



UNIVERSITEIT VAN AMSTERDAM

INFORMATIE EN COMMUNICATIE

HW-2

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11 januari 2016

1. Let X be a discrete random variable. Show that the entropy of a function g of X is less than or equal to the entropy of X by justifying the following steps:

$$\mathbb{H}[g(X)|X] = \mathbb{E} \left[\sum_n^i X_i \right] \quad (1)$$

Expected value is the expected value of the sum of the independent *Bernoulli distributions*.

$$= \sum_n^i \mathbb{E}[X_i] \quad (2)$$

$$= \sum_n^i p \quad (3)$$

$$= np \quad (4)$$

2. Let X and Y be independent binary random variables with:

$$\mathbb{P}_X[1] = \mathbb{P}_X[0] = \mathbb{P}_Y[1] = \mathbb{P}_Y[0] = \frac{1}{2}$$