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Letter to the Editor

Comments on the Paper "Jaynes's Maximum Entropy Prescription and Probability Theory"[1]

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The results given in this paper do not contain evidence for an inconsistency in the maximum entropy formalism of Edwin T. Jaynes, but rather demonstrate precisely the consistency with Bayes' equation, cited in Ref. 1, in which the formalism itself is shown to be a consequence of Bayes' equation.

Using the probability distribution of Eq. (3) in the paper, the expected value of E, conditional on b, is described by

$$\langle E \mid b \rangle = \tfrac{1}{2}(n + 1) \tag{1}$$

From Eqs. (4) and (5) the parameter β satisfies the equation

$$\sum_{i=1}^{n} (ie^{-i\beta}) \Big/ \sum_{i=1}^{n} (e^{-i\beta}) = \epsilon \tag{2}$$

[1] The paper, "Jaynes's Maximum Entropy Prescription and Probability Theory," by Kenneth Friedman and Abner Shimony appeared in *Journal of Statistical Physics* 3(4), 381 (1971).

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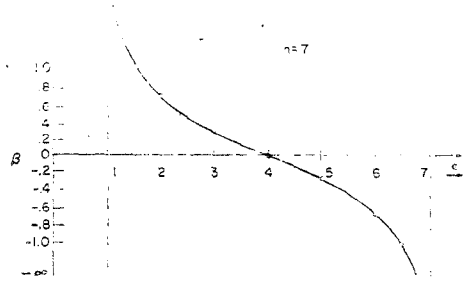

Fig. 1

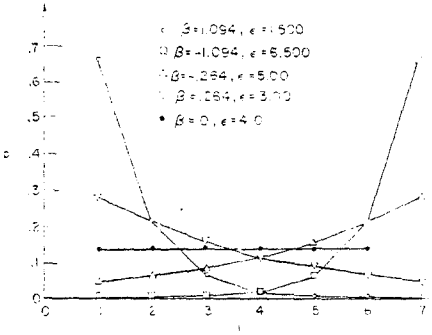

Fig. 2

Figure 1 shows a graph of β as a function of ϵ for the case $n = 7$. In Fig. 2 we show a graph of the posterior probability distribution as a function of either β or ϵ. It is obvious from this graph that the statement "The expected value of E is $\frac{1}{2}(n + 1)$" leads to precisely the same distribution as the statement "I have no reason to choose one value of i over another."

The information theory interpretation of this result is quite simple: Entropy measures what is unknown. Many statements in the English language lead to the same entropy because they say the same thing.

It is, of course, interesting to use probability distributions to describe what is known about ϵ. In the case of reliability estimates, this process has been carefully analyzed and leads to some very interesting results given in detail on pages 431–435 of Ref. 1.

In every instance the consistency with Bayes' equation is quite satisfactory.

REFERENCE

1. M. Tribus, *Rational Descriptions, Decisions and Designs*, Pergamon Press, Oxford and New York (1969).