

Lecture #23: Chomsky Hierarchy III – Context-Sensitive Languages

What Will Happen During the Lecture

Remember... You Had Homework!

Students were asked to have worked through a set of notes before this first lecture:

- Lecture Notes — “Chomsky Hierarchy III: Context-Sensitive Languages”

Of course, you may attend the lecture presentation if you have not worked through this material ahead of time — but it will not be repeated for you during the lecture presentation.

Topics To Be Discussed

Consider a phrase-structure grammar $G = (V, \Sigma, \Pi, S)$ such that

$$\Sigma = \{a, b, c\}, \quad V = \{S, B, C, T, W, Z\},$$

and Π includes the following productions.

$$\begin{array}{lll} S \rightarrow T & CB \rightarrow CZ & aB \rightarrow ab \\ S \rightarrow \lambda & CZ \rightarrow WZ & bB \rightarrow bb \\ T \rightarrow aBC & WZ \rightarrow WC & bC \rightarrow bc \\ T \rightarrow aTBC & WC \rightarrow BC & cC \rightarrow cc \end{array}$$

Then G is a **context-sensitive grammar**. During the lecture presentation, a proof will be sketched that

$$L(G) = \{a^n b^n c^n \mid n \in \mathbb{N}\}.$$