Final Recitation – Information Theory, Application.

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Introduction

- Brief overview of the topic
- Importance and relevance
- Objectives of the presentation

Key Points

- Main point 1
- Main point 2
- Main point 3

Your Title Here

Claim

Let Y be a bit given by moving X trough $\mathrm{BSC}(p)$. Then:

$$1 - H(Y) \leq \left(1 - p^2\right)\left(1 - H(X)\right)$$

Your Title Here

Denote by δ the parameter for which X distributed as $\sim \text{Bin}(\frac{1+\delta}{2})$.
First notice that:

$$\mathbf{Pr}\,(Y = 1) = \frac{1+\delta}{2}p + \frac{1-\delta}{2}(1-p) = \frac{1+\delta p}{2}$$

Claim

Let Y be a bit given by moving X trough BSC(p). Then:

$$1 - H(Y) \leq \left(1 - p^2\right)\left(1 - H(X)\right)$$

Your Title Here

Claim

Let $Y = (Y_1, Y_2, .., Y_m)$ be a bit given by moving each of $X_i \in X = (X_1, X_2, .., X_m)$ trough $\text{BSC}(p)$. Then:

$$m - H(Y) \leq \left(1 - p^2\right)(m - H(X))$$

$$
\begin{aligned}
m - H\left(Y_1, Y_2, .., Y_m\right) &= m - \sum_i H\left(Y_i | Y_1, Y_2, .., Y_{i-1}\right) \\
&\leq m - \sum_i H\left(Y_i | X_1, X_2, .., X_{i-1}\right) \\
&\leq \sum_i 1 - H\left(Y_i | X_1, X_2, .., X_{i-1}\right) \\
&\leq \sum_i \left(1 - p^2\right)\left(1 - H\left(X_i | X_1, X_2, .., X_{i-1}\right)\right) \\
&\leq \left(1 - p^2\right) \sum_i \left(1 - H\left(X_i | X_1, X_2, .., X_{i-1}\right)\right) \\
&= \left(1 - p^2\right)\left(m - H(X)\right)
\end{aligned}
$$

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