1 Announcement

Next week, we are going to critique students’ writing. Tom asked students to submit samples of their technical writing. Four years ago, we spent a whole class period to critique one paragraph of a student’s technical writing, and so you don’t have to submit much.

2 Mathematical writing

Today, we are going to finish talking about mathematical writing. When you write math in the main text, you should try to make the math symbol the same size as the main text. In particular, if you put a fraction in the main text, you could either use an in-line fraction in the main text or put it into a math display. Try not to use the $\frac{}{}$ command in the main text, because the text is too small. For example, write $x/y$ instead of $\frac{x}{y}$. In addition, you should avoid really small fonts, such as you get from a subscript of a subscript. You can sometimes avoid using subscripts by changing notation. For example, if $W = \{w_1, \ldots, w_n\}$, you can replace $\sum_{i=1}^{n} f_{w_i}$ by $\sum_{w \in W} f_w$.

2.1 Ellipsis

You can use an ellipsis to describe a sequence, but make sure that if you use an ellipsis in a sequence of values, use $\ldots$ in LaTeX, which puts the dots along the baseline. In addition, you can use $\cdots$ for vertically centered dots, as in $1 \cdot 2 \cdot 3 \cdots n$.

2.2 Greek letters

If you use Greek letters, stick to the letters that people know because many Greek letters are unfamiliar to most people. Do not let numbers, symbols, or abbreviations appear at the start of a line, especially when they are at the end of a sentence. For example, you do not break the line in front of a number or a symbol.

2.3 Higham’s math glossary (joke)

Higham has a glossary of terms we have seen in papers. For example, the meaning of Correct to within an order of magnitude is Incorrect.

3 Usage

3.1 Possessives

If you have a singular noun and you want to use it as a possessive, add ’s at the end of the noun.
Right: Charles’s student.
Wrong: Charles’ student. [Charles a singular noun]

3.2 Use the serial comma
If you have more than two things in a list, put commas after each item in the list except the last one.

Wrong: X, Y and Z
Right: X, Y, and Z

This rule makes the second list clear, because if you write the sentence like the first one, people might be confused about whether Y and Z are two components or just one. If X is itself a sequence, and the same for Y and Z, then you need to separate the sequences with semicolons.

3.3 Dashes
There are five kinds of dashes:

1. Hyphen. For example, commander-in-chief or x-axis. In LaTeX, you type it with a single dash.
2. En-dash. It is used to describe a range of values. For example, 6–12 or years 2000–2005. You type it with two consecutive dashes.
3. Em-dash. It sets apart a part of a sentence, and you type it with three consecutive dashes.
5. Two em-dash. Very rarely used, it sets apart a part of a sentence that already has an em-dash in it.

Tom’s guideline for when to use em-dashes or parentheses. If you’re setting apart a part of sentence and you would lower your voice when saying it, then enclose that part in parentheses. Otherwise, use em-dashes.

Linearity of expectation (which I use frequently) is a key technique in probabilistic analysis.
Linearity of expectation—a property that holds even when random variables are dependent—is a key technique in probabilistic analysis.

3.4 Garden-variety nonrestrictive clauses
I told my graduate students, Mridul and Lixing, that they have to work harder.

The commas set aside the part of the sentence saying who are Tom’s graduate students.

I told the CS 1 student who knocked on my door to go see the TA.

In this sentence, instead of giving nonrestrictive information, we specify the restrictive information that the student who knocked on my door should see the TA.
3.5 Compound sentences

If you have two subjects and two verbs, you have a compound sentence. In this case, you put an *and* and a comma:

I design algorithms, and I chair the Computer Science department.

If you have only one subject in the sentence, do not put a comma between the verb phrases because it is not a compound sentence:

I design algorithms and chair the Computer Science department.

If you really need a pause in this sentence, you need to rewrite the sentence:

She was the best programmer I have ever seen and could also skate really well.

You might want a pause after the word *seen*. In this case, you can break it into two sentences:

She was the best programmer I have ever seen. She could also skate really well.

Another way is to use a semicolon:

She was the best programmer I have ever seen; she could also skate really well.

Or you could add *moreover* to transition the two sentences:

She was the best programmer I have ever seen. Moreover, she could also skate really well.

It is OK to add a comma between two sentences if you use *but* to connect them.

She was the best programmer I have ever seen, but couldn’t prove a theorem to save her life.

We do not use a comma to connect two sentences; instead, we could use a semicolon to connect them.

1. *Wrong*: I am right, you are wrong. [This example shows a *comma splice*]
2. *Right*: I am right; you are wrong.
3. *Right*: I am right. You are wrong.

3.6 When do you use a colon?

People often make the mistake of putting a colon after a verb.

*Wrong*: The cluster includes: 32 nodes, a rack, and a high-speed network.

If you use a colon and find that by removing the colon the sentence is still grammatical and the meaning of the sentence does not change, you need to remove the colon.

Four ways of using a colon:

1. List of particulars. For example, *To be a good programmer requires the following: patience, memory, and love of pizza*.
2. Appositive. For example, *I wrote the program in my favorite language: APL*.
3. Amplification. For example, *Always check the denominator: dividing by zero will make your computer explode*.
4. Quotation. For example, *And then I heard those dreadful words: “the blue screen of death.”*
3.7 The participial phase at the beginning of a sentence must refer to the grammatical object

Wrong: Having crashed, I rebooted the computer.
Right: I rebooted the computer, because it had crashed.

The first sentence is wrong because I did not crash.

3.8 Put statements in the positive form

Bubblesort is not an efficient algorithm. [Negative form]
Bubblesort is a slow algorithm. [Positive form]

3.9 Use definite, specific language

OK: Dynamic programming is a good problem-solving technique.
Better: Dynamic programming helps us solve optimization problems that exhibit optimal substructure and also have overlapping subproblems.

The second sentence is more specific than the first one.

3.10 Colloquialisms

Do not use Informal language in writing. For example, stuff, as a noun.

3.11 Hyphenate compound adjectives

dynamic-programming algorithm
real-world example

Algorithm is a noun, and both of dynamic and programming are adjectives. Here, programming modifies algorithm, and dynamic modifies programming. When the first adjective modifies the second adjective, we should put a hyphen between the two adjectives. Otherwise, you imply that both of the adjectives modify the noun.

Well studied problem is correct because well is an adverb and could not possibly modify the noun problem.

If a noun does not follow the adjective, do not add hyphens: the algorithm uses dynamic programming.

3.12 Parentheses and sentences

Parentheses and sentences nest. If the parenthetical passage is a part of the sentence, put the period after the right parenthesis:

Right: I went home (by way of the bar).
Wrong: I went home (by way of the bar.)
If the parenthetical passage is one or more sentences, put the period before the parenthesis so that the sentences inside parenthesis are properly punctuated.

*Right:* I went home. (But first, I stopped at the bar.)

*Wrong:* I went home. (But first, I stopped at the bar).