Zero-Mean Gaussian System

1. Consider a system of correlated Gaussian channels with noise vector $\mathbf{Z}^* \sim \mathcal{N}(0, K)$, and so $\tilde{K}_{\mathbf{Z}^*} = K$.

2. Let C^* be the capacity of the system.

3. Let $\mathbf{X}^*$ be the zero-mean Gaussian input vector that achieves the capacity.

4. Let $\mathbf{Y}^*$ be the output of the system with $\mathbf{X}^*$ as input, i.e.,

$$\mathbf{Y}^* = \mathbf{X}^* + \mathbf{Z}^*.$$

Alternative System

1. Consider a system exactly the same as the Zero-Mean Gaussian System except that the noise vector $\mathbf{Z}$, which has the same correlation matrix as $\mathbf{Z}^*$, may neither be zero-mean nor Gaussian.

2. Assume that the joint pdf of $\mathbf{Z}$ exists.

3. Let C be the capacity of the system.

4. Let $\mathbf{Y}$ be the output of the system with $\mathbf{X}^*$ as input, i.e.,

$$\mathbf{Y} = \mathbf{X}^* + \mathbf{Z}.$$