

analysis is far easier than establishing a dedicated detection dog. For that reason, more sophisticated AI isn't used as much, as far as we can tell," said Dr Hayes. "As the ease of implementation, the cost of AI decreases, and its detection increases, it appears that it may be able to replace the canine nose in the future in some instances."

That being said, Dr Hayes believes it will be a very long time until detection dogs could be replaced entirely if at all.

What are the pros and cons of detector dogs versus sniffer technology?

"The paper goes into a lot more detail, but as it stands dogs are somewhat cheaper than analytical detection – the devices worthwhile at least," Dr Hayes explained. "Dogs tend to be less reliable, analytic detection tends to be less flexible. Dogs are more sensitive, but also carry risks relating to their mood, behaviour, exhaustion and so on."

Training professional detector dogs also takes time and resources, including independent certification. The dogs may have off-days, become ill or make mistakes (various studies discuss the reasons for errors, including beyond handler and dog training³). They also must be fed, rested and exercised.

"With all things considered, dogs are at the moment considered the best detection option for most target odorants," said Dr Hayes.

DETECTOR DOGS ARE UNIQUE

One of Australia's leading animal trainers, Steve Austin, also believes in the power of the dog's nose. In fact, his three decades in detector dog training has shown him that we haven't even touched the surface of using the dog's ability to find odour!

"Thirty years ago, it would be impossible to think that (electronic smelling technology) could happen. I would never say never, but how far do you think we can push the dog in his scent work? We have only scratched the surface!" said Mr Austin.

Formerly National Detector Dog Trainer for the Australian Quarantine and

Inspection Service for 10 years, Mr Austin has trained dogs around the world for search and rescue, police, environment, wildlife conservation and many other roles. He worked with the Australian Army, The Armed Forces, NSW Corrective Services, World Wildlife Fund, Cheetah Conservation Fund and others.

He is also responsible for Australia's first truffle detector dog and the completion of the first trial using sniffer dogs to detect hidden leaks from water pipes below the ground.

Not every dog can work as a professional detector dog, explained Mr Austin, adding "The working and service roles that these especially trained dogs perform distinguishes them from pedigree dogs who are bred for their conformation and show appearance."

A professional detector dog must be in good health, be intelligent, have the ability to work in all environments, have a hunt/prey drive and a 'whatever-it-takes' attitude to get the job done. These attributes help detector dogs work in extreme weather conditions - minus 20 degrees, 45 degrees Celsius or in a severe thunderstorm. They are trained to search for threatened desert wildlife whilst avoiding killer snakes and kangaroos or other animals that suddenly jump up in front of them.

The working dogs need to put up with many hours of road travel to get to their destination, and have the ability and agility to get up and down mountains, trudge in the snow, push through thick bush or climb 30 metre sandhills, plus swim across streams and rivers – sometimes with 5 metre crocs waiting in the distance for their next meal!

"The overall thought in the dog's brain should be, if I keep looking long and hard enough, it will turn up," said Mr Austin. "Their hunt, reward and prey drives are more important than a particular breed. These are working dogs under working conditions. Pet dogs cannot do it."

How do professional sniffer dogs sometimes fail to detect the target odour?

"This could be due to poor dog health, poor dog training or bad handling," he

said. "The dog may be tired, not feeling well or not received enough rewards by the handler in the field. I always blame the handler, not the dog."

There is concern the entire dog detection industry can 'fail the smell test' by the actions of one poorly trained dog, particularly as the industry is already challenged by the emergence of developing electronic smelling technology.

"To be successful in what we do, training of handlers and their detector dogs together as a package is critical. We need to set high standards for professionally trained handlers and dogs, and have them independently certified," said Mr Austin.

MEDICAL ALERT DOGS CAN BE A LIFELINE

Detector dog trainer Ryan Tate comes from a background of training marine and zoo animals and is now mainly focused on working with dogs who sniff out koalas, foxes, truffles, feral cats and narcotics. He has also helped train medical alert dogs to support individuals who live with dangerous health conditions, predominantly epilepsy and diabetes.

"When training medical alert dogs, our goal is to train them to pick up on any sudden changes in the person that are related to their medical condition, and there can be a wide variety of changes when it comes to someone with multiple medical conditions, such as heart arrhythmia, diabetes and epilepsy. When we release oxytocin (anti-stress hormones), dogs pick up on those changes, too," said Mr Tate.

Like conservation detector dogs protecting wildlife populations, medical alert dogs are also valuable and we are not even close to using medical detection dogs to their potential, Mr Tate said.

"It's easy for a good detection dog to pick up on a scent and maintain that ability their entire life. They rarely need re-programming, and get better with age and experience," he said. "And it's not only about the piece of sausage or tennis ball (reward). It's about the process of serving a purpose and service."

Mr Tate said he doesn't believe medical alert dogs could ever be superseded by 'electronic noses' because dogs learn from a person's change in body behaviour and odours, and he believes they pick up on a whole host of other subtle changes we don't yet understand.



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