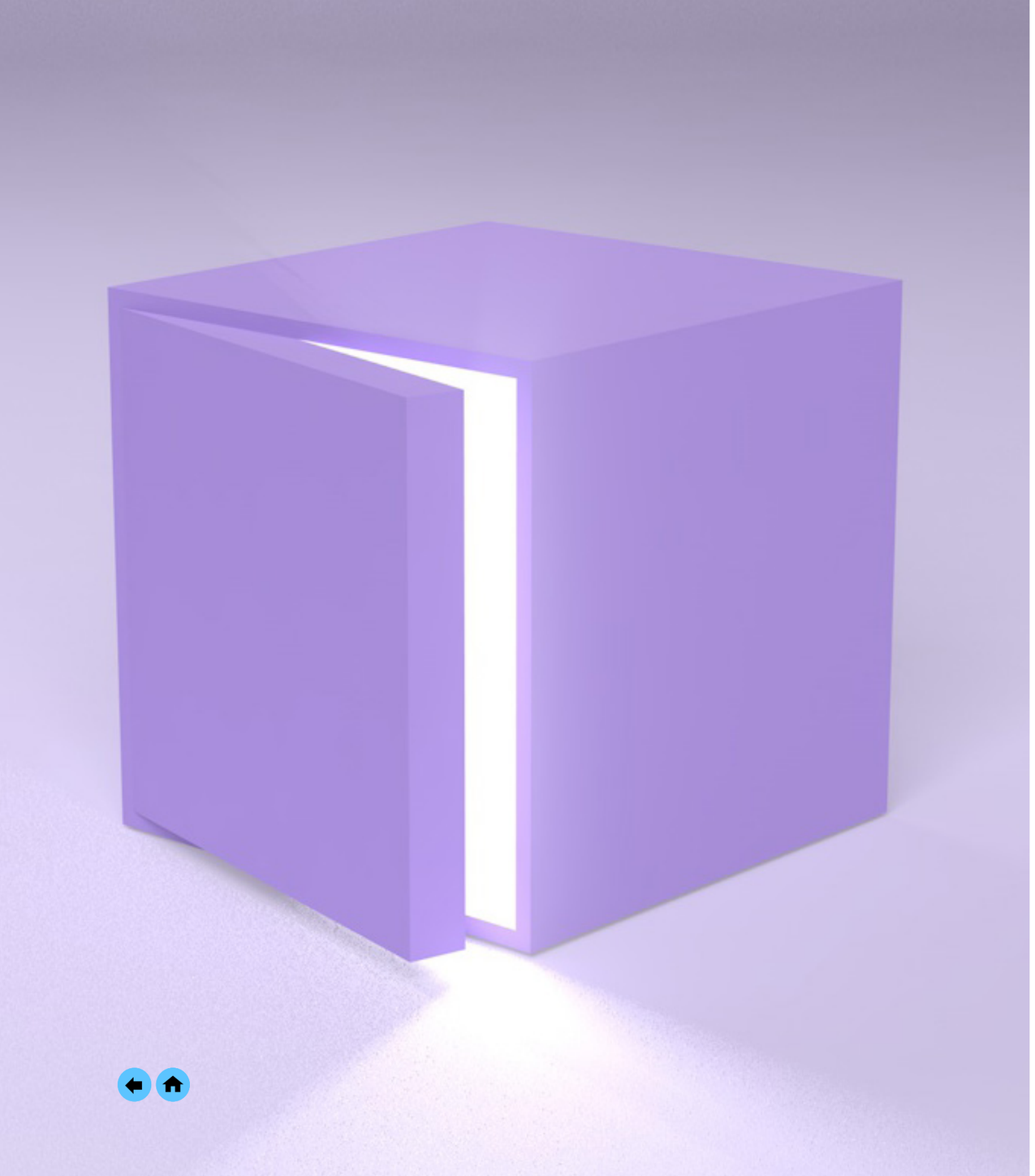
E-BOOK

Seeing the future with AI

Build an out-of-sight data infrastructure for computer vision

NetApp



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Seeing is believing

Computer vision is a field of AI that enables computers to see, to observe, and to understand.

By applying machine learning or deep learning models to ingested images, computers can classify objects in images. After the computer understands what it is seeing, it can respond appropriately—like unlocking your smartphone when it recognizes your face.

With 99% accuracy,[1] computer vision has expanded beyond facial recognition. It is now changing how we live and work.

Data is the key to clear vision

To work properly and eliminate blur, computer vision needs a huge amount of unstructured image data that can easily move across edge, core, and cloud. And the power to do it all in a blink of the eye. To be successful, a computer vision infrastrucutre must be able to:

1. Take in all the sights
2. Keep the sight line open
3. Respond at the speed of human thought

Computer vision: It's all around you

In nearly every aspect of your day-to-day life, computer vision is everywhere you look (and sometimes in the places you least expect it).

Self-driving vehicles

How does a self-driving car know when to stop or to swerve? Computer vision identifies pedestrians, sees stop lights, and assesses road conditions.[2]

The operating room

Computer vision uses real-time images of surgical sponges to accurately monitor blood loss and to prevent hemorrhaging.

The airport

No passport? No problem. Computer vision systems inside airports take your photo to determine who you are and whether you pose a safety threat. No more digging through your bags to find your ID.[3]

The bank

Computer vision makes opening a bank account an easy, two-step process: Take a selfie and join a short video call. No waiting in line. No piles of paperwork.

The farm

Farmers are using computer vision to find out which weeds, bugs, and diseases are damaging their crops.[4] They can also use it to detect disease in their livestock.

1. Take in all the sights

For computers to see, to observe, and to understand the world around us, they require data—and lots of it. For computer vision, you can never have enough data. The more you have, the more accurate your model is.

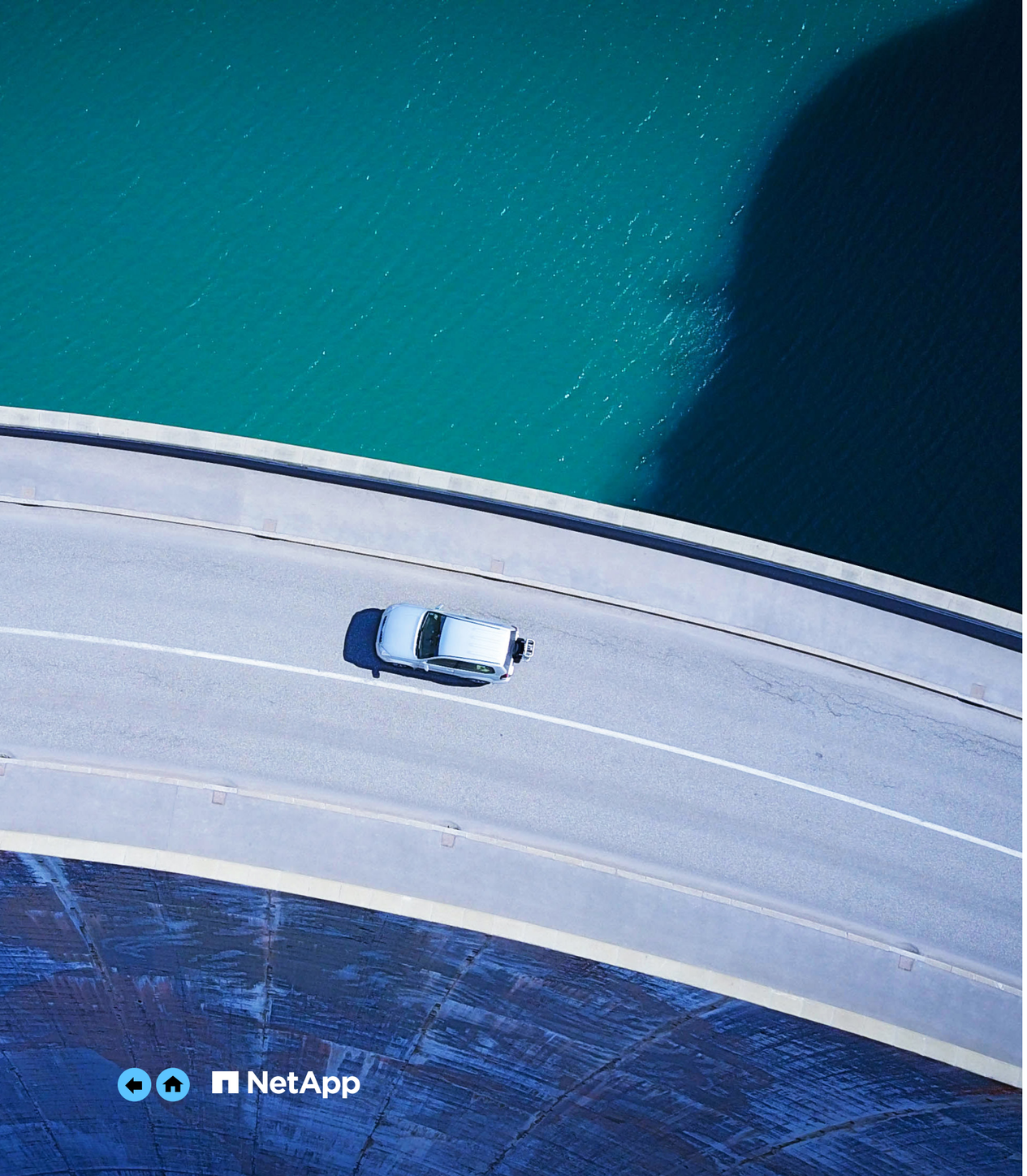
The human brain seemingly takes very little effort to identify common objects such as cats or dogs. But it takes hundreds of thousands or even billions of images to train a computer to see things as a human would.

At that rate, data volume is a massive challenge. Not only does that data have to be available, but it also has to be organized in a way that AI architectures can understand. To create an effective computer vision solution, you need to be able to collect, to sort, and to analyze huge quantities of data at scale. Training models of this size can take weeks of compute time and require the best-of-the-best machine learning and deep learning frameworks.

Is it a chihuahua or is it a blueberry muffin?

Urban legend. Developer lore. It's true: Some of the world's top computer vision APIs can confuse the chihuahua, an adorable tiny dog, with a blueberry muffin, a delicious breakfast treat.[5] Obviously, these are very different things.

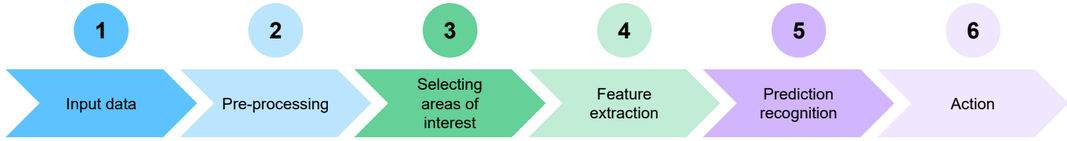
The size of your training dataset could be the difference between seeing a chihuahua or a tasty blueberry muffin.



2. Keep the sight line open

For computer vision, the line of sight has to span the entire ecosystem, from ingest and feature extraction all the way to action. To work, the sight line must remain clear with unending visibility.

Computer vision consists of six steps (think of them as scenic viewpoints along the highway):



For real-time image processing and near-instant action, data has to be able to flow quickly and freely throughout each step.

In autonomous vehicles, data can be collected, processed, and acted upon all within the small but powerful computer in the car (at the edge). That data can also be communicated over the air back to the core or the cloud where it's combined with data from other edges for further analysis. Updates and patches can then be sent back down to the car.

3. Respond at the speed of human thought

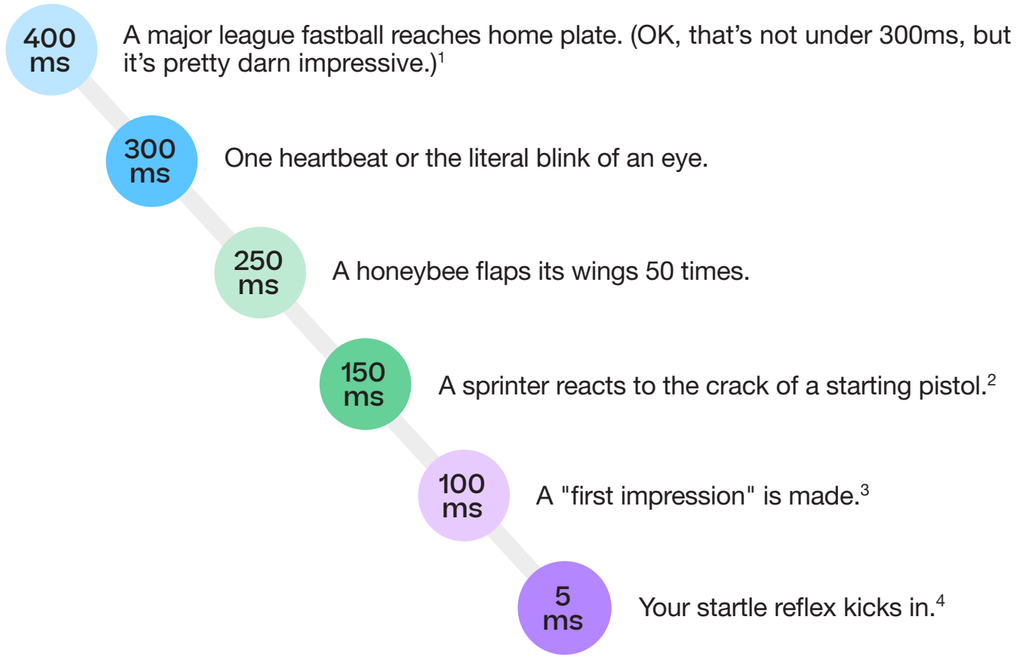
Sight is a function of the brain. Eyes are simply a portal through which sight happens. For AI to replicate human vision, it must be able to operate at the speed of the human brain—or even faster. With the human brain able to process images in as little as 13 milliseconds, computers have their work cut out for them.[6]

Computer vision often requires a response in milliseconds to tackle high-pressure, real-life scenarios.

Getting from first sight to instant action takes several steps, with no opportunities for rest in between. Each step involves separate AI models all working in tandem. The longer it takes for each model to run, the more time it takes to produce a response. If you're in a car that's driving itself, you want that response to happen instantly.

How fast are we thinking?

The human brain can process images in as little as 13 milliseconds (ms). How fast is that? Very fast. Things that we typically think of as fast happen in 300ms or less:



See a future with NetApp

Build an AI infrastructure with crystal-clear vision. NetApp® technology simplifies data management across the AI data pipeline, from edge to core to cloud.

- **NetApp AI solutions** remove bottlenecks to enable more efficient data collection, accelerated AI workloads, and smoother cloud integration.
- **NetApp unified data management solutions** support seamless, cost-effective data movement across a hybrid multicloud environment.
- **NetApp's world-class partner ecosystem** provides full technical integrations with AI leaders, channel partners and systems integrators, software and hardware providers, and cloud partners. They put together smart, powerful, trusted AI solutions that help achieve your business goals.
- **NetApp Professional Services** provides the specialized expertise that you need to reduce complexity and to expand your AI opportunities and success.

And, by the way, NetApp is positioned as a leader in the IDC MarketScape for worldwide scale-out file-based storage.[11] Which is important because computer vision workloads are—yep, you guessed it—scale out and file based.

Make your data scientists happy

5x

Run 5 times more data through your AI pipeline

<60 seconds

Copy datasets in seconds rather than in hours or days

~20 minutes

Configure your AI infrastructure with Ansible integration in ~20 minutes

NetApp and SFL Scientific partner to help save lives

NetApp and SFL Scientific have developed technology for high-performing COVID-19 lung segmentation. The model takes an average of just 6 seconds to identify the COVID lesions on each patient scan (hundreds of images)—much faster than a typical human analysis of a chest CT. Care teams can then zero in on patients who are at higher risk for severe complications.

Learn more

Robovision makes it easier to run computer vision workloads

Robovision chose NetApp to power its machine learning application with big volumes of data on premises and in the cloud. Our integrations are helping to facilitate large training workloads, such as autonomous driving and other computer vision workloads, to help Robovision's customers get more value from their data quicker.

Learn more

An out-of-sight computer vision infrastructure is closer than ever

We can’t give you crystal-clear vision. We can give you the tools you need to accelerate and improve the accuracy of your computer vision programs.

Learn more about NetApp AI solutions:

- NetApp AI
- ONTAP AI
- NetApp solutions for computer vision

Questions? Our AI solution specialists are standing by.

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About NetApp
In a world full of generalists, NetApp is a specialist. We’re focused on one thing, helping your business get the most out of your data. NetApp brings the enterprise-grade data services you rely on into the cloud, and the simple flexibility of cloud into the data center. Our industry-leading solutions work across diverse customer environments and the world’s biggest public clouds.

As a cloud-led, data-centric software company, only NetApp can help build your unique data fabric, simplify and connect your cloud, and securely deliver the right data, services, and applications to the right people—anytime, anywhere.

To learn more, visit **www.netapp.com**

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