1. What is the difference between stemming and lemmatization? Provide examples with the word “running.”

Stemming: uses simple, rule-based heuristics to chop off word endings (e.g., "running" → "run" or sometimes "runn"). It does not consider the context or part of speech, so it might produce non-dictionary forms.

- **Lemmatization**: is more sophisticated, using morphological analysis and vocabulary to convert a word to its base or dictionary form (lemma). For "running," a lemmatizer (knowing it’s a verb) would typically return “run."

2. Why might removing stop words be useful in some NLP tasks, and when might it actually be harmful?

Useful: In tasks like text classification, topic modeling, or keyword extraction, removing common words (e.g., "the", "in", "are") helps reduce noise and focuses on more meaningful tokens.

- **Harmful**: In sentiment analysis or other tasks where subtle linguistic cues matter, removing stop words can eliminate important context. For instance, negations like "not" drastically change meaning, so discarding them can lead to incorrect interpretations.
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