

How good is random information?

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The solution $S(f)$ of a numerical problem often depends on a function f of many variables. For example, $S(f)$ could be the integral or the maximum of f . It could also be the function itself. We want to compute $S(f)$, but we only have incomplete information about f : a certain a priori knowledge and the outcome of finitely many measurements.

The measurements might be point evaluations or other linear functionals.

Usually we assume that we can choose the measurements at will. We try to choose the measurements in a way that allows us to minimize the error. In this case, we talk about optimal information.

In this lecture we analyze what can happen in the case that we do not get to choose the measurements. Instead, we imagine that the information comes random and ask: How much do we lose in comparison to optimal information?

We study this question for several examples, where the answers range from almost nothing to almost everything.