Artificial intelligence can improve radioactive particles' detection

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Radioactive particles can be detected deeper in the ground, thanks to the application of artificial intelligence technology developed by University of Stirling researchers.

Stirling Environmental and Computer Scientists have worked together to produce an algorithm which can more effectively separate potentially dangerous 'hot particle' signals from benign natural ones.

Using modern data analysis techniques, it allows the maximum amount of information possible to be extracted from handheld and mobile detection systems.

Research Assistant Adam Varley, who led the research, said: "This new artificial intelligence approach represents a key milestone in routine site monitoring and can make a major difference to the reliability of detection and improve detection performance, in turn lowering the public health risk.

"Particles can be detected on average 10 cm deeper into the ground when compared to conventional systems. The unique algorithm can, at existing depths, also pick up hazardous particles on lower levels on the radioactive scale than previously possible, enabling more to be identified."

The breakthrough was developed using background readings taken at Fife's Dalgety Bay.

Reports suggest there are likely to be between 150 and 250 - possibly as many as 1000 - contaminated sites across the UK. The precise number globally is unknown. The vast majority are in Europe and North America – where technology for industrial, military and pharmaceutical Radium use was available in the early to mid-20th century.

Professor Andrew Tyler, Head of Biological & Environmental Sciences, said: "The innovative approach which Stirling has developed, through close interdisciplinary collaboration, has global potential. It can be applied to the wider characterisation of radioactively contaminated land and in the decommissioning of nuclear power plants."

Leslie Smith, Professor of Computing Science and Mathematics, said: "It is most rewarding when modern data analysis techniques can be used in a research project such as this, where the implications could result in contaminated land being more easily identified – and thus remediated, with the benefits this would bring to public health."

The research, funded by the Natural Environment Research Council was conducted in partnership with the Scottish Environment Protection Agency (SEPA), the lead regulator for historic radioactive contamination, and Nuvia Limited.

Dr Paul Dale, Radioactive Substances Specialist at SEPA and an Honorary Senior Lecturer at the University of Stirling said: "Dalgety Bay has brought to the fore the need for alternative techniques to identify radioactive contamination which is buried at depth. Any improvements to the detection capability should therefore be welcomed, as it will ultimately reduce the hazards posed to the public.

"Once fully developed, the new approach outlined in this paper may well enable us to identify potentially harmful particles to a greater depth than current techniques allow, with a reduced need for intrusive works."

The research has been published by *Science of the Total Environment*.

More information: "Remediating radium contaminated legacy sites: Advances made through machine learning in routine monitoring of 'hot' particles," *Science of The Total Environment*, Volumes 521–522, 15 July 2015, Pages 270-279, ISSN 0048-9697, dx.doi.org/10.1016/j.scitotenv.2015.03.131

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