Artificial intelligence accurately predicts distribution of radioactive fallout

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When a nuclear power plant accident occurs and radioactive material is released, it is vital to evacuate people in the vicinity as quickly as possible. However, it is difficult to predict where the emitted radioactivity will settle, making it impossible to prevent the exposure of large numbers of people.

A means of overcoming this difficulty has been presented in a new study reported in the journal *Scientific Reports* by a research team at The University of Tokyo Institute of Industrial Science. The team has created a computer program that can accurately predict where emitted radioactive material will eventually land over 30 hours in advance, using weather forecasts on the expected wind patterns. This tool enables evacuation plans and other health-protective measures to be implemented in the event of a nuclear accident like the 2011 Fukushima Daiichi Nuclear Power Plant disaster.

This latest study was prompted by the limitations of existing atmospheric modeling tools in the aftermath of the accident at Fukushima, tools considered so unreliable that they were not used for planning immediately after the disaster. In this context, the team created a system based on a form of artificial intelligence called machine learning, which can use data on previous weather patterns to predict the route that radioactive emissions are likely to take.

"Our new tool was first trained using years of weather-related data to predict where radioactivity would be distributed if it were released from

a particular point," lead author Takao Yoshikane says. "In subsequent testing, it could predict the direction of dispersion with at least 85 percent accuracy, with this rising to 95 percent in winter when there are more predictable weather patterns."

"The fact that the accuracy of this approach did not decrease when predicting over 30 hours into the future is extremely important in disaster scenarios," Takao Yoshikane says. "This gives authorities time to arrange evacuation plans in the most badly affected areas, and to issue guidance to people in specific areas about avoiding eating fresh produce and taking potassium iodide, which can limit the absorption of ingested radioactive isotopes by the body."

More information: Takao Yoshikane et al, Dispersion characteristics of radioactive materials estimated by wind patterns, *Scientific Reports* (2018). DOI: 10.1038/s41598-018-27955-4

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