

arm

AI Today, AI Tomorrow

The Arm 2020 Global AI Survey



NORTHSTAR

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A Note on the Research

Research for this report was conducted by Northstar Research Partners Ltd on behalf of Arm. Northstar is an independent research agency working out of London.

How many people were spoken to?

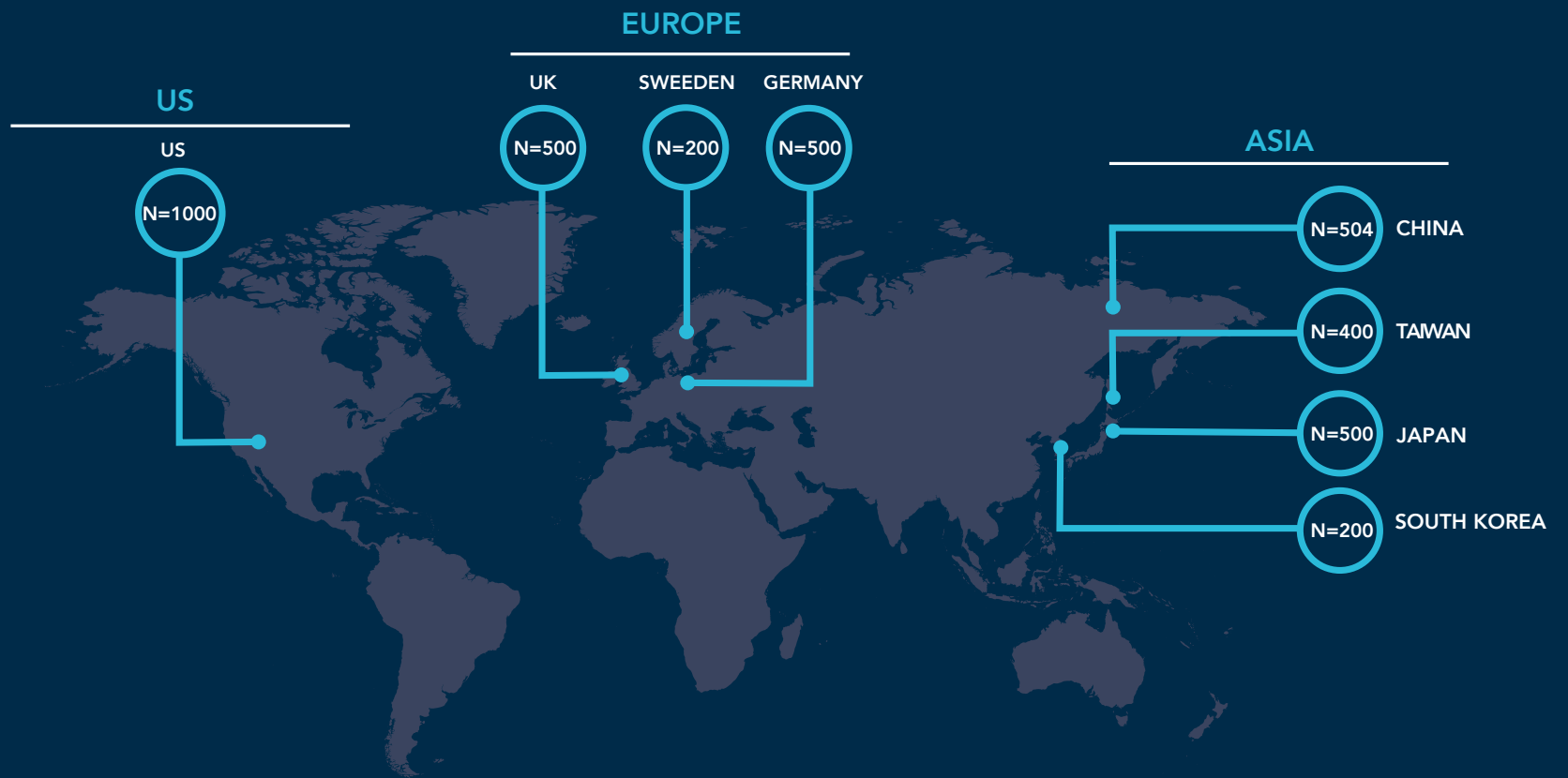
Globally, 3,804 consumers were interviewed through an in-depth online survey. These interviews fall out across regions and markets as below.

The survey group

All respondents who took part in the survey were screened to make sure they had at least a basic understanding of artificial intelligence (AI).

All respondents know either “lots” or “a bit” about AI. We screened out people who knew less than this.

All respondents think that AI either “already” has or “eventually” will have an impact on the way we live as humans. We screened out people who selected that AI will “never” have an impact.





Jem Davies, VP, Fellow
and GM, Machine
Learning Group at Arm

A world made better by artificial intelligence (AI) has been one of humanity's longest-held technological visions, and in 2020 that vision is undoubtedly being realized. AI is in our pockets, our homes, our cars, our workplaces and it's already making a real difference to how we experience the world around us.

This report—the result of a survey of almost 4,000 consumers from around the world by Northstar Research on behalf of Arm—aims to answer those questions and in doing so, paint a picture of AI acceptance in 2020.

It's a guidebook to how people feel about the advancement of intelligent technology already reshaping many human experiences.

Foreword

Today, Arm is at the center of AI devices. Through a combination of Arm Cortex CPUs, Mali GPUs and Ethos NPUs, we're enabling advanced AI use cases capable of transforming industries and user experiences on 85 percent of the world's mobile devices and a vast number of AIoT devices such as smart home appliances, wearables and sensors.

But what *are* those AI use cases? What AI-assisted technologies are currently most popular? What makes people comfortable with one AI-based technology and uncomfortable with another? Where are the opportunities for device manufacturers and what are the risks?

To find out, we presented consumers with a range of AI use cases, and asked them how comfortable they felt about each one. Some were already mainstream: a device that controls your heating and lighting, for example.

Others were more hypothetical, such as a car that intervenes if the human operator begins driving poorly or a television that recognizes young viewers in order to impose content restrictions. As you'll discover, there's certainly a line to be crossed between comfort and concern.

Another key theme in this report is what consumers perceive AI is, and what it isn't. The good news is that consumers can clearly differentiate reality from sci-fi dystopia: fewer than 1 in 10 respondents in Northstar's survey defined AI as describing human-like android robots that talk, walk and feel human emotions or have any element of self-awareness or free will. While these elements aren't inherently negative, it's certainly a relief to see most consumers recognizing the reality of AI as it exists today.

However, one thing that stands out for me is that public awareness of AI seems highly dependent on the visibility of its application. Northstar makes an interesting distinction between 'visible' and 'invisible' AI: at one end of the spectrum we have the most tangible AI devices such as robots, while at the other are those algorithms silently and seamlessly improving our experience behind the scenes. Case in point, 90 percent of respondents understood that voice assistants such as Alexa make use of AI. But when we asked the same about online shopping sites, streaming video services and social media—all employers of AI and machine learning—almost a third didn't think they did.

You'll find a great deal of positivity towards both current and near-future AI applications in the report, but it's always worth remembering the high stakes for AI. As awareness over the level of personal data that AI needs to perform well has grown, so has demand for security.

So much so that concern around data privacy extends to a one-chance mentality for many. More than a third of respondents said they would switch to a competitor's product should an AI device they use be hacked, and a further third would consider stopping using that device category altogether.

But while awareness and concern might fluctuate across use cases, there's a clear understanding that AI is all around us. In every country, age group and demographic in our survey, over half of respondents felt AI is already having an impact on the way they live and the world around them.

It's time to stop talking about AI as a futuristic technology and begin talking about how we're adapting to it as a force already enhancing so many aspects of our daily lives.

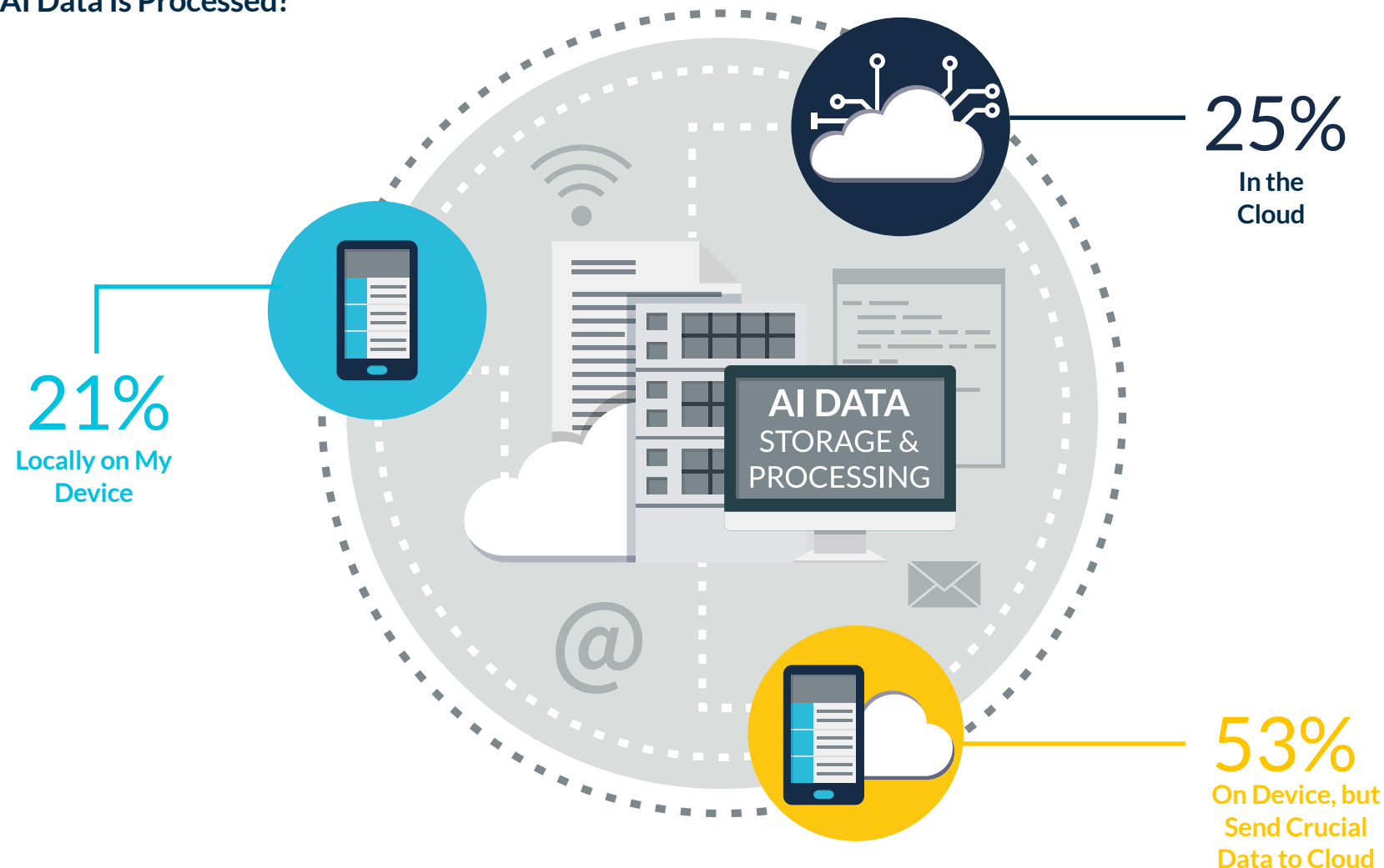
Where Should AI Data Live?

One of the most important questions in AI is where the substantial amount of data our devices generate about us is stored and processed.

Would people prefer it only ever exist within our device, be sent to some point within the network infrastructure or go all the way to the cloud for AI processing?

In this survey, we found that while most people accept AI as a technology that learns from their personal data, the fact that so much of this data is today being sent to the cloud for processing is currently a limiting factor in AI adoption.

Where Would Consumers Prefer AI Data Is Processed?



The majority of respondents would feel more secure with devices that process data locally and only uploaded data about them to the cloud when absolutely necessary. In short, users need to trust that devices “know” a lot about them but will only “tell” the absolute minimum needed to anyone else. It’s not dissimilar to the confidentiality and trust we’d expect from a doctor/patient relationship.

As data breaches become more serious for companies and regulators prepare to hit bad behavior hard, digital

discretion in the form of data protection and on-device processing will move from a feature to an expectation for customers. Bear that in mind as you read the rest of this year’s report.

Anything that learns from your habits could be seen as a spy unless you are previously told it’s doing so. That information is probably shared with the owner of the AI. What do they do with that information? [UK Consumer]

Phases of Consumer AI Innovation

When we asked respondents about the AI-driven technologies they are using right now, it became clear that AI's evolution within the consumer market falls into three distinct camps.

These align loosely with the first two decades of the 21st century.

First, we see tech which went mainstream in the mid- to late-2000s and is now used by well over half the people we talked to. Online shopping, GPS and navigation apps, and social networking are firmly part of everyday life—they don't feel new anymore.

AI already exists in our daily lives... like travel, shopping, browsing the web. [US Consumer]

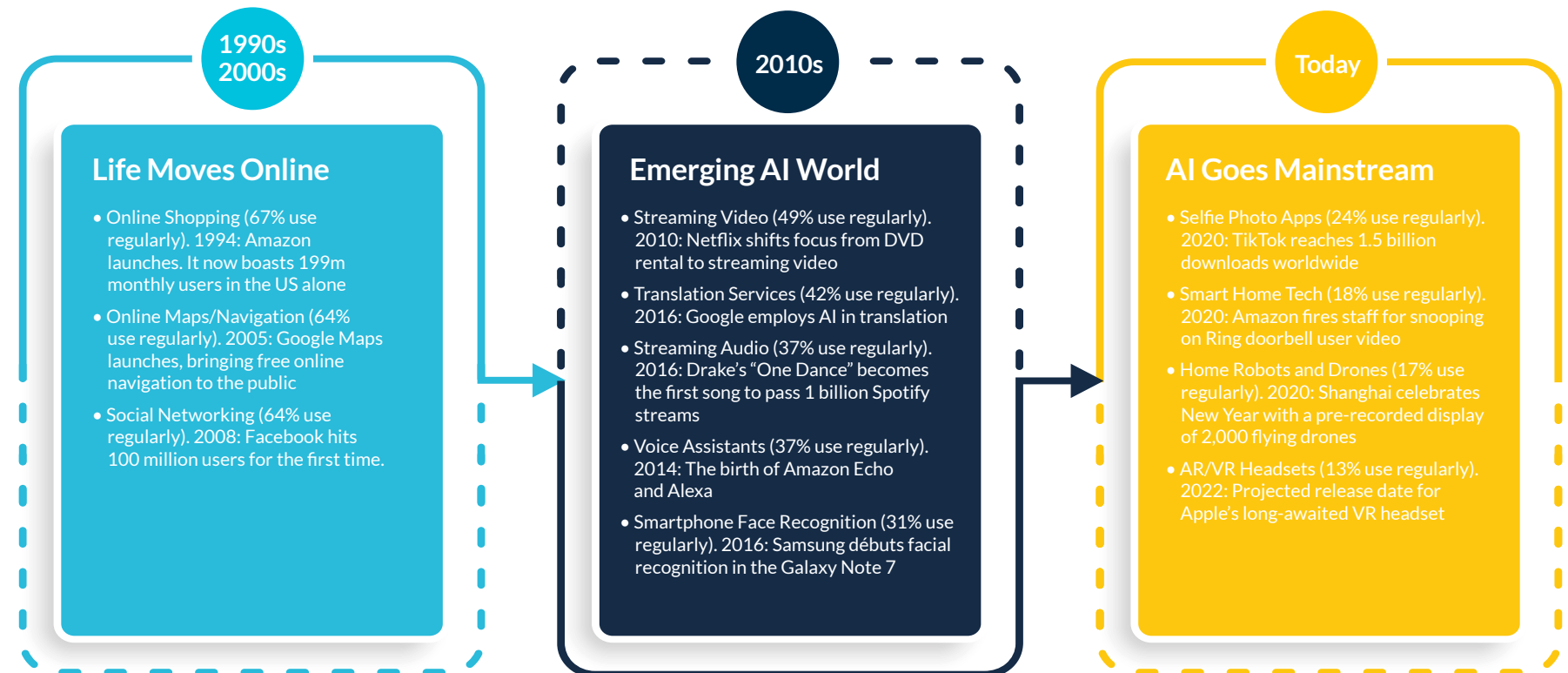
Then we see innovations that begin to create a personal engagement between us and AI, this time in the mid- to late-2010s. Between 30 and 50 percent of our participants use these, with the numbers rising for those aged under 45. Computational photography, facial recognition and voice assistants are close to becoming fully mainstream.

I really like my Amazon Alexa device. She is a great help. [US Consumer]

And finally, we see the innovations whose adoption will define the 2020s. That's AI-enabled tech used by under a third of participants today but is set to play a far greater role in the future through devices such as drones, augmented and virtual reality (AR/VR), wearables and smart home technology.

There are plenty of devices with AI, but I think they are very expensive. I think people are getting too lazy by having Smart Home [technology] managing lighting or temperature. I guess, when it gets more popular and less expensive, I would like to try some AI devices, e.g. wearables for fitness. [UK Consumer]

All this technology uses AI—but it's the emerging innovations that hold the greatest promise for applications which might transform society in the near future.



AI Optimism: The Age of Improvement

How are humans feeling about crossing the threshold into an AI-enhanced world? According to our survey, the majority think AI will make the world a better place.

This optimism crosses demographics and borders—only in Germany, where privacy laws are stronger and tech firms are viewed with greater suspicion, is there a significantly greater concern over AI's impact on our lives (41 percent).

AI has great potential. It can be used in medical, education, daily life, etc., can reduce production costs, improve efficiency, reduce operating risk... there are endless benefits. [Chinese Consumer]

The business conversation around AI is often framed in terms of savings—automation will save us money and time.

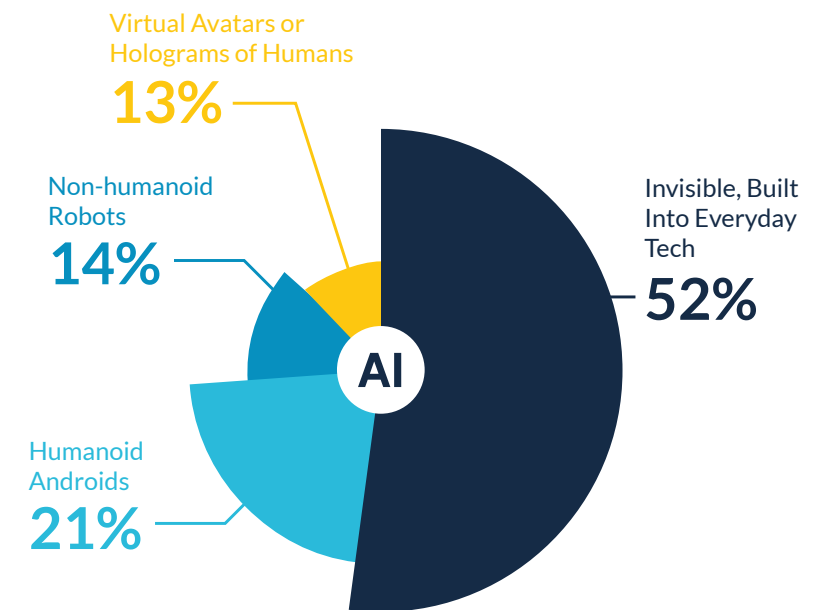
But consumers are also excited by the possibilities not just for savings but for more innovative changes. Asked how AI might benefit the world most, a third pointed to its ability to drive scientific advances that will help humans, especially when it comes to health and environmental protection. Only 12 percent thought the biggest benefit would lie in economic efficiencies, and only 11 percent named more free time for humans.

Most people think of a future with AI and assume a life like the old Jetsons cartoon. I would just like to have a future where AI is used to help in the medical field, saving lives or protecting our homes and loved ones. [US Consumer]

We can see this positivity in the stories around AI that hit the headlines. At the start of 2020 a study from Google claimed that AI breast cancer screening was already outperforming human doctors in accuracy. It's the kind of hopeful news that our study shows the public want and expect from the AI revolution.

The Google cancer story aligns with another finding in our data. People are optimistic about AI, but realistic about the ways it's going to show up in their daily lives. Just over half of respondents anticipate a world in which AI is invisible to us, as it will be built into everyday technology and integrated with data. Interestingly, public perception of AI is finally shifting away from a primarily sci-fi view: Far fewer people expect to interact with AI in the form of humanoid androids (21 percent), non-human robots (14 percent) or virtual holograms (13 percent).

How Will Humans Mainly Interact with AI?

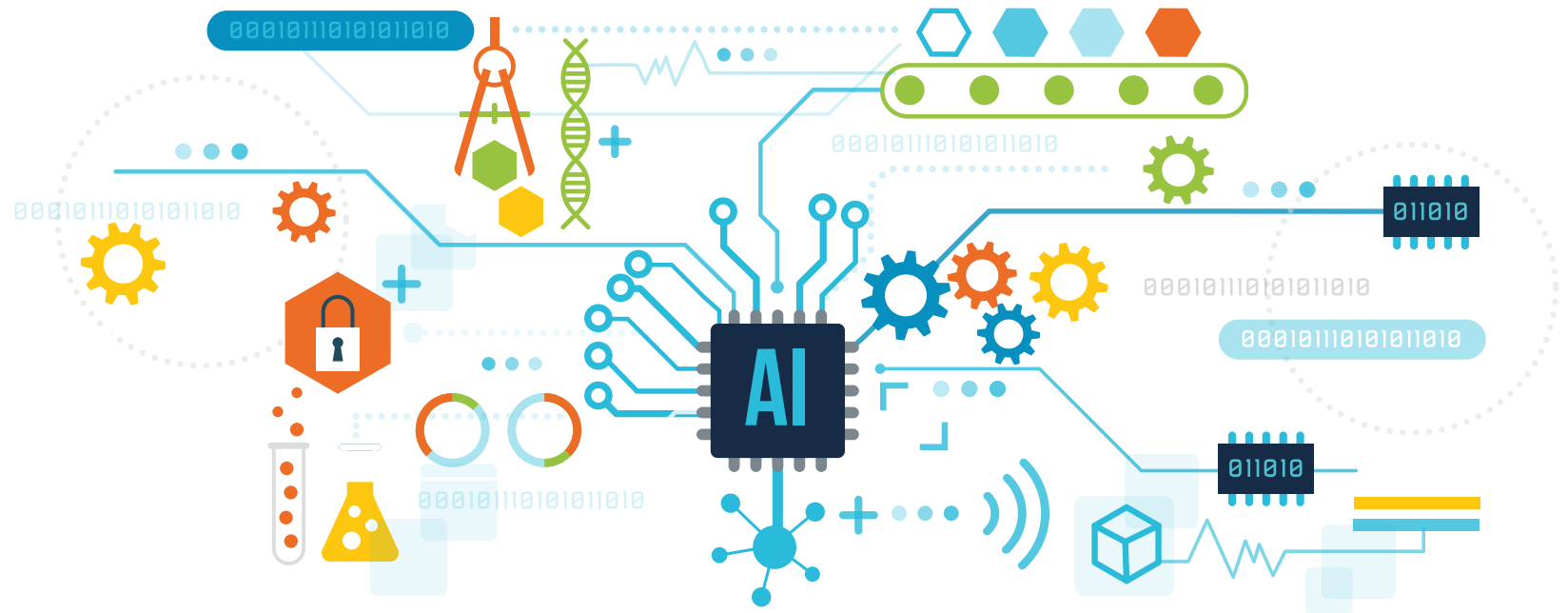


This is a big shift from the last time we asked this question, in 2017. Then, only 30 percent of people imagined AI would be integrated into machines, with 38 percent predicting a variety of forms including virtual avatars. The more AI shapes the world around us, the less we imagine it will take dramatically different forms.

It's a theme we'll see again and again. People aren't looking to AI to create science fiction wonders. They are expecting it will quietly but meaningfully improve their lives.

AI Pessimism: Who Might Be Left Behind?

While the people we talked to this year are broadly optimistic about AI, they aren't naïve. Any change may bring downsides as well as positives, and AI is no different.



All age groups feel that AI will ultimately make the world a better place. However, asked about their emotional response to the change, we saw differences between younger and older people.

The under-45s have spent their adult lives sharing personal information online. They understand the give-and-take, and their dominant emotions around AI are optimism and excitement. That's in line with what we found in our [2019 Youth On Tech report](#): when you talk to teens about AI, they're looking forward even more strongly than adults to the role it'll play in their lives.

Optimism is still strong among the over-45s, but it's tempered with a feeling of concern too. As more AI-enabled technology goes mainstream, winning the trust of older consumers may be a challenge. It's especially important because so many of the applications of AI, like better medical monitoring and home security, will be vital in helping ageing societies around the world.

As the need for its help grows, people may come to trust AI more. In Japan, for instance, which has the world's highest number of centenarians, only 20 percent definitely wouldn't trust an AI to look after elderly relatives. That's half the proportion with the same view in European countries and the US.

I'm old school and still prefer dealing person to person. However, IT has its place in manufacturing, healthcare, and safety. [UK Consumer]

What concerns do people have? The answer varies by region. In continental European countries, like Sweden and Germany, the biggest worry is loss of control: AI decisions overriding human agency. While in most Asian markets we surveyed (China, Japan and Taiwan) the single largest fear is around data privacy and potential breaches.

But for UK and US participants, the biggest concerns revolve around workforce replacement. Over half of Brits said AI's biggest drawback will either be direct job losses or the societal impact of reduced human opportunities. In those countries we're already seeing public pressure for governments to shield their citizens from the fallout of automation—a petition in Scotland for job quotas for humans, for instance. As with any new technology capable of performing tasks humans were previously paid to perform, this is likely to be one of AI's greatest social hurdles as it becomes more widespread.

If these things do all the jobs what is the point of people? We will cease to exist, we will have no purpose. [UK Consumer]

The Three Roles of AI

People already accept they’re living in an AI world. But how visible is that intelligence in the technologies they use?

Results show that people have three distinct ideas of AI’s role—ideas which may not align with the reality of AI in certain applications.

1. AI as a Separate Being

People are most likely to say AI is essential to a technology when it feels like something autonomous they can interact with as if it was alive. 58 percent of people believe AI is essential to voice assistants, for instance. Drones and robots (52 percent) and smart home devices (47 percent) also fall into this category. Issuing commands or asking questions and getting a reply makes a technology feel more intelligent in people’s eyes. Smartphone recognition (50 percent) fits in here too—it turns your phone into something that seems to know you.

2. AI as a Visible Enhancement

The second perceived role of AI is as something you consciously use to improve or change your interactions with the world—often letting you do or see things you couldn’t before, like translate a language you don’t know. These feel a little less intelligent than autonomous technology—for instance, while 81 percent of people think AI plays a role in

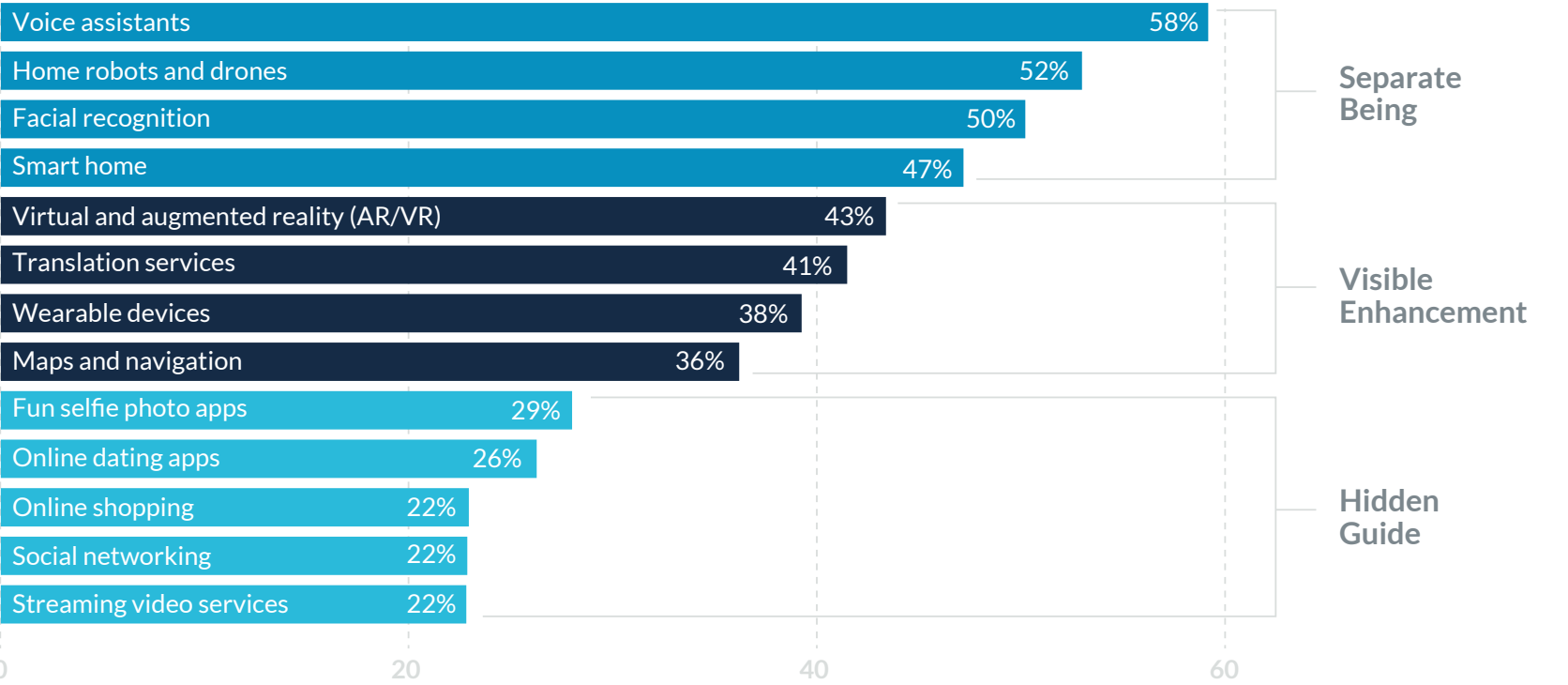
translation services, only 41 percent say it’s essential. Other technologies which work as enhancements are mapping services (36 percent say AI is essential), VR and AR headsets (43 percent) and wearable devices (38 percent).

3. AI as a Hidden Guide

Finally, there are online technologies and services in which a large majority of people don’t believe AI plays an essential role: Online shopping (22 percent say AI is essential), online dating (26 percent), streaming music and video (22 percent each) and social networking (22 percent). In fact, respondents were more likely to believe AI played no role at all in these services than that it performs an essential task. What these technologies have in common is that AI is used as a silent partner, assisting and enhancing your experience without you noticing. Netflix, famously, offered a seven-figure prize for teams who could use deep learning to improve its algorithm.

If it’s not obvious that it’s there and it does nothing to make me uncomfortable or nervous, then it’s fine. [UK Consumer]

According To Consumers, How Essential Is AI To These Technologies?



The Three Roles of AI (cont.)

People start to feel less comfortable when AI applications become either too autonomous or too dictatorial. For reasons of privacy, people also seem to be more enthusiastic about devices that are 'semi-connected'—communicating with the cloud only when needed.

In the short to medium term there will be incremental advantages. Problems will start to occur when organizations begin to presume that the algorithms behind AI are always right and so human experience can be ignored. [UK Consumer]

Popular applications of AI, on the other hand, often sit in the middle role—enhancing what we do, making us safer and more aware of our environments and bodies.

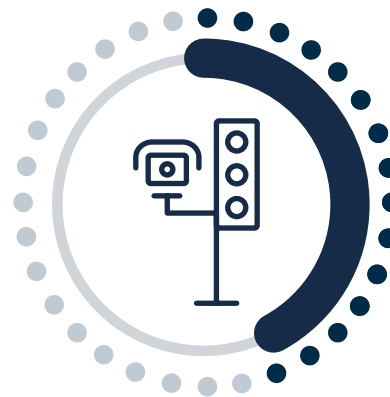
There's a "Goldilocks Effect" in AI applications the public feel happy with. Not too independent, and not too manipulative, but just right.

If it is certain that the devices will always serve us rather than dominate us, I would feel very comfortable. [German Consumer]

From robot surgeons to virtual entertainers, the list of applications for AI is enormous. But the problem people want AI to solve first is a lot more mundane: Job one is to get the world's traffic moving.

AI Automation Wish List: The Top 5 Benefits We Want

44%



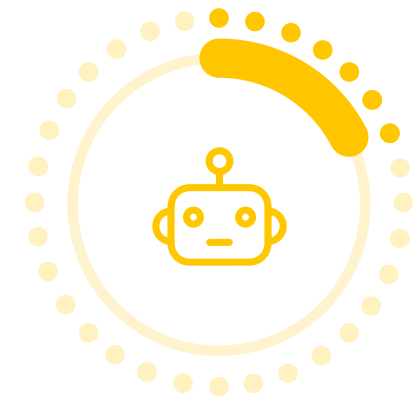
Traffic control systems that adapt lights and vehicle flows based on real-time traffic conditions to ease congestion

31%



Fully self-driving cars proven to be safer than a human driver

19%



AI customer service capable of handling your query instantly without the need to wait for a human operator

26%



Connected city systems that predict required maintenance

24%

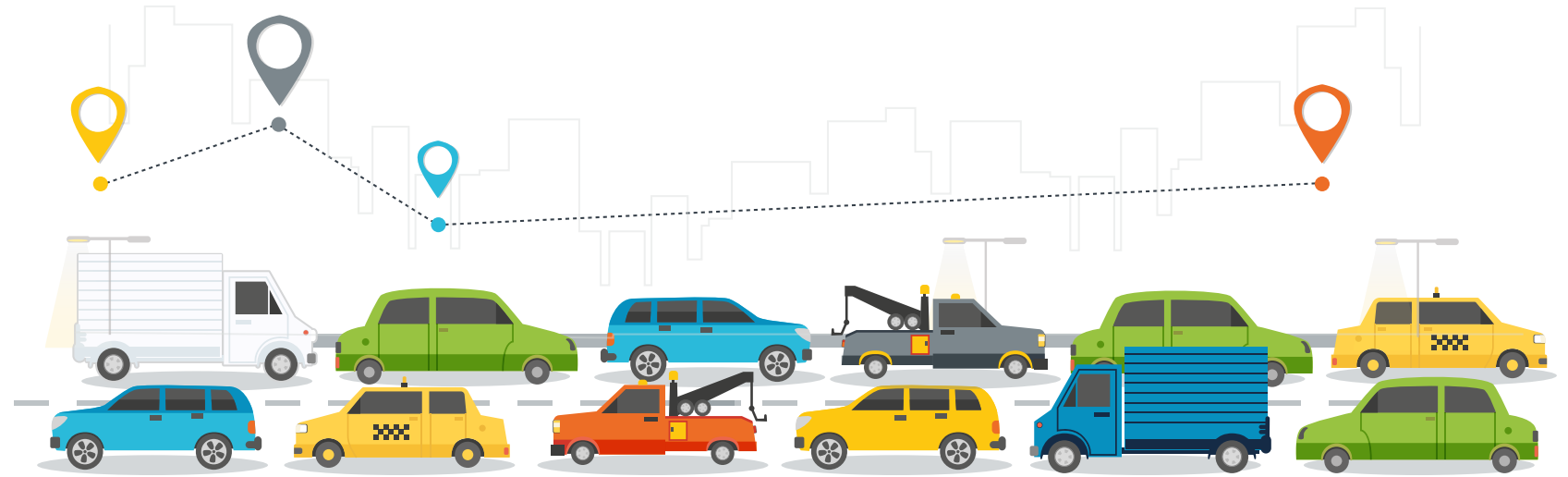


Smart habitats that automatically maintain temperature, security and lighting

Cars in an AI World

The fact that people put traffic control as their top automation priority shows they understand one vital piece of AI's potential—its power to solve problems that happen at a network level.

A lot of the hype around AI has focused on self-driving cars, but when we asked people about the benefits of automation, it wasn't the cars themselves which got them excited. It was the potential for AI to integrate with existing data to manage traffic flows.



Gridlock is a modern nightmare and a big environmental issue, and AI has enormous potential to solve congestion problems. Chinese e-commerce giant Alibaba has demonstrated its potential in the firm's home city of Hangzhou—it claims its "City Brain" traffic management technology has cut congestion there by 15 percent.

Traffic management is an issue that's troubled human planners for decades. But because systems like City Brain can "see" the entire network, it can make interventions that get things moving.

At a vehicular level, we asked people which innovations in cars they'd be most comfortable with, and the top answers put safety first. Three quarters of respondents said they'd be comfortable with a device that alerted them when they became drowsy or began driving erratically or suggested their driving style would lead to earlier maintenance being required.

Advocacy drops slightly when it comes to innovations which could take human autonomy away. Just over half of respondents would be comfortable with a car recognizing its owner and starting the engine when it sees you approach, while somewhat surprisingly just under half would be okay with a car overriding their driving if it thought they were being aggressive or inefficient.

I think people like to be in control of a vehicle. I would feel uneasy to be in a moving vehicle that you are not in control of...I feel things should evolve slowly in order for people to trust it fully. [UK Consumer]

These responses reveal an overall level of excitement and comfort around the idea of AI-powered autonomy in automotive applications. But again, there's a clear difference in public reaction towards AI that enhances our activity and AI that takes control away from us.

Whether drivers want AI to intervene may be a moot point, though. Firms focusing on monitoring driver emotion, like Affectiva and Pioneer, have been attracting a lot of capital and interest.

Arm and Pioneer recently joined forces to explore how artificial intelligence-powered predictive scoring could make for safer roads by combining multiple data points ranging from the road and weather conditions to the mood of the driver in real time. Push the car a bit too hard for current weather or start to drive erratically and you'll be instantly advised to change your driving behavior.

With the majority of these innovations in the pilot phase, our report shows that they will need careful handling if humans are to trust them in production vehicles.

Healthcare in an AI World

Advances in AI, and the rising costs of human-administered healthcare for an ageing population, mean we’re sure to see more use of medical AI over the next 10 years. Robot surgeons, AI doctors, and even android carers for the elderly—all are on the agenda. But how much do people trust AI-assisted medicine?

People trust AI in healthcare more than you might expect at this stage in its growth as a medical tool. As the chart shows, presented with the scenario of a robot surgeon proven to outperform humans, 43 percent said they’d be happy to go under its knife—with only 24 percent disagreeing. More people agreed than disagreed with trusting AI diagnoses and AI caregivers, too.

In all cases, a large chunk of people simply weren’t sure—suggesting that some applications may simply be too ‘far out’ for people to contemplate. However, much of this technology already exists. In the first trial of its kind, AI diagnosis of brain tumors was faster and more accurate than the human equivalent.

Innovation doesn’t always mean replacing the human element, though: at CES 2020 one of the innovation award nominees, CarePredict, learns the everyday activities and routines of elderly people in order to alert caregivers if it notices changes in those routines.

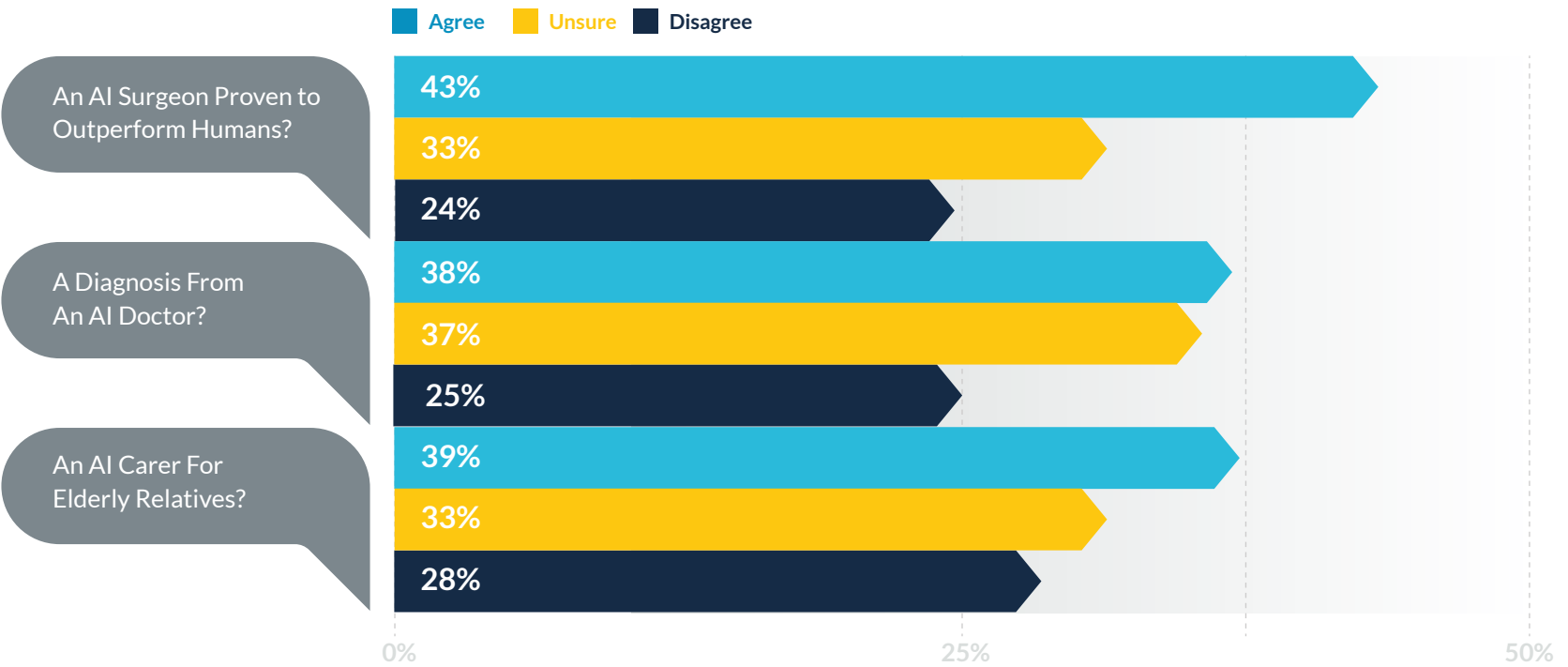
I think AI in the future will benefit society more than it does now. I am looking forward to seeing the healthcare sector adopt AI support for at-home carers. [US Consumer]

Why are people comfortable with AI doctors and surgeons when they’re suspicious of AI getting too involved in much less important decisions? Some of it comes down to the degree of perceived difficulty. Just like traffic management, we know surgery and diagnoses are complex, multi-faceted problems. Few of us trust doctors implicitly. If there are proven results, people are more willing to accept the delegation of some decisions to AI.

We also saw this when we asked about the healthcare applications people felt would bring the most benefit (see chart). The top choices involved swapping humans for robots in dangerous tasks and detecting complex illnesses faster.

When the work is difficult and dangerous, we’re happier for AI to integrate with and enhance human systems.

How Comfortable Are Consumers With AI-Assisted Healthcare?



Homes in an AI World

When it comes to smart homes, it's a thin line between devices that make people feel more secure and those people feel are intrusive.

We also noted variation depending on who the smart device would primarily affect. For example, two thirds of respondents were comfortable with the idea of a smart TV recognizing their child's voice in order to safeguard them from accessing restricted content.

Respondents were happy to let AI assist with parental responsibilities. Yet when we asked whether they'd accept a smart TV monitoring their own viewing time, this dropped to less than half. As for a TV which monitored viewers' eye movements to learn which ads they were interested in, only a third liked that idea.

This pattern repeats across reactions to smart home devices. Convenience and safety win approval, but as soon as devices start monitoring you as well as helping you, there's a level of discomfort.

People were comfortable with a smart fridge that monitors items when they run out (62 percent), and a home hub which controls most of the lights and appliances (62 percent). Given that the latter isn't a particularly new concept, it's an interesting barometer reading of how prevalent the vision of the smart home is in 2020. And when it comes to time-saving devices, the smarter the better—a home hub which predicts simple maintenance tasks (like light bulb failures) won the highest approval of all (69 percent). Predictive maintenance within the home is one use case that we expect AI to play a major role in over the next few years, so it's great to see that affirmed as the top benefit consumers want from their smart home technology.

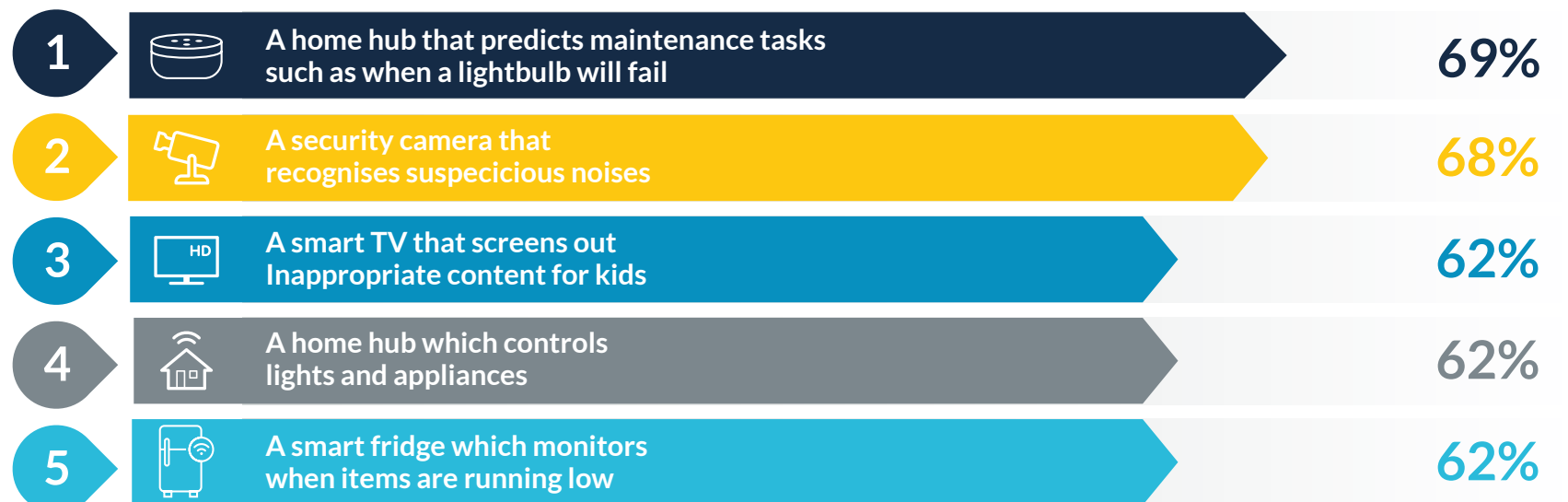
I love tech and I can imagine AI making things simpler for me and saving me time. [UK Consumer]

Some level of intelligent monitoring is acceptable, too. People understand the security benefits of a security camera learning to recognize their family and pets (60 percent), or a smart speaker that learns their voice and distinguishes them from others in the household in order to better meet their requests (56 percent). They're even comfortable with the privacy trade-off of an AI learning their daily routine in order to automatically adjust the heating or turn on the TV or make them a coffee (59 percent). And almost two thirds of respondents would accept a security camera that was always listening in order to detect suspicious noises like breaking glass or shouting.

The problem comes when smart home tech crosses a line into intimacy or presumes too much. People are less comfortable with the (currently fictional) idea of a smart speaker that senses if they are sad or upset and asks if they are okay (41 percent) or a camera that warns if their outfit is not suitable for predicted weather conditions when they leave the house (46 percent). A smart door lock which opens for delivery drivers gets the lowest comfort level of all (31 percent)—ironic, because it's a technology Amazon's already trialing.

What do people want from AI in the smart home? Safety, and to make home comforts that bit more comfortable. But in delivering those things, AI needs to respect human boundaries wherever possible.

Smart Home Devices Consumers Are Most Comfortable With



Shopping in an AI World

Bricks and mortar retail has had a tough decade, with online competition, high real estate prices and changing tastes impacting many household-name brands. Can AI and smart shopping offer some respite? Our study paints a cautiously optimistic picture.

There’s an overall feeling of comfort in the idea of retail AI helping out shoppers, but the more control people have, the more positive they are about it. When we posed the concept of a smart billboard that recognizes respondents’ faces and serves up targeted advertising, reaction was split between those who were comfortable, those who were uncomfortable and those who just weren’t sure.

This picture doesn’t necessarily improve when you get a more immediate benefit— we asked respondents how they’d feel about a camera in their favorite restaurant that suggested their usual order to the waiter or offered a discount for repeat custom and despite the benefits, fewer than half were open to this level of AI recognition.

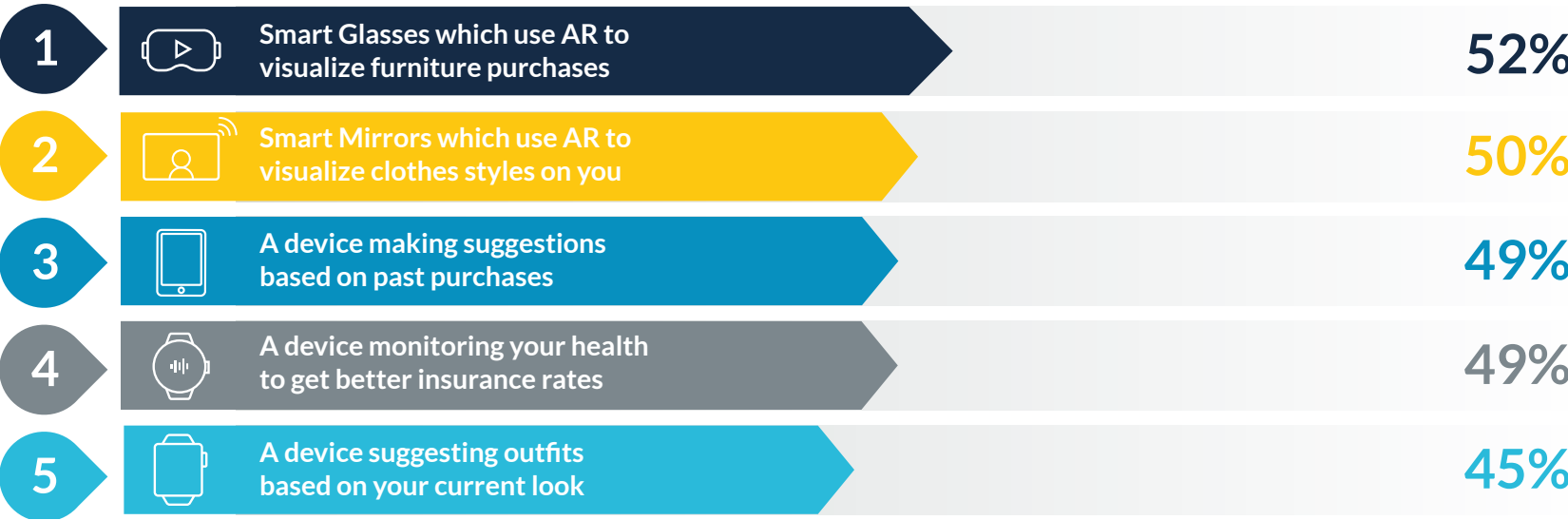
This suggests that while ‘invisible AI’ is viewed as a positive overall, the moment it crosses the line and becomes too ‘Big Brother’-like it loses its perceived value.

Clothing retailers do a little better—45 percent of people are comfortable with a device suggesting outfits based on their current look; 49 percent with suggestions based on past purchases.

The two highest-rated applications, though, were both to do with online shopping—glasses and mirrors that use Augmented Reality (AR) to visualize potential purchases of clothes (50 percent) and furniture (52 percent).

There’s definite potential for AI to make shopping more practical as well as more fun—but the comfort levels are lower in retail than for wearables in general. People want AI to offer helpful advice, not make personal assumptions. Of course, the best customer service has always been about recognizing boundaries as well as going the extra mile—this is something AI will need to learn.

Smart Shopping Devices Consumers Are Most Comfortable With



Wearables in an AI World

The promise of perfect vision, better hearing and even instant translation make wearable AI tech applications some of the most appealing.

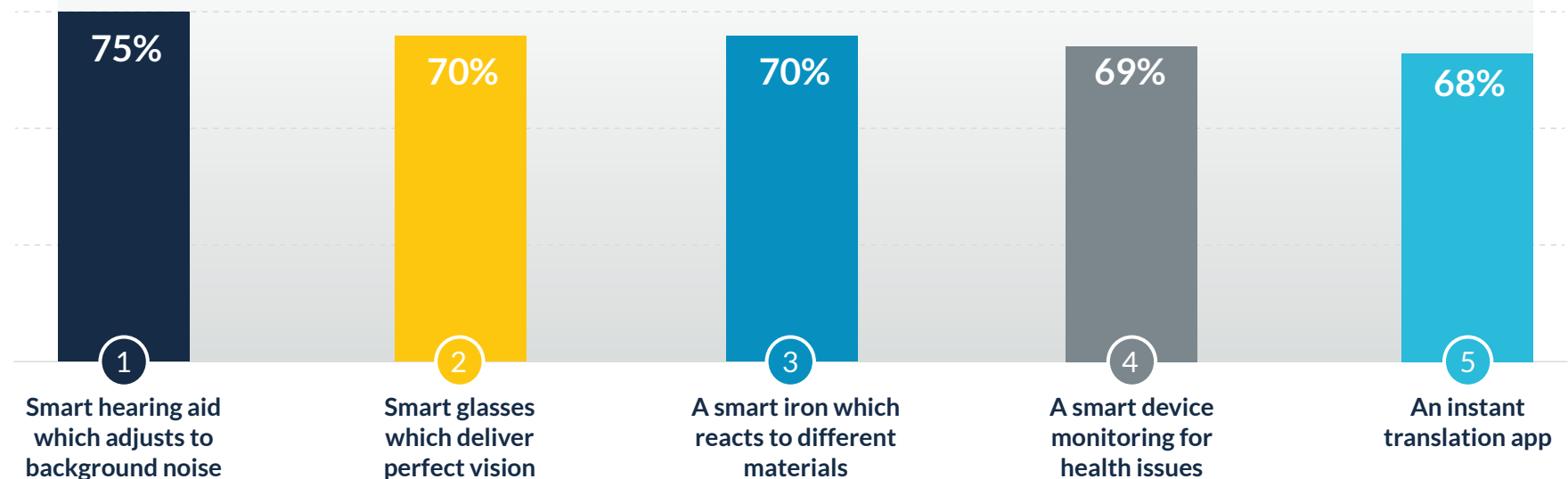
Overall comfort levels with wearables were very high—over half of respondents felt comfortable about any idea we put to them.

The applications people like the most are ones that promise to enhance our natural human capabilities or solve tricky medical issues. Around three quarters of respondents were comfortable with the notion of a smart hearing aid that automatically adjusts for background noise and glasses which deliver perfect vision, while 69 percent and 62 percent respectively were comfortable with a smart device monitoring their heartbeat or a smart inhaler. Given that the latter exists and is already being used by asthma sufferers, we'd hope that as AI continues to prove its effectiveness, those numbers increase further.

Good because for me as a blind person more things would be accessible. [US Consumer]

But perhaps none of these AI applications would change the world around us as dramatically as an instant translation app—bringing to life the famous “Babel Fish” from Douglas Adams’ Hitch-Hikers Guide to The Galaxy. 68 percent were comfortable with the idea. At the more mundane end of the spectrum, 70 percent approved of a smart iron which could react to different materials.

Smart Wearable Devices Consumers Are Most Comfortable With



All these devices score highly because they take the things people do already to the next level, augmenting our own senses. In other areas there's sometimes a sense of AI interfering with human autonomy, but that's far less of an issue with wearables.

That said, we do see a small dip in enthusiasm when wearables stop enhancing and start predicting our needs. Devices which learn our behavior and act accordingly saw slightly lower comfort levels. Automatically adjusting earbuds aren't a problem (65 percent comfort). But there was less enthusiasm for devices that learn your exercise routine, especially one that learns what you eat, drink and how much exercise you do in order to reduce or increase health insurance premiums (49 percent).

AI recognizing friends is another area where some aren't quite on board yet—52 percent were fine with it in a photo app (despite it occurring as default in most smartphone photo apps), and wearable glasses which remind you of people's name got 50 percent approval. These are still high levels of appeal—but the dip is enough to make you realize that when wearables get to know you personally, users become a little less comfortable.

Living and Loving in an AI World

In this report, we've been focusing on the way AI will enhance other technology, from cars to homes to wearable devices.

But as the AI revolution progresses, we'll see deeper and deeper effects on the 'softer' areas of life—language, art and culture, and even love and romance.

It's here that we've found some of the most thought-provoking responses to our study. Take language, for instance. Communicating with our newly empowered devices will obviously be a vital part of life in the AI future, and 88 percent feel it's important for AI technology to understand human language. But a startling 58 percent say they would try and learn a new language or way of speaking to communicate with AI devices.

No device makers are suggesting this yet, and the focus is likely to remain squarely on enabling AI devices to listen and respond to us in our natural language, but it shows how far people are willing to go if they perceive a tangible benefit from AI.

[It will be] a dependable friend. A presence, such as [cartoon character] Doraemon. [Japanese Consumer]

It's a favorite topic for science-fiction writers and filmmakers, but just over 1 in 4 people in the real world think they could grow to love an AI like they love a person. That's

not too far below the 36 percent of people who say they could love a robot like they love a pet.

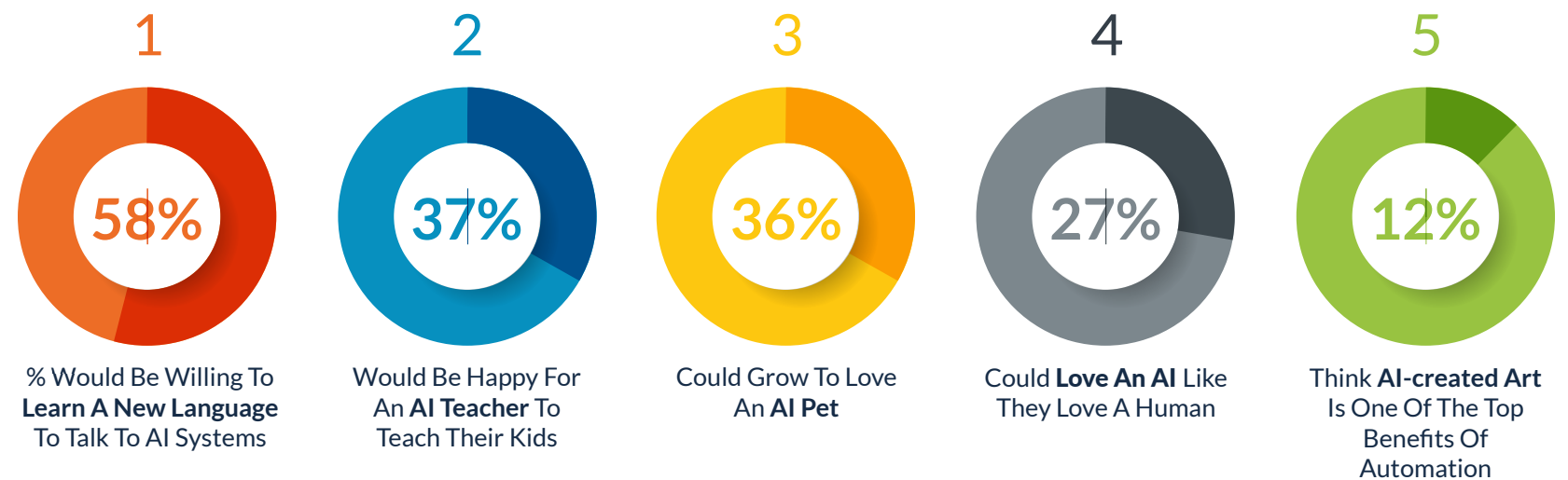
It's the pet application innovators are exploring more so far. Appealingly cute devices like Groove X's Lovot—"the robot that needs you more than you need it"—are coming onto the market. The round, big-eyed Lovot, which can learn emotions and even comes to feel jealousy, caused a stir at CES 2020 and we're sure to see plenty more robot companions following in their wake.

About the only aspect of AI culture that doesn't win much support is the idea of AI art and music. While virtual performers like the holographic 'vocaloid' Hatsune Miku might play Coachella, her songs are still human-created.

People seem to accept the idea of AI DJs selecting songs and even singing them, but only 12 percent feel that AI creating art and music will be one of its main benefits.

Don't expect a Droid Sheeran any time soon.

Lifestyles In An AI World



No Compromise on Security

This year's report reflects an overall positivity and excitement towards the opportunities and advances coming from AI.

But there's still a level of apprehension over how secure the data AI-powered devices generate about us is.



When we asked about scenarios drawn from science fiction—robots becoming too powerful or evolving too quickly, for instance—these still attracted a certain degree of worry. The classic trope of an AI becoming self-aware and choosing to harm humans, plucked directly from movies such as *The Terminator*, still worries over half of us.

I am a child of the 80s and have seen lots of dystopian movies about AI taking over the world. [UK Consumer]

But this is very different version of AI from what it is today, and attitudes are becoming far more tuned to that. Dystopic tropes are giving way to more tangible concerns over AI's misuse by human criminals, in the form of weaponization (using AI to perform cyberattacks, for example), data breaches and identity theft. Three out of four people are worried about their data being stolen, for example.

As long as AI is safe, reliable, and well-regulated, all is fine. Corruption and abuse are more of an issue—and that is down to the people in control, not the AI itself. [UK Consumer]

Given the rash of “Top Data Breaches of 2019” articles in mainstream media and high-profile cases affecting banks, airlines and social networks, it's not surprising that the general public is concerned. Most people are reassuringly positive about the benefits of AI, but the stakes are high and what came through strongly in the study is the willingness to punish companies who let them down.

Faced with a data breach from their devices, over two thirds of respondents would either switch brand or stop using that kind of device entirely. Whether that's a realistic threat remains to be seen, but it should remind companies that AI applications will be built on trust, and that people are clear about the responsibilities their devices have to keep them safe.

It's a finding that should reinforce the importance of data security—remember that a large majority of people favored data being stored on devices and kept off the cloud except where necessary. People know that when data enters the cloud, the risks of it falling into the wrong hands shoot up.

Afterword: A More Connected World

One of the most eye-catching AI announcements of 2020 so far wasn't about a single device or application at all.

Toyota announced that it was building a “Woven City” in Japan at the base of Mt Fuji, bringing together systems from the wide range of applications we’ve covered in this report.



It will be a city of autonomous vehicles, smart delivery systems and connected homes: all it's missing is a robot pet or two.

Toyota's 'woven city' isn't just a neat place to live: it's a roadmap for what's coming next in AI. This report has looked at advances and applications of near-future AI and found a lot of public enthusiasm. Positivity stems from AI's ability to integrate seamlessly with existing data systems and enhance human abilities and outcomes.

As these opportunities increase, so do the stakes for device manufacturers entrusted with securely generating and processing not just any data, but data pertaining to the most intimate aspects of our lives. The question of what each device ‘knows’ and what it ‘tells’ will become even more important and getting that right will be the difference between success or failure in the AI world.

A device's ability to store and process data locally, only sending information to the cloud when absolutely required in order to perform its function, is also likely to become a major driver in consumer AI adoption.

Coming advances in device technology will significantly increase the capability of endpoint devices in processing AI data without sending it anywhere else, and the resulting security and performance benefits will undoubtedly help manufacturers deliver devices that meet the expectations of an ever more aware general public.

*It might take some getting used to for some people.
But in the end, AI will be as important as electricity.
[US Consumer]*