Comments on unknown channels
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1. Introduction
This paper is in tribute to Prof. Tom Cover whose seminal paper discovered degraded broadcast models while investigating unknown (compound) channels.

PROBLEM STATEMENT

Our problem:

Rateless coding:

- Block of m message bits
- Achieved rate

Minmax Regret

- $R^f$: differential rate allocation
- $eta$: outage capacity
- Regret: $\xi(R^f,\beta) = \int R^f(\beta) d\beta$

Comparing different metrics

- Gaussian, $\beta = 1$
- Gaussian, $\beta = 5$

Technical results

- Gaussian: Given rate region $P = P_{C_1} + \int_{C_0}^\infty P(\beta)e^{-\beta}d\beta$, $R(C_0) = \ln(1 + P_{C_1} + N(C_0)) + \beta C_0$, $R(\beta) = R(C_0) + \beta C_0 - \beta C_0$, the conjectured solution (true if lemma 3.3 holds for Gaussians as well) is that $\xi_m(C_0)$ is equal to $\frac{1}{\beta}$.

Optimal rate allocation and regret

Outage vs. regret

Deterministic: $\xi_m(C_0) = 1 \quad \forall C_0$.

Deterministic (slope = 0)

BEC (slope = -.95ln(10))

Gaussian, $\beta = \beta_{max} = 1$

Gaussian, $\beta_{max} = 5$

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