The science of systems with sensors

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We've built systems with sensors before: lots of embedded systems have them, for example for plant control. But we're now starting to use sensors for different things. They're often exposed, and so subject to damage, mechanical degradation, and deliberate tampering. A single system may use a varying population of sensors over time, if for example we make spontaneous connections to IoT devices. And we want to use these sensors to make high-level classifications of what they're observing, such as environmental events or human activities, from which will make important decisions.

This class of "open" sensor systems presents us with a lot of new challenges. In particular we need to relate sensor input to evidence-based decision-making even in the face of noise, error, partial failure, and changing requirements: a level of mission creep we'd previously have regarded as untenable, which is now normal and which is often not amenable to the usual engineering approaches. This leads us to want to understand the relationship between sensors, the phenomena they're sensing, the ways in which they degrade, and the confidence we can place of the resulting data and decisions. In this talk I'll discuss some of the ideas that we have in S4 for tackling these issues.