Algolux Recognized for

2021

Technology Innovation Leadership

North American Computer Vision Industry

Excellence in Best Practices

FROST *&* SULLIVAN

Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each award category before determining the final award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. Algolux excels in many of the criteria in the computer vision space.

AWARD CRITERIA

Technology Leverage	Business Impact
Commitment to Innovation	Financial Performance
Commitment to Creativity	Customer Acquisition
Stage Gate Efficiency	Operational Efficiency
Commercialization Success	Growth Potential
Application Diversity	Human Capital

Abundant Opportunities in an Evolving Market

Cameras and computer vision are the preferred sensor modality for system developers in safety-critical applications, such as automotive advanced driver-assistance systems (ADAS), autonomous vehicles, vision-guided robotic systems, and video surveillance and security. Cameras are not only cheaper, easier to deploy, and more reliable compared to other sensor systems (such as radio detection and ranging [radar] and light detection and ranging [Lidar]), but also uniquely enable visual object detection (for instance, to locate traffic lights and determine if they are red, yellow, or green). The resulting increase in the prevalence of cameras across various applications leads to the growing demand for computer vision solutions.

The automotive sector, in particular, presents significant opportunities for computer vision companies in applications including commercial ADAS, highway autopilot, and geo-fenced autonomous vehicles. Moreover, the growing ubiquity of autonomous driving scenarios, with the overall perception architecture utilized by mass-market vehicles markedly favoring cameras over other sensor systems, will further amplify the growth of the computer vision market. Frost & Sullivan's research anticipates the global automotive camera market to reach $15 billion by 2025, with exponential growth in the forward-acing, surround view, and inward-facing cameras.[1] The increasing concerns around vehicle and

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[1] *Frost Radar™: Global Automotive Camera Market, 2020* (Frost & Sullivan, September 2020).

passenger safety and the accelerating technological advancements in computer vision-based solutions will fuel market growth in the coming years.

Despite these positive prospects, there are certain challenges associated with computer vision technology. Typically, the cameras used for automotive applications are designed to deliver subjectively "good" images for human vision in real time. Today's traditional camera architecture and imaging pipeline [wherein the sensor module provides raw data to the image signal processor (ISP), which processes and compresses that data to generate images] is not optimized for computer vision. As a result, even the most advanced vision systems deployed today do not deliver effective results under unfavorable illumination scenarios (low light conditions) and harsh weather conditions (fog, rain, and snow). According to a 2019 study published by the American Automobile Association, Inc. (AAA), pedestrian safety features deployed in leading mass-market vehicles frequently fail under low light and bad weather conditions, highlighting the inherent critical limitations of computer vision technology. This AAA research found that existing computer vision solutions completely failed in low light conditions and were grossly ineffective for vehicles traveling at a speed of 30 miles per hour or above.[2] Moreover, the reliance on expert imaging teams or external image quality service companies to manually tune camera architectures is highly resource-intensive, time-consuming, and expensive (with costs exceeding $50,000 per camera program and running for many months). This conventional manual tuning approach is neither scalable nor predictable.

As computer vision systems become an increasingly important part of vehicles' future safety and functionality and a necessary complement to other sensor modalities (such as Lidar and radar), it is imperative for market participants to develop novel solutions that enhance vision accuracy in all possible real-life scenarios. Companies that successfully address these market gaps to serve evolving customer needs will witness robust growth*.*

Disrupting the Market with a Novel Approach to Computer Vision Technology

Established in 2014, Montreal, Canada-headquartered Algolux (with subsidiary offices in Palo Alto and Munich) is a globally recognized computer vision company addressing the fundamental vision-system gaps by developing and delivering the industry's most robust and scalable perception solutions. Despite the applicability of Algolux's computer vision technology across a range of vertical markets, the company currently focuses on the automotive space, leveraging the sector's existing and emerging growth opportunities. Algolux offers innovative computer vision and image optimization solutions to address mission-critical safety concerns for the automotive ADAS, autonomous vehicles, fleets, mobile robots, and smart city traffic video analytics applications.

Algolux's differentiation lies in its groundbreaking research encompassing deep learning, computer vision, and computational imaging. More than 85% of Algolux's team of highly skilled employees strives to execute the company's research and development aspirations. For instance, Algolux's prolific research team published six groundbreaking papers on computer vision at the prestigious Conference

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[2] https://newsroom.aaa.com/wp-content/uploads/2020/11/Pedestrian-Detection-Research-Fact-Sheet-Oct-2019.pdf, accessed September 2021.

on Computer Vision and Pattern Recognition in 2020.[3] Furthermore, an in-house data annotation team of 40+ people complements the company's core team of 60+ employees. Algolux's strategic decision to develop its in-house data annotation (or data labeling) capabilities ensures better control over product development and customer engagements, effectively distinguishing the company against its competition. Moreover, the company strengthens its intrinsic innovation capabilities through enduring partnerships with world-leading technology companies (Arm, Intel Movidius, NVIDIA, OmniVision Technologies, On Semiconductor, SONY, Renesas, and XILINX) and academic organizations (McGill University, Mila, Princeton, Stanford, University of Toronto, University de Montreal, and The University of British Columbia).

Algolux's most robust value proposition is its novel approach to solving the inherent issues of computer vision systems by rethinking the vision architecture, thereby delivering unprecedented performance improvements. Relating the inefficiency of existing computer vision models and neural networks to the widespread use of the traditional siloed approach, Algolux became the market's first company to leverage computational imaging techniques to design algorithms that treat the camera as part of the overall perception stack. Unlike the conventional approach that relies on ISPs, the company takes raw sensor data as input, then fuses and processes this data through an end-to-end deep neural network, eliminating unnecessary intermediary steps in the imaging pipeline to deliver the best possible system

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>
> *- Varun Babu, Senior Research Analyst, TechVision*

performance. Moreover, the company's computer vision technology is compatible with existing and emerging innovations, and it is agnostic to lens components, image sensor types, and compute platforms.

Algolux is unique in the computer vision space with its distinctive approach to disrupting the imaging pipeline with two cutting-edge solutions;

- **Eos Embedded Perception Software**: Eos is Algolux's innovative embedded perception solution that improves vision system robustness up to a remarkable three fold under all conditions, especially in unfavorable low light and poor weather scenarios. The company equips the robust, scalable, efficient, and flexible Eos solution with its end-to-end deep learning architecture, enabling seamless customization to any camera lens/sensor configuration or for multi-sensor fusion. Particularly suitable for customers who want to overhaul their entire system, the Eos perception stack can be embedded into the customers' new designs to improve their imaging systems' perception capabilities significantly.

- **Atlas Camera Optimization Suite:** Atlas is the industry's pioneering set of workflows and machine learning tools that automatically optimize camera architectures to deliver optimal image quality for computer vision applications. Through a secure cloud-enabled interface, Atlas significantly improves

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[3] https://algolux.com/groundbreaking-computer-vision-research-at-cvpr-2020/, accessed September 2021.

computer vision results in days compared to suboptimal results obtained after months of manual ISP tuning, significantly accelerating time to revenue. Suitable for customers who want to update their existing computer vision systems, Atlas is the only commercially available camera optimization solution addressing the limitations of traditional tuning workflows.

Algolux's solutions considerably outperform other state-of-the-art computer vision solutions available in the market, resulting in notable enhancements in object detection accuracy under a wide array of scenarios. For instance, customers can immediately apply the Atlas tool suite to their existing vision systems to improve computer vision accuracy by over 40% mean average precision (mAP). Similarly, Algolux's Eos solution surpasses competing solutions by 38 to 55 mAP points in adverse imaging conditions and 8 to 27 mAP points in clean, noise-free environments.[4]

Use Case Example: A leading automotive Tier I supplier utilized Algolux's Atlas solution to automatically maximize computer vision accuracy for their front-facing vision system. Atlas optimized the ISP configuration for two trained object detection models of the customer's Renesas V3H ISP and Sony IMX490 HDR image sensor system. As a result, the customer reported a successful accuracy improvement of their YOLOv4 model by up to 28% mAP points compared to the original image quality tuning. Moreover, further optimization of the ISP configuration with an additional embedded Eos vision model enhanced object detection accuracy by up to 48% mAP points. Furthermore, Atlas's automated workflow enabled significant cost savings and resource scaling by drastically accelerating the system optimization process from the typical period of several months to an industry-leading few days.[5]

Enhanced visualization using Algolux's Atlas and Eos solutions

Source: Algolux

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[4] https://algolux.com/case-studies/eos-vs-state-of-the-art-models/, accessed September 2021.

[5] https://algolux.com/case-studies/how-an-automotive-tier-1-supplier-improved-computer-vision-accuracy-by-up-to-48-map-within-days/, accessed September 2021.

Frost & Sullivan commends Algolux for its novel approach to computer vision technology resulting in the development of robust perception solutions, including its innovative Eos embedded perception software and pioneering Atlas camera optimization suite. The company's substantial success in enhancing computer vision for all illumination scenarios and weather conditions, thereby ensuring exceptional object detection accuracy for safety-critical applications, is particularly noteworthy.

Demonstrated Success Unlocking Lucrative Growth Opportunities

Over its seven years of operations, Algolux has established itself as the industry's most-recognized perception solutions company. It has built a strong market reputation through its demonstrated success in several use cases, enabling the company to elicit interest consistently from new customers and industry collaborators. Moreover, Algolux utilizes its eminent leadership team's comprehensive industry expertise and longstanding market experience (comprised of globally recognized machine learning and computer vision experts) to drive its market growth. For instance, Algolux recently appointed Matthias Schultz, a longtime ADAS veteran, as the Vice President of its Europe and Asia operations. The company aspires to leverage Mr. Schultz's extensive collaborative experience with the European Commission and the national governments of Germany and Japan to reinforce its go-to-market strategy and accelerate penetration into the European and Asian markets.

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- Sama Suwal, Best Practices Research Analyst

Algolux works directly with original equipment manufacturers and Tier I and Tier II automotive companies, responding to demand from different areas due to the company's unmatched success in addressing market needs. For instance, in July 2021, Mercedes Benz selected Algolux for the $25.24 million (i.e., €21.58 million) AI-SEE project to develop a robust perception solution and enable Level 4 autonomy for mass-market vehicles. As a part of this project, the company will collaborate with a global consortium of 20 leading automotive OEMs and suppliers over three years to build a novel Lidar-free sensor system supported by artificial intelligence (AI)-enhanced vehicle vision for low visibility conditions. Algolux will facilitate the project with its technological know-how and domain expertise in deep learning AI algorithms, data fusion across distinct sensor types, radar signal processing, and long-range stereo sensing.[6]

As a result of its exceptional technology offerings and strong growth strategy, Algolux witnessed accelerated progress in 2020, recording its highest financial success during the pandemic. The company leveraged the paradigm shift in the industry's outlook towards virtual interactions to expedite and optimize customer engagements. Moreover, in July 2021, Algolux closed its $18.4 million Series B funding (bringing the total amount of funding raised to over $30 million till date) with investors including Forte Ventures, Drive Capital, GM Ventures, Generation Ventures, Intact Ventures Investissement

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[6] https://algolux.com/newsroom/mercedes-ai-see/

Quebec, Castor Ventures, and Nikon-SBI Innovation Fund.[7] The company plans to utilize this new investment to accelerate the market adoption of its cutting-edge computer vision solutions, expand to new vertical market applications, and grow its engineering and customer enabling teams.

Moving forward, Algolux expects to build on its 2020 momentum and register record growth in 2021 as well. The company aspires to extend its operations into higher value vision applications in the automotive space and penetrate new market verticals (such as consumer-prosumer camera vision usage in work-from-home and study-from-home scenarios). Algolux also plans to strengthen its North American and European market presence while opportunistically targeting other geographies, including India, Japan, South Korea, and China.

Frost & Sullivan believes Algolux is well-positioned for robust growth in the coming years due to its industry-leading computer vision solutions, carefully curated growth strategy, unparalleled industry expertise, and strong market reputation.

Conclusion

Despite the proliferating demand for computer vision solutions, even the most advanced vision systems deployed today do not deliver effective results under unfavorable illumination scenarios (low light conditions) and harsh weather conditions (fog, rain, and snow). Canada-based Algolux is a globally recognized computer vision company that employs a novel approach to vision architecture to address these fundamental market gaps by delivering the industry's most robust and scalable perception solutions. The company's innovative Eos embedded perception software and cloud-based Atlas camera optimization suite considerably outperform contemporary computer vision solutions, resulting in notable enhancements in object detection accuracy under a wide array of scenarios. Moreover, Algolux strives to leverage its pioneering computer vision solutions, solid growth strategy, unmatched industry expertise, and strong market reputation to build on its 2020 momentum to register record growth in 2021.

For its strong overall performance, Algolux is recognized with Frost & Sullivan's 2021 North American Technology Innovation Leadership Award in the computer vision industry.

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[7] https://algolux.com/newsroom/series-b/, accessed September 2021

What You Need to Know about the Technology Innovation Leadership Recognition

Frost & Sullivan's Technology Innovation Leadership Award recognizes the company that has introduced the best underlying technology for achieving remarkable product and customer success while driving future business value.

Best Practices Award Analysis

For the Technology Innovation Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Technology Leverage

Commitment to Innovation: Continuous emerging technology adoption and creation enables new product development and enhances product performance

Commitment to Creativity: Company leverages technology advancements to push the limits of form and function in the pursuit of white space innovation

Stage Gate Efficiency: Technology adoption enhances the stage gate process for launching new products and solutions

Commercialization Success: Company displays a proven track record of taking new technologies to market with a high success rate

Application Diversity: Company develops and/or integrates technology that serves multiple applications and multiple environments

Business Impact

Financial Performance: Strong overall financial performance is achieved in terms of revenues, revenue growth, operating margin, and other key financial metrics

Customer Acquisition: Customer-facing processes support efficient and consistent new customer acquisition while enhancing customer retention

Operational Efficiency: Company staff performs assigned tasks productively, quickly, and to a high-quality standard

Growth Potential: Growth is fostered by a strong customer focus that strengthens the brand and reinforces customer loyalty

Human Capital: Commitment to quality and to customers characterize the company culture, which in turn enhances employee morale and retention

About Frost & Sullivan

Frost & Sullivan is the Growth Pipeline Company™. We power our clients to a future shaped by growth. Our Growth Pipeline as a Service™ provides the CEO and the CEO's growth team with a continuous and rigorous platform of growth opportunities, ensuring long-term success. To achieve positive outcomes, our team leverages over 60 years of experience, coaching organizations of all types and sizes across 6 continents with our proven best practices. To power your Growth Pipeline future, visit Frost & Sullivan at http://www.frost.com.

The Growth Pipeline Engine™

Frost & Sullivan's proprietary model to systematically create ongoing growth opportunities and strategies for our clients is fuelled by the Innovation Generator™. Learn more.

Key Impacts:

- **Growth Pipeline:** *Continuous Flow of Growth Opportunities*
- **Growth Strategies:** *Proven Best Practices*
- **Innovation Culture:** *Optimized Customer Experience*
- **ROI & Margin:** *Implementation Excellence*
- **Transformational Growth:** *Industry Leadership*

The Innovation Generator™

Our 6 analytical perspectives are crucial in capturing the broadest range of innovative growth opportunities, most of which occur at the points of these perspectives.

Analytical Perspectives:

- Mega Trend (MT)
- Business Model (BM)
- Technology (TE)
- Industries (IN)
- Customer (CU)
- Geographies (GE)