Lecture 5
Sentences and Paragraphs

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Sentences

Roles of Words in Clauses

Words and phrases can assume the following **roles** in a clause:

- **subject**;
- **verb**;
- **direct object**;
- **indirect object**;
- **complement**;
- **adverbial**.

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These roles are not to be confused with the parts of speech (noun, verb, etc.).

Subjects

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Examples of subjects:

She ate lunch.
Whom did you see?
Naomi and Yuta both looked exhausted.

Verbs

The verb **describes an action** or **state**. It forms the core of the clause.
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Examples of direct objects:

She ate lunch.
Whom did you see?
His grandparents gave him the money he needed.

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Examples of indirect objects:

Tell me a story.
His grandparents gave him the money he needed.

Complements

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Examples of complements:

Put the dish on the table.
She is the one to whom they gave it.

Adverbials

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Examples of adverbials:

> *He arrived after dinner.*
> *Initially, we set `i` to 0.*

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Compare:

> *This approach is reliable, but it is incomplete.*
> *This approach is incomplete, but it is reliable.*

Both sentences have *this approach* as their topic.
The first sentence, in true "yes, but" style, puts the focus on *incomplete*, whereas the second puts the focus on *reliable*.

Topic, then Stress

Notice the **topic** and the **stress** in the following sentences.

The mean error will guide the design of the evaluation's next phase, so it is a critical thing to get a good estimate of.

The mean error will guide the design of the evaluation's next phase, so it is critical that we get a good estimate of it.

The mean error will guide the design of the evaluation's next phase, so it is critical that we estimate it accurately.

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Subject, then Verb

As a rule, get to the **subject** quickly. Compare:

> *Although the problems are easy for Jeha (Jeha solves each of these problems within 15 seconds on a modern laptop), without the variable argument pruning rule they become substantially more difficult.*
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> *The variable argument pruning rule makes the problems easy for Jeha, which can solve each one within 15 seconds on a modern laptop. Without the rule, the problems become substantially more difficult.*

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> *The variable argument pruning rule makes the problems easy for Jeha, which can solve each one within 15 seconds on a modern laptop. Without the rule, the problems become substantially more difficult.*

In the first paragraph, the subject of the main clause comes at position 27.
In the second paragraph, the subjects come at positions 2 and 4 in the respective sentences.

Subject, then Verb

As a rule, get to the **verb** quickly. Compare:

> *Exploiting knowledge about specific models of a theory for improving automated proof search has received quite some attention in the past.*
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> *Many automated theorem provers enhance their proof search by exploiting knowledge about a theory's specific models.*

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We also shifted the focus from what researchers do (the **metascience**) to what programs do (the **science**).

Short before Long

Within sentences—and also paragraphs, sections, and chapters—try to present **short segments before long segments**. Compare:

> *These sections develop auxiliary theories about optimum techniques for sorting and searching and about permutations.*
>
> *These sections develop auxiliary theories about permutations and about optimum techniques for sorting and searching.*

Left-Heavy vs. Right-Heavy

- A **left-heavy** sentence has a long subject (on the left)
  and short objects, complements, or adverbials (on the right).
  Any subordinate clauses in the subject are recursively left-heavy.

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- A **right-heavy** sentence has a short subject (on the left) and long objects, complements, or adverbials (on the right). Any subordinate clauses in the objects, complements, or adverbials are recursively right-heavy.

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- A **right-heavy** sentence has a short subject (on the left) and long objects, complements, or adverbials (on the right). Any subordinate clauses in the objects, complements, or adverbials are recursively right-heavy.

Left-heavy sentences are **difficult to parse**.
Right-heavy sentences are **easy to parse**, even if they are long.

Left-Heavy vs. Right-Heavy

Example of a **left-heavy sentence**:

> That radix sorting is usually inferior to merge sorting, which happens because the technique of replacement selection gives merge sorting a definite advantage, and there is no apparent way to arrange radix sorts so that we can make use of internal sorts encompassing more than one memory load at a time, is one important consequence of the duality principle.

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Example of a **right-heavy sentence**:

> One important consequence of the duality principle is that radix sorting is usually inferior to merge sorting, which happens because the technique of replacement selection gives merge sorting a definite advantage, and there is no apparent way to arrange radix sorts so that we can make use of internal sorts encompassing more than one memory load at a time.

Left-Heavy vs. Right-Heavy

Below, a left-heavy sentence is **broken into two sentences**:

> *The observation that Huffman's algorithm might be implemented using a priority queue is of note to computer scientists because it represents a substantial opportunity to improve performance.*
>
> *Huffman's algorithm can be implemented using a priority queue. This greatly improves its performance.*

Shape of Sentences

Vary the shape and length of your sentences.

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Vary the shape and length of your sentences.

Aim for **10 to 20 words** per sentence on average.
Use short sentences for important points that need more stress.
Do not bury your main point in a 45-word sentence.

Characters and Actions

To make your text more enjoyable to read and easier to follow,
imagine you are telling a story.

- Make the main **characters** the grammatical **subjects** of your sentences.
- Make the main **actions** the grammatical **verbs** of your sentences.

A Story

Main character
Main action
Subject
Verb

Once upon a time, as a walk through the woods was taking place on the part of Little Red Riding Hood, the Wolf's jump out from behind a tree occurred, causing her fright.

A Story

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Verb

Once upon a time, as a walk through the woods was taking place on the part of Little Red Riding Hood, the Wolf's jump out from behind a tree occurred, causing her fright.

vs.

Once upon a time, Little Red Riding Hood was walking through the woods, when the Wolf jumped out from behind a tree and frightened her.

Another Story

Main character
Main action
Subject
Verb

The design of the new supercomputer was more of a struggle for the engineers than had been their expectation.

vs.

The engineers struggled more than they had expected when designing the new supercomputer.

Inanimate Characters

Main character
Main action
Subject
Verb

Characters are often people.

But **inanimate things** and **abstractions** can also be characters,
particularly when they play some active role in a sequence of sentences—e.g.:

> *The CYK algorithm considers every substring of the word* w *to determine if it belongs to the language* L. *It was originally published by Itiroo Sakai in 1961.*

Placement of Only

The adverb *only* is often **misplaced**.
The following sentences carry different meanings or at least nuances (Knuth et al.):

Only I hit him in the eye yesterday.
I only hit him in the eye yesterday.
I hit only him in the eye yesterday.
I hit him only in the eye yesterday.
I hit him in only the eye yesterday.
I hit him in the only eye yesterday.
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If you write *Here we only draw the first two points*,
you probably mean *Here we draw only the first two points*.

Against Superstitions

- A preposition is a legitimate word to end a sentence **with**.
- You need not try **to not split** infinitives.
- **And** it is acceptable to start a sentence with *and* or *but*.

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- The passive might allow you to follow the "**topic, then stress**" or the "**characters and actions**" principle—e.g., *Gradient descent was discovered by Cauchy in 1847.*
- The passive might let you replace a **long** subject with a **short** one. Compare:
  Research demonstrating the soundness of our reasoning and the need for action supported this decision.
  This decision was supported by research demonstrating the soundness of our reasoning and the need for action.

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- Nominalization can replace clunky, tangled constructions with **simple and direct phrasings**—e.g., *After optimization, the program ran twice as fast.*
- Nominalizations serve as **characters** in your narrative—e.g., *Optimization is not the root of all evil.*

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- The more harmless type arises when you keep referring to the **same concepts** using the same words. For clarity, it is often better to accept the repetition than to employ synonyms.
- More harmful is the accidental repetition of words to refer to **different concepts**. This will likely distract the reader and perhaps confuse them.

Word Repetition

Example of the harmless type:

> *To prove the theorem, we must prove the base case and the induction step.*

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Example of the harmless type:

To prove the theorem, we must prove the base case and the induction step.

Example of the harmful type:

It proved difficult to prove the induction step.

In the second sentence, *proved* should have been *turned out to be*.

Paragraphs

Topic of a Paragraph

Each paragraph should have **one topic**.

The first sentence of a paragraph often announces the topic. It is called a **topic sentence**. The rest of the paragraph then expands on the topic.

The topic sentences alone should provide a reasonable outline of the section.

Length of a Paragraph

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Break long paragraphs into shorter ones, such that each resulting paragraph has one identifiable topic.

Conversely, try to avoid single-sentence paragraphs.

Flow of a Paragraph

Sentence $k+1$ in a paragraph should have a **logical link** to sentence k.
They should fit like two pieces of a **jigsaw puzzle**. Compare:

> *There are several efficient sorting algorithms. Recursion is easy to reason about, so merge sort is particularly straightforward to implement.*
>
> *There are several efficient sorting algorithms. Of these, merge sort is particularly straightforward to implement, since recursion is easy to reason about.*

Coherent Paragraphs

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To achieve coherent paragraphs:

- The topic of each sentence should be clear from the first **eight words or so**.
- The sequence of topics in a paragraph should form a small **set of related ideas**.

Coherent Paragraphs

Compare (and pay attention to the **subjects**):

Consistent metaphors help users understand how to use a graphical application. A sense of consistency arises when a sequence of user actions comprises a narrow set of related ideas. But the context of what they are doing is lost due to inconsistent metaphors. Poorly designed is what they would call the application.

Users understand how to use a graphical application when they see consistent metaphors deployed in the user interface. They feel that an application is consistent when they execute a sequence of actions based on a narrow set of related ideas. But when the metaphors are inconsistent, users lose the context of what they are doing. When that happens, they feel that the application is poorly designed.

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Danglers

When a sentence starts with a participle or some other modifying word, the reader's natural expectation is that this word modifies the sentence's subject. They are let down when this is not the case—e.g., *As an early GitHub adopter, we never had the chance to ask you about your email preferences.* Here, it sounds as though the sender is an early GitHub adopter.

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Empty verbs

These are verbs with little semantic content relevant to the main action of the sentence (e.g., *is*, *seems*, *has*, *occurs*). Rework your sentence following the "characters and actions" principle.

Pitfalls

False attraction

Sometimes, a word other than the subject "attracts" the verb, leading to a wrong verb form—e.g., *Each of these points are . . .* (write *is*),
Lupin is one of the most famous thieves that is . . . (write *are*).

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Garden paths

A garden-path sentence starts in such a way that a reader is likely to misparse it—e.g., *We now prove A and B imply C*. (Until the reader reaches *imply C*, the sentence sounds as though we would now prove A and B.) Reword to avoid.

Pitfalls

Inelegant variation (also called, ironically, "elegant variation")

Some authors clumsily use synonyms to avoid repetition.
This can distract or even confuse readers.
"If you call a car 'the BMW' in one place and 'the sporty import' in another,
can your reader be certain that you're referring to the same car?
If you write about a person's 'candor' in one sentence and 'honesty' in the next,
is the reader to infer that you are distinguishing between two traits,
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Sentence fragments

These are occasionally useful, but usually wrong in formal English. In particular,
do not put a period between a main clause and a subordinate clause—e.g.,
The proposal was rejected. Because it did not address their main concerns.

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Unclear antecedent of ‘this’

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Waffle

Some paragraphs have the form *A but B but A*. The cure is to rearrange the material. Example (van Leunen): *We would like to have more information about the small-scale flow, but our model can account for all the information in laboratory experiments. Observations in nature are, however, all too few. The fact remains that under experimental conditions much of value can be learned. But the fieldwork will undoubtedly mean that we must correct many of our assumptions. In the meantime, nevertheless, the work in vitro will continue.*