

CMSC 858F: Algorithmic Lower Bounds: Fun
with Hardness Proofs
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Bugs

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1. Pg 29 and 30: CoNP is mentioned 4 times as a reason why FACT and DL are unlikely to be NP-complete. However, CoNP is not defined before this, so there is no intuition why $\text{CoNP} = \text{NP}$ is probably false
2. Pg 32: Missing curly braces at the end of each equation of Definition 1.12.2
3. Pg 32: \exists^P is not defined, yet used extensively. It's definition is non-trivial and should be included (I had to look it up on wikipedia when I read through)
4. Pg 35: It seems too difficult to ask a beginner reader of the first chapter to prove Savitch's theorem for Exercise 1.15.2: $\text{NSPACE}(f(n)) \subseteq \text{DSPACE}(f(n)^2)$. I think a reference should be mentioned as this is an important result for the understanding of $\text{NPSPACE} = \text{PSPACE}$.
5. Pg 153: Steiner tree problem seems to be defined incorrectly (or at least as a equivalent or specific case). According to Wikipedia, it is "Given an undirected graph with non-negative edge weights and a subset of vertices, usually referred to as terminals, the Steiner tree problem in graphs requires a tree of minimum weight that contains all terminals (but may include additional vertices)." This definition seems more applicable to the Steiner tree problems that are mentioned later (SCSS, DSF, etc.).
6. Spelling Errors:
 - Pg 431: Wemi-streaming algorithm
 - Pg 4: Rectlinear

- Pg 15: Completeness, Shortly, Defintions
 - Pg 16: Exponential
 - Pg 26: obvious
 - Pg 30 and 31: probability (four times), probabilistic (twice)
 - Pg 35: similar, interrogated, nondeterministic, nondeterministic
 - Pg 217: being
7. Pg 35: Not clear (but maybe obvious) that y needs to take $\leq S(n)$ space in the definition of NSPACE
 8. Pg 386: It seems unnecessary to copy the array the description of an $O(n^2)$ 3SUM Algorithm
 9. Pg 227: “We will measure the complexity of a problem by the number of big gates it has” should probably say “We will measure the complexity of a problem by the number of big gates on a path from input to the output.” (when I first read this, it seemed to imply we would measure the complexity by the total number of big gates across all paths)
 10. Pg 229: Con-dom is defined but not named as “Connected Dominating Set”
 11. Pg 184: In the definition of 3Partition, it is not clear what $t = \sum +I = 1^n/(n/3)$ means. What is 1^n ? Isn't this just 1. Is this a typo?
 12. Pg 176: Typo in definition of CandyCrush “6 candies, a numbers k of moves.” It should be “number k ”.
 13. Pg 148: Induced Subgraph Vertex Cover is defined with a graph of degree 4. But theorem 5.2.1 says “Induced Subgraph Vertex Cover is NP-complete, even when restricted to graphs of degree 4.” Either ISVC should be defined for general graphs, or the theorem should not mention the restriction.
 14. Pg 147: It is said that this chapter deals with vertex covers, coloring, and ordering. However, it is not clear what the “ordering” problems are. Is this referring to the graph orientation problems? I think this should be made clear.