

Notes on Information Theory:

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We present expository notes and detailed solutions to problems from several texts and papers on information theory. This is meant to be an expansive set of notes on information topics that I have studied or am currently studying. Any typos or mistakes are my own - please redirect them to [my email](#).

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Part I.

Elements of Information Theory

We present expository notes on *Elements of Information Theory* by Cover and Thomas. Solutions to some exercises are presented, but many topics are currently left out.

1. Entropy, Relative Entropy, Mutual Information

Let X be a discrete random variable with alphabet \mathcal{X} and probability mass function $p(x) = \Pr\{X = x\}$, $x \in \mathcal{X}$.

Definition 1.1 (Entropy). The entropy $H(X)$ of a discrete random variable X is defined by

$$H(X) = - \sum_{x \in \mathcal{X}} p(x) \lg p(x).$$

We will sometimes denote this as $H(p)$, and note that \lg denotes \log_2 . The unit of entropy is bits, and we use the convention that $0 \lg 0 = 0$.

Part II.

Information Theory and Statistics

This will contain notes from *Information Theory and Statistics* by Duchi, with notes from their corresponding course.