



2.3 Continuity of Shannon's Information Measures for Fixed Finite Alphabets

Finite Alphabet vs Countable Alphabet

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- For countable alphabets, Shannon's information measures are everywhere discontinuous.
- To probe further, see Problems 28, 29, 30, 31, and

S. W. Ho and R. W. Yeung, "On the discontinuity of the Shannon information measures," *IEEE Transactions of Information Theory*, IT-56, no. 12, pp. 5362-5374, 2009.

Definition 2.23 Let p and q be two probability distributions on a common alphabet \mathcal{X} . The variational distance between p and q is defined as

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for all $q \in \mathcal{P}_{\mathcal{X}}$ satisfying

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