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MMSE Dimension

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MMSE Dimension

- MMSE of estimating X based on $Y = \sqrt{\mathsf{snr}}X + N$.
- $\mathcal{D}(X) = \lim_{\mathsf{snr}\to\infty} \mathsf{snr} \cdot \mathsf{mmse}(X, \mathsf{snr})$
- Shown to be equal to the Information Dimension of X
- $D(X) = \lim_{m\to\infty} \frac{H(\langle X_m \rangle)}{m}$
- $\langle X_m \rangle = \frac{\lfloor mX \rfloor}{m}$
- $$\mathcal{D}(X, N) = \lim_{\mathsf{snr}\to\infty} \frac{\mathsf{mmse}(X, \mathsf{snr})}{\mathsf{lmmse}(X, \mathsf{snr})}$$

Cognitive Networks Achieve Throughput Scaling of a Homogeneous Network

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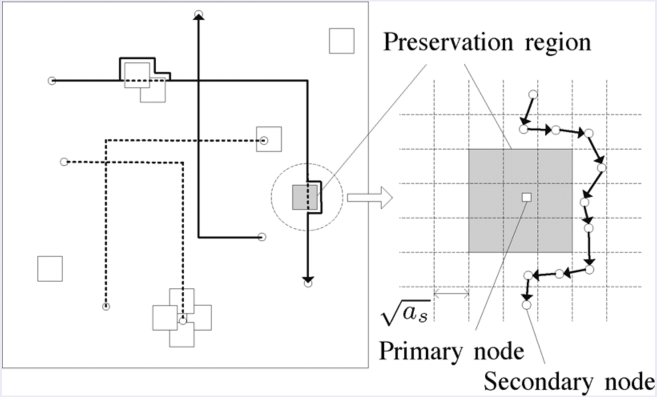
Cognitive Networks Achieve Throughput Scaling of a Homogeneous Network

- Primary network (n users) and secondary network (m users) coexist, $m = n^{\beta}$.
- Primary will have guaranteed throughput in presence of secondary, while secondary can be in outage.
- Primary does not change its protocol
- Primary achieves the sum throughput of order $n^{\frac{1}{2}}$ and, for any $\delta \geq 0$, the secondary achieves the sum throughput of order $m^{\frac{1}{2}-\delta}$ with an arbitrarily small fraction of outage.

Cognitive Networks Achieve Throughput Scaling of a Homogeneous Network



Distributed Scalar Quantization for Computing: High-Resolution Analysis and Extensions

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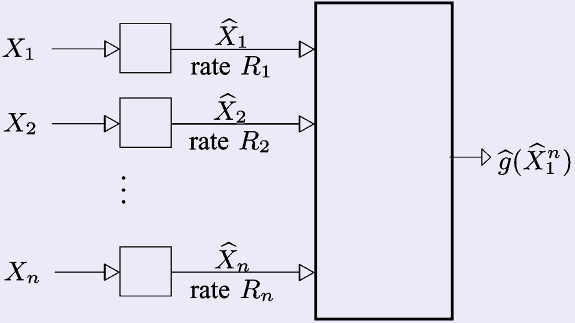

Figure: System Model

Main Results

- If g is linear, there is little advantage from accounting for g.
- for large values of n distortion improvement over ordinary source coding by a factor that is polynomial in in the fixed-rate (FR) case and exponential in in the variable-rate case (VR).
- Optimal quantizers are regular at sufficiently high rate.
- The inter-sensor communication can reduce distortion in VR arbitrarily large, while it is bounded in FR.

High-Rate Vector Quantization for the NeymanPearson Detection of Correlated Processes

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Main Results

- Error exponent analysis of high rate quantizers when observations are correlated.
- If $\beta_{n,N}(\alpha)$ represents the miss probability of the NP test of level α,
$$\beta_{n,N}(\alpha) \sim \exp\left(-n\left(K - \frac{D_c}{N^{(2/d)}}\right)\right)$$
- A analytical optimal scaler quantizer is proposed.
- In case of vector quantization, a method based on the LBG algorithm is proposed.

Fading Cognitive Multiple-Access Channels With Confidential Messages

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Fading Cognitive Multiple-Access Channels With Confidential Messages

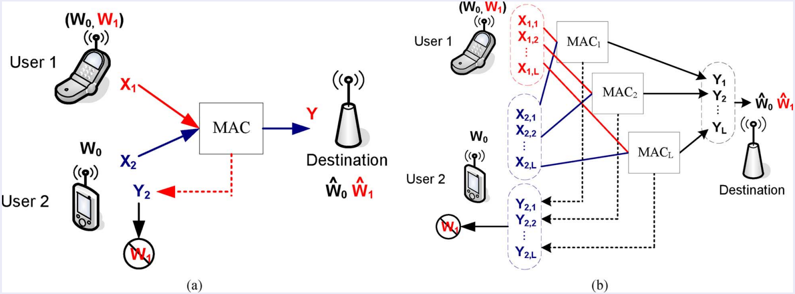

Figure: System Model

Main Results

- The secrecy capacity region of the parallel CMAC-CM is obtained.
- It is seen that having independent inputs to each subchannel is optimal.
- Above result is used to obtain secrecy capacity of the parallel Gaussian CMAC-CM and the ergodic secrecy capacity region for the fading CMAC-CM.
- Optimal power allocation policy for fading CMAC-CM is obtained.

Some Other Papers

- Minimum Energy to Send k Bits Through the Gaussian Channel With and Without Feedback
- Rumors in a Network: Whos the Culprit?
- Sequential Problems in Decentralized Detection With Communication
- Design and Generalization Analysis of Orthogonal Matching Pursuit Algorithms