

36 Lecture - CS402

Important Subjective

1. **What is Chomsky Normal Form (CNF) in the context of Context-Free Grammar?**

Answer: Chomsky Normal Form (CNF) is a standard form of Context-Free Grammar in which all production rules have the form $A \rightarrow BC$ or $A \rightarrow a$, where A, B, and C are non-terminal symbols, and a is a terminal symbol.

Why is it useful to convert a Context-Free Grammar to Chomsky Normal Form?

Answer: Converting a Context-Free Grammar to Chomsky Normal Form makes it easier to analyze and manipulate. It simplifies the structure of the grammar and allows for more efficient parsing algorithms to be used.

How can we convert a Context-Free Grammar to Chomsky Normal Form?

Answer: The conversion process involves the following steps:

Remove all productions with epsilon (ϵ) on the right-hand side.

Replace all unit productions with the original non-terminal symbol.

Eliminate all non-terminal symbols that do not produce any terminal symbols.

Replace all remaining productions with a length greater than 2 with a series of productions with two non-terminals on the right-hand side.

What is the benefit of having Chomsky Normal Form?

Answer: Chomsky Normal Form simplifies the structure of the grammar and allows for more efficient parsing algorithms to be used. It also provides a way to prove certain properties of the grammar, such as ambiguity.

What are the limitations of Chomsky Normal Form?

Answer: Chomsky Normal Form only applies to context-free grammars, and not all context-free grammars can be converted to CNF. The conversion process can also result in an increase in the number of production rules.

What is the difference between a context-free grammar and a grammar in Chomsky normal form?

Answer: A context-free grammar is a formal grammar consisting of a set of production rules that generate a set of strings in a language. A grammar in Chomsky Normal Form is a specific form of a context-free grammar where all production rules have the form $A \rightarrow BC$ or $A \rightarrow a$, where A, B, and C are non-terminal symbols, and a is a terminal symbol.

What is the significance of having only unit or binary production rules in Chomsky Normal Form?

Answer: Having only unit or binary production rules in Chomsky Normal Form makes it easier to generate parse trees and to apply parsing algorithms. It simplifies the structure of the grammar and allows for more efficient processing.

Can every Context-Free Grammar be converted into Chomsky Normal Form?

Answer: Yes, every context-free grammar can be converted into Chomsky Normal Form.

How does Chomsky Normal Form simplify parsing algorithms?

Answer: Chomsky Normal Form simplifies parsing algorithms by reducing the complexity of the grammar. This allows for more efficient algorithms to be used, such as the CYK algorithm.

What is the difference between Chomsky Normal Form and Greibach Normal Form?

Answer: Chomsky Normal Form and Greibach Normal Form are two standard forms of context-free grammars. The main difference is the form of the production rules. In Chomsky Normal Form, all production rules are of the form $A \rightarrow BC$ or $A \rightarrow a$, where A , B , and C are non-terminal symbols, and a is a terminal symbol. In Greibach Normal Form, the production rules are of the form $A \rightarrow aB$, where A and B are non-terminal symbols, and a is a terminal symbol.