CHAPTER 5: FINITE AUTOMATA *

Peter Cappello
Department of Computer Science
University of California, Santa Barbara
Santa Barbara, CA 93106
cappello@cs.ucsb.edu

• The corresponding textbook chapter should be read before attending this lecture.

• These notes are not intended to be complete. They are supplemented with figures, and other material that arises during the lecture period in response to questions.

*Based on Theory of Computing, 2nd Ed., D. Cohen, John Wiley & Sons, Inc.
Definition of a Finite Automaton

A finite automaton is defined by a 5-tuple:

- A finite set of states, $Q$.
- A finite set of input symbols, $\Sigma$.
- A transition function, $\delta : Q \times \Sigma \rightarrow Q$.
- A start state, $q_0 \in Q$.
- A set of final or accepting states $F \subseteq Q$. 


Let $A = (Q, \Sigma, \delta, q_0, F)$ be a finite automaton.

- Let $s_1 s_2 \ldots s_n \in \Sigma^*$.
- $A$ starts in $q_0$, reads $s_1$, and transitions to $\delta(q_0, s_1)$, say, $q_1$.
- $A$ continues in $q_1$, reads $s_2$, and transitions to $\delta(q_1, s_2) = q_2$.
- Continuing in this way, $A$ goes through a sequence of state transitions $q_0, q_1, \ldots, q_n$.
- $A$ accepts $s_1 s_2 \ldots s_n$ if and only if $q_n \in F$
- $L(A)$, the language accepted by $A$ is $\{w \mid A$ accepts $w\}$.

It is useful to represent the finite automaton as a transition diagram.