

# Games, graphs, and machines

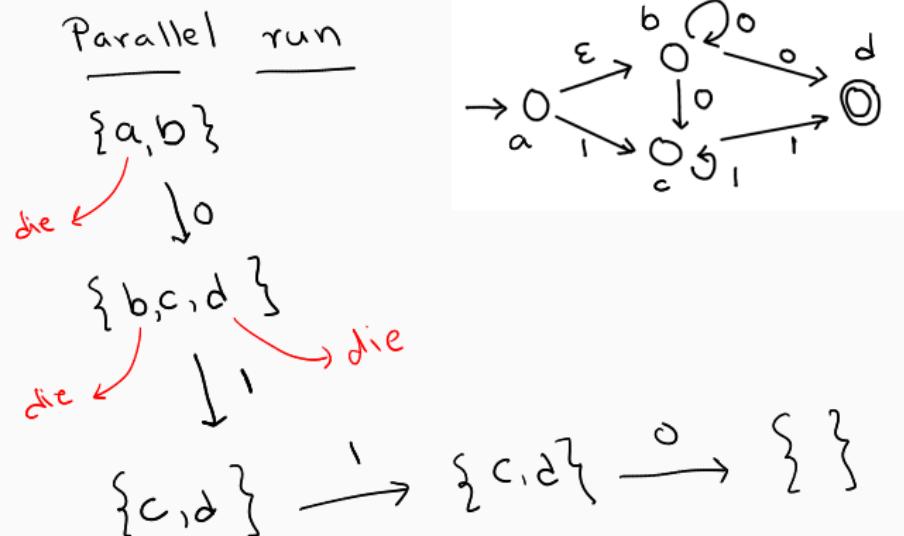


← NFA

Why not both?

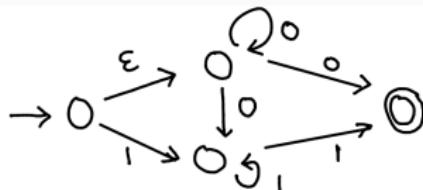
# NFA Acceptance

Is the string 0110 accepted by the following NFA?



# NFA Rejection

accepted  
Find a few strings not accepted by the same NFA.



$$\begin{aligned} 0^+ &= 0^* 0 \\ &= 00^* \end{aligned}$$

accepted :  $0, 00, 000, \dots, 0^* 0, \dots \checkmark$   
 $11, 11^* 1, \dots \checkmark, 01^* 1, \dots$

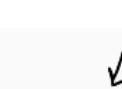
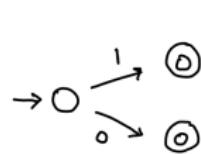
Not :  $0110,$   
 $\epsilon, (01)^*(10)(01)^* \leftarrow \text{maybe}$

Coming up : convert aut.  $\rightarrow$  regex.

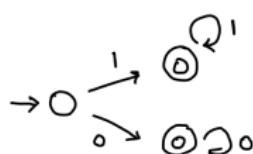
# NFA Language

What strings are accepted by the following NFAs?

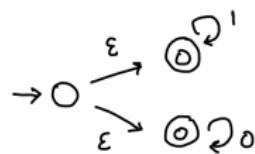
(DFAs  $\subseteq$  NFAs)



$(0|1)$



$(11^*|00^*)$

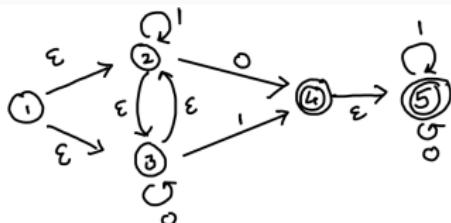


$1^* 0^*$

# NFA to DFA

Convert the following NFA to an equivalent DFA.

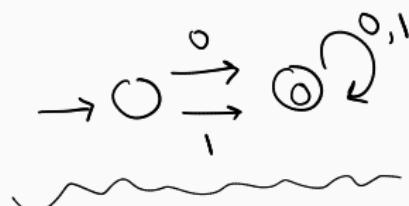
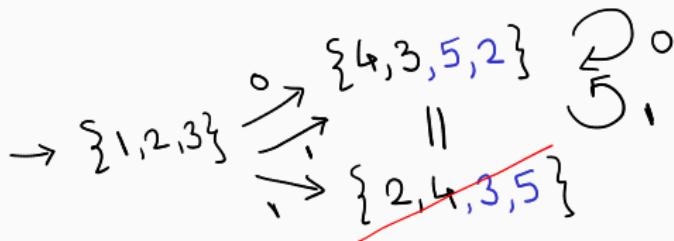
DO NOT  
enumerate all  
 $\epsilon$ -closed states.



DONE when

every  
state has  
0 out &  
1 out

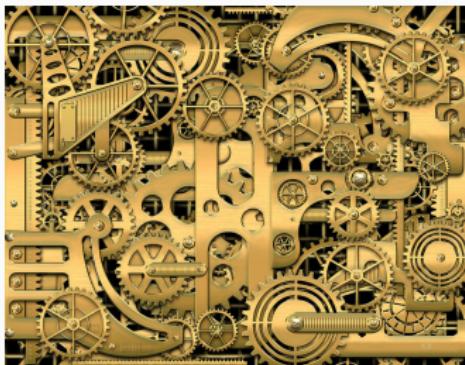
1. Write the Starting  $\epsilon$ -closed state  
 $= \epsilon\text{-closure } \{\text{original start}\} = \{1, 2, 3\}$



DFA

# Determinism vs non-determinism

Q: IS  $P = NP$  or  $P \not\subseteq NP$  ?



$P$   
class of feasible problems  
with a det.  
computer

$\subset$   $NP$   
class of feasible  
problems with  
non-det. computer