Institut for Matematik og Datalogi
Syddansk Universitet

March 25, 2020
JFB

DM553/MM850 – Complexity and Computability 2020 – Lecture 10

Lecture, March 17

The online lectures can be found under Course Materials in Blackboard. There are slides and three videos in this case (the number of videos may vary in the future). We finished chapter 5 (the reduction from MPCP to PCP). Then, we began on NP-Completeness. starting with Definitions 7.7, 7.9, 7.12 and section 7.3 in Sipser's book, introducing definitions and showing that SAT and CLIQUE are in NP. Regarding NP-Completeness, we covered up through Theorem 7.36 in Sipser. Note that some of this is also in chapter 34 in the CLRS book.

Lecture, March 20

We will first show that 3-SAT is NP-Complete. To do this, we assume that CNF-SAT is NP-Complete. The proof that 3-SAT is NP-Complete combines the proofs in both the Sipser and the CLRS books. Then, we will cover the proof that SATISFIABILITY (actually CNF-SAT) is NP-Complete, from section 7.4 in Sipser's textbook.

Lecture, March 25

We will show that more problems are NP-Complete, from chapter 34 in CLRS.

Problems to be discussed on March 31

From CLRS do:

1. Do the problems from CLRS left over from March 17/18:
2.
   - Do 34.5-1. Two graphs $G_1 = (V_1, E_1)$ and $G_2 = (V_2, E_2)$ are isomorphic if there exists a bijection (a function that is 1-1 and onto) $f : V_1 \to V_2$ such that for all $v_i, v_j \in V_1$, $(v_i, v_j) \in E_1$ if and only if $(f(v_i), f(v_j)) \in E_2$. The function f is called an isomorphism.
   - Now assume that you have a polynomial-time algorithm for solving the subgraph-isomorphism problem. Describe how to use this algorithm to find an isomorphism from the first graph to a subgraph of the second.
3. 34.5-2 – try a reduction from Vertex Cover, too.