

CMSC 858S: Algorithms in Networking
Fall 2004
Class Project: Problem-Solving

This part of the course project is to do some paper-reading and problem-solving (related to hashing). This is due on **November 9th at the beginning of class**, and is worth 10% points total for your final grade.

This project is to be done with your project-group.

1. Read the following four papers from the references posted for the class, at <http://www.cs.umd.edu/class/fall2004/cmcs858s/refs.html>.

(P1) Paper [AMS], up to the end of Section 2.

(P2) Paper [BR94]: Section 2 and the Appendix.

(P3) Paper [KL+97], up to the end of Section 4.

(P4) Paper [BM02], up to the end of Section 4. (Bloom Filters form a practically-important alternative to universal hashing etc., as described in this paper.)

For the final exam, I will assume that you have done the above reading.

2. Give a complete proof of Theorem 4.1 in [KL+97], even when only $O(\log C)$ -wise independent hash functions $r_{\mathcal{B}}$ and $r_{\mathcal{I}}$ are used. Assume t is a constant, and clearly specify any other assumptions you need to make.

3. In the middle of page 2 of [BM02], the following two calculations are given: (i) the probability of a particular bit still being positive is $(1 - 1/m)^{kn}$, and (ii) the probability of a false positive is $(1 - (1 - 1/m)^{kn})^k$. Are these two correct? Justify. If one or both of these are wrong, correct it/them.