



Ministry of Foreign Affairs

Artificial Intelligence in Mobility

Commissioned by the Netherlands Enterprise Agency

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ARTIFICIAL INTELLIGENCE IN
MOBILITY

Netherlands Innovation Network



**“The challenge is to show
the world how effective and
innovative Dutch companies
are as technology partners”**

Connecting Innovation Worldwide



GLOBAL



“The attachés provide an overview of trends and developments worldwide”

It is with pleasure that we present this second edition of the Netherlands Innovation Network magazine, looking at developments in Artificial Intelligence (AI) in a selection of the countries where our network is based.

On 8 October 2019, the Netherlands launched its *Strategic Action Plan for AI*, along with a public-private *National AI Coalition*, which already has over 250 representatives from business, universities and government. The magazine focuses in particular on AI in Mobility, one of the priority sectors we have identified for AI in the Netherlands.

The Innovation Attachés provide an overview of scientific and technological developments worldwide, and have an important trend-watching role. The Netherlands Innovation Network is there for you: companies, knowledge institutes and public authorities with ambitions in the field of international innovation and cooperation. You can email or phone any of our attachés for networking purposes or any other particular requests you may have.

“We’re here to support your international ambitions in AI or other key enabling technologies”

We look forward to exploring with you how we can support you and your international ambitions. Whether that be in AI, or any of our other key enabling technologies or top sectors.

On behalf of the Netherlands Innovation Network,

Focco Vijselaar
Director General Entrepreneurship and Innovation
Ministry of Economic Affairs and Climate Policy

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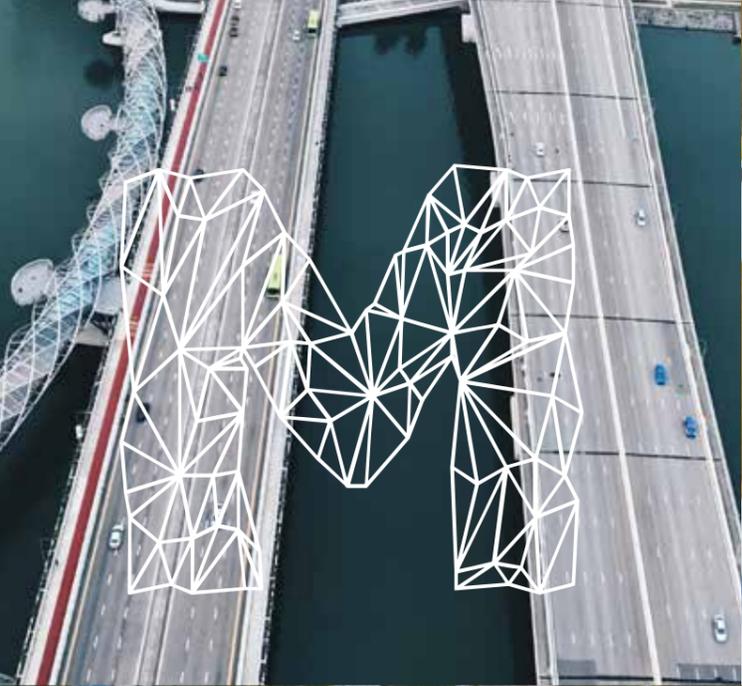
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Throughout this special, we use Automated Vehicles (AV) as an umbrella term for all forms of automated mobility (such as self-driving cars, connected and autonomous vehicles, driverless cars, etc).



Stefan Koreneef

Coordinator Digital Economy EU & Global policy,
Dutch Ministry of Economic Affairs & Climate Policy

MOBILITY: A CORNERSTONE OF OUR AI STRATEGY

Stefan Koreneef sketches the road ahead for the Netherland's AI Coalition

In his coordinating role, Stefan Koreneef (Coordinator Digital Economy EU & Global policy, Dutch Ministry of Economic Affairs & Climate Policy) will be instrumental in ensuring the Dutch AI Coalition can help deliver the massive economic, academic and societal benefits that the AI revolution promises. Here he explains how the Coalition, together with the Ministry of Economic Affairs & Climate Policy, plans to build on a very promising start.

Could you briefly sketch the current state of progress for the Dutch AI Coalition?

On 8 October 2019, we launched the AI Strategic Action Plan. The same day we launched the Dutch AI Coalition with 60 members from business, universities and government. Less than 3 months later, we had over 250 members, including all the ministries, nearly every university, many municipalities and provinces, and businesses from pretty well every sector of the Dutch economy.

The Strategic Action Plan brings together all the proposed AI initiatives of all ministries in one document. It also meets our requirement under the EU AI Strategy, as a member state, to develop an AI action plan.

Many countries already have AI coalitions, and we're actually relatively late in launching ours, but that's not necessarily a bad thing: we recently presented our AI Action Plan and Coalition to the various EU institutes in Brussels and got very positive feedback. People were really impressed with how the Netherlands has managed so quickly to get all parties on board and on the same page. It's a great example of the strength of the Dutch polder model: public-private partnerships where everyone is genuinely working together to the same ends.

So I think we've made a good start. The challenge now is to present the coalition globally, and show how effective Dutch companies and institutions are as partners, and how innovative we are in terms of technology. Which is why our Innovation Attachés play such a crucial role in the key AI countries, both in 'selling' Dutch companies and knowledge institutes, and in providing us with on-the-ground intelligence.

The strategy designates Mobility as a priority sector (along with Agriculture, Energy and Health). What does that mean in practice?

The Ministry of Infrastructure & Water Management identified mobility as a priority sector because of our country's huge opportunities in this field, and its importance to us as a densely-populated land with an economy highly dependent on good logistics and traffic management.

A good example is intelligent traffic lights. There are now a number of pilots running across the Netherlands, using some 450 intelligent traffic lights in collaboration with over 50 cities and companies. Intelligent traffic lights are a core element of connected and automated mobility. Intelligent vehicles receive traffic data via the traffic lights. In turn, the traffic lights gather data on each vehicle in order to manage traffic better, for example by clearing routes for emergency services or reducing rush-hour congestion.

“The challenge is to show the world just how effective and innovative Dutch companies are as technology partners”

What are the next key steps internationally in terms of AI and mobility?

The Netherlands obviously has a lot of world-class mobility-related companies. In that sense, we're already a world player. But in terms of the AI strategy, we first need to put good governance in place for the Coalition together with all Ministries and determine exactly what the ecosystem looks like.

During 2020, we'll start with some international activities, including positioning ourselves internationally. We want to explain what makes the Netherlands a leader in terms of AI, and why anyone involved with AI should consider working with and investing in Dutch AI companies and institutes.

We'll initially focus on Germany as a pilot project followed by France, the US, Singapore and Belgium. We'll then hopefully expand next year to countries like South Korea and Japan. And finally, to every country where we have an Innovation Attaché, each of whom we see as vital to maximising the impact the AI strategy and coalition will have around the world.

Listening to Stefan, it's clear that the respect Dutch companies enjoy across the global AI community isn't just because of the quality of those businesses themselves. It's also down to the Dutch approach: an ability to harness the talents and strengths of individuals, businesses and knowledge institutes to get everyone working together. It may seem like the obvious thing to do, but very few manage to do it as effectively as the Dutch.





Helping world class Dutch companies drive the mobility revolution

RAI Automotive Industry NL is the cluster organisation of the Dutch automotive, automotive education and mobility sector. As its Program Manager Smart Mobility & Internationalization, Bram Hendrix works to bring the organisation's 200 members and other key stakeholders together, and help create a roadmap that will guide everyone to a mutually successful future.

NL inside

"The Dutch automotive industry isn't that well-known internationally because, truck and coach makers DAF and VDL aside, we don't have big consumer brands. But we're definitely a leading nation when it comes to supplying the technology that makes smart mobility possible, and the Netherlands is helping drive innovation in areas like AV."

A vital part of innovation is inspiration, and RAI Automotive Industry NL regularly organises events that will inspire and connect partners and potential partners. "It's critical we do this not just nationally but also internationally. The Dutch market is small and automotive is a global industry, so we have to work, think and act internationally."

Focused on impact

But Bram stresses the importance of not spreading yourself too thin, which is why the organisation has chosen to focus primarily on making a real impact in three markets: Germany, France and the US (specifically Michigan, America's automotive hotspot). In all three markets, the Innovation Attachés play a crucial role.

"They're our eyes and ears. They have the contacts in local markets; without them we can't do anything. And I'm not just saying that! RAI Automotive Industry NL isn't a trade organisation; our focus is on innovation. We need to be brought into contact with other innovative parties, so we can work together on solutions.

The Netherlands Innovation Network is important not just in our focus markets, but wherever Innovation Attachés are based. We have an open line with many of them, and continuously get local insights on specific topics, such as AI."

"The Dutch market is small and automotive is a global industry, so we have to work, think and act internationally"

Well-positioned

Asked which areas of smart mobility he thinks offer opportunities for the Netherlands, Bram identifies two.

"First, traffic management, which with megacities on the increase globally will become more important. The Netherlands has been a frontrunner in traffic management for years, but we must build on that knowhow if we're to develop tomorrow's solutions. Like smart AI solutions that can make optimal use of the huge amounts of data available from vehicles, roadside units, municipalities, etc to create smart traffic management systems."

The second area is in the vehicle itself. "For vehicles to take more and more tasks over from the driver you need AI in areas where the Netherlands has world-class companies. TomTom, for example, now focus on making the highly-detailed maps needed for AV. Those maps are only possible by combining massive amounts of data with AI that can make optimal use of it. AI that in turn needs cutting-edge semi-conductors, technology in which NXP is a world leader."

These are just two examples. Many more of RAI Automotive Industry NL's members are working on these sorts of key enabling technologies with partners locally and around the world. "Every AV car will need these powerful maps and semi-conductors, and every city will want these traffic management systems. At RAI Automotive Industry NL, we want to ensure they'll be supplied by Dutch companies."



Following the smart road to a brighter future

Professor Mehdi Dastani, Chair of the Intelligent Systems group at Utrecht University, is leading research into how smart roads can contribute to tomorrow's transport systems. It goes way further than simply keeping AVs from crashing into each other.

While research on AVs is currently focused on autonomy to enable them to observe their environment and decide how to plan their actions without human input, smart roadway infrastructure can also add huge value by supervising and coordinating the AVs. Mehdi and his colleagues have therefore been considering ways that smart roadway infrastructure might orchestrate AVs to improve traffic throughput and safety.

"While AVs will only know about their immediate environment, a smart roadway infrastructure will have information about the global situation across the whole roadway network. So instead of just telling AVs how to avoid congestion on their route, the system could also issue customised directives to each AV – telling one to slow down to 27.5km/h, another to accelerate to 82.3km/h – in order to optimise traffic flow across the country.

They could also address classic traffic bottlenecks like merging ramps, by telling each AV the precise speed at which it should merge to maximise flow. And of course, unlike humans, AVs can follow instructions perfectly."

Flipping the mindset

But the role of a smart road infrastructure could go far beyond traffic flow optimisation. "Currently, if a car exceeds the speed limit the owner gets a fine, which is essentially a penalty for undermining the traffic laws." But as Mehdi says, with smart roads you can flip that mindset. "Someone in a hurry could pay a premium, probably depending on various factors, like income, so they can travel faster. A bit like airport fast-track services. Permission to 'speed' would be managed by the infrastructure to ensure traffic flow and safety aren't compromised."

"AVs will know their immediate environment, but smart roads will know the global situation"

Local and national policymakers could use premiums, for example for peak-time travel, using inner city roads, to reduce CO₂ emissions or finance the infrastructure. Using incentives or directives, the smart roadway infrastructure could even do a bit of matchmaking:



if it learns that two AVs always travel the same commuter route at the same time, it could encourage the two users to carpool, leading to less traffic and, who knows, the start of something beautiful.

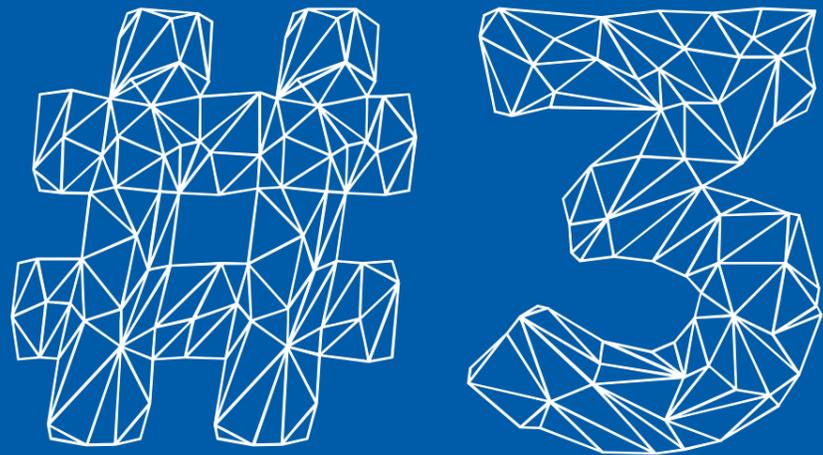
Invaluable role

Though it's still early days, Mehdi is confident the Dutch AI Coalition will be hugely beneficial. "It will connect and stimulate collaborations between knowledge institutes and public and private organisations. Enabling institutes to help society address pragmatic mobility issues in the 'real world', and respond and contribute to policymakers' challenges and goals."

Mehdi hadn't previously known about the Innovation Attachés, but was immediately enthusiastic. "As a researcher, you obviously develop a network of contacts and colleagues. But it's time-consuming and your network can always be expanded and enriched."

Mehdi sees all sorts of ways in which the Attachés' local knowledge and global networks can add value. "For example, I'm currently spending two months a year as a visiting professor at Hangzhou University in China, which is also Alibaba's hometown. So I'm already investigating collaborations with Alibaba, but helping researchers like me link up with local companies and institutes would be really welcome. But equally, identifying relevant people globally for, say, a recent initiative to investigate AI ethical questions could also be invaluable."

So by combining the professional networks of people like Mehdi and the Netherlands Innovation Network, we can build strong, sustainable innovation partnerships. Together the partnerships can advance common innovation, technology and science ambitions.



BY 2030, KOREA AIMS TO
RANK #3 GLOBALLY FOR
DIGITAL COMPETITIVENESS
AND CREATE **350 BILLION EUROS**
IN ECONOMIC BENEFITS FROM
AI ALONE

Korea: Working hard to stay ahead

Mobility has always been a major part of Korea's economy and under the slogan 'From IT powerhouse to AI powerhouse' it is working hard to remain a global innovation frontrunner. The ambitions are far-reaching: by 2030, Korea aims to rank #3 globally for Digital Competitiveness and #10 for Quality of Life. Hoping to create a staggering €350 billion in economic benefits from AI alone, the government is setting up 9 strategies across 3 different fields and implementing 100 AI-related projects. Mobility and logistics are key components in the new vision.

Korea is doing what's needed to move to the next level in terms of IT. The large Korean Telcos have already rolled out the necessary fast, stable, low-latency 5G network. Hyundai Mobis is developing short-, medium- and long-range radars, V2X modules, and steering systems that use cameras and sensors. And Hyundai MNsoft is working on an HD map that by June 2020 will cover some 16,000km of Korea's highways.

Talent shortage

Aside from Hyundai (see box), other Korean corporates like Samsung, LG and SK have also launched AI R&D programmes: opening offices around the world, scouting startups for ideas and technologies, and acquiring companies to access knowhow and talent.

Lack of talent, in particular, seems a major growth constraint on AI.

Naver Labs, the country's leading AI centre for mobility, released indoor and outdoor HD maps in October 2019 for free public use. They are now working on what they call an 'autonomous-driving robot platform', an AV base vehicle that can be adapted to different purposes and situations.

Startups spearheading innovation

Korean startups are responding to the need to optimize personal mobility. Despite blocking efforts by the traditional taxi industry, Socar has introduced a new AV van/taxi service. Code42 is developing an AV Transportation-as-a-Service (ATAas) platform for AV

drone- and road vehicle-based services such as robot taxis, smart logistics and food delivery. While the municipality of Seoul has recently started an AI taxi project that aims to predict real-time taxi demand.

Both the traditional car industry and ICT sector are pushing hard to be at the front of the AV journey. And by harnessing innovation from local and foreign startups, the Korean automotive industry looks set to remain a major player as we enter the AV era.

Netherlands Innovation Network Korea

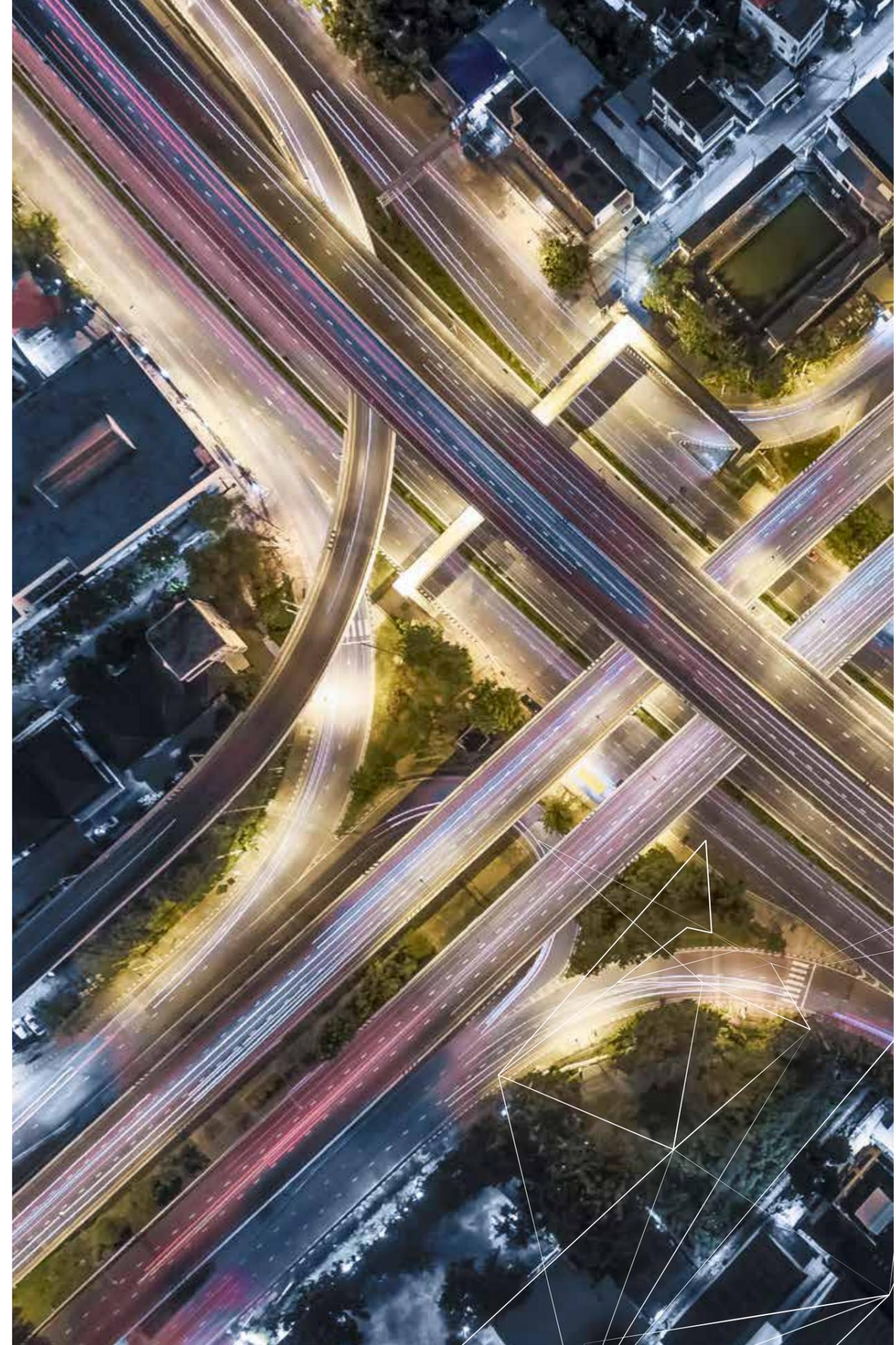
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Korean corporates are scouting startups for technologies and acquiring companies to access talent

Hyundai: Korea's leading mobility player

- 2019: AI research Lab (Air Lab) launched.
- 2020: announce 5-year €78 billion p.a. investment in mobility technologies.
- In 2020: aim to mass-produce a 'Level 3' AV car (supporting total AV in certain circumstances).
- By 2021: aim to mass-produce a Level 4 AV car jointly developed with US startup, Aurora.
- By 2022: aim to develop AV platform.
- By 2025: aim to develop AI-based vehicle personal assistant operated by voice recognition.



China: Government and municipalities pushing progress

Driven by the need to solve two persistent problems, pollution and congestion, China is investing heavily in smart mobility. The 2019 Urban Mobility Readiness Index ranked Shanghai 4th and Beijing 8th in cities leading the mobility revolution, because of their commitment to advanced technologies and investment in infrastructure. Now the results are beginning to show.

In 2017, the Ministry of Science & Technology assigned the first wave of AI technology R&D leads to four companies: Baidu (AV), Alibaba (smart cities), Tencent (digital healthcare) and iFlytek (voice recognition), adding SenseTime (intelligent vision) in 2018.





The Apollo open-source platform is one of the world's largest AV ecosystems and 'Android for the AV industry'

Automotive is one of China's key industries and highly focused on AI and AV. Unlike the US, where private companies are driving AV research, it's municipalities who support and fund public-private sector AV research in China. In 2018 Shanghai was the first Chinese city to open a 50-km pilot zone for open-road AV testing. Today, AV is being tested by 35 companies on designated roads across 16 cities, including Beijing, Shanghai, Hangzhou and Chongqing. Of 109 licenses issued by the government, nearly half went to Baidu.

'Android for AV'

Baidu, China's equivalent to Google, has filed more AI patent applications than any other Chinese company. The company focused on four key research areas: natural language processing, smart search & recommendation, speech recognition and AV.

The company created Apollo, an open-source platform for AV solutions, along with the €1.38 billion Apollo Fund, as part of a plan to invest in 100 AV projects over the next three years. This makes Apollo one of the world's largest AV ecosystems, with over 100 partners, including national and international carmakers, China's top universities and government tie-ups. Apollo nowadays can be seen as the 'Android for the AV industry'.

Apollo 1.0 was launched in July 2017 and was focused on closed-venue AV. Apollo 5.0 covers highway driving, valet parking, AV minibuses, robo-taxis and smart traffic signal solutions. Smart traffic solutions have already been implemented in Baoding, where it has reduced rush-hour traffic congestion by 20-30%.

Decongestion

Alibaba's Cloud Intelligence Brain is an AI platform with several sector-based 'brains' that provide solutions to complex business and social problems, increasing sustainability and efficiency in areas like agriculture, manufacturing and city management.

Its City Brain is an urban traffic-management system designed to address areas like traffic congestion and signal control. It uses AI to analyse traffic conditions based on integrated real-time data from the Chinese navigation app AutoNavi, traffic police Weibo accounts and video. Following a two-year trial, Alibaba's home town of Hangzhou has gone from China's 5th to 57th most congested city; fire and ambulance service response times have halved and illegal parking is being tracked in real-time.

Netherlands Innovation Network China

Though Netherlands Innovation Network China follows local AI developments closely and keeps interested Dutch public and private sector parties up-to-speed, China's focus on getting an edge in AI makes facilitating any large-scale Sino-Dutch collaborations difficult.

The network has organized a bootcamp for Dutch AI startups to help them explore the Chinese market; runs local seminars that promote Dutch values regarding AI ethics; and helps Dutch companies and research institutes find partners in China.

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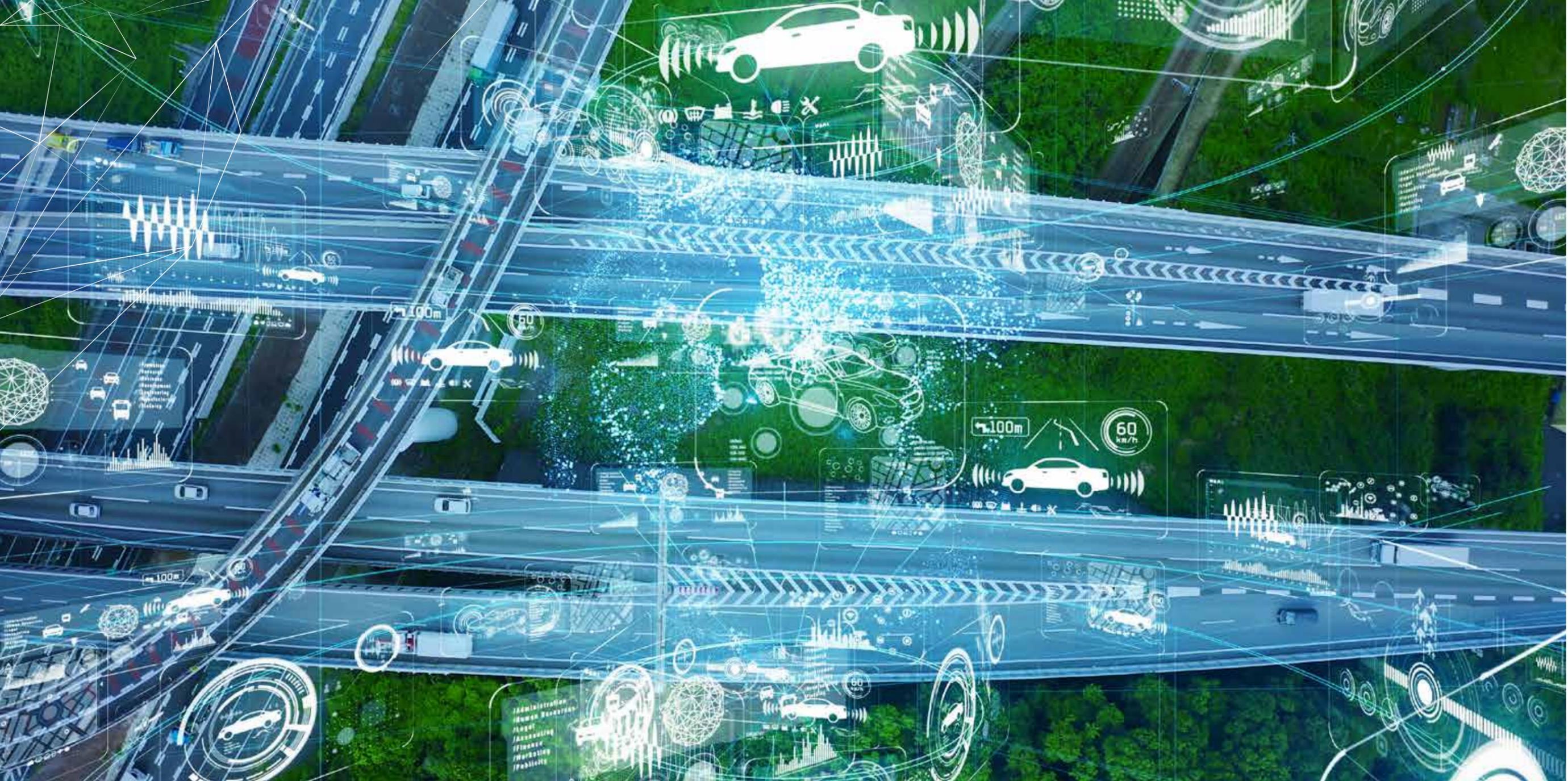
Germany: Economy's engine switching to AV

With over 6.3 million cars produced in 2019 and a gross value added of €106 billion, the German automotive industry has for decades literally been the country's economic engine. But it has come under increasing pressure, not least from the transition to new mobility concepts such as electric, shared and AV. In response, the German government and private sector has given AI and AV higher priority in recent years. Today, with over €18 billion in investment and half of all related patents originating in Germany, the country is fast becoming the world's innovation leader in AV and connected driving.

Government driving transformation

When in 2018 chancellor Merkel published Germany's AI strategy with a budget of €3 billion, mobility was identified as one of the key application areas. A National Platform for Future Mobility (NPM) was established, with separate working groups headed by leading figures from the public and private sector. The digitalization working group advises on how to create a safe infrastructure and level playing field. Data-sharing and communications are critically important to the ministries of Infrastructure (BMVI) and Economic Affairs (BMWFi), who have proposed international cooperation via the European Data Taskforce (DTF) and a European cloud service for production data called GAIA-X.





Nearly half of all the world's AV-related patents currently originate in Germany

Innovating companies, innovating communities

Many test initiatives occur at a local level. For example, a network of AV test fields has been set up on highways near Munich. Karlsruhe has a live test field and parking garage that combine smart parking systems and charging stations. In Berlin, a digital test location has been created where AVs drive around campus. And in Dresden, drones are being used to collect traffic data.

Every car manufacturer and mobility-focused company in Germany is also busy developing exciting new digital technologies. A few examples:

- Bosch has a new highly-sensitive MPC3 camera that reliably detects objects and people;
- Daimler uses heart rate sensors in the steering wheel

and AI predictive algorithms so the car knows to intervene if a driver is falling asleep;

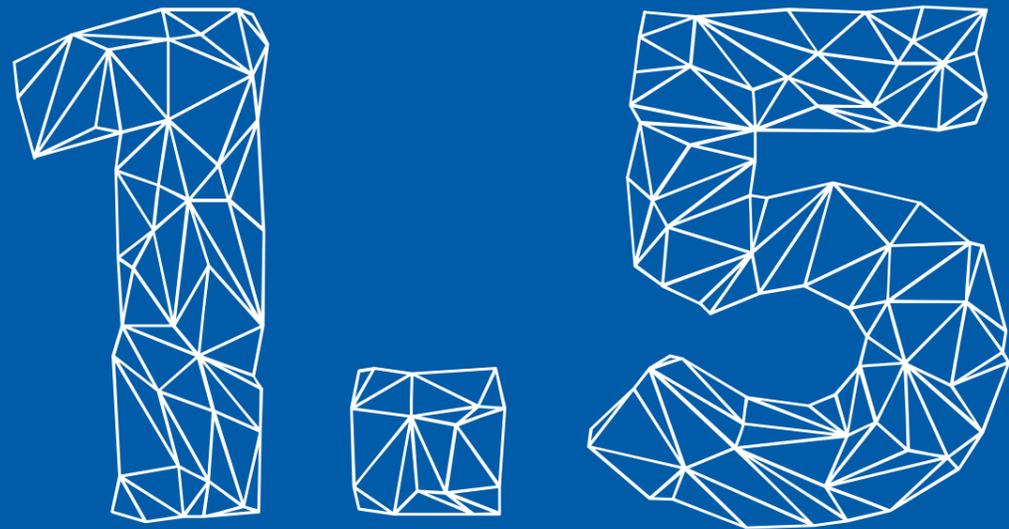
- BMW uses AI in its production processes, delegating repetitive tasks to robots;
- Volkswagen has set up an AI research unit at its Munich data lab (headed by Dutchman, Patrick van der Smagt) that is collaborating with the Technical University of Munich and the German AI research institute (DFKI).

A sector in transition

These are just some of the numerous examples of pioneering AI and AV work taking place. However, KPMG's latest AV Readiness Index says more progress is still needed on both infrastructure and consumer

acceptance levels, for example through practical test cases. To address this, many German carmakers are working closely with partners to test AV technologies. This includes Dutch partnerships, such as BMW's collaboration with the city of Rotterdam and a joint deep learning lab set up by Bosch and the University of Amsterdam. But more such collaborations will be needed if Germany is to remain the leading automotive nation that it is today.

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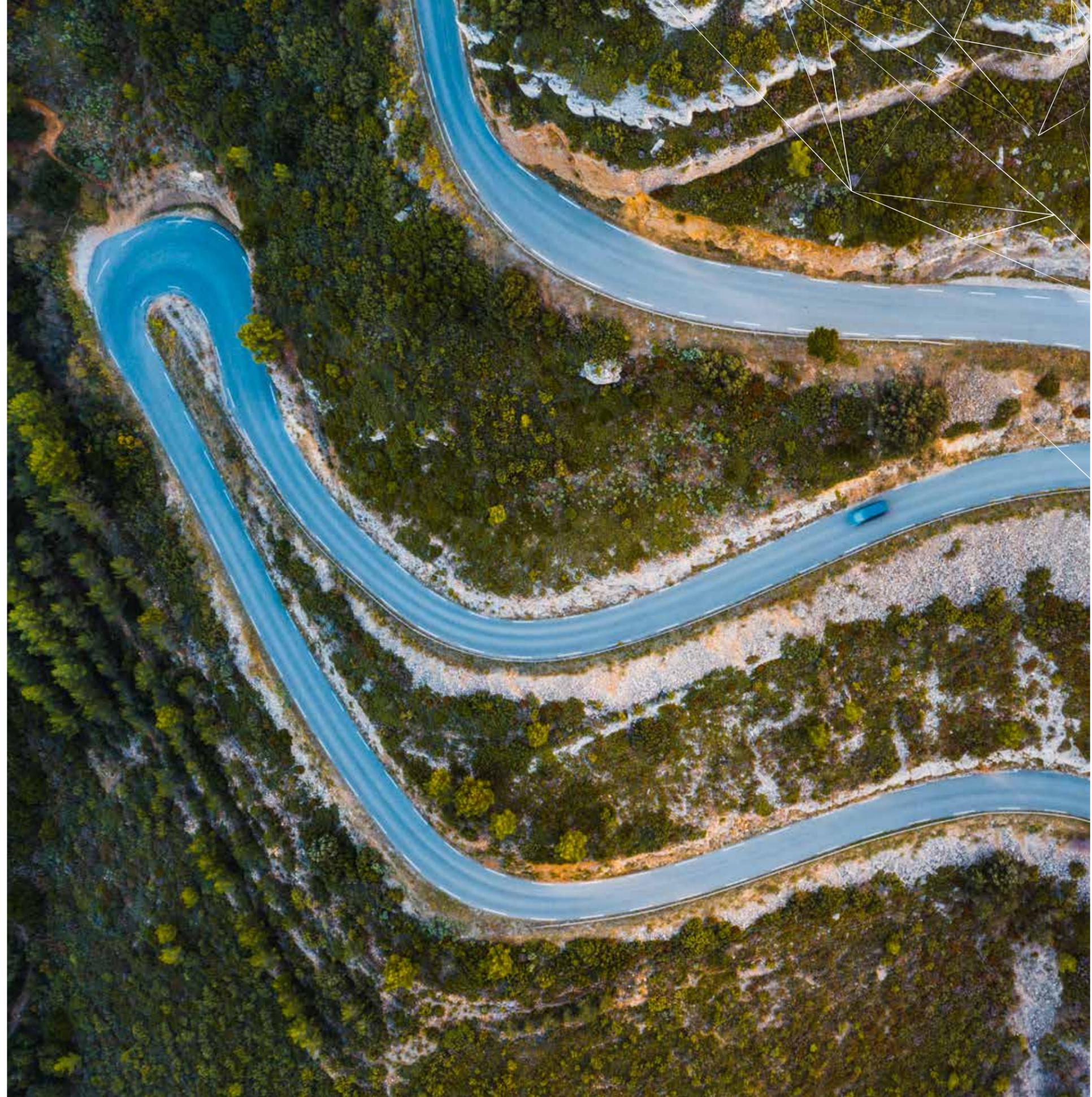


FRANCE'S 1.5 BILLION EURO AI STRATEGY INCLUDES 16 PUBLIC-PRIVATE CONSORTIA-LED AV EXPERIMENTS AND **INVESTING 100 MILLION EURO** IN AI EDUCATION & RESEARCH VIA INTERDISCIPLINARY INSTITUTES

France: Mobilising the nation for AI

In the past two years, AI has gained significant momentum in France. In 2018, President Macron presented a national AI strategy with a €1.5 billion budget, highlighting mobility as a priority area. The same year, a national 5G roadmap was published and over 25 tests involving 5G are currently underway, many around mobility. Since then, more initiatives have followed.

In 2019, following earlier publication of a national AV strategy, two public-private consortia launched 16 AV experiments to test technologies and raise public acceptance of AV. In one, Transdev and Renault will be testing AV shuttles before going on to trial a taxi service using four Renault passenger cars.



Large companies will lay down mobility and transport-related AI challenges, so they can utilise the large amounts of data they possess

In the railway sector, Alstom, SNCF and the Institute for Research & Technology's SystemX are testing AI applications in areas such as predictive train maintenance and train traffic coordination. While Airbus has been using machine learning in the production of its A350 to minimise quality issues and ensure aircraft are delivered on time.

AI institutes

Four interdisciplinary AI institutes will together receive €100 million over four years to set up AI education & research, focusing on themes such as health, sustainable development, transport and energy. For example, the Artificial & Natural Intelligence Toulouse Institute will be targeting mobility & transportation and robotics/cobotics for tomorrow's industry. The public money will be matched by private sector funding, for example for research grants.

AI challenges

In late 2019, the Mov'eo and Systematic clusters were tasked with coordinating some ten 'AI challenges' around transport and mobility over the next three years. The challenges, in the form of calls-for-proposal to French SMEs, will be made by private companies and public sponsors keen to utilise the large amounts of data they possess. Public investment bank, Bpifrance, will financially support to SMEs through to the proof-of-concept stage. Two challenges have already been announced:



Thales is looking to develop 'smart catenaries' that can detect pantograph anomalies before they cause problems. While medical transport company, Keolis Santé, is seeking algorithms that can find routes and methods to maximise the efficiency of its drivers.

Smart & Green Mobility

Since 2017, a Partners for International Business (PIB) programme led by the Dutch automotive cluster organization, RAI AutomotiveNL, has been focusing on smart and green mobility. Three Memorandums of Understanding have been signed: between RAI AutomotiveNL and its French counterpart, the competitiveness cluster Mov'eo; between ElaadNL, a knowledge and innovation centre for smart-charging infrastructure in the Netherlands, and VEDECOM, a French public-private

consortium focusing on mobility; and between ElaadNL and Enedis, the French national grid operator. The Netherlands Innovation Network France provides support to the PIB from our Paris embassy.

European AI Village

From 31 March-3 April 2020, a European AI Village will be held in Paris during *Global Industrie Paris*, where the Dutch Ministry of Economic Affairs & Climate Policy and the Dutch AI Coalition will be looking for collaborative opportunities with potential French partners.

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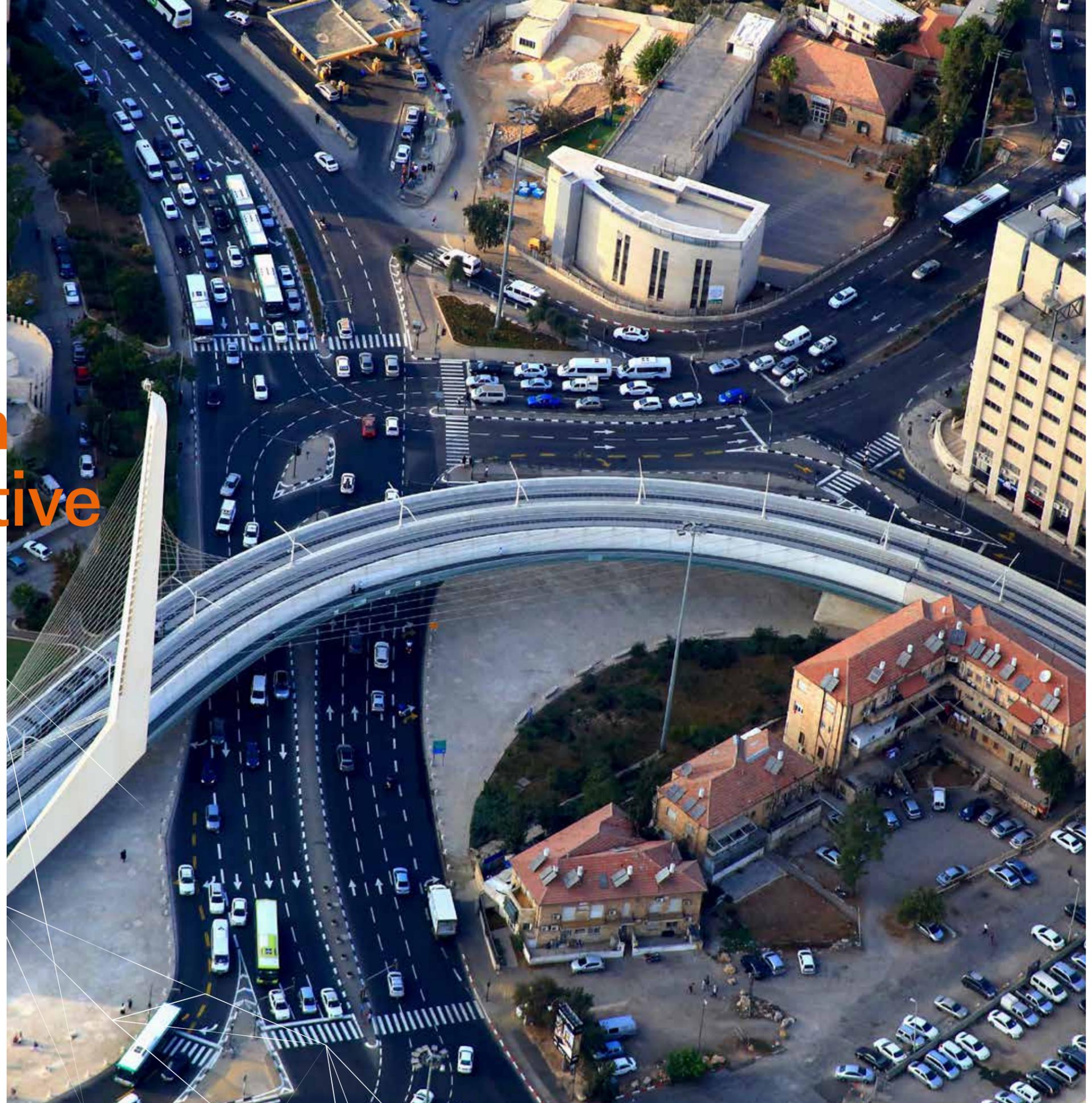
Israel: A dynamic presence on the automotive AI arena

Despite having no traditional automotive industry, Israel has become a significant player in the mobility industry. Two things help explain this. First, the country's strong track record in AI and cybersecurity, technologies both vital to AV ecosystems. And secondly, a dynamic local startup scene strengthened by a genuinely entrepreneurial business culture.

Thriving ecosystem

Israel is home to over 1,000 companies, academic institutions and corporate R&D centres specializing in AI. This includes both core AI technologies and usage in the healthcare, cybersecurity, automotive and manufacturing sectors.

At last count, there were 63 Israeli automotive startups, with an average 12 new ones joining the local ecosystem annually. Over the last five years, these startups have pulled in some €760 million in funding, nearly two thirds of it in the last two years. The companies are primarily active in the fields of AV, automotive security and connected cars.





When it comes to smart mobility, the similarities between Israel and the Netherlands are striking

Concrete opportunities for Dutch Israeli cooperation
H2020 and JTI (Horizon 2020 and Joint Technology Initiatives) projects are public-private technological partnerships with strategic economic growth value within the EU. They form ideal collaborative platforms, as they involve substantial funding for inter-disciplinary R&D consortia, focused on developing cutting-edge technology. These are two examples involving Dutch-Israeli collaboration:

- Pristine ECSEL-JU – a project on Programmable Systems for Intelligence in Automobiles, involving participants from several countries, including two Israeli companies as well as NXP, TNO, TU Delft and TU Eindhoven from the Netherlands;
- MADEin4 ECSEL-JU – coordinated by Applied Materials Israel, this project aims at 'Advancing Industry 4.0 Solutions for the European Semiconductor Manufacturing Industry' and comprises a consortium of 50 manufacturers and R&D organizations from 10 countries, including the Netherlands.

Together stronger

As relatively small, but agile players, both the Netherlands and Israel are punching above their weight in the global AI and mobility arena. By seizing the opportunities out there to get parties from the two countries working together, they can ensure things stay that way.

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There have also been headline-catching financial success stories, such as Mobileye, specialists in AV and ADAS (advanced driver-assistance systems), who were taken over in 2017 by Intel for some €12.5 billion, the largest ever acquisition of an Israeli company.

But it isn't just about cashflows. In 2018 alone, Intel and Technion (Israel Institute of Technology) jointly launched a Centre for AI research in Haifa, only to be followed the same year by US tech giant, Nvidia, opening its own AI research centre in Tel Aviv.

Ideal partners

There are striking similarities between Israel and the Netherlands when it comes to smart mobility: both are relatively small countries with strong high-tech sectors that have a fresh eye to challenges, without the legacy that can weigh down countries with large automotive sectors.

This synergy offers huge potential for Dutch-Israeli R&D collaborations around AI and smart mobility, and the Israel Innovation Attaché arranges regular activities to catalyse them. For example:

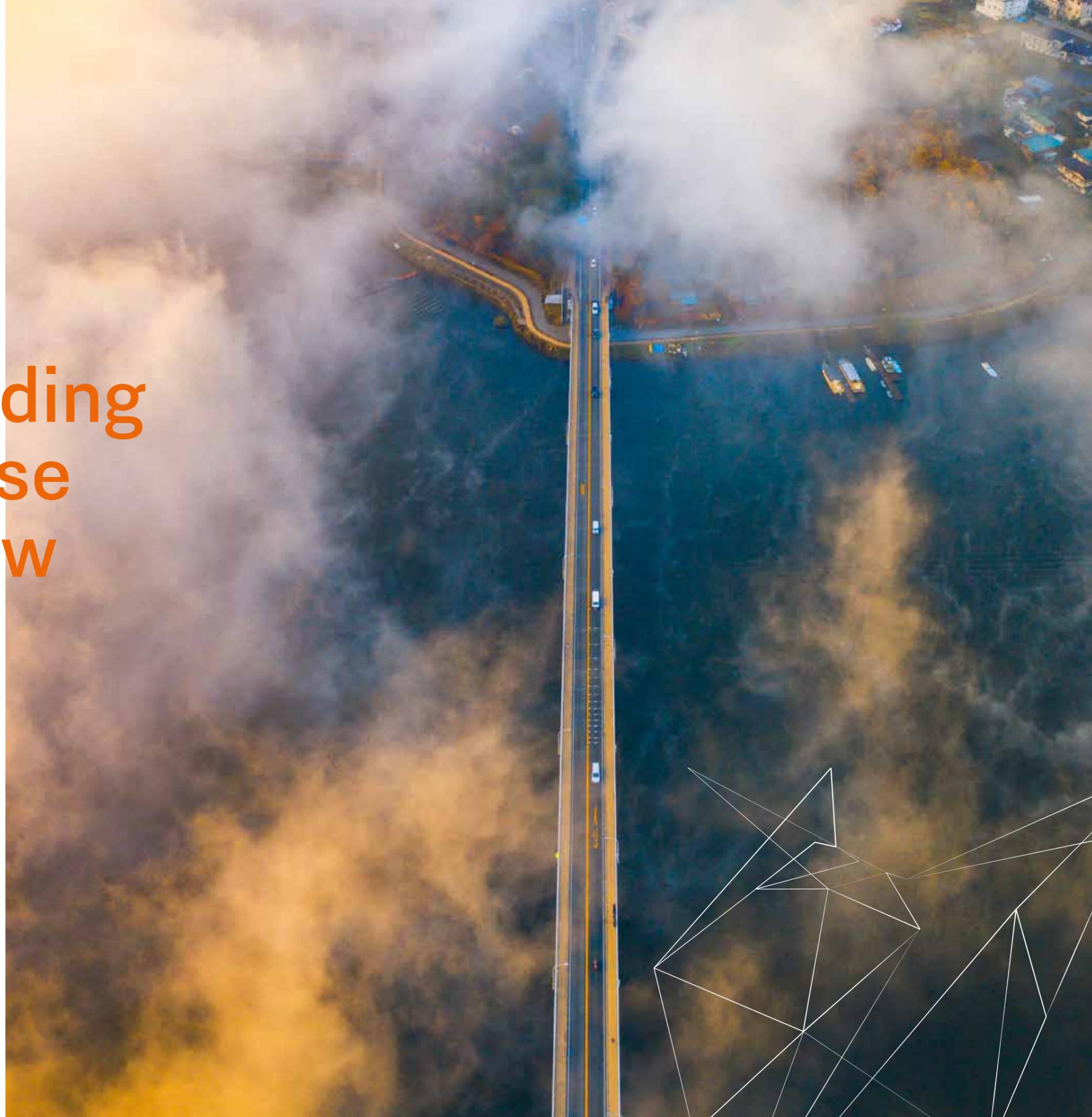
- organising an Israeli mission to the October 2020 Global AI summit in Amsterdam;
- demonstrating Israel's AI competence during a Dutch minister's visit to Israel;
- involvement with the 2020 Brabant Innovation Day, which is focused on smart mobility, and;
- searching out partners for open H2020/JTI Calls for Proposals (see below).

Japan: Building a strong case for tomorrow

In 2019, the Japanese government published two key policy papers: an Integrated Innovation Strategy, and related AI Strategy, which identified the technology areas that will largely define the new automotive era as Connected, Automated, Shared and Electric (CASE).

Backing its vision

To address these areas and stimulate research activity, in December Japan launched its AI Research Network. This will involve the country's three main AI institutes: AIST (National Institute of the Advanced Industrial Science & Technology), RIKEN (Institute of Physical & Chemical Research) and NICT (National Institute of Information & Communications Technology) working together to ensure a more 'all-Japanese' approach to AI R&D, but at the same time developing more collaborations with foreign AI research institutes and universities.



Some companies are adopting English as their working language, recognizing the need to recruit globally to be a serious AI player

The government is certainly backing its commitment financially. In December, Prime Minister Abe earmarked nearly €0.9 billion for post-5G (6G) technologies, including advanced automotive technologies, as part of an upcoming €9 billion budget for development work in digital technologies, including AI and 5G.

The government is also supporting initiatives to address the shortage of top-level AI and AV personnel, such as the Japan Automotive AI Challenge, designed to attract AI people from other sectors and countries. The government also launched a Smart Mobility Challenge to stimulate new mobility services using IoT and AI in local areas. 28 projects have been selected to investigate the feasibility of a shift towards CASE by 2030.

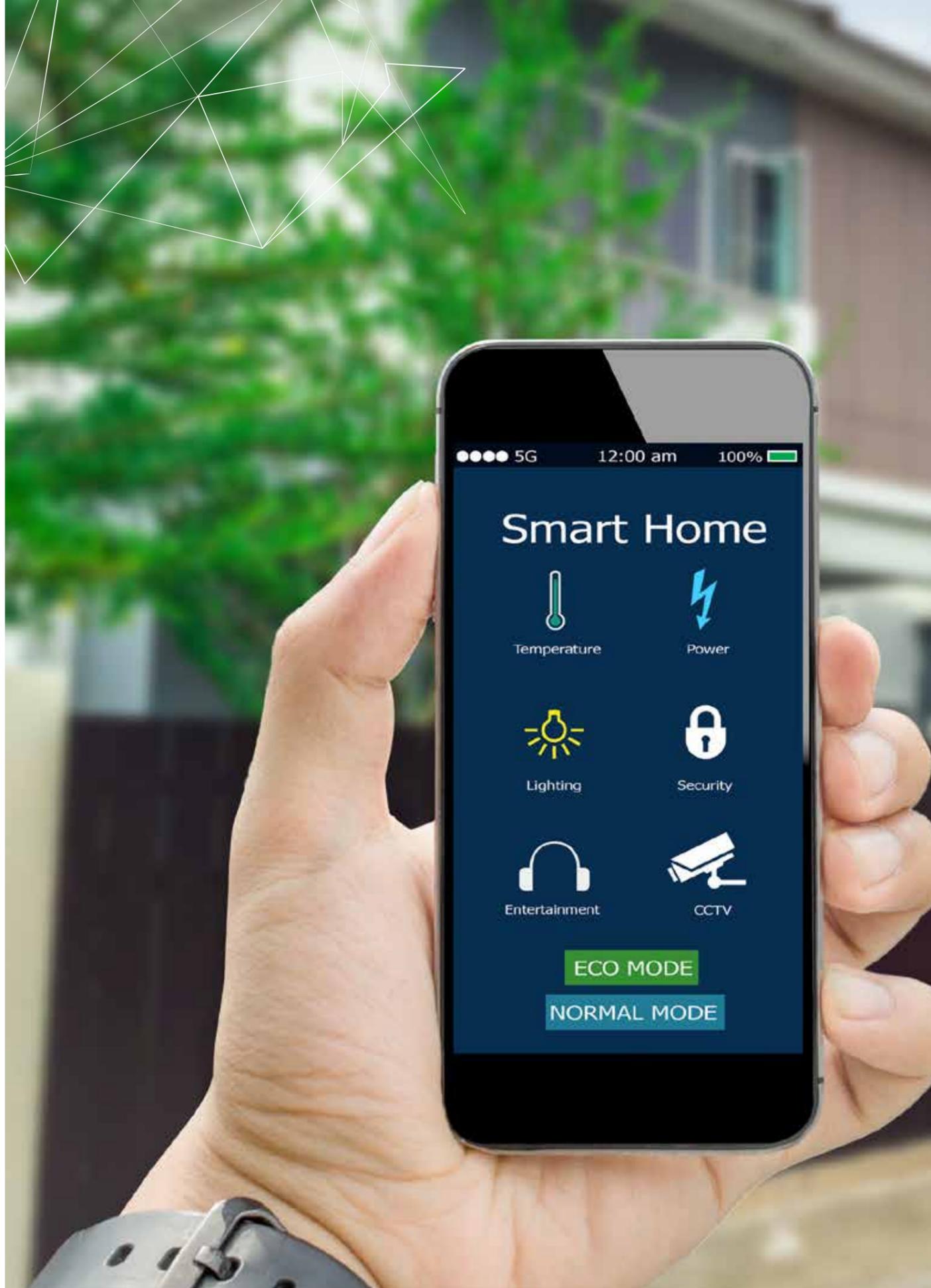
Private and public

Japan drives AI research via both the private and public sectors. For example, AIST's cutting-edge Artificial Intelligence Research Center is developing a multi-scale framework that integrates geospatial data from diverse mobile sources (satellites, aircraft, drones, etc.) to create more accurate real-time 3D maps that give AVs better control.

While the Toyota Research Institute (TRI) was established in 2016 for the transition to AI-powered mobility services. TRI recently launched its second €90 million 'Toyota AI Ventures' fund for AI, autonomy and mobility technologies. The first edition is supporting 19 companies to further develop their concepts.

In 2018, TRI-Advanced Development (TRI-AD) was launched with Aishin Seiki and Denso to further develop TRI research outcomes. Interestingly, TRI-AD has broken with normal Japanese business practice and uses English as its working language, reflecting the need to recruit globally if you wish to be a serious player in AI.

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Japanese companies target CES

Sony and Toyota both unveiled interesting projects at the 2020 Consumer Electronics Show (CES) in Las Vegas.

Sony launched its Vision-S electric concept car. Developed with partners like Bosch, BlackBerry and Magna, it shows that traditional automotive companies will have no monopoly when it comes to AV. The car also leverages Sony's strengths. It has, for example, a 360° audio system and panoramic screen for driving data and entertainment, as well as using Sony's AI software, telecoms and cloud technologies to enhance safety and reliability.

Toyota announced plans for Woven City, a smart city at the foot of Mt. Fuji. From 2021, some 2,000 Toyota employee family members will live and work in this 175-acre 'living laboratory'. The interaction of new technologies in areas like robotics, AV and smart homes will be tested in a real-world environment in which people, buildings, vehicles, etc. are connected with sensors and data to create an ideal testing environment. Three types of roads will be 'woven' through the city, one of which dedicated to high-speed, fully-automated, zero-emission cars. Toyota is looking for business partners for the project.

USA: Safety first on the long road to AV

Major investments in AV technology in the 2010s fueled sector-wide optimism about AV. However, early expectations remain largely unmet, the tone has become less bullish and, after peaking in 2018, investments fell sharply last year. Instead, US smart mobility players are keen to show that they shifted gear and give priority to safe and trustworthy technology..

Massive investments in the smart mobility sector have created an impressive AI ecosystem in the US geared to making AVs a reality. McKinsey estimates the sector saw over €76 billion invested in 471 companies between 2010 and 2019, with the main US players being Waymo (Google), Uber, Cruise (GM), Argo (Ford and Volkswagen) and Nuro. In 2018, nearly €3.6 billion went to three startups alone: Cruise, Argo and Nuro. Much less has been spent beyond AV, on broader mobility concepts such as traffic optimization (ITS, Mobility as a Service) or micro-mobility solutions (e.g. scooters, bike-sharing).

Recalibrating expectations

The injected capital generated much excitement about AI technology, helped attract talent, and created regional ecosystems in Pittsburgh, Detroit and, of course, Silicon Valley. It also led to many predictions, with some US companies like Fiat-Chrysler and Ford even claiming they would have level 4 and 5 cars ready by 2021. Since 2019, CEOs have been far more cautious. Even though two years of intensive testing have seen significant technological advancements, the sector is still way off delivering an AV to which regulators or passengers would confidently delegate full control. And a few well-documented fatal AV-related accidents only underline the current need to prioritize safety.

The main challenges are complexity (changing traffic conditions) and reliability (fault-free driving in routine situations). These go well beyond the machine-learning systems that operate AVs, and include sensor and

navigation technology for advanced braking and lane-keeping, adaptive high-resolution mapping, and communication systems.

In 2019, the AV sector is de-facto split between major OEMs, like Ford and GM, who are designing for safety and following a long-term strategy; and tech outfits competing to deliver an innovative prototype or betting on a specific niche, such as Nuro's food-delivery concept.

Crucial to any advancements is the level of the government's commitment to supporting America as the global AV leader. In 2020, the Department of Transportation launched a new set of 'light-touch' AV guidelines that call for a safety-first approach. At the same time the White House published a first version of ethical guidelines for 'trustworthy' AI in all sectors.

Sky-high potential...?

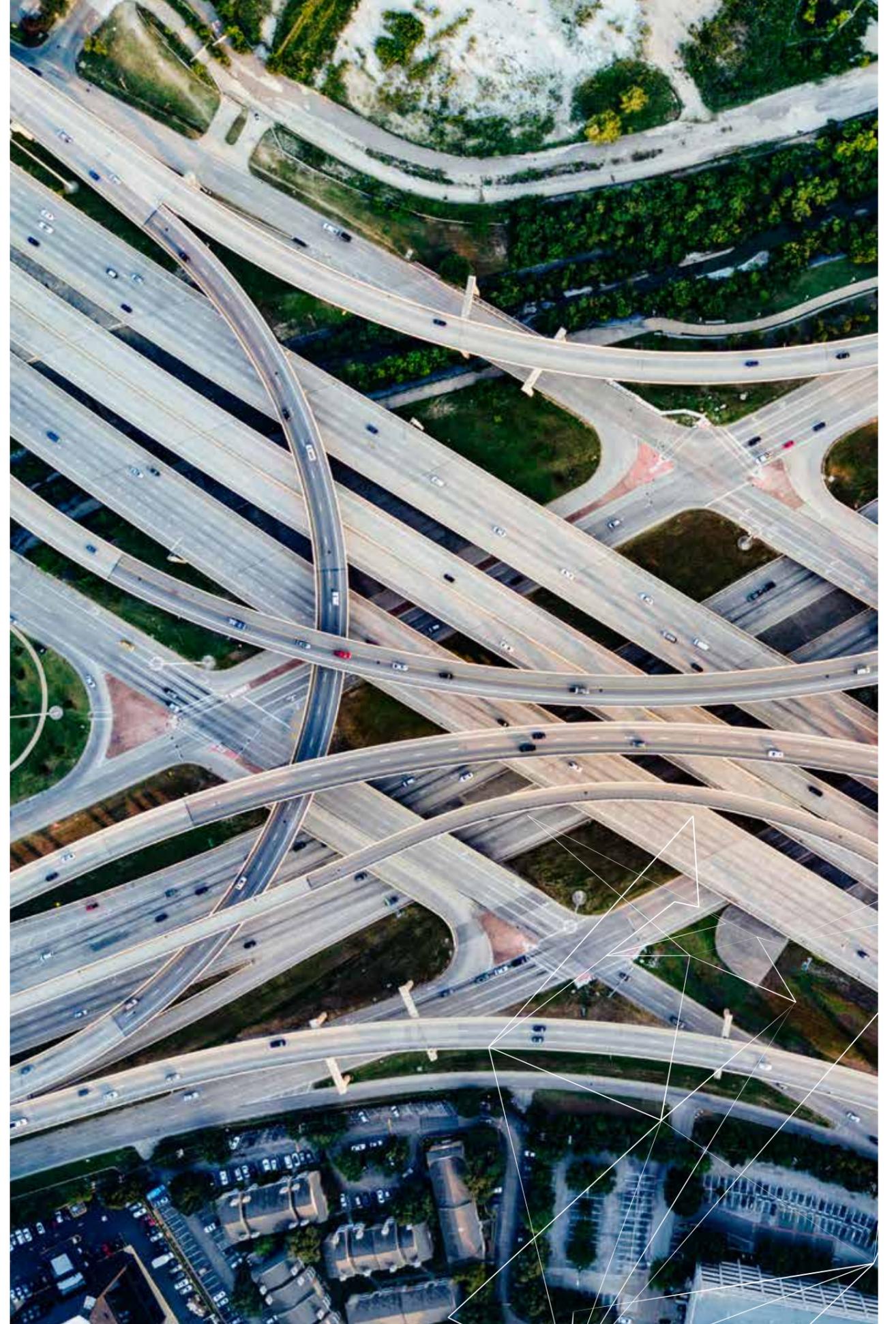
Going forward, various AV technologies are likely to be adopted in specific, less complex environments (no passengers, predictable weather, fixed routes, highways without level crossings). It might also be worth watching test results from first-generation airborne AVs (including consortia like Hyundai and Uber): while road traffic remains so challenging, flying AV may become a valid option alongside, or even before, their road-based counterparts.

For the US, Dutch expertise is of particular interest when it comes to testing complex, highly connected and increasingly autonomous mobility systems. The Netherlands Innovation Network is continuously seeking to facilitate possible matches,

particularly in the fields of sensor and navigation technology, traffic management, safety standards and cyber security.

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The AV sector is split between major OEMs following a long-term strategy and tech outfits competing to deliver an innovative prototype



Singapore: A smart balance of vision and implementation

Singapore is investing heavily to become a digital powerhouse and the world's first Smart Nation. AI is a key technology on that journey. Singapore's national AI strategy focuses on implementation of AI, scalable AI projects and expanding engineering capabilities.

A focused, pragmatic strategy

In 2017, Singapore's National AI Programme was launched to support the development of AI solutions and talent. Followed by the National AI Strategy (NAIS) in November 2019. This strategy focuses on strengthening the AI ecosystem and identifying National AI Projects within key sectors. These are sectors where Singapore already enjoys a competitive edge, including transport & logistics, cybersecurity, smart cities & estates, and healthcare.





Singapore is positioning itself as a living lab for AV deployment and smart mobility infrastructure

In 2019, Singapore also published a Model AI Governance Framework, which translates ethical principles into practical measures organisations can take when deploying AI solutions.

Enhancing liveability

To maintain liveability in Singapore, the government has set a goal to create a car-lite city state, with AV used as a last-mile solution. And not just cars: Volvo and Nanyang Technological University have launched the world's first 12-meter long autonomous electric bus.

High flyers working together

Singapore and the Netherlands both rank high on multiple smart mobility indexes. With Singapore positioning itself as a living lab for AV deployment and smart mobility infrastructure, the Netherlands Innovation Network can help Dutch knowledge institutes and companies develop collaborative projects in Singapore.

TNO is since 2017 involved in developing safety assessment methods for AV certification in Singapore. TNO researches the use of AI in identification and classification of scenarios in large datasets collected in traffic. The scenarios are used in assessments and must therefore be representative of real-world traffic.

In 2019, Singapore, the Netherlands and seven EUREKA countries launched the first Global Stars Call for collaborative R&D projects. One of the successful projects is a technology partnership between Dutch company Sioux Technologies, and Singapore's Moovita to create a system that can share an AV's intention in a user-friendly way with nearby road users.

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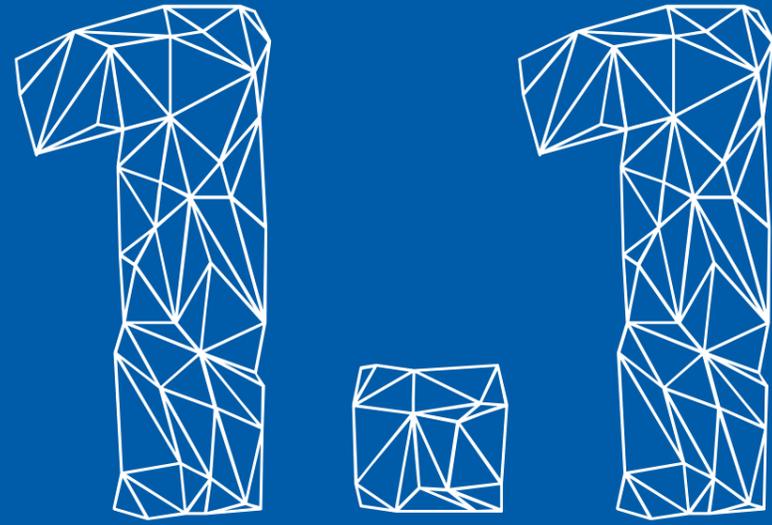
Two national AI projects

Intelligent Freight Planning

This longer-term project will use AI to pool and dynamically assign trucking jobs in order to optimize freight movement on Singapore's busy roads. Next steps will be intelligent truck routing & scheduling, and AI-enabled urban planning & modelling.

Ride-hailing and urban planning

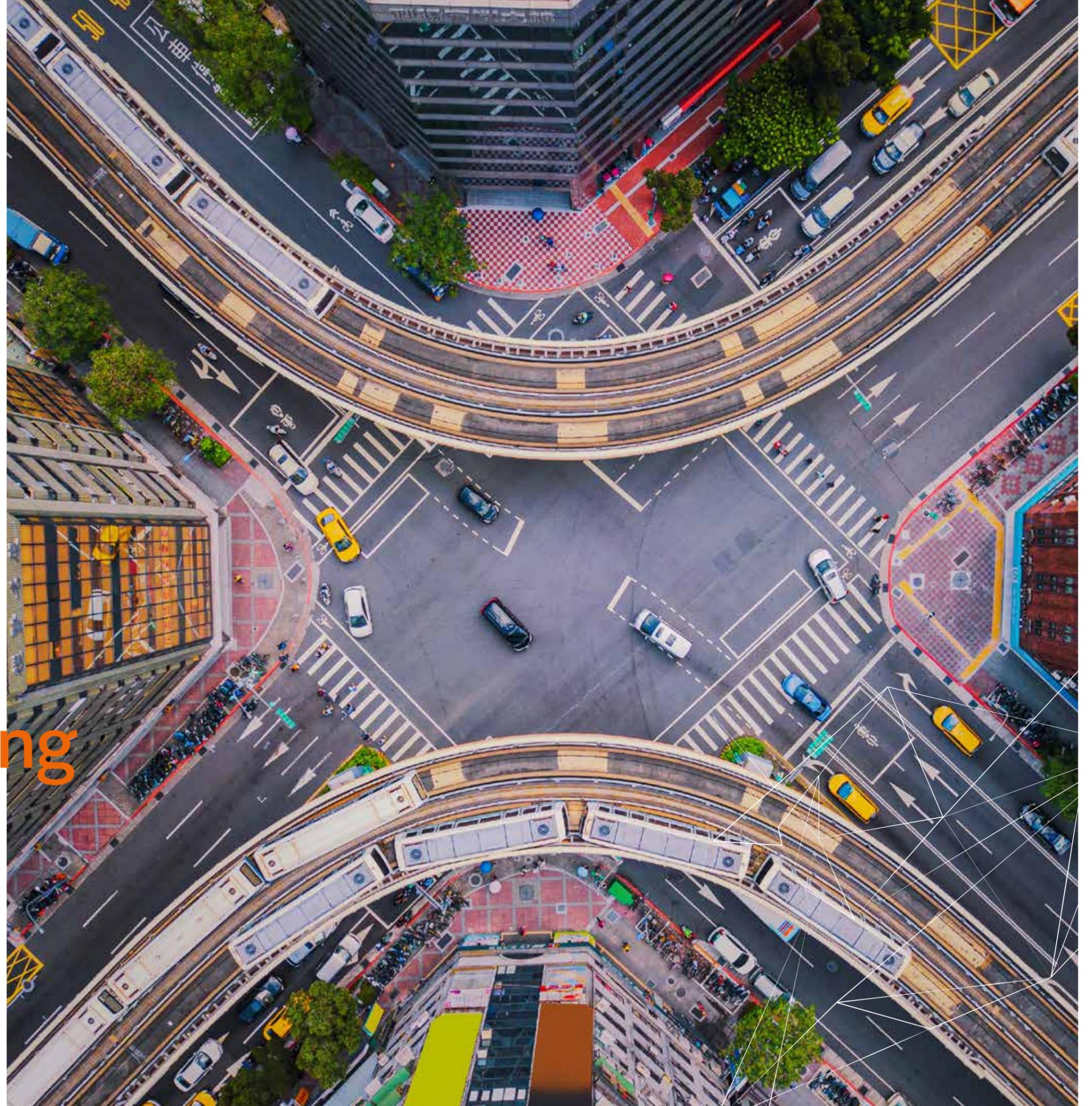
Singapore-based ride-hailing company, Grab, has opened an AI Lab in collaboration with the National University of Singapore. Data that Grab gathers will be used to develop algorithms and models that can assist government urban planning to optimize traffic flow.



TAIWAN: IN 2018,
THE GOVERNMENT
PUBLISHED A **€1.1 BILLION**
4-YEAR AI ACTION PLAN,
ON TOP OF A €500 MILLION
5-YEAR AI STRATEGY
PUBLISHED IN 2017

Taiwan: Strong foundations for a promising future

With strong technological foundations in ICT, semi-conductors and manufacturing, a healthy talent pool and well-funded government plans, Taiwan is well-positioned to flourish in AI development. In addition, its comprehensive transportation infrastructure and commitment to smart cities have made the country an Asian hub in the area of smart mobility.



Government policies

In 2018, the government published a €1.1 billion 4-year AI Action Plan, on top of a €500 million 5-year AI Strategy laid out by the Ministry of Science & Technology (MoST) in 2017 (see Table X). A 'sandbox' bill was also passed that facilitates and encourages AV developments in the automotive industry by minimising bureaucracy and regulations.

PAIR Labs

One of the four MoST AI innovation research centres (see Table Y) focuses on AI technologies in daily applications (PAIR Labs), including advanced driver assistance systems and self-driving applications for mobility. Research focuses on areas such as automatic data labelling for deep learning applications, behaviour analysis algorithms for model development, and the development of a real-time computing platform.

Table X
AI Action Plan

AI for industrial innovation	Connect industry with AI solutions and enable AI-driven innovation in SMEs
AI International Innovation Hub	Foster 100 AI startups and develop international AI innovation clusters
AI Pilot projects	Launch AI research projects
AI Talent Programme	Cultivate, train and attract talent
Test field and Regulatory Co-Creation	Open fields and data for testing

Table Y
MoST AI Strategy

AI Cloud Platform	Develop an AI R&D platform for cloud services and high-speed computing
AI research centres	Establish 4 AI innovation research centres at universities, focused on health, manufacturing and day-to-day applications
AI robot makerspace	Develop test fields for AI robotics
Semiconductor programme	Focus on AI-powered edge computing
AI Grand Challenges	Competitions to stimulate AI innovations

Taiwanese universities rank consistently well on AI and turn out some 10,000 graduates a year in AI-relevant disciplines



Taiwan CAR Lab

The Taiwan CAR (Connected, Autonomous, Road-test) Lab is a €7.5 million test facility to encourage the development of AV technologies and services, and provides tests required for innovative experiments in the regulatory sandbox.

7StarLake

7StarLake specialises in AV public transportation. The locally manufactured EZ10 electric-powered AV shuttle bus has been tested across 2500 km in Taiwan, transporting over 14,000 passengers.

Multinationals in Taiwan

In recent years, IBM, Google, Microsoft and others have all opened AI R&D centres in Taiwan. Apart from subsidies from the Ministry of Economic Affairs, they chose Taiwan because of its easy access to software, hardware, talent, data and infrastructure.

Audi, for example, hold annual innovation awards for smart mobility in Taiwan. The winner gets to collaborate with Audi, who choose to drive their innovation in Taiwan because of the country's extensive transport infrastructure and the ease of doing tests.

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AI Talent

Taiwan has established a two-track AI Academy to train and prepare professionals for AI. The AI-specific track focuses on the computer science skills needed to develop AI further. The AI-domain knowledge track focuses on applying AI in specific domains.

Taiwanese universities score consistently well on AI rankings in Asia, and turn out some 10,000 graduates annually in computer science and information system management-related subjects.

The Netherlands Innovation Network in Taiwan is currently writing an extensive report on AI developments in the country, and specifically on AI in Health.

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Netherlands Innovation Network

The Netherlands Innovation Network stimulates international cooperation between companies, research institutes and public authorities in the fields of innovation, technology and science. The network's activities help implement the international knowledge and innovation agenda of the Dutch government. We address national and global challenges, aiming to further develop key enabling technologies through international cooperation and a worldwide network of offices in: France, Germany (including Switzerland), Israel, United Kingdom, Sweden, Russia, USA (including Canada), Brazil, China, India, Japan, Taiwan, Singapore and Korea.

We develop international cooperation by:

- providing knowledge and information on the latest innovation, technology and science developments around the world;
- connecting to potential partners abroad;
- organizing innovation missions, seminars, workshops and matchmaking events abroad;
- identifying funding mechanisms for bi- and multilateral cooperation.

We look forward to the opportunity to help you become involved in sustainable innovation partnerships, so we can together advance our common innovation, technology and science ambitions.



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