

Insights, Investments and Acquisitions

Vision Technology

First Half 2021

Thoughts and Observations

- According to a recent report published by **MarketsandMarkets**, the AI in Computer Vision Market is estimated to be valued at USD \$15.9 billion in 2021 and reach USD \$51.3 billion by 2026 and is anticipated to grow at a CAGR of 26.3% during this period. Computer vision software is expected to experience the highest growth within the enabling technologies sector. See [here](#) for a full market map of the embedded vision and visual AI market.
- Vision Technology in the **retail sector** continued to grow rapidly in 1H 2021. [Trigo](#) raised \$10M for its CV based checkout systems; [Trax](#) raised a whopping \$640M for its CV based inventory management; [Standard Cognition](#) raised \$150M from Softbank and others for its autonomous checkout solution. Meanwhile, Walmart acquired [Zeekit](#) to bring a virtual try-on fitting room to its customers. Last year [Bossa Nova Robotics](#) raised an estimated \$34.5 million of Series B1 venture funding putting the company's pre-money valuation at \$179 million. Overall, CV is well positioned to help brick and mortar retailers address several problems including long checkout lines, out-of-stock inventory, and theft.
- Vision Technology in the **mobility sector** continued to attract significant investment although consolidation has started. In the LiDAR sector six LiDAR companies have managed to go public via SPACs ([Velodyne](#), [Ouster](#), [Luminar](#), [Aeva](#), [Innoviz](#), [Aeye](#)). These public LiDAR companies are trading at EV/Forward Revenue multiples anywhere from 18x (Velodyne) to 234x (Luminar). The ever-slipping schedule for fully autonomous cars, coupled with the emergence of these six well funded public LiDAR companies, is forcing the other 70+ LiDAR companies that have been funded over the last few years to look for market opportunities outside of automotive or face extinction. For the time being, [Tesla](#) continues to bet on camera technology being able to replace both LiDAR and Radar in its vehicles. My rule is to never bet that mass-produced incumbent technologies (CMOS cameras in this case) will be unable to evolve to meet new challenges and new market opportunities.
- The **SPAC market** went from red hot to ice cold almost overnight during 1H 2021. In March of this year a total of 116 SPACs listed. In April the number dropped to 18. SPAC activity ballooned in 2020 and the beginning of 2021 as the Federal Reserve's easy-money policies pumped liquidity into the market. Now, concerns over inflation and increased regulatory scrutiny has dramatically slowed the market for new SPAC listings. Despite this, there are still over 300 SPACs in the market looking for targets.
- We continue to be amazed by the incredible **application diversity** of vision technology. Vision Tech funding in 1H 2021 include companies focused on mobility, retail, health & safety, robotics, and AR/VR. It has truly become a horizontal pervasive technology. To quote Arthur C. Clarke "Any sufficiently advanced technology is indistinguishable from magic" (1973).

In The News

[Tesla is replacing Radar with Computer Vision in FSD Beta V9.0](#)

[Postal Service turns to computer vision AI, edge computing to improve delivery](#)

[Computer vision inches toward 'common sense' with Facebook's latest research](#)

[Amazon launches computer vision service to detect defects in manufactured products](#)

[Trigo bags \\$10M for computer-vision-based checkout tech to rival Amazon's 'Just Walk Out'](#)

[Orca AI, which puts computer vision onto cargo ships, raises \\$13M Series A funding](#)

[Facebook AI's Latest Computer Vision Model SEER Teaches Itself To Classify A Billion Images Accurately With No Human Annotations](#)

[How Computer Vision Technology Will Redefine the Shopping Experience](#)

[Israel's Elbit Systems eyes growth from night-vision tech](#)

[Theator raises \\$15.5 million to analyze surgical footage with computer vision](#)

[Trax Raises \\$640M for its Computer Vision-based Grocery Inventory Management](#)

[Intenseye raises \\$4M to boost workplace safety through computer vision](#)

[Top 10 Computer Vision Startups Shaping the Future of Healthcare](#)

[Augmented Reality & Computer Vision Company StradVision to Supply its Technology to a Leading German OEM and Tier-1 Supplier](#)

[Intel RealSense increases flexibility for computer vision developers with SDK upgrade](#)

[Computer Vision Solutions in 2021: Background Removal and Real-Time Video Blur](#)

[Camera-processor Chip Brings Computer Vision Closer to Natural Perception](#)

[Cox Automotive acquires computer vision company Fyusion](#)

[Blue Hill Brings Computer Vision to Its Coffee Robot to Recreate the Barista Experience](#)

[Veo raises \\$25M for AI-based cameras that record and analyze football and other team sports](#)

[Standard Raises \\$150M from SoftBank Vision Fund 2, Others to Usher in the Computer Vision Revolution](#)

Vision Technology Stock Market Performance

As of June 28, 2021

(Dollars in millions, except per share data)

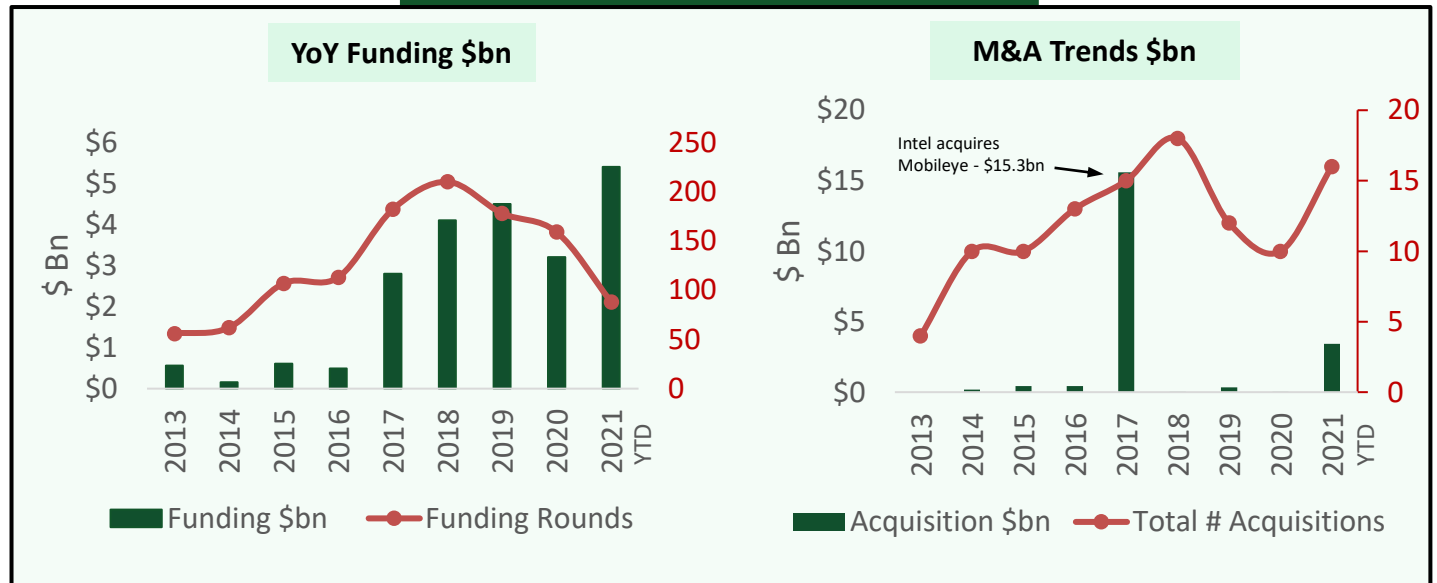
Company	Ticker	EV (\$Bn)	Sales (\$Bn)	Share Price (\$)	▲ TTM '21-20	▲ TTM '20-19	EV/EBITDA
Aeva	NYS: AEVA	\$1.9	\$0.004	\$11.1	-	-	-
Apple	NAS: APPL	\$2,107	\$325.4	\$134.8	49%	82%	21x
Ambarella	NAS: AMBA	\$3.1	\$0.2	\$106.1	135%	12%	-
AMS AG	SWX: AMS	\$7.0	\$5.0	\$21.0	25%	(34%)	9x
Arcsoft	SHG: 688088	\$2.7	\$0.1	\$54.3	(36%)	16%	84x
Basler AG	FRA: BSL	\$1.2	\$0.2	\$118.9	71%	16%	29x
Cognex	NAS: CGNX	\$14.3	\$0.9	\$82.8	41%	23%	50x
Facebook	NAS: FB	\$882.7	\$94.4	\$355.6	61%	25%	19x
Faro Technologies	NAS: FARO	\$1.4	\$0.3	\$78.8	47%	6%	237x*
Hamamatsu	TKS: 6965	\$8.5	\$1.4	\$61.6	43%	20%	21x
Intel	NAS: INTC	\$238.1	\$77.7	\$57.5	(1%)	22%	7x
Huddly	OB: HDLY	\$0.2	\$0.004	\$1.1	40%	2%	-
Jenoptik	ETR: JEN	\$2.0	\$0.9	\$30.0	13%	(26%)	17x
Kapsch TrafficCom	WBO:KTCG	\$0.2	\$0.6	\$17.7	(18%)	(43%)	-
Keyence Corp	TKS: 6861	\$101.0	\$5.1	\$514.2	26%	44%	41x
Novanta	NAS: NOV	\$4.8	\$0.6	\$133.9	29%	12%	48x
Nynomic	ETR: M7U	\$0.3	\$0.09	\$46.4	82%	27%	23x
ON Technology	NAS: ON	\$18.2	\$5.5	\$38.7	95%	5%	15x
Qualcomm	NAS: QCOM	\$155.3	\$29.4	\$139.7	57%	23%	15x
Renishaw PLC	LON: RSW	\$5.6	\$0.6	\$72.4	33%	1%	32x
Seeing Machines	LON: SEE	\$0.3	\$0.03	\$12.0	219%	14%	-
Smarteye	OM: SEYE	\$0.4	\$0.007	\$28.0	121%	7%	-
Sony	TSE: 6758	\$129.0	\$81.3	\$98.2	42%	32%	10x
Stemmer Imaging	FRA: S9I	\$0.2	\$0.1	\$34.5	54%	(44%)	14x
Teledyne	NYS: TDY	\$19.7	\$3.1	\$424.1	37%	22%	29x
Tobii	OM: TOBII	\$0.7	\$0.2	\$7.2	86%	(23%)	-
TKH Group	AMS:TWEKA	\$2.5	\$1.5	\$53.1	21%	(33%)	17x
Mean					53.70%	7.60%	28x
Median					42.70%	14.20%	21x

*Excluded

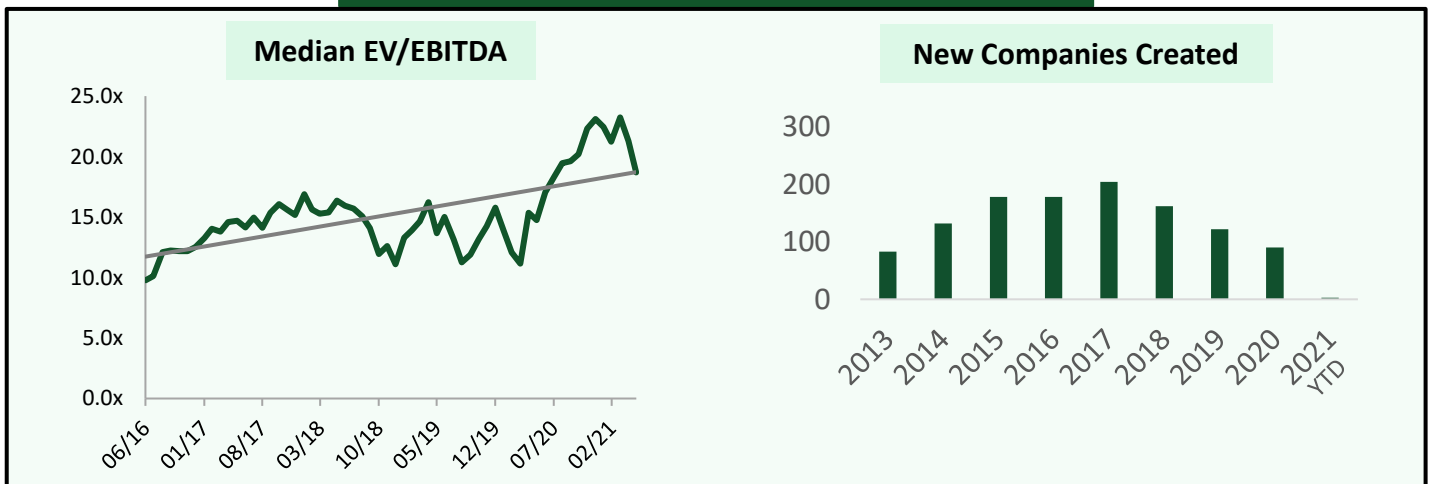
Unicorn Watchlist

Company	Stage	Total Funding \$mm	Post-Money \$mm	Institutional Investors	Acquisitions
Argo AI	F	3,671	7,250	3	1
SenseTime	D	2,820	12,000	44	-
Trax	E	1,020	1,200	20	6
Anduril	D	777	4,600	15	1
Skydio	D	340	1,070	18	-
Standard Cognition	C	230	1,000	20	3
Pony.ai	B	182	5,300	14	-
Planet	D	38	1,770	37	8

Vision Sector Snapshot



Computer Vision Investment Trends



1H 2021 Vision Tech Key Investments 1/2

Deal Date	Company Name	Investors	Deal Stage	Deal Size \$mm	Pre-money Valuation \$mm	Business Description
04/07/21	Trax	Softbank, Blackrock, Omers, Sony Innovation	Series E	640.0	1,200.0	Developer of an image recognition platform designed to deliver accurate and reliable performance analysis for consumer goods companies.
03/01/21	Skydio	Andreessen Horowitz, IVP, Playground Global	Series D	171.4	900.0	Developer of AI-powered drones that use an array of cameras and proprietary computer vision technology to recognize, avoid objects in real-time.
02/17/21	Standard Cognition	Softbank, CRV, EQT Ventures, SK Networks	Series C	150.0	1,000.0	Developer of autonomous checkout solution that can be quickly and easily installed in retailers' existing stores
01/05/21	Ghost	Human Capital Investment	Series D	100.1	450.0	Developer of automated driving device that connects a set of cameras and computers to a passenger car's drivetrain.
06/03/21	Leolabs	Insight Partners, Velvet Sea Ventures	Series B	65.0	315.0	Developer of radar technology for low earth orbit mapping and space situational awareness for commercial satellite operations, government and space agencies.
02/17/21	Recogni	BMW I Ventures, Celesta Capital, Continental Tyre Group, Toyota Ventures	Series B	48.9	115.0	Developer of visual perception platform designed to assist autonomous driving, delivering inference performance and energy efficiency via novel edge processing.
05/31/21	Red6	Capital Factory, Irongate Capital Advisors, Moonshots Capital	Series A	37.0	90.0	Developer of Airborne Tactical AR system intended to create an air combat training platform.
03/30/21	Augmedics	Almeda Ventures, Healthcare Corporation of America, Revival Healthcare Capital	Series C	36.0	50.0	Developer of AR surgical visualization system designed to assist viewing through patient's anatomy and tissues during surgery.
04/27/21	Plus One Robotics	BMW I Ventures, CEAS, Ironspring Ventures, Kensington Capital Partners	Series B	33.0	70.0	Developer of 3D vision and control software designed to create robotic automation in the logistics and e-commerce markets
01/01/21	Aeye	Continental (ETR: CON), Horizon 3 VC, Keiretsu Forum	Series B	29.8	-	Developer of iDar, a robotic solution of artificial perception that fuses LiDar, computer vision and AI for perception and motion planning for advanced driver assistance systems.
06/14/21	XYZ Reality	ActivumSG Capital, Hoxton Ventures, J Coffey Construction, Tishman Speyer Ventures	Series A	28.2	-	Developer of AR device that laser scans and models augmented and 3D virtual reality holograms real-time for construction workers.

1H 2021 Vision Tech Key Investments 2/2

Deal Date	Company Name	Investors	Deal Stage	Deal Size \$mm	Pre-money Valuation \$mm	Business Description
03/15/21	Skycatch,	ADB Ventures, Falkon Ventures, Gaingels, I2BF Global Ventures, Wavemaker Partners	Series C	25.0	-	Developer aerial intelligence platform for enterprise-grade drone mapping and data analytics, indexing and converting critical information from this physical world into 3D.
04/01/21	Osaro		Series C	17.3	100.0	Developer of AI-based vision that has perception and adaptive decision-making abilities that extract information from the real-time environment for the industrial automation space.
04/21/21	Orca AI	OCV Partners, MizMaa Ventures, Playfair capital	Series A	13.0	1.25	Developer of vision technology that can be retrofitted to cargo ships and improve navigation and collision avoidance
04/08/21	CrowdAI	Threshold Ventures, AME Cloud Ventures, Y Combinator	Series A	10.1	30.1	Developer of an image recognition software installed in satellites, automated drones and self-driving cars for mapping and obstacle detection
05/25/21	EYs3D Microelectronics	ARM IoT Capital, WI Harper Group, Marubun	Series A	7.0	100.0	Fabless designer of end-to-end software and hardware systems for computer vision technology
06/15/21	Cord	CRV	Seed	4.5	-	Developer of automating annotation processes for computer vision
02/11/21	Intenseye	Air Street Capital, Point Nine Capital	Seed	3.0	8.5	Developer of computer vision technology that integrates with facility cameras to monitor employee health and safety

1H 2021 Vision Tech Key Acquisitions 1/2

Deal Date	Buyer(s)	Target	Transaction Value	EV/ Revenue	EV/ EBITDA	Target Description
06/21/21	Sighthound	Boulder AI	-	-	-	Provider of smart cameras and edge computing solutions for smart cities
06/17/21	Match Group (NAS: MTCH)	HyperConnect	\$1.73bn	8x	-	Developer of platforms based on deep learning image-based processing and AR graphics
06/17/21	Bigtincan (ASX: BTH)	Vidinoti	\$0.77mm	-	-	Provider web and augmented reality-based content management system designed to enhance customer experiences.
06/11/21	Facebook (NAS: FB)	BigBox AR	-	-	-	Operator of a virtual reality game development company aimed at platform-defining games, social communities, and competitive play to create a VR e-sport ecosystem.
06/07/21	Faro Technologies (NAS: FARO)	HoloBuilder	\$34mm	-	-	Provider of a construction management platform designed to offer a 360-degree view of projects and buildings. The company's platform utilizes virtual reality and the internet of things.
06/02/21	Pangjam	Trueface	-	-	-	Developer of facial recognition, weapon detection and age verification technologies
06/01/21	Atos (ENXTPA: ATO)	Ipsotek	-	-	-	Developer of AI-enhanced video analytics software for airports, roads, transportation, public spaces and government.
05/27/21	Amyris (NAS: AMRS)	Beauty Labs	\$208.8mm	-	-	Developer of AI-driven product recommendation platform built for beauty brands. The company's platform facilitates interactive, realistic and virtual try-on of beauty products according to face, shape, skin tone and hair color.
05/25/21	Smart Eye	Affectiva	\$73.5mm	-	-	Developer and marketer of eye-tracking technology that can measure and calculate where a person is looking.
05/21/21	Snap (NYSE: SNAP)	WaveOptics	\$520	16.8x	-	Developer of a patented technology based on waveguides for projected display applications
5/19/21	Zebra Technologies (NAS: ZBRA)	Adaptive Vision	-	-	-	Provider of graphical machine vision software and libraries for machine vision developers.
05/13/21	Walmart (NYSE: WMT)	Zeekit	-	-	-	Developer of a virtual fitting room application designed to offer an interactive shopping experience.

1H 2021 Vision Tech Key Acquisitions 2/2

Deal Date	Buyer(s)	Target	Transaction Value	EV/ Revenue	EV/ EBITDA	Target Description
05/06/21	Genius Sports (NYSE: GENI)	Second Spectrum	\$200mm	11.1x	-	Fully integrated sports AI provider, offering tracking, analytics and data visualization services
05/06/21	Procore (NYS: PCOR)	INDUS.AI	-	-	-	Developer of a construction intelligence platform designed to help clients gain real-time visibility into their construction site.
05/06/21	Valmont Industries (NYSE: VMI)	Prospera	\$300mm	-	-	Develops machine vision technologies that monitor plant development by analyzing multiple layers of visual data from a crop field
04/15/21	ePlay Digital (CNQ: EPY)	Holo3D Technologies	-	-	-	Developer of an augmented reality platform designed to visualize and keep track of fitness activities.
03/29/21	Vista Equity Partners	TripleLift	\$1.4bn	-	-	Developer of a programmatic native advertising platform intended to make advertising better for content owners, advertisers and consumers.
03/22/21	Seaspine (NAS: SPN)	7D Surgical	\$110mm	-	-	Developer of devices such as surgical navigation, surgical tool tracking with optical technologies and machine vision-based registration algorithms, aiming to improve surgical workflow and patient care.
02/26/21	Cox Automotive	Fyusion	-	-	-	Manufacturer of imaging products and embedded systems intended to offer digital imaging products and related system.
01/26/21	Snap (NYSE: SNAP)	Aerial AI	-	-	-	Aerial AI powers consumer experiences on mobile devices through pixel-accurate, real-time 3D Human Perception and Reconstruction.
02/23/21	Rokk3r (OTCPK:ROKK)	Admobilize/ Matrix Labs	\$19.5mm	-	-	AdMobilize quantifies digital advertising in the physical world and its spinoff, Matrix Labs, develops hardware that integrates computer vision and voice recognition.
01/18/21	Cure.fit	Onyx	-	-	-	Developer of body tracking technology and personalization of workout feedback
01/04/21	Teledyne (NYSE: TDY)	Flir Systems (NAS: FLIR)	\$8mm	4.2x	17.1x	Developer of technologies that detect people, objects, and substances for industrial and defense use cases.

1H 2021 Vision Tech Key IPO / SPAC Transactions

Deal Date	Company Name	Investors	Deal Stage	Deal Size	Pre-money Valuation	Business Description
02/27/21	Berkshire Grey	Revolution Acceleration Acquisition	SPAC	2,700.0	-	Developer of materials handling system that uses computer vision and novel sensing to deploy intelligent bots
4/15/2021	TuSimple (NAS: TSP)	Classic Elite, Perry Creek Capital	IPO	1,350.0	7,410.0	Company is an autonomous technology company in the global truck freight market.
04/21/21	UiPath (NYS: PATH)	G Squared, Discovery Capital Management	IPO	1,340.0	27.8	Developer of a platform that makes use of computer vision technologies used in AI systems and software bots employed by auto manufacturers.
3/21/2021	Aeva (NYS: Aeva)	Interprivate Acquisition, Sylebra Capital	SPAC	243.0	1,860.0	Company is engaged in the next generation 4D LiDAR sensing and perception systems.
3/11/2021	Ouster (NYS: OUST)	Colonnade Acquisition	SPAC	200.0	1,600.0	Manufacturer of high-resolution digital lidar sensors used throughout the industrial automation, smart infrastructure, robotics, and automotive industries
4/6/2021	Innoviz Technologies (NAS: INVZ)	Collective Growth	SPAC	141.0	-	Provider of solid-state LiDar sensors and perception software for automotive original equipment manufacturers (OEMs) and Tier-1 autonomous manufacturers.
2/21/2021	Ropeok Technology (SHG: 688619)	CEFC China Energy, Haixi Shengxian, October Assets,	IPO	128.1	559.3	Leader in video image information processing and security and protection products.
3/11/2021	PomVom (TAE: PMVM)	Israel-China Accelerator, Green Innovations	IPO	11.6	29.5	Pomvom Ltd is engaged in developing and manufacturing an artificial intelligence (AI) system for image recognition.
4/26/2021	Argeo (OSL: ARGEO)		IPO	-	26.6	Argeo AS offers the ocean surveying and inspection industry by utilizing autonomous surface and underwater robotics solutions.

About the Author

Rudy is a leading expert on M&A transactions within the technology sector. As the founder of Woodside Capital, he focuses on computer vision and imaging companies within the autotech, security, retail, consumer electronics, and digital health sectors.

Prior to Woodside Capital Partners, Rudy was the founding CEO of the MIT Media Lab Europe, a joint venture between MIT and the Irish government. Rudy has founded five imaging and computer vision companies during his career and currently serves on a number of public and private boards.

Rudy holds degrees from Yale (BSc and MSc in EE) and Cambridge (PhD in Digital Imaging).



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