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## CS 374 LAB 4: NONDETERMINISTIC FINITE AUTOMATA

Date: January 28, 2016.

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**Problem 1.** [Category: Design] Design an NFA for the set of strings that consist of 01 repeated one or more times, or 010 repeated one or more times.

**Problem 2.** [Category: Design] Let  $M = (Q, \Sigma, \delta, s, A)$  be a DFA recognizing language  $L$ . Show that  $L^R = \{w^R \mid w \in L\}$  is also regular by constructing an NFA  $N = (Q_N, \Sigma, \delta_N, s_N, A_N)$  that recognizes  $L^R$ . You should completely, formally, specify each component of  $N$  in terms of  $M$ . *Hint:* reverse the edges of the graph representing  $M$ ?

**Problem 3.** [Category: Design] **To think about at home.** Let  $L = \{w \in \{a, b\}^* \mid \text{an } a \text{ appears in some position } i \text{ of } w, \text{ and a } b \text{ appears in position } i + 2\}$ .

1. Create an NFA  $N$  for  $L$  with at most four states.
2. Using the “power-set” construction, create a DFA  $M$  from  $N$ . Rather than writing down the sixteen states and trying to fill in the transitions, build the states as needed, because you won’t end up with unreachable or otherwise superfluous states.
3. Now directly design a DFA  $M'$  for  $L$  with only five states, and explain the relationship between  $M$  and  $M'$ .