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The world through a bathroom window: Statistics as you've never seen it before

Statistical data provides us with windows we can use to look out upon our world and learn about it to inform our world views and decision making. These are not windows of plain glass, however, but of rippled glass – like many bathroom windows. What we see through them is never quite the way it really is. We get unfocussed, sometimes distorted views of reality. One prime cause is systematically biased observational schemes, like a distorting filter on a camera lens – something that sits between us and the reality we want to see, filtering the stream of data that we get to see. The second prime cause is sampling error or other random factors. Classical statistical inference provides us with tools to help us reason in the face of the uncertainties caused by the latter. This talk will consider all of these elements and provide a visual tour, via sequences of static and moving images, showing the effects of sampling and randomisation variation on what we see in our data, the resulting uncertainties in what we can conclude, and the big ideas of what we can do about it using modern computer-intensive techniques based on randomisation and the bootstrap.