

# T AFL, Automaton, Alphabet, String, Language, DFA

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# What is an Automaton?

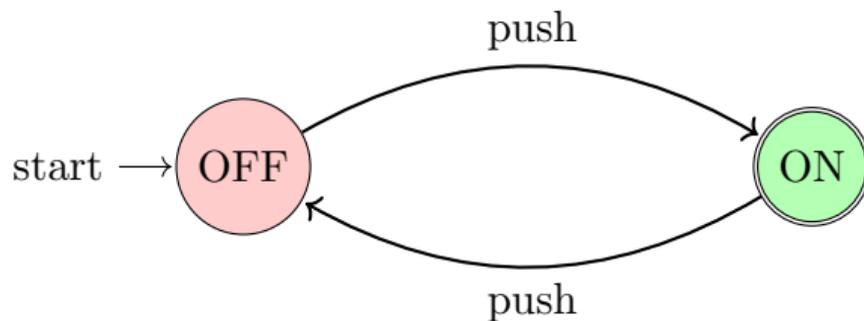
## **Definition:**

An **Automaton** is a mathematical model of a machine that reads input symbols and changes states.

## **Real Life Example: Push Button Switch**

- Press  $\rightarrow$  ON
- Press again  $\rightarrow$  OFF
- Every press changes state

# Switch ON/OFF Automaton (Push Example)



Odd pushes  $\rightarrow$  ON Even pushes  $\rightarrow$  OFF

# Symbols and Alphabet

**Symbol:** A single character

Examples: ***a***, ***b***, 0, 1

**Alphabet ( $\Sigma$ ):** Finite set of symbols

$$\Sigma = \{a, b\}$$

# String and Length

**String:** Sequence of symbols

If  $\Sigma = \{a, b\}$

*a, b, ab, aabb, baba*

If  $w = aabb$ , then  $|w| = 4$

Empty string:  $\epsilon$

A **Formal Language** is a set of strings.

Example: Even number of ***a***'s

$$L = \{\epsilon, aa, bb, aabb, bbaa, aaaa, \dots\}$$

$$L \subseteq \Sigma^*$$

# Deterministic Finite Automaton (DFA)

A DFA is defined as:

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

- $Q$  = Set of states
- $\Sigma$  = Input alphabet
- $\delta : Q \times \Sigma \rightarrow Q$
- $q_0$  = Start state
- $F$  = Final states

- Automaton = Mathematical model
- Alphabet = Set of symbols
- String = Sequence of symbols
- Language = Set of strings
- DFA = Deterministic machine