

**Theory of Computation, CSCI 438 spring 2022**  
**Finite automaton, pg. 31-40, Jan. 12**

Automaton - abstract model of a digital computer

Elements:

- Finite input alphabet and finite output alphabet
- Input file, read left to right, one symbol at a time, end of input can be detected
- Output file, in some cases this is just 'accept' or 'not accept' (and the automaton is called an acceptor); in other cases this is a solution to a problem (and the automaton is called a transducer)
- Optional temporary storage
- Control unit which has a finite set of internal states including a start state and a set of final states
- Transition function which looks at the current state, input symbol and storage and determines which state to go into next, what belongs in storage, and possibly creates output. This is called a move.

Each of the machines we'll study has this model.

Differences:

- Temporary storage
- Deterministic and nondeterministic
- Acceptor or transducer

Deterministic finite automaton, DFA,  $M = (Q, \Sigma, \delta, q_0, F)$

- $Q$  - finite set of states
- $\Sigma$  - finite set of symbols, input alphabet
- $\delta: Q \times \Sigma \rightarrow Q$ , transition function
- $q_0 \in Q$ , initial state
- $F \subseteq Q$ , set of accept states

(Definition 1.5, page 35)