

AI computing for automotive: The battle for autonomy¹

OUTLINES:

- Who are the winners and losers in the race for autonomy? The marriage of AI² and computing is at the heart of it.
- The market is divided between centralized platforms and vision processors.
- The 2025 market for AI, including ADAS and robotic vehicles, is estimated at US\$2.75 billion - of which US\$2.5 billion will be “ADAS only”.

“AI is gradually invading our lives and this will be particularly true in the automotive world” asserts **Yohann Tschudi, PhD, Technology & Market Analyst, Computing & Software at Yole Développement (Yole)**. *“AI could be the central tool to achieve AD³, in the meantime some players are afraid of overinflated hype and do not put AI at the center of their AD strategy”*.

The players that have grasped this aspect of the technology battle are already leading the race. The impact of COVID-19 is still uncertain, but Yole’s analysts can already affirm that it will have a profound effect - with autonomy-related research likely to slow down at least this year and next due to cash shortages.

In this context, the market research & strategy consulting company Yole releases today its new technology & market analysis: Artificial Intelligence Computing for Automotive 2020 report. In this new analysis, Yole proposes a comprehensive scenario for AI within the dynamics of the autonomous automotive market, and a deep understanding of the AI’s impact on the semiconductor industry. Including ASP⁴, revenue and volume shipments forecasts, a focus on autonomous car, ADAS⁵ and robotic vehicles, this report delivers an in-depth understanding of the ecosystem & players. This study also points out key technical insights and analyses into future technology trends and challenges.

What is the status of AI for automotive applications? Who are the players? What relationships exist within the ecosystem? Who will win the “autonomous battle”? Who are the key suppliers to watch, and what technologies do they provide? Yole presents today its vision of the AI computing industry for automotive applications.

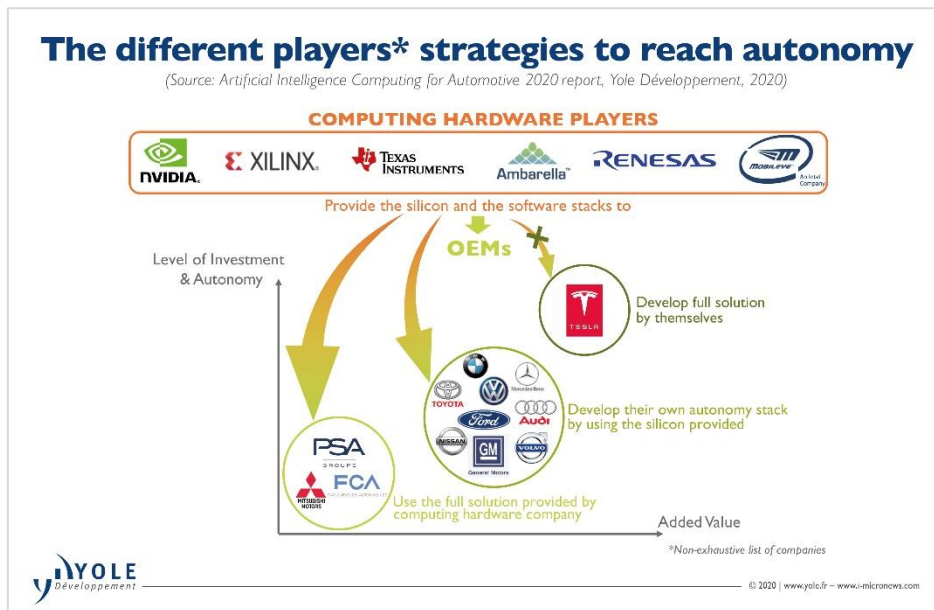
¹ Extracted from : Artificial Intelligence Computing for Automotive 2020 report, Yole Développement

² AI : Artificial Intelligence

³ AD : Autonomous Driving

⁴ ASP : Average Selling Price

⁵ ADAS : Advanced Driver Assistance Systems



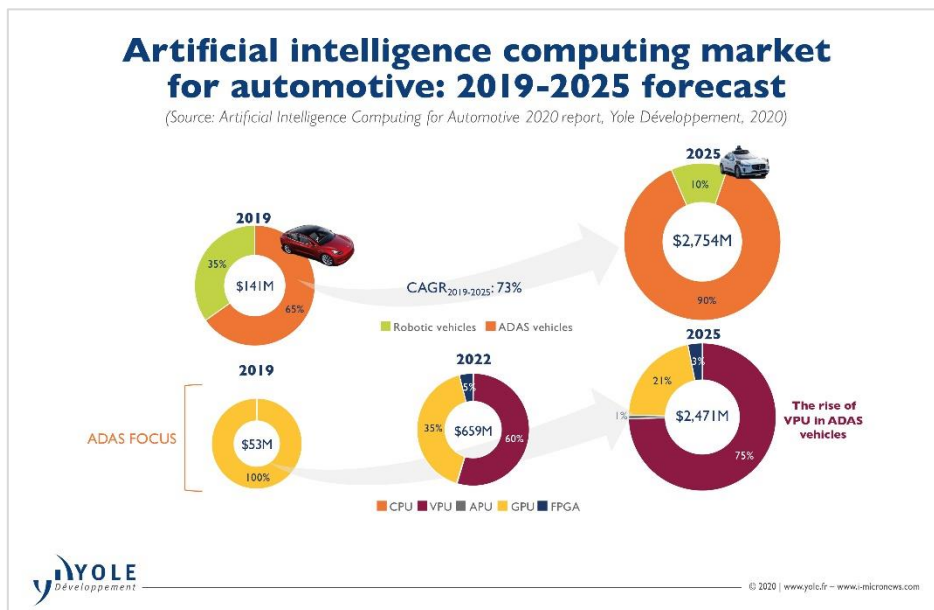
For a player like Tesla, which has built all of its autonomous stack internally (software and hardware) and thus holds sole ownership, the strategy of moving forward in small steps will pay off since this strategy is not “side research” but rather an integral part of the Tesla project, just like electrification. In fact, the impact of this crisis will probably accentuate Tesla’s market leadership, which is already estimated at several years. In the second line, analysts find OEM⁶s which develop their own autonomous software stack, but with hardware provided to them by other industry players. Lack of cash can slow down some programs, but others have been active for several years now and will probably not be stopped. And even if they are delayed, autonomy is an integral part of these OEMs’ middle-term strategies – just as it is for Tesla. As for those companies with speculative programs that do not have the quest for autonomy as a cornerstone, it is very likely that these research programs, if they exist, will at best be postponed until the crisis has disappeared completely. These companies will be the big losers in the autonomy race and will have to rely even more on computing players to provide them with full autonomous solutions / functionalities.

As analyzed by Yole’s team in the new Artificial Intelligence Computing for Automotive 2020 report, AI computing dedicated to the automotive market segment is divided between centralized platforms and vision processors.

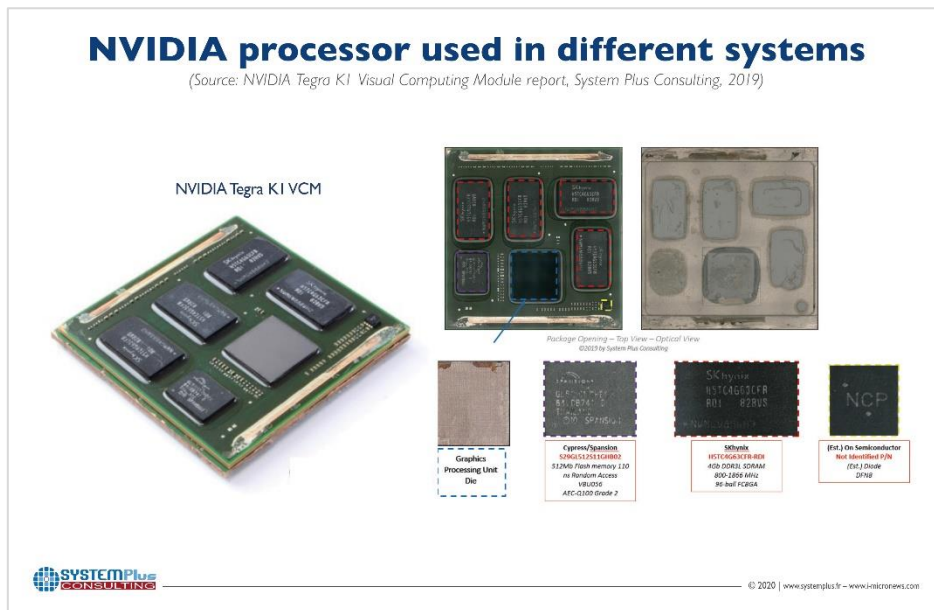
According **Pierrick Boulay, Technology & Market Analyst, Solid-state Lighting at Yole**: “We suggest that two paths are available: either a single computer-type NVIDIA or FSD, descending from the high-end segment of robotic vehicles (i.e. the “brain” of a car); or, the number of vision processors incorporating accelerators is multiplied, a path already embraced by several OEMs”.

⁶ OEM : Original Equipment Manufacturer

Competition will arise between these two platforms and determine the revenue. The 2025 market for AI, including ADAS and robotic vehicles, is estimated at US\$2.75 billion - of which US\$2.5 billion will be “ADAS only”, explains the market research and strategy consulting company, in its new technology & market report.



Yole collaborates with its partner System Plus Consulting to investigate all disruptive technologies related to ADAS applications. Under this context, System Plus Consulting has been recently interviewed by **Junko Yoshida, EETIMES** about innovations related to Audi A8. A part of this interview details technology advances led by NVIDIA in this domain. **Romain Fraux, CEO of System Plus Consulting** explains: “...The processors that make up the platform are NVIDIA Tegra K1 used for traffic signal recognition, pedestrian detection, collision warning, light detection, and lane recognition. Tegra K1 with eight layers of PCBs integrates 192 Cuda cores, the same amount that NVIDIA integrates into a single SMX module inside the Kepler GPUs currently on the market (figure 3) with DirectX 11 and OpenGL 4.4 support...”. Full article is available on [i-Micronews](http://i-micronews.com).



“This is only the beginning, and the challenges surrounding AI and its impact on the automotive industry are already being felt,” comments **Yohann Tschudi from Yole**. Some companies have a considerable lead, and it will be difficult to catch up with them, especially without integrating AI and the computing that goes with it. So, what are the challenges? Who can keep up? And has the impact of COVID-19 and the resulting lack of cash permanently wiped some players off the map?

The market research & strategy consulting company proposes its vision and analysis through its reports, articles and events. Stay tuned!



Throughout the year, *Yole Développement*, publishes numerous software and computing-related reports. The sensing part of the automotive industry, which is linked to the computing one, has also been studied by Yole’s analysts in a dedicated report: *Sensing and Computing for ADAS vehicle 2020*. In this analysis, Yole announces attractive market forecasts. Together, both reports give a complete understanding of the automotive industry.

Make sure to be aware of the latest news coming from the industry and get an overview of our activities, including interviews with leading companies, analyses from our experts and dedicated online and onsite events on *i-Micronews*. In this regard, don’t miss the *recording version of the AI Computing for Automotive: Powering Autonomy webcast*.

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About our analysts

As a Technology & Market Analyst, **Yohann Tschudi**, PhD is a member of the Semiconductor & Software division at Yole Développement (Yole). Yohann is daily working with Yole's analysts to identify, understand and analyze the role of the software parts within any semiconductor products, from the machine code to the highest level of algorithms. Market segments especially analyzed by Yohann include big data analysis algorithms, deep/machine learning, genetic algorithms, all coming from Artificial Intelligence (IA) technologies. After his thesis at CERN (Geneva, Switzerland) in particle physics, Yohann developed a dedicated software for fluid mechanics and thermodynamics applications. Afterwards, he served during 2 years at the University of Miami (FL, United-States) as a research scientist in the radiation oncology department. He was involved in cancer auto-detection and characterization projects using AI methods based on images from Magnetic Resonance Imaging (MRI). During his research career, Yohann has authored and co-authored more than 10 relevant papers. Yohann has a PhD in High Energy Physics and a master degree in Physical Sciences from Claude Bernard University (Lyon, France).

As part of the Photonics and Sensing division at Yole Développement (Yole), **Pierrick Boulay** works as Market and Technology Analyst in the fields of Solid State Lighting and Lighting Systems to carry out technical, economic and marketing analysis. Pierrick has authored several reports and custom analysis dedicated to topics such as general lighting, automotive lighting, LiDAR, IR LEDs, UV LEDs and VCSELs. Prior to Yole, Pierrick has worked in several companies where he developed his knowledge on general lighting and on automotive lighting. In the past, he has mostly worked in R&D department for LED lighting applications. Pierrick holds a master degree in Electronics (ESEO – Angers, France).

Pierre Cambou MSc, MBA, is a Principal analyst in the Photonics and Sensing Division at Yole Développement (Yole). Pierre's mission is dedicated to imaging related activities by providing market & technology analyses along with strategy consulting services to semiconductor companies. He has been deeply involved in the design of early mobile camera modules and the introduction of 3D semiconductor approaches to CMOS Image Sensors (CIS). Pierre has a broad understanding of the various markets and technologies associated with CIS, having obtained 6 patents in this field and founded one startup company in 2012. At Yole, Pierre is responsible for the CIS Quarterly Market Monitor while he has authored more than 15 Yole Market & Technology reports. Known as an expert in the imaging industry, he is regularly interviewed and quoted by leading international media. Previously, Pierre held several positions at Thomson TCS, which became Atmel Grenoble (France) in 2001 and e2v Semiconductors (France) in 2006. In 2012, he founded Vence Innovation, later renamed Irlinx (France), to bring to market an infrared sensor technology for smart environments. Pierre has an Engineering degree from Université de Technologie de Compiègne (France) and a Master of Science from Virginia Tech. (VA, USA). Pierre also graduated with an MBA from Grenoble Ecole de Management (France).

As a Technology & Market Analyst, specialized in RF devices & technologies within the Power & Wireless division at Yole Développement (Yole), **Cédric Malaquin** is involved in the development of technology & market reports as well as the production of custom consulting projects. Prior his mission at Yole, Cédric first served Soitec as a process integration engineer during 9 years, then as an electrical characterization engineer during 6 years. He deeply contributed to FDSOI and RFSOI products characterization. He has also authored or co-authored three patents and five international publications in the semiconductor field. Cédric graduated from Polytech Lille in France with an engineering degree in microelectronics and material sciences.

About the reports

Artificial Intelligence Computing for Automotive 2020

AI paves the way to full autonomy. – Performed by Yole Développement

Companies cited:

Alphabet, Algolux, Amazon, AMD, Apple, ARM, Baidu, Bosch, BMW, Continental, Delphi, EasyMile, Eyesight Faurecia, Ford, Fujitsu, General Motors, Google, Infineon, Intel, Intel MobilEye, Kalray, Lyft, Melexis, Mercedes-Benz, Microship, Microsoft, Nanya, NEC, Nio, Nissan, Nuance, NVIDIA, NXP, Parrot, PSA, Qualcomm, Renesas, Samsung, Sony Softkinetic, STMicroelectronics, Tesla, Texas Instruments, Toshiba, Toyota, Uber, Valeo, Videantis, Volkswagen, Volvo, Waymo, Xilinx, and many more...

Sensing and Computing for ADAS vehicle 2020

Advanced Driver Assistance System functionality will attract customers and restart growth of the automotive business. –

Performed by Yole Développement

Companies cited:

AGC, Algotex, Altera, Ambarella, ams, Apple, Aptiv, Argo, ARM, Audi, Aurora, Avis, Baidu, Blackmore, Blickfeld, BMW, Bosch, BrightWayVision, Cambricon, Cepton, Chevrolet, Continental, Cruise, Delphi, Denso, Didi, Dodge, Excelitas, Fiat, Ford, Geely, GM, Google, Hitachi, Honda, Horizon Robotics, Hyundai Hyundai-Mobis, Infineon, Innoviz, Jabil, Jaguar, Kalray, Land Rover, Laser Components, Lattice, LeddarTech, Lexus, Lumileds, LuminarMarelli, Maxel, May Mobility, Mazda, Melexis, Mercedes, Metawave, Micron, Mobileye, Nichia, Nidec, Nissan, NXP, Omnivision, OnSemiconductor, Osram, Ouster, Panasonic, Peugeot, Pioneer, Pony.ai, Porsche, Qualcomm, Renault, Robosense, Samsung, Sony, STMicroelectronics, Sunny Optical Technology, Tesla, Texas Instrument, Toshiba, Toyota, Trumpf, TSMC, Uber, Valeo, Velodyne, Veoneer, Volkswagen, Volvo, Waymo, Xenomatrix, Xilinx, Xperi, ZF, ZKW and many more...

Related reports:

- [Sensors for Robotic Mobility 2020](#)
- [Nvidia Tegra KI Visual Computing Module](#)

About System Plus Consulting

System Plus Consulting specializes in the cost analysis of electronics, from semiconductor devices to electronic systems. Created more than 20 years ago, System Plus Consulting has developed a complete range of services, costing tools and reports to deliver in-depth production cost studies and estimate the objective selling price of a product... [More](#)

About Yole Développement

Founded in 1998, Yole Développement (Yole) has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services, reverse engineering and reverse costing services and well as IP and patent analysis. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole group of companies has expanded to include more than 80 collaborators worldwide... [More](#)

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