

Elements of academic writing

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1 Notation

1. Use bold letters for vectors and regular letters for scalars. For instance, let n denote the sample size and \mathbf{v} denote the vector that collects the parameters of interest.
2. Use bold capital letters to denote matrices. For instance, let $\mathbf{W} \in \mathbb{R}^{d \times K}$ denote the weight matrix.

2 Mathematical display

1. Use `\top` to denote the transpose of a vector or matrix. For instance, the transpose of matrix \mathbf{A} is \mathbf{A}^\top .
2. Use `\balpha^\top\bbeta` to denote the inner product between two vectors $\boldsymbol{\alpha}$ and $\boldsymbol{\beta}$. For instance, let $\boldsymbol{\alpha}$ and $\boldsymbol{\beta}$ be two vectors of dimension $d \times 1$, then its inner product is given by $\boldsymbol{\alpha}^\top \boldsymbol{\beta}$.
3. Use `\texttt{}` to refer to a package or a specific function therein. For instance, the `Pytorch` library adds the bias term by default, or be sure to do `optimizer.step()` before `scheduler.step()`.
4. Don't use `\texttt{}` when referring to an approach or algorithm; for example, Principal Component Analysis (PCA).
5. Use `\mathrm{}` to refer to math functions. For instance, the `LogSoftmax()` function returns the logarithm of the `Softmax()` function.
6. Do not use `\cdot` for any kind of multiplication, e.g., scalar-scalar product, Hadamard product, inner product, matrix-vector product, etc.

7. Use $\log_{\text{base}}(\text{number})$ instead of $\log_{\text{base}}(\text{number})$ to denote logarithm. For instance, the objective function we want to minimize is $\text{Loss} := -\log(q_j(x))$, where $q_j(x)$ is obtained by applying the `Softmax()` function to the raw scores.

3 Word choice

1. There is no multi-dimensional vector; instead we should use the term multi-dimensional tensor.
2. Instead of using “number of samples”, we should use “number of observations” or “sample size” to describe how many observations we have.
3. Never use “want to”. Use “plan to”, “wish to”, “intend to”, etc.

4 Organization

1. Define a quantity before using it.
2. Explain the domain and image space first when describing a function. For example, consider $f : \mathbb{R} \rightarrow \mathbb{R}^d$.

5 Coding style