

The Social Entropy Process: Axiomatising the Aggregation of Probabilistic Beliefs

by

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The present work stems from a desire to combine ideas arising from two historically different schemes of probabilistic reasoning, each having its own axiomatic traditions, into a single broader axiomatic framework, capable of providing general new insights into the nature of probabilistic inference in a collective context. In the present sketch of our work we describe briefly the background context, present a set of natural principles for a broader axiomatic approach to aggregating subjective probabilistic beliefs than that taken historically, and finally define a general method of aggregating the *partial* subjective probabilistic beliefs of several individuals into a single “social” probability distribution in a manner which satisfies those principles. We call this method of aggregation the Social Entropy Process (**SEP**).

SEP has a natural interpretation in terms of information theory, and is closely related to minimum cross entropy principle, as well as to the maximum entropy inference process which has been intensively studied from an axiomatic standpoint (see e.g. [3],[4]). Moreover **SEP** satisfies a set of highly desirable principles. **SEP** marginalises to the maximum entropy inference process in the case when there is just a single individual and to the **LogOp** method of aggregating definite probabilistic beliefs in the case when there are several individuals each of whom specifies a particular probabilistic belief function.

We conjecture that **SEP** is the only “natural” generalisation of the maximum entropy inference process to the aggregation of disparate probabilistic beliefs of members of a collective, where no additional knowledge is available concerning the specific expertise of individual members.

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