

# CLEARING UP THE MYSTERIES: COMPUTING ON HYPOTHESIS SPACES

Kevin H. Knuth

Department of Physics

University at Albany (SUNY)

Albany NY, 12222, USA

(e-mail: [kknuth@albany.edu](mailto:kknuth@albany.edu), <http://www.huginn.com/kknuth>)

## Abstract

We all have become very comfortable with Bayesian probability theory and the interpretation of probabilities as real numbers representing degrees of belief. Indeed this level of comfort was necessary for these methods to become widely accepted. In keeping with Jaynes' original goal of 'Clearing up the Mysteries', I aim to inject some healthy discomfort back into this meeting by closely examining hypothesis spaces and the computations we perform on them. For example, these spaces are not necessarily Boolean spaces. There are two different types of logical *and* operations, one which occurs within a lattice and the other which is induced by the lattice product. Clearly, these details do not upset the Bayesian inferential framework with which we have become so comfortable. Instead, they serve to highlight the fact that even today there remains uncharted territory in the foundation of probability theory.

Key Words: Hypothesis Space, Bayes' Theorem, Boolean Algebra, Lattice Theory, Associativity, Distributivity