

## PS04-05: Closures

January 28, 2018

Let  $A$  and  $B$  be two CFLs with start variable  $S_A$  and  $S_B$ , respectively.

1. Union. Given  $A$  and  $B$ , let  $C$  be a CFL with a grammar as follows:

$$S \rightarrow S_A | S_B$$

2. Concatenation. Given  $A$  and  $B$ , let  $C$  be a CFL with a grammar as follows:

$$S \rightarrow S_A S_B$$

3. Star. Given  $A$  let  $C$  be a CFL with a grammar as follows:

$$S \rightarrow S_A S | \varepsilon$$