

CFL vs. CSL

Property	Context-Free Languages (CFL)	Context-Sensitive Languages (CSL)
Grammar	Context-Free Grammar (CFG)	Context-Sensitive Grammar (CSG)
Automaton	Pushdown Automaton (PDA)	Linear Bounded Automaton (LBA)
Union	Yes	Yes
Concatenation	Yes	Yes
Kleene Star	Yes	No
Intersection	No	Yes
Complement	No	Yes
Homomorphism	Yes	Yes
Inverse Homomorphism	Yes	Yes
Substitution	Yes	Yes
Reversal	Yes	Yes
Example Languages	$\{a^n b^n \mid n \geq 0\}$, $\{w \in \{a, b\}^* \mid \text{number of } a's = \text{number of } b's\}$	$\{a^n b^n c^n \mid n \geq 1\}$, $\{ww^R \mid w \in \{a, b\}^*\}$

Table 1: Comparison of Context-Free Languages (CFL) and Context-Sensitive Languages (CSL)