Deterministic Finite Automaton (DFA)

machine = = automaton

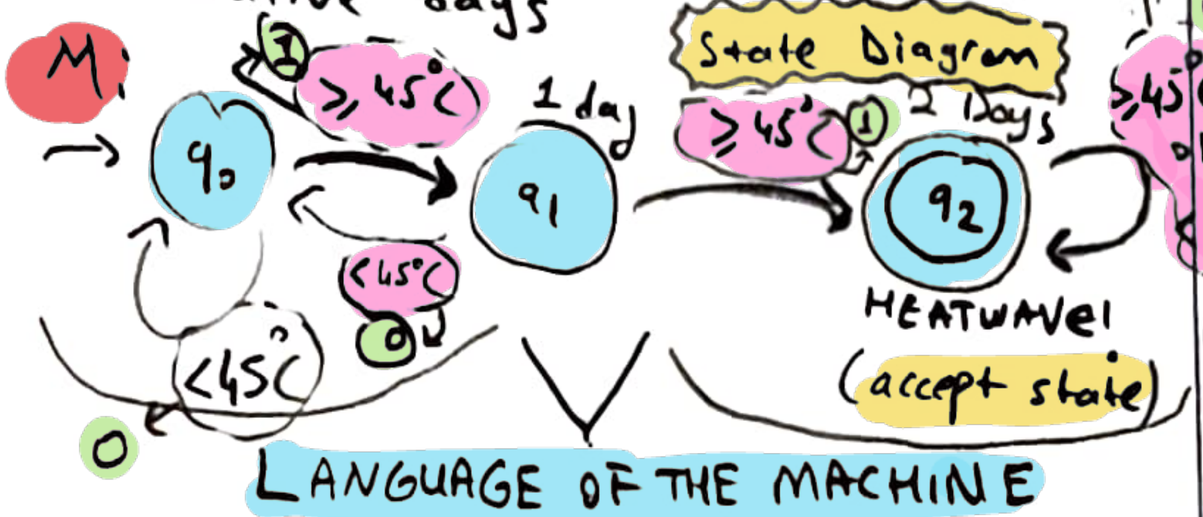
↳ one = automaton (tekil)

↳ two = automata (çoğul)

Example! Did a heatwave occur?

Input! String of weather data

* Heatwave: temperature ≥ 45°C for 2 consecutive days



LANGUAGE OF THE MACHINE

$L_M = \{$ all strings containing 11 $\}$

M accepts 11,

Also M accepts 110, 0110, 1011, 1010110.

WHY we call deterministic?

↳ Because the next steps are all determined.

Formal Definition of $M = (Q, \Sigma, \delta, q_0, F)$

- Q: is the set of states (q_0, q_1, q_2)
- Σ: is the alphabet $\Sigma = \{1, 0\}$
- δ: is the transition function

	1	0
q_0	q_1	q_0
q_1	q_2	q_1
q_2	q_2	q_2

↳ q_0: Start State

↳ F: set of accept/final states $= \{q_2\}$

Regular Language

A language recognized by some finite automaton

SUMMARY

DFAs are 5-tuples $(Q, \Sigma, \delta, q_0, F)$

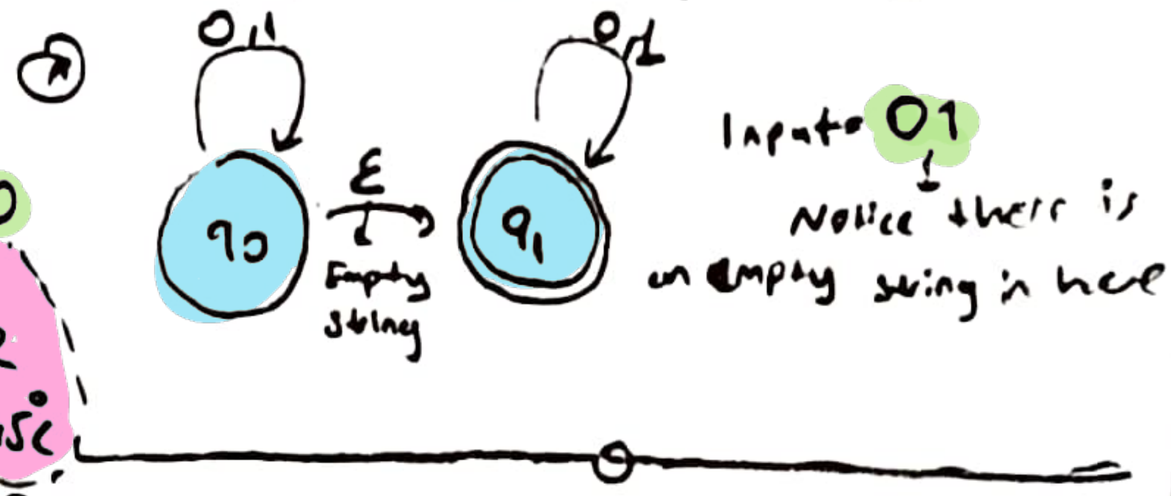
◯ = This means accept state

L_M is set of all accepted strings

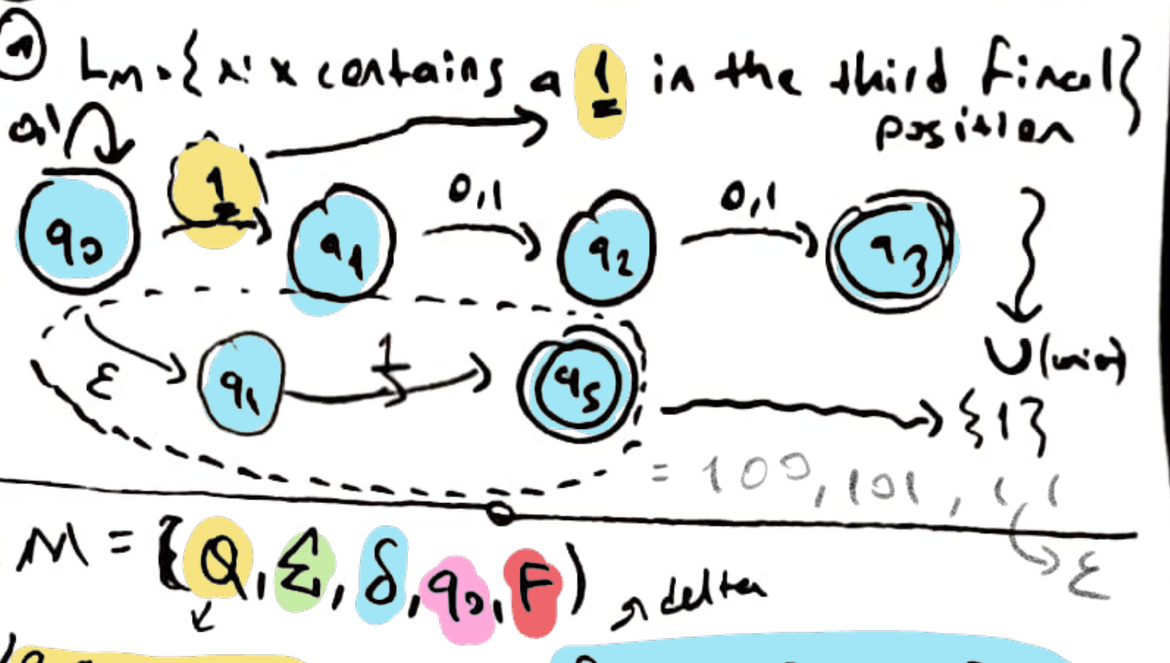
NONDETERMINISTIC FINITE AUTOMATON (NFA)

INPUT: 11 = goes "two different path.

The NFA still accepts the string, because there is a path to an accept state.



(a) $L_M = \{x : x$ contains a 1 in the third final position$\}$



$M = (Q, \Sigma, \delta, q_0, F)$ ↗ delta

$\{q_0, q_1, q_2, q_3, q_4, q_5\}$

$\Sigma = \{1, 0\}$

q_0 start

$F: \{q_3, q_5\}$

$\delta : Q \times \Sigma_\varepsilon \rightarrow P(Q)$

↳ $\Sigma \cup \{\varepsilon\}$

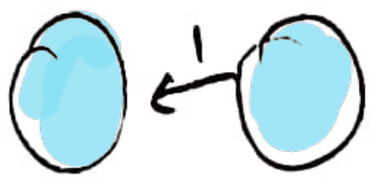
(*) δ" gives a set of possible states, instead of just 1

δ:	1	0	ε
q_0	$\{q_0\}$	$\{q_0, q_1\}$	$\{q_4\}$

NFA can only do as much as DFA can so DFA is more powerful

SUMMARY

- NFAs are 5-tuples $(Q, \Sigma, \delta, q_0, F)$
- 

- 

That means set of possible states
- Languages recognized by an NFA regular languages