

Science News

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Scientists develop AI-powered 'electronic nose' to sniff out meat freshness

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Source: Nanyang Technological University

Summary: Scientists have invented an artificial olfactory system that mimics the mammalian nose to assess the freshness of meat accurately. The 'electronic nose' comprises a 'barcode' that changes color over time in reaction to the gases produced by meat as it decays, and a barcode 'reader' in the form of a smartphone app powered by artificial intelligence.

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FULL STORY

A team of scientists led by Nanyang Technological University, Singapore (NTU Singapore) has invented an artificial olfactory system that mimics the mammalian nose to assess the freshness of meat accurately.

The 'electronic nose' (e-nose) comprises a 'barcode' that changes colour over time in reaction to the gases produced by meat as it decays, and a barcode 'reader' in the form of a smartphone app powered by artificial intelligence (AI). The e-nose has been trained to recognise and predict meat freshness from a large library of barcode colours.

When tested on commercially packaged chicken, fish and beef meat samples that were left to age, the team found that their deep convolutional neural network AI algorithm that powers the e-nose predicted the freshness of the meats with a 98.5 per cent accuracy. As a comparison, the research team assessed the prediction accuracy of a commonly used algorithm to measure the response of sensors like the barcode used in this e-nose. This type of analysis showed an overall accuracy of 61.7 per cent.

The e-nose, described in a paper published in the scientific journal *Advanced Materials* in October, could help to reduce food wastage by confirming to consumers whether meat is fit for consumption, more accurately than a 'Best Before' label could, said the research team from NTU Singapore, who collaborated with scientists from Jiangnan University, China, and Monash University, Australia.

Co-lead author Professor Chen Xiaodong, the Director of Innovative Centre for Flexible Devices at NTU, said: "Our proof-of-concept artificial olfactory system, which we tested in real-life scenarios, can be easily integrated into packaging materials and yields results in a short time without the bulky wiring used for electrical signal collection in some e-noses that were developed recently.

"These barcodes help consumers to save money by ensuring that they do not discard products that are still fit for consumption, which also helps the environment. The biodegradable and non-toxic nature of the barcodes also means they could be safely applied in all parts of the food supply chain to ensure food freshness."

A patent has been filed for this method of real-time monitoring of food freshness, and the team is now working with a Singapore agribusiness company to extend this concept to other types of perishables.

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A nose for freshness

The e-nose developed by NTU scientists and their collaborators comprises two elements: a coloured 'barcode' that reacts with gases produced by decaying meat; and a barcode 'reader' that uses AI to interpret the combination of colours on the barcode. To make the e-nose portable, the scientists integrated it into a smartphone app that can yield results in 30 seconds.

The e-nose mimics how a mammalian nose works. When gases produced by decaying meat bind to receptors in the mammalian nose, signals are generated and transmitted to the brain. The brain then collects these responses and