

## DM551/MM851 – Fall 2023 – Weekly Note 5

### Stuff covered in week 39

As the lecture has not been given yet, I will just say what I expect to have covered on September 28.

- Remaining part of my notes on the probabilistic method from Weekly note 3.
- Rosen 8.5-8.6 on the inclusion-exclusion principle and applications
- We may have started on Kleinberg and Tardos Chapter 13.1

Note that the polynomial algorithm  $\mathcal{A} = \mathcal{A}(\epsilon)$  described in the notes (for instances of SAT where all clauses have length at least  $\epsilon n$ ) does NOT imply that 3-SAT (or any other  $k$ -SAT with  $k \geq 3$ ) is polynomial! This would be tempting to think as it is easy for a given instance of 3-SAT with  $n$  variables to take  $\epsilon = 3/n$  and then run the algorithm  $\mathcal{A}(\frac{3}{n})$ . Do you see the problem? The running time of  $\mathcal{A}(\epsilon)$  is  $|\mathcal{F}|^{1+\frac{1}{\epsilon}}$  which is  $|\mathcal{F}|^{\frac{n}{3}+1}$  when  $\epsilon = \frac{3}{n}$  so it is exponential in the size of the input!

### First set of exam problems

These will be posed on itslearning and the home page on October 2nd. Hand in date will be October 27th in the morning. Note that this first set of problems may be solved in groups of up to 3, so if you want to work in groups, you should form these now. I strongly encourage you to do the first hand in in groups.

### Literature on Randomized algorithms

Part of Chapter 13 of the book “Algorithm Design” by Kleinberg and Tardos, Addison-Wesley 2005 has been made available from itslearning. Please download a copy asap as we shall use these notes already on Thursday.

### Lectures in Week 40

We will go through the following in the given order.

- Kleinberg and Tardos 13.1-13.2

- Kleinberg Tardos 13.3-13.4.

### **Exercises in Week 40**

- Exercises 1-4 and 8 from the first set of exam problems in Fall 2022.
- Selected problems among the remaining exercises from Weekly note 4.