has become a value driver for leading public security companies including Microsoft, JFrog (NASDAQ: FROG), and SentinelOne (NYSE: S), yet pure-play companies in the category have not yet reached public markets. The category's recent shakeout has left several potential winners in key subcategories, such as industrial control systems, smart home, and enterprise IoT. Enterprises are focusing on IoT/OT security, given the prevalence of ransomware attacks and ongoing cloud transformation initiatives, suggesting that high growth can continue through a public listing.

Caveat: IoT/OT security remains a relatively small market and may not produce the growth outlook necessary to earn high valuations. We estimate IoT/OT security spending will reach \$3.8 billion in 2021, growing at a 23.8% CAGR to a \$7.2 billion market in 2024. Public listings have flowed from larger segments, including endpoint detection & response, with SentinelOne and CrowdStrike; identity & access management, with Okta and Riskified (NYSE: RSKD); and network security, with Darktrace (LON: DARK) and IronNet (NYSE: IRNT). IoT software vendors can suffer from the cyclical nature of their customers' businesses and less sophisticated security teams than at large tech and financial services companies. As a result, some IoT/OT security unicorns may become targets for leveraged buyouts (LBOs) rather than candidates for public listings.

IoT/OT security stands out as a commercial opportunity in IoT, given the expanding set of pre-existing security vulnerabilities and high volume of ransomware attacks on critical infrastructure. IoT/OT security vendors benefit from industrial companies' technical debt, while pure-play IoT device vendors must often overhaul it. Significant headroom exists for growth in device security, as recent vendor research finds that fewer than half of enterprises invest in hardware encryption and hardware-based operating system protection.⁶ Despite this, 55% of IT leaders are concerned about industrial IoT attacks.⁷ This mismatch between prioritization and adoption means that enterprises may not yet comply with recent US federal laws on device security, including the Internet of Things Cybersecurity Act of 2020. In response to the White House's Executive Order on Improving the Nation's Cybersecurity, the National Institute of Standards & Technology (NIST) is developing guidance on IoT cybersecurity in addition to existing guidance in its Cybersecurity Framework (CSF). Enterprise customers must accelerate adoption to get ahead of expanding standards.

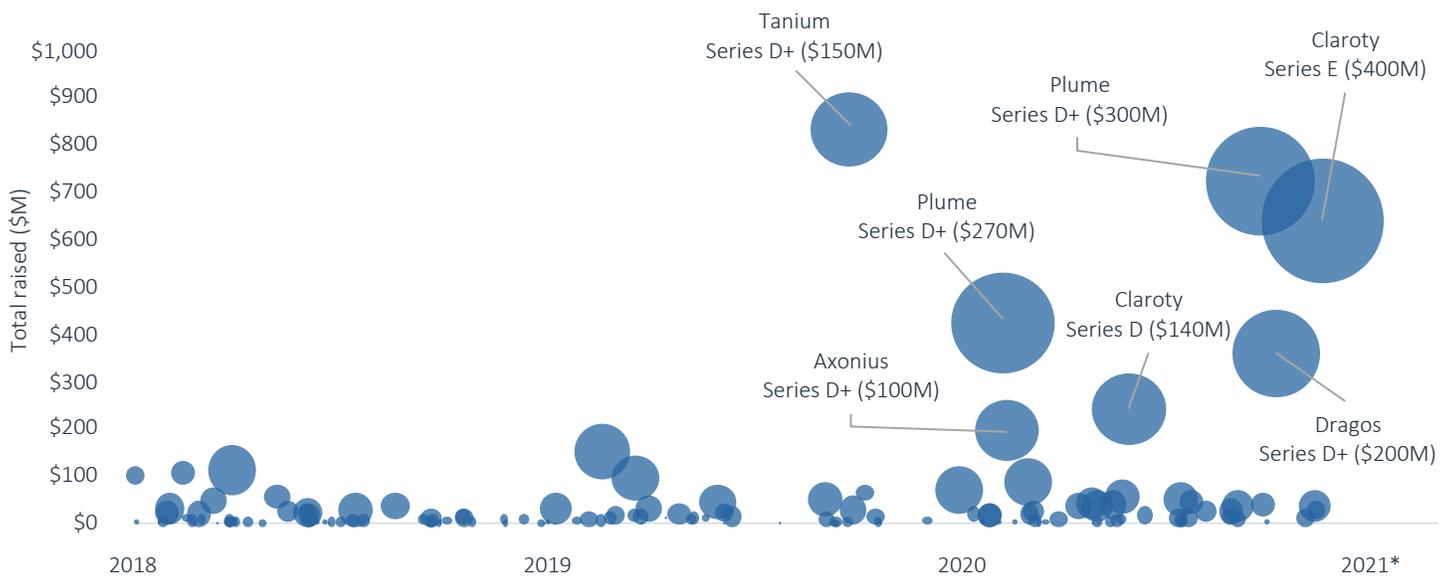
6: "New Security Signals Study Shows Firmware Attacks on the Rise; Here's How Microsoft Is Working To Help Eliminate This Entire Class of Threats," Microsoft, March 30, 2021.

7: "The Connected Enterprise: IoT Security Report 2021," Palo Alto Networks, October 20, 2021.

Exit values have picked up in 2021 after numerous low-value exits from 2019 to 2020, thus suggesting that the category is maturing. Darktrace featured industrial control systems (ICS) security as a central driver of its \$2.2 billion IPO in 2021. Public DevOps vendor JFrog recently acquired device-level security startup VDOO for \$300.0 million to scan binary code in embedded applications for vulnerabilities and malware. Microsoft also announced the acquisition of firmware security startup Refirm Labs, thus demonstrating the strategic value of device security. This acquisition complements its earlier acquisition of OT/ICS-focused network & communication security startup CyberX. Acquisition values are increasing overall, which demonstrates increased appetite for innovation in the space.

Numerous IoT/OT security companies are pursuing public exits. Given the stack of solutions required to provide layered defense, as well as different device types, the space can support a range of large companies. For an extensive market overview, see our [Q2 2021 analyst note](#) on the category. In ICS/OT security, Dragos plans to remain independent via an IPO and is not pursuing an acquisition. In IoT security, Armis was bought out in January 2020 and has since raised growth funding to pursue an IPO. Both Claroty and Nozomi Networks have raised self-proclaimed pre-IPO rounds. IoT vulnerability assessment unicorn Axonius has a stated goal “to go from zero to IPO faster than any other cyber security company in history.”⁸ Given this pipeline, the category could be one of the leading drivers of public market exit value in all of enterprise software.

Recent deal sizes of VC-backed IoT/OT security companies by total capital raised



Source: PitchBook | Geography: North America & Europe
*As of December 8, 2021

8: “Fueled by Sales & Marketing Alignment, Go From Zero to IPO in Record Time, Interview with CMO of Axonius,” InsideUp, Jeff Leroux, August 11, 2021.

ASAD HUSSAIN Senior Analyst,
Emerging Tech
asad.hussain@pitchbook.com

Mobility tech

Prediction: Mobility sector-focused VC and PE firms will raise outsized funds in 2022.

Rationale: Mobility sector-focused venture firms can provide strategic value to automakers and other transportation incumbents that face significant disruptive threats from electrification and automation, especially as consumers shift to on-demand and shared mobility consumption models.

Caveat: A market downturn or pullback in investing in the sector would negatively affect fundraising.

We expect VC firms with a mobility focus to raise outsized funds in 2022, driven by strategic and financial investors seeking to increase exposure to the industry. While some CVCs—such as Toyota Ventures, Shell Ventures, BMW I Ventures, and Hella Ventures—have been successful at investing in mobility, we believe many transportation incumbents have constraints that prevent investment into the broad spectrum of mobility technologies. Some incumbents are not able to move quickly enough to catch investment opportunities as they arise. As a result, we expect incumbents will increase their investments in dedicated venture firms that not only promise high returns but can also provide intelligence and business development opportunities to strategic corporates. Dozens of successful exits of mobility firms—most notably Rivian's (NASDAQ: RIVN) \$67.7 billion IPO—have paved the way for financial LPs such as endowments, pensions, and high-net-worth individuals to seek exposure to the fast-growing mobility sector for outsized financial returns.

One example is First Move Capital, a Colorado, US-based VC firm investing in automotive and transportation technology. The firm's LPs include corporate strategics as well as institutional investors. It was founded in 2012 and has raised three funds, with a total of \$178.8 million in AUM. Successful exits include Vroom's (NASDAQ: VRM) \$2.5 billion IPO and Frontier Car Group's \$400.0 million acquisition. Current investments include Via, an on-demand shuttle and software company that provides a platform enabling partners to create end-to-end transit systems; Indigo Technologies, a developer of a purpose-built light electric vehicle (LEV) for commercial applications; and Gatik, a developer of autonomous vehicles for middle-mile applications.

While late-stage-focused mobility firms could provide strategic value in the mid- to late-stage market, we also see an opportunity for seed- and early-stage mobility VC firms. The early-stage market is more opaque, and VC funds could provide value to corporate partners by gathering strategic intelligence among seed- and early-stage startups. For example, Maniv Mobility is a Tel Aviv, Israel-based VC firm investing in seed- and early-stage mobility startups. The firm was founded in 2015 by Michael Granoff, who helped establish Securing America's Future Energy (SAFE) and was a key investor in electric vehicle (EV) network startup Better Place. The firm currently has \$158.0 million in AUM, and its LPs include Valeo (PAR: FR), Renault (PAR: RNO), Hyundai (KRX: 005380), and Shell (NYSE: RDS.B). Maniv has had several successful exits, including Arbe Robotics' \$722.0 million SPAC market listing, Otonomo's (NASDAQ: OTMO) \$1.3 billion

SPAC market listing, and Bipi's \$118.8 million acquisition by Renault. Maniv's recent investments include Zoomo, which provides e-bikes for commercial customers; Autofleet, which has developed a Vehicle-as-a-Service platform for fleets; and FENIX, which operates a combined micromobility/ultrafast delivery platform in the Middle East.

Autotech Ventures is another VC firm investing in seed- and early-stage ground transportation startups. The firm invests across the connectivity, autonomous, shared mobility, electrification, and digital enterprise segments. It was founded in 2013 and currently has \$270.0 million in AUM. Its LPs include Denso (TKS: 6902), Lear (NYSE: LEA), Shell, and Volvo (STO: VOLV A). Autotech's successful exits include Cazoo Group (NYSE: CZOO), Volta Charging (NYSE: VLTA), Swvl (NASDAQ: GMBT), Indie Semiconductor (NASDAQ: INDI), Xnor.ai, Frontier Car Group, and Lyft (NASDAQ: LYFT). Recent investments by the firm include micromobility platform Veo, on-demand logistics service PICKUP, and shipment aggregation platform newtrul.

Seed- and early-stage VC mobility tech startups to watch (\$M)*

Company	Segment	Category	Post-money valuation	Total VC raised	Reason to watch
Recurrent	EVs	Battery monitoring	\$9.2	\$3.2	Recurrent performs CARFAX-like reports on battery health for EV buyers/sellers.
ChargerHelp!	EVs	EV charging	\$6.5	\$2.8	ChargerHelp! offers on-demand repair for EV charging stations.
Halo	Autonomous driving	Teleoperation	N/A	N/A	Halo is a remotely operated mobility service that uses existing tech.

Source: PitchBook | Geography: Global
*As of December 15, 2021

Late-stage VC mobility tech startups to watch (\$M)*

Company	Segment	Category	Post-money valuation	Total VC raised	Reason to watch
Argo AI	Autonomous driving	Full stack	\$7,250.0	\$2,600.0	Argo is a Ford- and VW-backed autonomous startup poised for exit.
Ample	EVs	Battery swapping	\$1,000.0	\$275.7	Ample offers affordable battery-swapping stations for EV fleets.
actnano	Autonomous driving	Smart coatings	\$77.6	\$31.8	actnano develops smart-coating tech for automotive chips.

Source: PitchBook | Geography: Global
*As of December 15, 2021

KAIA COLBAN Analyst,
Emerging Tech
kaia.colban@pitchbook.com

Retail healthtech

Prediction: Retail healthtech startups will increasingly focus on building technology that increases the frequency of low-touch interactions between patients and providers.

Rationale: Delivering high-quality, preventative, holistic care requires patients to interact with healthcare providers on a more regular basis, though interactions can be quick and fully digital.

Caveat: Although the healthcare industry is primed for disruption, one of the largest obstacles facing the industry is how to shift the interaction patterns between providers and patients. Incumbent insurers have generally been slow in evolving coverage models to incentivize frequent interactions; providers are unaccustomed to proactively reaching out to patients and tend to have poor systems for doing so; and patients are used to interacting with physicians only intermittently—when they are ill or in need of care.

To increase the level of holistic and preventative care, startups are focusing on boosting the frequency of clinically significant, low-touch interactions between patients and providers. These interactions can occur both virtually and in person. New technologies and the proliferation of mobile devices have enhanced providers' ability to provide care via video chats and chatbots. Furthermore, the COVID-19 pandemic increased virtual care acceptance and adoption among both providers and patients. For instance, insurance provider Firefly Health claims that, on average, it interacts virtually with each patient 48 times annually.⁹ Company management believes 80% of all healthcare can be provided virtually and that frequent interactions greatly mitigate the need for annual, in-person primary care checkups. Gennev, a menopause-focused virtual care provider, offers a "Healthfix Membership," which provides ongoing support from physicians and nutritionists for \$85 per month.¹⁰ Gennev reports that the average member interacts with a nutritionist about once a month, with doctors on a quarterly basis, and with texting providers on a "more frequent basis."¹¹ Other companies, including Forward, One Medical (NASDAQ: ONEM), and Iora, provide concierge care memberships with both in-person and virtual appointment offerings. One Medical, a primary care provider, reports engaging with its average member 10 times per year, while Iora, a subsidiary of One Medical that focuses on the older adult population, engages with each of its patients an average of 19 times annually.

9. Fay Rotenberg, telephone interview by Kaia Colban, November 4, 2021.

10: "One-Size-Fits-All Medicine Fits No One," Gennev, n.d.

11. Jill Angelo, telephone interview by Kaia Colban, November 11, 2021.

Top concierge specialty & primary care providers by total VC raised (\$M)*

Company	Backing status	Last financing valuation	Total VC raised
VillageMD	VC-backed	N/A	\$1,346.0
One Medical	Public	N/A	\$777.7
Oak Street Health	Public	N/A	\$651.7
Carbon Health	VC-backed	N/A	\$537.9
DispatchHealth	VC-backed	\$1,700.0	\$416.8
Forward	VC-backed	\$891.6	\$408.7
CityMD	PE-backed	N/A	\$392.6
Iora Health	Operating subsidiary (One Medical)	\$1,917.8	\$382.3
Crossover	VC-backed	\$1,168.0	\$281.5
Maven Clinic	VC-backed	\$1,000.0	\$202.0
Tia	VC-backed	\$600.0	\$127.3
Parsley Health	VC-backed	N/A	\$111.8
Eden Health	VC-backed	\$370.0	\$98.8
Privia Health	Public	N/A	\$64.4
Gennev	VC-backed	N/A	\$4.5
HeyRenee	VC-backed	N/A	\$3.8
ChenMed	VC-backed	N/A	N/A

Source: PitchBook | Geography: Global
*As of December 1, 2021

Seed- and early-stage VC retail healthtech startups to watch (\$M)*

Company	Segment	Category	Post-money valuation	Total VC raised	Reason to watch
Woebot	Clinical care	Digital therapeutics	\$225.0	\$129.9	Woebot develops compelling AI-based chatbot technology to deliver mental healthcare through a digital therapeutic.
Found	Mobile and digital health	Personalized health tools & tracking	\$124.0	\$32.0	Found's CEO served as the former executive of Bumble (NASDAQ: BUMBL).
HeyRenee	Clinical care	Concierge specialty & primary care	N/A	\$3.8	HeyRenee's CEO previously started a successful on-demand healthcare platform, Heal.

Source: PitchBook | Geography: Global
*As of December 15, 2021

Late-stage VC retail healthtech startups to watch*

Company	Segment	Category	Post-money valuation (\$B)	Total VC raised (\$M)	Reason to watch
Hinge Health	Clinical care	Digital therapeutics	\$6.2	\$1,030.0	Hinge Health's valuation doubled in the past 12 months, making it the top-valued VC-backed retail healthtech startup, as well as a likely IPO candidate.
Carbon Health	Clinical care	Concierge specialty & primary care	\$3.3	\$537.9	Carbon Health is a leading primary care provider and likely IPO candidate for 2022.
Maven Clinic	Clinical care	Concierge specialty & primary care	\$1.0	\$202.0	Maven Clinic is benefiting from heightened VC investment in women-focused healthtech.

Source: PitchBook | Geography: Global
*As of December 15, 2021

ASAD HUSSAIN Analyst,
Emerging Tech
asad.hussain@pitchbook.com

Supply chain tech

Prediction: Commercial delivery vehicles will shift to electric in 2022.

Rationale: Passenger EVs on the market today are tailored to consumer applications, meaning they are not ideal for commercial applications. New businesses providing tailored commercial EVs could gain prominence in 2022.

Caveat: A market downturn or pullback in investing in the sector could delay commercial EV adoption.

We believe the commercial vehicle market is rapidly electrifying and see opportunities for startups to provide purpose-built EVs for last-mile delivery applications. Passenger EVs on the market today are tailored to consumer applications, meaning they are not ideal for commercial applications. For example, a 5,000-pound Tesla may not be the best way to transport a 5-kilogram burger, given carbon emissions (through battery manufacturing) and the need to maneuver city streets. We see a tremendous opportunity for LEVs to take a more prominent role in the commercial vehicle landscape. In 2022, we anticipate more outsized rounds for startups focused on electrifying logistics and commercial vehicles that optimize cost, emissions, and maneuverability for the on-demand economy.

Indigo Technologies has developed a purpose-built LEV platform optimized for total cost of ownership. Gig economy workers tend to not use commercial vans, instead preferring smaller, lighter vehicles such as the Toyota Prius due to its maneuverability and relative affordability. Indigo plans to manufacture LEVs that are tailor-made for the needs of rideshare and delivery workers. Indigo's motors—which integrate all the drivetrain components needed for driving—sit in the wheel hub of the vehicle, thereby flattening the chassis and maximizing passenger and cargo space. The company's proprietary active suspension technology improves the vehicle's ride quality, handling, and reliability. In addition, the company has established a partnership with fintech provider OV Loop to enable on-demand vehicle rentals that include insurance costs, thereby allowing rideshare drivers and couriers to gain access as needed for a per-mile cost up to 20% less than traditional vehicle rentals or leases inclusive of insurance.

UK-based Arrival (NASDAQ: ARVL) is a commercial EV manufacturer that recently went public through a SPAC merger. The company operates flexible, highly automated microfactories that enable low-cost manufacturing. Whereas traditional vehicle manufacturing relies on large, assembly line-based factories that cost more than \$1 billion each, Arrival expects to spend just \$50 million per microfactory. Additionally, the use of advanced composites is expected to reduce costs associated with painting, stamping, and welding. Arrival's novel approach could allow the company to produce commercial EVs at a much lower cost than competitors, as cost acts as a major deterrent for fleet operators and could be key in expanding the market for commercial EVs. So far, the company has established partnerships with UPS (NYSE: UPS) and Uber. In 2022, we expect the company to achieve additional partnerships with additional logistics providers, particularly in Europe, as they seek to decarbonize their fleets.

Seed- and early-stage VC supply chain tech startups to watch (\$M)*

Company	Segment	Category	Post-money valuation	Total VC raised	Reason to watch
OneRail	Last-mile delivery	Aggregator	\$59.0	\$21.5	OneRail is an aggregator of courier networks for retailers/shippers.
Circular	Supply chain management	Traceability	N/A	\$18.4	Circular provides traceability for EV supply chains.
Greywing	Freight tech	Marine logistics	N/A	\$2.5	Greywing provides maritime intelligence and crew management.

Source: PitchBook | Geography: Global
*As of December 15, 2021

Late-stage VC supply chain tech startups to watch (\$M)*

Company	Segment	Category	Post-money valuation	Total VC raised	Reason to watch
Indigo Technologies	Last-mile delivery	Vehicle supplier	N/A	\$109.0	Indigo is a purpose-built LEV platform optimized for total cost of ownership.
Zoomo	Last-mile delivery	Vehicle supplier	N/A	\$72.7	Zoomo provides utility e-bikes for last-mile delivery.
Airspace Technologies	Last-mile delivery	Delivery service	\$238.0	\$68.5	Airspace provides services for time-critical shipments.

Source: PitchBook | Geography: Global
*As of December 15, 2021