

# AquaCat: Fluid and Powder Identification using Radar and Machine Learning

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**Abstract**—*The AquaCat project makes use of low-cost miniaturised radar technology and machine learning in order to reliably detect various liquids and powders. The project builds on RadarCat, a radar-based object classification system developed by the University of St Andrews[1, 2].*

*Current fluid and powder sampling and analysis techniques, such as inductively coupled plasma mass spectrometry (ICPMS), require expensive specialist equipment, reducing the possible scale of measurement, both in time and in space. We are addressing this issue by producing a small, low-cost and portable pollutant detector based on miniaturised radar technology. With our system we have shown we are capable of discriminating a sucrose solution in water (1molar concentration) against water with over 92% classification accuracy, and 100% accuracies discriminating powdered dextrose, sucrose and ferrous sulphate.*

*Our long-term plan is to allow environmental researchers to make cheaper, faster and thus more numerous measurements in the field and therefore create a richer data set. When miniaturised radar technologies are deployed into smartphones and other devices, AquaCat could be available to a much larger section of the population. This will enable the collection of crowd-sourced pollution data over a large geographic area and over a long time.*

[1] Hui Y, Flamich G., Schrempf P, Harris-Birtill D., Quigley A. RadarCat: Radar Categorization for Input & Interaction, ACM UIST 2016, Tokyo Japan.

[2] <https://sachi.cs.st-andrews.ac.uk/research/interaction/radarcats-exploits-googles-soli-radar-sensor-for-object-and-material-recognition/>

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