Institut for Matematik og Datalogi
Syddansk Universitet

Assignment 2 — Introduction to Computer Science 2015

This is your second assignment in DM534/DM558. The assignment is due at **8:15 on Monday, October 19**. You may write this either in Danish or English. It must be made in LaTeX. Write your full name, your section number (D1, D2, or D3), and your "instruktor"s name (Kristine Vitting Klinkby Knudsen, Mathias W. Svendsen, or Jesper With Mikkelsen) clearly on the first page of your assignment (on the top, if it's not a cover page). You should turn it in as a PDF file via Blackboard through your DM534/DM558 course. The assignment hand-in is in the menu for the course and is called "SDU Assignment". Choose the correct one for your section number, D1, D2 or D3. Keep the receipt it gives you proving that you turned your assignment in on time. Blackboard will not allow you to turn in an assignment late.

Cheating on this assignment is viewed as cheating on an exam. You are allowed to talk about course material with your fellow students, but working together on this assignment is cheating. If you have questions about the assignment, come to Joan Boyar or your "instruktor" for DM534/DM558.

Please note that you must have this assignment approved in order to pass DM534/DM558. If it is not turned in on time, or if you do not get it approved, it will count as one of your two retries in the course, and you must have it approved on your single allowed retry for this assignment.

Assignment 2

Do the following problems and write your solutions in LaTeX. Do not include the statements of the problems or other information not asked for in the problems, but show your work/calculations.

1. According to a list of the 15 oddest laws from around the world, the state of Kansas at one time passed a law stating, "When two trains approach each other at a crossing, both shall come to a full stop and neither shall start up again until the other has gone."

   (a) Explain how this could really be considered one of the oddest laws. In particular, for each of the conditions for deadlock, ex-

plain how it would be met here if two trains approached each other at a crossing. (Here we do not need to know what a crossing is. Below, we consider two possible definitions of "crossing".)

(b) Suppose that two trains approaching each other at a crossing means that both are on the same track. Suppose that at any crossing there is a location at most one kilometer before the crossing (in both directions) where a train has a choice of getting on one of two parallel tracks. Thus, if two trains are approaching each other at a crossing, they chose the same track when they had that choice. Give an algorithm which avoids deadlock in this situation. Which of the three conditions does your algorithm avoid?

(c) Suppose that two trains approaching each other at a crossing means that both are on the same track. Suppose that a crossing is a location where the tracks split, so both trains could have chosen to switch to a second track immediately ahead of their current positions, if the law did not require that neither move. (Note that if they both switch, they will be on another track, but the same other track, and would run into each other if they did not stop.) Recommend a change to the law to prevent deadlock. (Note that the law contains an algorithm, but should have contained a better algorithm.) Which of the three conditions does your algorithm avoid?

2. Consider the IPv4 Internet address is 145.64.10.211.

   - How many bits are used to express this address?
   - Write this address in hexadecimal notation.

3. Find some location on the Internet. Write its address in IPv4 (or IPv6) form and its URL. (The address and URL must correspond to each other.)

4. Include your LaTeXcode for this assignment at the end.