a, $\mathbf{a}$, A and $\boldsymbol{A}$ represent scalar, vector, constant, and matrix. $\boldsymbol{A}^{\mathrm{T}}$, $\boldsymbol{A}^{*}$, $\boldsymbol{A}^{\mathrm{H}}$, $\boldsymbol{A}^{-1}$ denote the transpose, conjugate, Hermitian, inversion of the complex matrix $\boldsymbol{A}$, respectively. The notations $\mathrm{Tr}(\boldsymbol{A})$, and $|\boldsymbol{A}|$ indicate trace, and determinant of the complex matrix $\boldsymbol{A}$, respectively. $\mathrm{Diag}\{\boldsymbol{A}\}$ denotes a vector whose elements are the diagonal elements of the matrix $\boldsymbol{A}$, and $\mathrm{Blockdiag}\left(\{\boldsymbol{A}_k\}_{k=1}^{K}\right)$ is a block diagonal matrix with diagonal sub-matrices of $\boldsymbol{A}_k$'s. Furthermore, the i-th row and the j-th column of $\boldsymbol{A}$ are denoted as $[\boldsymbol{A}]_{i,:}$ and $[\boldsymbol{A}]_{:,j}$, respectively, and the element in the i-th row and j-th column is denoted as $[\boldsymbol{A}]_{i,j}$. The symbols $\mathrm{d}x$, ∂x, and $\mathrm{d}f$ represent the differential, partial differential, and total differential, respectively. For instance, the differential and partial derivative of f with respect to a variable a are expressed as $\frac{\mathrm{d}f}{\mathrm{d}a}$ and $\frac{\partial f}{\partial a}$, respectively.

Sets can be represented by A, B, and C. For example, $A \subseteq B \cup C$ indicates that set A is a subset of the union of sets B and C. Random variables can be represented by X, Y, and Z. For example, the expectation of the sum of two random variables is given by $E(X + Y) = E(X) + E(Y)$. The symbol $\mathbb{C}$ represents the set of complex numbers, such as $\exists z \in \mathbb{C}\,(z^2 + 1 = 0)$. $\mathbb{Z}_n$ denotes the set of integers modulo n, and Z stands for the standard normal distribution. The symbol ω is used for the smallest infinite ordinal number, $\aleph_0$ represents the cardinality of natural numbers, and $\mathfrak{c}$ denotes the cardinality of real numbers. Moreover, they are the key mathematical infinity symbols. The symbols $\top$ and $\bot$ represent tautology and contradiction, respectively. For example, for each proposition A, $A \wedge \top \equiv A$ and $A \wedge \neg A \equiv \bot$. These symbols are used in propositional logic, where $\top$ denotes a statement that is always true, and $\bot$ denotes a statement that is always false. In addition, $\sum_{i=m}^{n} a_i$ represents summation, $\prod_{i=m}^{n} a_i$ denotes the Pi product, and $[a]$ refers to the equivalence class of a. Δ refers to the discriminant, which is commonly used in polynomial equations to determine the nature of their roots. The symbols δ and ε represent small quantities used in proofs involving limits.

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