

Abstract for Nozer Singpurwalla

TITLE: Information Theory and Shannon's Formula

ABSTRACT: I start by motivating as to how the notion of information arose, and how it evolved, via the idealistic scenarios of a courtroom, or that of a hacker trying to break a computer's password. I then introduce the notion of Shannon entropy as a natural consequence of the basic Fisher-Hartley idea of self-information, and subsequently make the claim that Shannon took a giant leap of faith when he proposed his famous, and well lubricated, formula. A consequence is that Shannon's formula overestimates the inherent uncertainty in a random variable. I also question Shannon's strategy of taking expectations, and suggest alternatives to it based on the Kolmogorov-Nagumo functions for the mean of a sequence of numbers. In the sequel, I put forward the case that the only way to justify Shannon's formula is to look at the self-information as a utility in a decision theoretic context. This in turn enables an interpretation for the recently proposed notion of "extropy". I conclude my presentation with the assertion that a complete way to evaluate the efficacy of a predictive distribution (or a mathematical model) is by the tandem use of entropy and extropy.