

COSC 545, Spring 2014: Problem Set #5

Due: Thur., 4/24, at the beginning of class (hand in hard copy).

Covers: Lectures 21 to 24.

Collaboration: You must work alone on the problem set and not consult outside sources. See the syllabus for details on the academic integrity policy for problem sets.

Problems

1. Show that A_{NFA} is NL-complete.
2. In class we mentioned that if you can prove $\overline{PATH} \in \text{NL}$ then it follows that $\text{NL} = \text{coNL}$. Explain why this is true.
3. Point out what sentence is wrong in the following argument that $P \neq \text{NP}$. Then explain why it is wrong.

Assume for contradiction that $P = \text{NP}$. It follows that $SAT \in P$. Therefore, $SAT \in \text{TIME}(n^k)$ for some k . Because we can reduce every language in NP to SAT , it follows that $\text{NP} \subseteq \text{TIME}(n^k)$. The time hierarchy theorem, however, tells us that there is a language L in $\text{TIME}(n^{k+1})$ that is not $\text{TIME}(n^k)$. It would follow that $L \in P$ but $L \notin \text{NP}$ —a contradiction to our assumption $P = \text{NP}$.