

COSC 91/191, Spring 2019

Lecture 4

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Scribes: Shaojie Jiao and Michael C. Millian

Tom restated the importance of the introduction at the start of class. See the previous class's notes for this information. In this class he explained how to organize the remaining sections in a paper, improve writing style, and write better sentences.

1 Organization of a paper

Tom did not reiterate strategies for the introduction since they were covered in previous class. He first went through the strategies to organize the building blocks of a paper—paragraphs and sections—and next explained how to organize the interior sections of a paper, the conclusions section, acknowledgements, appendices, and the bibliography.

1.1 Paragraphs

Every section is made up of paragraphs, and so every paragraph should be well formed. Tom wanted us to keep two points in mind. First, a paragraph should be sized reasonably. For example, if it's a whole page long, it's probably too long. Second, a paragraph should always have a topic sentence. In most cases, the topic sentence is the first sentence in the paragraph. Sometimes however, the last sentence can be the “real” topic sentence, with the first sentence being a placeholder. You can also use the last sentence as a transition sentence to lead into the topic sentence of the next paragraph.

1.2 Sections

Sections should be well formed in the same way as paragraphs. Every section and subsection should have a topic paragraph. Even headings and unnumbered subsection should follow this rule. You don't need to worry about being repetitive when writing topic paragraphs and topic sentences, because the readers feel comfortable reading familiar information.

1.3 Organization of interior sections

The interior sections of a paper should tell a story. Some academic fields, for example, biology, have a strict organizational format to follow. Creative research areas such as computer science and engineering offer more organizational freedom. Zobel suggests four different ways to organize a paper which are *chain*, *by specificity*, *by example*, and *by complexity*.

The *chain* structure describes the problem, then reviews previous work, followed by introducing your work, and finally argues why your work is better. With the *specificity* structure, you start with the general and then focus on the specific. The *example* structure shows a typical problem and then explains it more formally (the section on suffix arrays in the fourth edition of CLRS is a good example of this structure). The *complexity* structure is similar to a tutorial, in which you start with a simple case and then show the complex case as an extension of the simple one.

No matter how you organize the interior sections, place the results up front so that readers see them immediately. Readers don't want to wait until the conclusions to see the results.

1.4 Conclusions

The conclusions section concludes the ideas presented in the paper. The proper section title is "Conclusions," not "Conclusion," because you are concluding the ideas of the paper, not the paper itself. The conclusions section complements the introduction: the introduction tells the reader what will be covered in the paper, and the conclusions reminds the reader what was covered in the paper. You should vary the wording instead of copying and pasting from the introduction.

The conclusions section can present information other than a recap of what the paper covers. Other information that belongs in the conclusions includes limitations, extensions, applications (especially those other than the "killer applications" presented in the introduction), theoretical and practical implications, open problems, and future work.

The conclusions section is the last chance you have to wrap up your work and leave an impact on the reader. Many authors seem to run out of steam before they write conclusions and therefore write weak conclusions. Don't fall into this trap. Set aside enough time to write your conclusions and make it comprehensive.

1.5 Acknowledgement

Thank people who helped you perform your research. It is OK to thank reviewers for their feedback, even if the reviewers are anonymous. It is unnecessary to thank people who help you in the course of their day-to-day job, but you should thank people who do something special beyond their ordinary responsibilities. For example, you do not need to thank Wayne if you just use Dartmouth's shared servers, but you could thank him if he installs a package specifically for you. You should also thank people or organizations that provided funding. You can alternatively use the \thanks macro to thank funding providers.

1.6 Appendix

The appendix is a workaround to meet page limits. You can move some content from the paper into an appendix, and the appendix does not count against your page limit. When deciding what to move to an appendix, look for details that interrupt the flow of the paper, e.g., proofs. Keep in mind that reviewers are not required to read the appendix and may judge your paper without reading it.

1.7 Bibliography

The bibliography is just as important as the rest of the paper, yet many bibliographies contain mistakes. Always compile and read the bibliography (RTFB). Look for and correct unexpected capitalization and formatting issues.

Every item in the bibliography should include enough information for the reader to directly find the referenced work. To this end, you should only cite resources that you have access to. Never directly copy the bibliography from someone else, as this is how errors propagate. Authors sometimes even reference their own publications incorrectly. Compare each of your references with the original source. Use complete author names when available, and be consistent when referencing multiple works by the same author. If the same author uses his or her full name on one paper and initials on another, use the full name for both

papers in your bibliography. If the resource is online, include the access date because online resources can change. When possible, reference the conference version of a paper rather than an archived version, because conference versions are guaranteed to have been reviewed. An archived version is OK if no better version is available.

2 Style

You want to have good style so that the reader can understand your ideas clearly. Even if your paper is organized well, if individual sentences are confusing then your paper is confusing. This section deals with understanding why bad writing exists, suggests some high level improvements, presents Williams's method to diagnose and revise bad sentences, and concludes with examples of bad sentences coupled with improvements.

2.1 Why is there bad writing?

Understanding why bad writing exists is the first step to improve it; different patterns of bad writing require different solutions.

There are lots of reasons why an article can be confusing. For example, one possibility is that the author wants to fool the reader into thinking the ideas are deep by making the writing hard to understand. Other than intentionally making the article confusing, other possibilities include not understanding the topic well enough, failing to take the intended readers into consideration, or simply not knowing how to write better, which is what this course mainly focuses on fixing.

2.2 How to make your article clearer?

First you need to make sure all sentences are grammatical. At the same time, a grammatically correct sentence could still be confusing—for instance, a sentence that contains double negatives—and you should avoid such kinds of constructions.

To make a sentence clearer, emphasize the main subjects and actions. Keep actions as verbs and characters as subjects. An action could take various forms other than a verb in a sentence. For instance, an action can be a nominalization—a noun derived from a verb or adjective—such as *analysis* and *importance*; a gerund—the *-ing* form of a verb—such as *increasing* and *performing*; or an adjective that implies an action, such as *applicable* or *repeat*. Another thing to pay attention to is that the same word can be either a noun or a verb, such as *review* or *request*. Avoid weak verbs with little information and abstract verbs, such as *do*, *yield*, *exhibit*, or *result*, as they would increase nominalizations and prepositions.

2.3 Williams's method for diagnosing a bad sentence and revising it

Williams offers a three-step procedure to fix bad sentences. These steps are diagnose, analyze, and rewrite.

First, diagnose the style of the sentence. Examine the first seven or eight words in the sentence. If you see abstract nouns as simple subjects or if there is no verb in these first words, then you should make a note, as this sentence likely needs improvement.

Next, analyze the sentence to understand how to improve it. Identify the main characters and actions. The characters and actions might not map to subjects and verbs in the sentence as is. You fix this discrepancy in the next step.

Finally, rewrite the sentence. Change nominalizations to verbs. This change makes the action clear. Make the characters you identified the subjects of the verbs. Rewrite the sentence with connecting words, subordinating conjunctions such as *because*, *if*, *when*, *although*, *how*, *why*, *whether*, *that*, and *though*. Subordinating conjunctions clarify the connection between details in your sentence.

2.4 Examples

Tom showed some examples of bad sentences, and discussed how to fix them using Williams's method. In sentence

We did an analysis of the differences between the systems,

you can mark down *analysis* and *difference* as nominalizations. After turning them back to verbs, you get

We analyzed how the systems differ.

In sentence

Prior to entry of data into the CPU taking place, there is an interception of the data by the cache, resulting in data storage within the cache,

there are multiple nominalizations including *entry*, *interception*, *storage*; weak verbs including *taking place*, *resulting in*, which are also in gerund form; and *there is* before a nominalization. After identifying the actions and characters and turning them back to verbs and subjects, you get

Before data enters the CPU, the cache intercepts and stores it.

Another example was

The slow speed of disk rotation relative to the propagation of electrical signals results in the exhibiting of high latency by disk I/O operations.

In this sentence you can identify that *exhibiting*, *rotation*, and *propagation* contain the main actions. Thus, you can fix it by turning these words back to verbs, making the main characters subjects, and adding the connecting word *because*. You get a much more concise sentence:

Disk I/O operations exhibit high latency because disks rotate more slowly than electrical signals propagate.

2.5 How the examples were produced

Tom produced the examples of bad sentences used in class by starting with good sentences and applying the inverse of Williams's transformations.

2.6 Some patterns with nominalizations that often show up in bad sentences

Tom discussed some patterns that commonly appear in bad sentences and how to fix them, by showing some examples.

The first pattern is a nominalization as the subject of an empty (weak) verb. For example, in

The performance of our system is better than previous systems,

the main verb is *is*, with a nominalization *performance* as the subject. The real main action is *perform* and the main character is *system*. After turning the main action back to a verb, you get

Our system performs better than previous systems.

Similarly, a nominalization could also be following an empty verb, for instance, in

We performed an analysis of the data,

you can find a nominalization *analysis* as the object of a weak verb *perform*. After turning the nominalization back to a verb, you get

We analyzed the data.

Nominalizations can also show up on both sides of a verb at the same time. For example, in

The decrease in performance was due to an increase in cache misses,

after turning *decrease* and *increase* back to verbs and adding a subordinating conjunction *because*, you get

Performance decreased because cache misses increased.

Another pattern is a nominalization after *there is/are*, for instance, in

There is no requirement that the parameter be positive,

the “*there is no requirement*” can be replaced by “*is not required*,” giving

The parameter is not required to be positive.

You can also remove the passive voice by using *we* as the subject and write

We do not require the parameter to be positive.

2.7 We

As shown in the last example, when the main subject is unclear, it is OK to use *we* to avoid passive voice. Here’s another example: in

An experimental analysis of the rate-limiting components of the system could yield a significant increase in throughput,

the main action is contained in “*increase in throughput*,” but no subject is specified. Thus you can rewrite it as

We could speed up the system if we found its bottlenecks.