sensen.ai
the Live Awareness platform

Revealed:
The biggest and most important tech trend you've never heard of

LIVE AWARENESS
AND WHY IT'S AT THE CORE OF AI

ABSTRACT

Despite so much having been written and discussed on the topic of neural networks, Large Language Models, Diffusion Models and the AI tools they have generated since mid 2022, one of the most important trends has gone almost unnoticed.

Providing AI with Live Awareness of all that is happening within the physical world in real-time is an essential function of the drive towards making AI more capable, ultimately allowing for greater decision-making powers and autonomy.

It is our view that insufficient Live Awareness is a key factor holding back cities from the deployment of self-driving cars on our roads. Meanwhile, Apple's Vision Pro may ultimately triumph over its competition as it appears to have more Live Awareness baked in than Meta's Quest headsets.

Given the central importance of Live Awareness to AI, it is odd that more attention has not been paid to it. Yet this insight gap has also insulated our business, SenSen, from direct competition.

Whilst Live Awareness is being created on a product-by-product basis, we have developed the only platform which can fuse multiple real time data sources of any type into a single stream of Live Awareness for AIs, allowing our team to build better, more performant services on top.

This platform is already commercialized through a range of live awareness solutions and in intensive daily use. In this White Paper we reveal the significance of Live Awareness and why it is core to the future of AI.

THE CURRENT CONTEXT IN WHICH LIVE AWARENESS EXISTS

What will be the
final impact of neural networks and
the Large Language Models and Large Diffusion
Models they create?

At the start of 2023, these felt like impossible questions. The qualitative differences in MidJourney's public beta and then GPT-4's capabilities had taken many well-connected industry insiders, let alone the general public, by surprise.

Now, however, the fog is lifting. If Artificial General Intelligence does not emerge from ever-larger neural networks, it will turn out that size is not everything required for 'thought'. And the current crop of technology is likely to significantly augment, rather than entirely replace, many human activities.

This does, of course, remain an 'if'. The extent to which LLMs will accelerate the advent of Artificial General Intelligence (AGI) remains an open question.

There is evidence that GPT-4 is more than the statistical pattern-matcher it was built to be. Certain other properties seem to have emerged. GPT-4 could have other reasoning abilities. It may even have a theory of mind.

Much of which would help explain the enormous and inarguable global fascination in LLMs. SimilarWeb reported that in May 2023 chat.openai.com received 1.8bn visits of an average duration of 8 minutes and 32 seconds. That was less than one 48th of Google.com's traffic. But it's closing in on Amazon.com's 2.3 billion.

However, it is not hard to find experts who doubt whether LLMs are as capable as they seem. And there remains wild disagreement on how close we are to AGI.

In this paper we argue that amidst this continued fog, there is one certainty which has slipped past most of us. Whatever happens over the next decade, one of the most immediate step changes in AI is already here. Artificial Intelligence is being made far more proficient by being given Live Awareness.

Allow us to explain...

WHAT IS LIVE AWARENESS?

We define Live Awareness as an emergent capability of an AI system which receives sensor data from physical spaces fused with contextually relevant digitally-originated data, often from an enterprise source.

This Live Awareness allows the AI to find accurate signals within the hybrid real world and digital input, identifying patterns and delivering insights that are otherwise impossible to obtain.

Live Awareness, of course, occurs in humans. Our brain fuses together some of the sensory data it has access to and brings it together in our conscious mind.

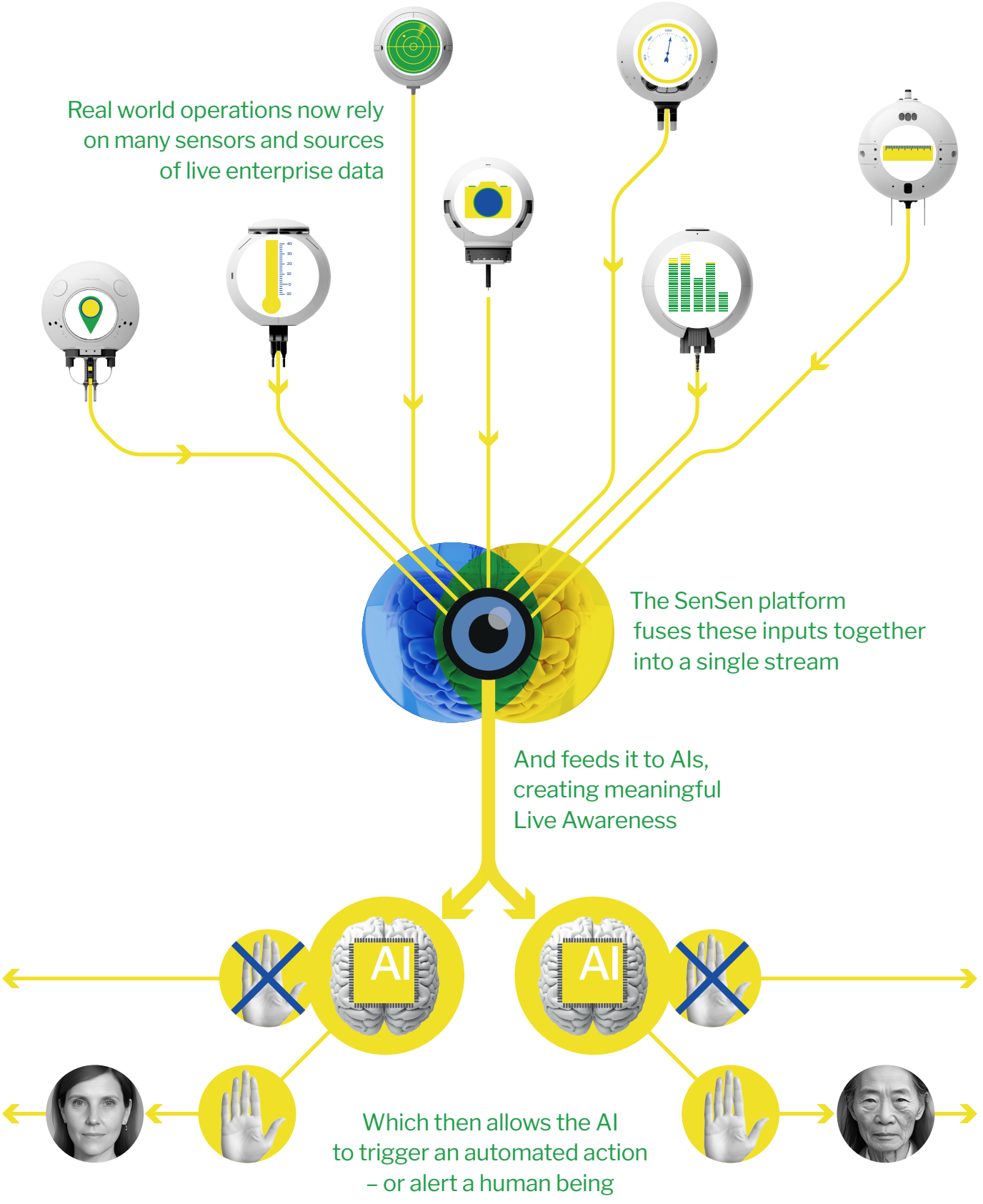
Animals, using different senses and varying degrees of consciousness, also have Live Awareness. It creates a unique 'umwelt' for each organism – the way in which a species perceives its environment. Without an understanding that we, and animals, have Live Awareness, we could not ask Thomas Negel's famous question: 'What's it like to be a bat?'

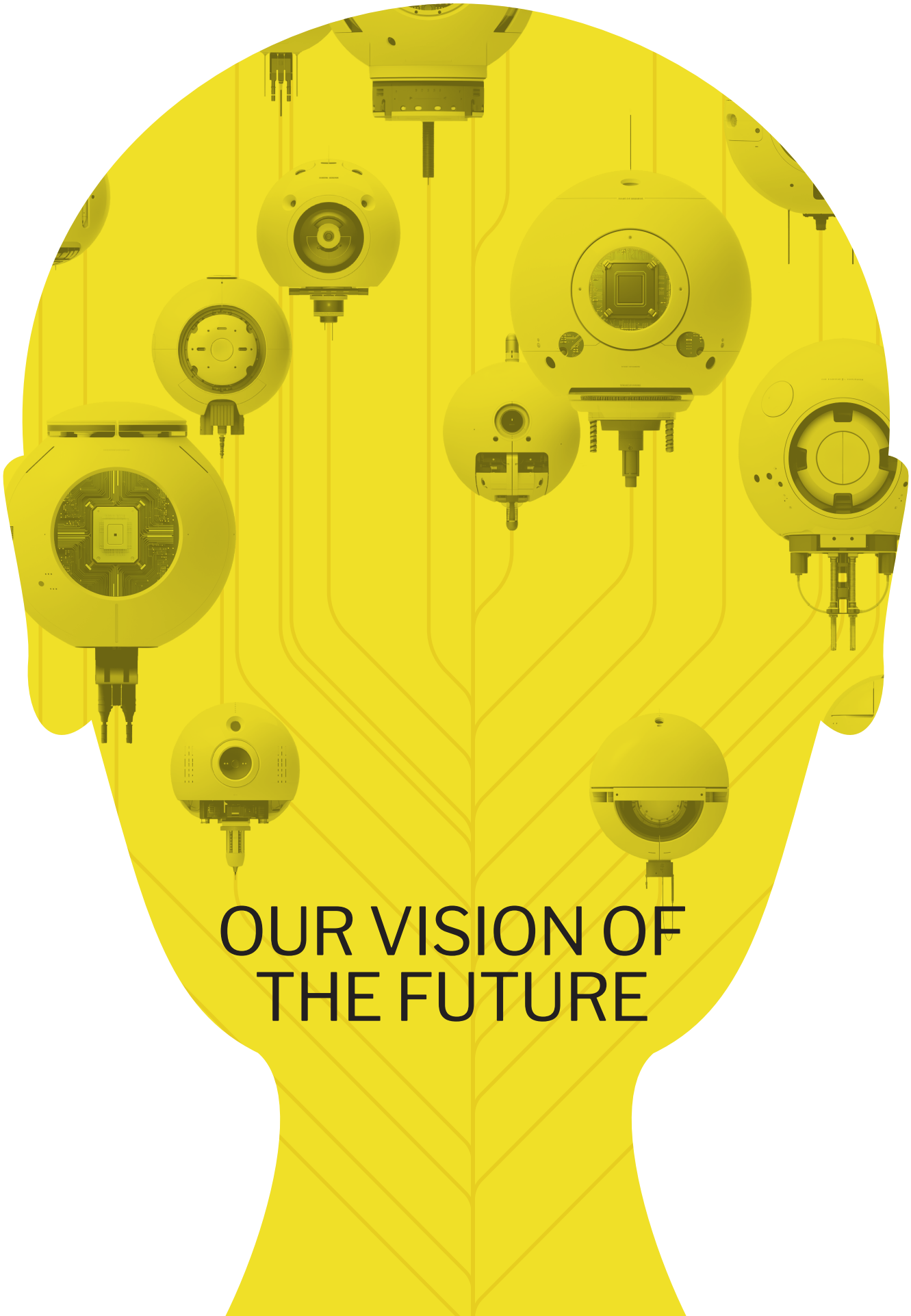
Machines, of course, do not currently exist on the same continuum as humans and animals. Even the most sophisticated machines lack consciousness. They also only have limited aspects of an umwelt – the data points machines use can only provide 'meaning' in a strictly logical sense. It is not 'like' anything to be a machine. Machines do not feel. They do not have mental models. They run via a series of instructions determined by logic gates.

Yet they can be given Live Awareness. Driverless cars. Boston Dynamics' robots. And on a more basic level, Apple's forthcoming Vision Pro. As well as the smartphone in your pocket. All have a variety of sensors which deliver streams of data that are fused together so an AI can interpret the real-time context and environment, detect patterns and make decisions.

Live Awareness is also being used on city streets as well as in shops, airports, seaports, casinos, universities, schools and even in petrol station forecourts. Why this clearly trending feature of technology has not been spotted, analyzed, tracked and discussed at length is something of a mystery to SenSen.

This white paper has the objective of correcting that absence.


Real world operations now rely on many sensors and sources of live enterprise data
The SenSen platform fuses these inputs together into a single stream
And feeds it to AIs, creating meaningful Live Awareness
AI
AI
Which then allows the AI to trigger an automated action – or alert a human being



OUR VISION OF THE FUTURE

It's probable that what we expect of the future is not far from your own vision.

Compute and energy costs will continue to trend towards zero. Total compute power will continue to grow exponentially. AI will increase our efficiency and productivity. The human immune system will be mapped and largely mastered, leading to increased life expectancy.

We also see that humanity's future includes a single physical-digital realm – a unified Internet of Everything, enhanced by AI, rapidly increasing the rate of innovation and change. Where everything physical is also represented digitally as data.

Almost every object will be networked. And AIs will manage tasks – in the real and digital worlds – which no longer need our physical, intellectual, or moral intervention.

Ultimately, the natively digital will blend into the natively physical, creating one singular realm. Which, if built and managed correctly, will be motivated by a good-enough understanding of humanity's generalized wellbeing to improve average and minimum quality of life globally.

Climate change is perhaps the most serious potential disruptor we face on this journey. It will, at best, act as a limiter to certain categories of progress. At worst, it will lead to billions of deaths and greatly retard the rate of technological development.

Given all the above, the ways in which economies function will have to evolve. Almost certainly on some fundamental levels. Meanwhile, governments and fortunes will continue to rise and fall. Sometimes in turbulent and unpredictable ways.

There are, of course, many other probabilities of the future we could mostly agree on.

However, there is one significant area which is often overlooked. One which helps start to explain why the trend of Live Awareness – and its necessity for successful AI evolution – is a relatively unchartered territory.

That area is the ubiquity of sensors. The apparatus which detects and reports data on the state of the world – the devices which tell us 'what's going on' – are seldom considered interesting in their own right. They therefore garner little attention, thought or speculation.

Yet without the incredible accuracy, sophistication, and sensitivity of optical, positional, pressure and chemical sensors we could not pack billions of transistors onto a single semiconductor. In fact, most of our automated manufacturing and other machine processes would be very hit and miss indeed.

Then there are CCTV cameras, of which it is reckoned the world has more than 1 billion. Not to mention the billions of cameras in smartphones – loaded front and back – and packed tightly against sensors for light, sound, direction, velocity, proximity, and temperature. And that's before we take account of the explosion in wearables measuring health statistics.

Every form of motorized transport also relies on sensors. As does your washing machine, iron, refrigerator, oven and all your computing devices. Well-established trends such as smart homes, smart cities, the Internet of Everything, robotics and healthcare technologies – already expanding to include sensors at the nanoscale – are set to ensure future sensor use vastly eclipses today's.

And with the ubiquitous nature of sensors, Live Awareness is also set to become as commonplace. Because sensor data is far more valuable when fused and streamed to advanced AI.

THE PRIMACY OF LIVE AWARENESS

It may seem self-evident that when a critical mass of AI exists in the world alongside a critical mass of sensors, the two will be hooked up and some form of relatively generalized level of Live Awareness will emerge.

It is difficult to argue that AI will be more capable without the knowledge of what's going on around it – especially as Live Awareness will be easily integrated and cheaply available.

However, we must first acknowledge the complexity of delivering effective Live Awareness today.

We hold that the current delays in fully autonomous vehicles are, in large part, a Live Awareness problem. There is nothing deficient in AI's current compute abilities. In addition, many millions of driving hours have been recorded. Sufficient, it would seem, for almost every statistically relevant driving situation to have occurred a number of times. Certainly in the case of Tesla. The quantity of available data appears entirely sufficient for the requisite machine learning.

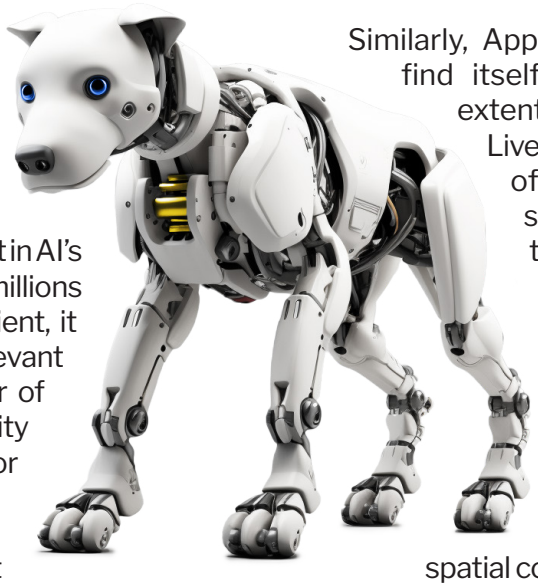
Instead, SenSen would argue, it is the current level of Live Awareness, or at least governments' and public perception of its inadequacy, which is holding back full autonomy. Self-driving cars have to make almost instantaneous decisions as the world around them changes suddenly and unpredictably. They then have to work out what to do with the tons of metal they are controlling.

This is certainly a lot to take into account, especially when the stakes are high. Yet imagine each vehicle had a god's-eye view of all traffic, pedestrians, trajectories, velocities, terrains, road signs and markings within 100 meters.

Clearly this level of Live Awareness, fused with existing sensor data and processed by available levels of compute, would be sufficient. In reality and in the minds of licensing agencies. The question then becomes which elements are necessary – and which are not – to create rich-enough Live Awareness. And that captures the current debate between the use of Lidar as a core sensor and Elon Musk's claim it is a 'crutch'.

This Live Awareness 'sufficiency' lens then allows us to deepen our understanding of what is stifling many of the adoption rates of autonomous AI – in both the digital and physical realms.

Autonomous robots, whether in canine or human form, have the poise and dexterity to flip and cartwheel in relatively low-complexity environments. But they do not have sufficient Live Awareness to be let loose in public.



Similarly, Apple's Vision Pro may find itself successful to the extent that its onboard Live Awareness, courtesy of its multitude of sensors including eye tracking, is able to create and then translate sufficient understanding of a user's intentions, state of mind and the external environment, to provide a seamless spatial computing experience.

Mark Zuckerberg is correct that his rival's tech has 'no magical solutions'. But he may have secretly come to realize that Quest headsets have been missing sufficient Live Awareness – of users' feelings and the world around them.

The underlying conclusion of these insights is that sufficient Live Awareness is critical to products using AI, at least to those assuming greater levels of influence and ultimately autonomy. Live Awareness, in turn, is dependent on sufficient data. And, where the real world is concerned, that critical data comes from sensors.

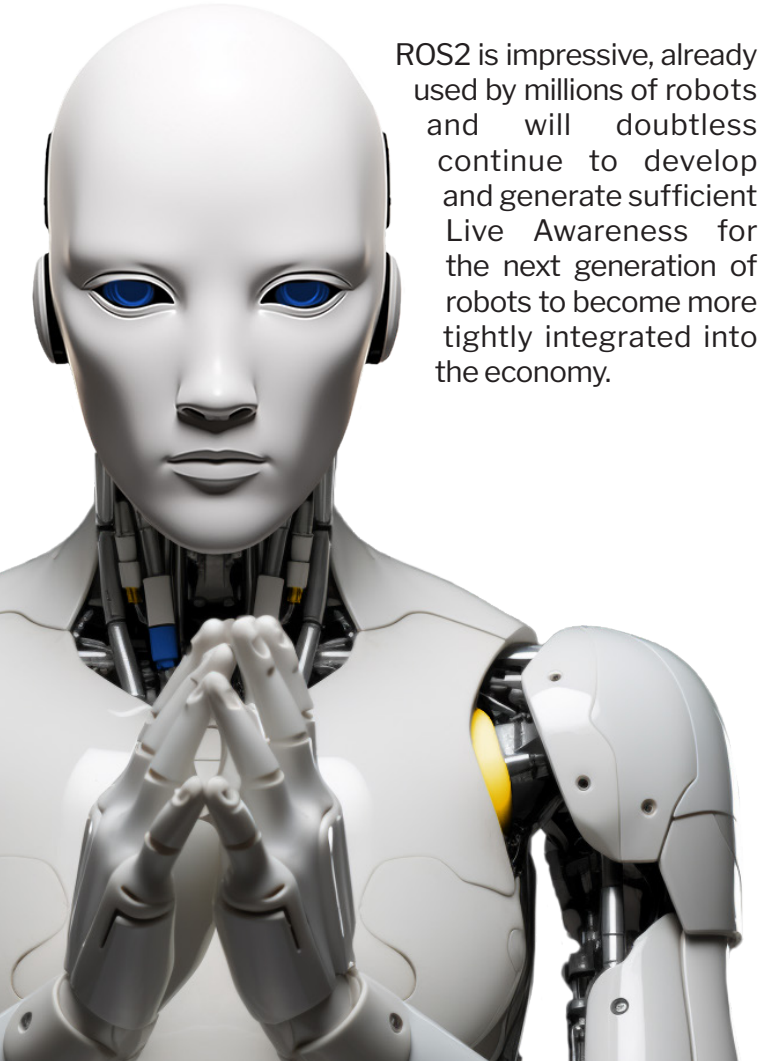
So, as developers realize the relationships between sensor data, Live Awareness and mass adoption of products and services, it is reasonable to conclude that Live Awareness is set to become widespread.

HOW WILL LIVE AWARENESS BE COMMERCIALIZED?

Given Live Awareness' necessary role in the development of AI, it would be reasonable to expect that a multitude of platforms delivering Live Awareness already exist. And it is certainly true that individual products have achieved sufficient and impressive levels of Live Awareness.

The most ubiquitous being smartphones. As well as being highly portable, connected computers, smartphones are multi-sensor systems with the ability to capture and fuse data from cameras, microphones, accelerometers, gyroscopes, altimeters, GPS, and magnetometers. These fused streams can also be fed into on-board AI, now running on ever-advancing processors, which take decisions and make suggestions based on the understanding its Live Awareness creates.

There are also other platforms like ROS2 (Robot Operating Systems 2) that can receive multiple real world sensory data streams, fuse them together in an input-agnostic manner and build a unified picture of reality. All before delivering it to an onboard or remote, AI.



ROS2 is impressive, already used by millions of robots and will doubtless continue to develop and generate sufficient Live Awareness for the next generation of robots to become more tightly integrated into the economy.

Yet both of those builds have been limited to a tightly bounded set of use cases. The technologies are not easily extractable from their contexts. Nor would they easily support a more abstracted and generalized set of features. They were coded for specific use cases and as such are unable to provide sufficient Live Awareness to other use cases.

This is precisely the gap which SenSen fills.

Our platform provides an abstracted and generalized set of capabilities which fuses data together from any sensor or other digital source and delivers it to any relevant AI. SenSen could create Live Awareness for smartphones. It could also enable robots to integrate tightly into a complex human environment. And it could be a core component in spatial computing products.

Our only focus is to deliver Live Awareness to any intelligent system. As far as we are aware, SenSen is without peers in this.

Development began fifteen years ago. And whilst our clarity of vision was not as singular then as it is today, the core vision for the Live Awareness platform and its abilities have always remained the same.

We realized back then that the world will transition towards a single physical-digital realm. And that most data inputs will come from several thousand billion sensors. Sure enough, environments as small as nanoscale chemistries – and systems as large as our planet – have been increasingly subject to monitoring during the intervening period.

And we remain certain that in the next few years even more data will be streamed from shops and satellites, homes and offices – as well as from roads and vehicles, farms, factories and forests, rivers and oceans. Even deserts.

And so much of that data will need to be fused. AIs with many different applications and purposes will need to sift and sort through this universe of ones and noughts; searching for patterns, finding signals within the cacophony, making decisions, taking actions.

As well as delivering AI autonomy, Live Awareness will also form the basis for many co-decisions. AI will judge your openness to being disturbed by a WhatsApp, relative to how urgent a reply seems given the sender and the text of the message. Live Awareness will allow AIs to nudge, suggest, recommend, remind and persuade humans.

And for critical areas in which we have yet to grant autonomous authority, Live Awareness will allow AIs to raise flags on issues which need further human analysis and consideration.

At SenSen we believe no area of life will be unaffected. Economic and business strategy, social policy, energy production and distribution, healthcare, national security, media, logistics, retail, etail and even daily transport choices will be driven by the data captured and processed by Live Awareness.

The volume of data to create this new sense – and the value of its outputs – are almost too large to fully conceive. The Live Awareness commercial opportunity is similarly massive.

However, taking our learnings from the likes of Amazon, Apple, Google, Microsoft, Netflix and Tesla, we are proceeding one market at a time.

Smart cities are currently our primary focus. Live Awareness is now baked into city streets across Singapore, Las Vegas, Chicago, Calgary, Vancouver, Brisbane, the Sunshine coast, and many others.

Because our platform is agnostic in terms of input it can blend any sensor data sources, collaborating with frontline workers to improve road and personal safety in cities. Which means it helps traffic flow more easily, manages toll systems and gives planners hitherto hidden insight on how to improve quality of life.

It also spots speeding cars, parking infringements, distracted drivers, illegal u-turns and unauthorized vehicles driving in bus lanes. Infrastructure and assets including roads, curb sides, parking spaces and street furniture are all monitored. And all fused data can be managed in a single application.

Meanwhile, in the casino industry our operators and their AIs have almost complete Live Awareness of their gaming floors, having fully digitized their environment with sensors and use our platform to fuse the data into a single stream which allows fully contextualized decisions to be made – either by an AI, a croupier or a manager.

Live Awareness ensures compliance with regulations, while also identifying the most valuable customers to reward with loyalty bonuses, and provides a vast range of real time intelligence on the bets being placed to improve customer experience and financial performance.

All of which can be surfaced in the player's apps as well as management systems.

The same platform is also saving businesses, such as Chevron and AMPOL, millions of dollars every year by intercepting fuel thieves before they steal from pumps. Forecourt cameras scan number plates, and Live Awareness alerts staff when prepayment is required before fuel is delivered. Point of sale data is also included.

Should a theft still occur, the system reports offenders and manages the debt recovery process.

Given this is just the very beginning of our commercial vision, why is SenSen the only player in the Live Awareness market?

In the main, it is because no one else has spotted the opportunity. Whilst Elon Musk's team has developed a sophisticated Live Awareness system at Tesla, it is very specific to the self-driving use case. The ROS2 open source community of developers has built Live Awareness that is very specific to robotics use cases. All the amazing teams that continue to build ever more capable smartphones are delivering Live Awareness for in-context communication and entertainment needs.

At SenSen we strongly believe the world has failed to see that Live Awareness is not only an essential component of real time AI automation. It can also be successfully abstracted and genericised for any use case.

So isn't revealing this informational advantage something of a dumb move? Fortunately, no.

The practical complexity of live data fusion – coalescing all forms of sensor data into a single layer in real time – is so exponentially difficult that it helpfully digs a moat around our first mover advantage.

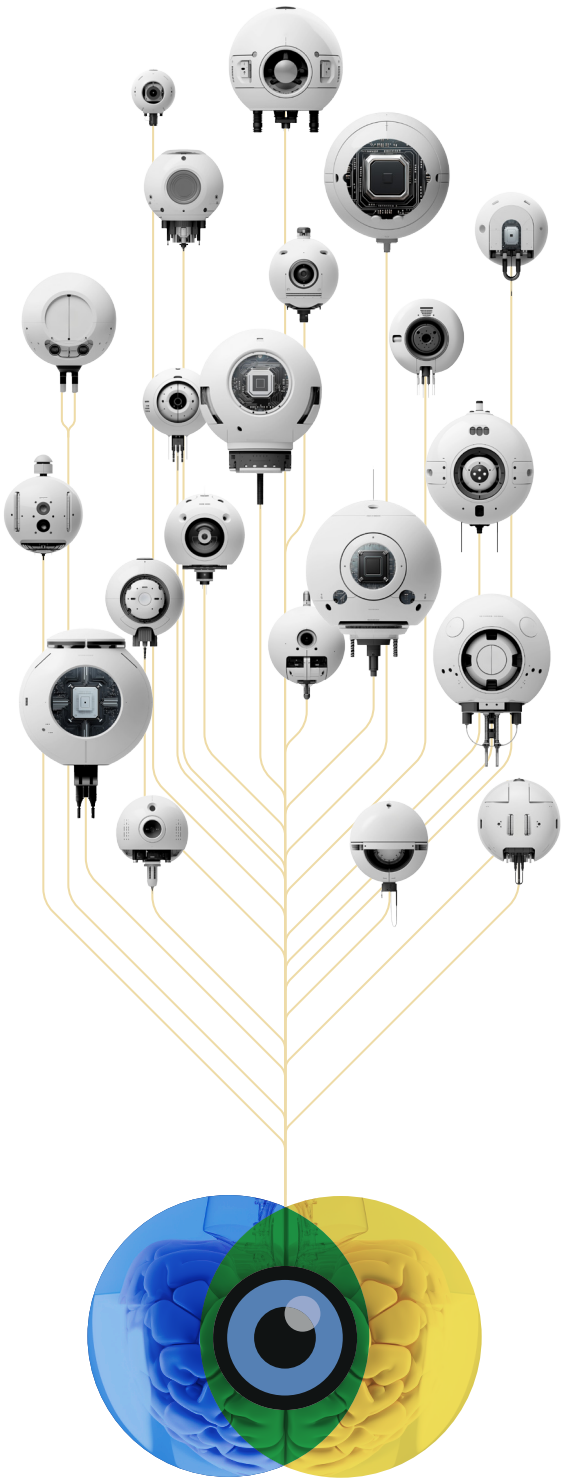
Having sunk fifteen years into product development, economies of scale have kicked in and the business is able to offer customers affordability, despite providing access to leading-edge capabilities. And given the new and valuable abilities Live Awareness unlocks, customers are not in the habit of canceling contracts – strengthening our ability to scale.

Sensen is now pressing home our first mover, scale and cost advantages to accelerate the growth of our Live Awareness network to deliver a truly global presence. As well as growing by one city, one forecourt, one school, one university and one casino at a time.

Campaigns into other sectors such as defense, mining, homeland security and healthcare are being prepared. SenSen's flexible and extensible platform steps across industry lines as if no delineation existed.

Which is why Sensen continues to believe in its big vision of the future – a single physical-digital realm, made better by automated AI which rapidly increases the rate of innovation and improves the lives of humanity.

All fueled by sensors, the data they produce and SenSen's global layer of Live Awareness.



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