# CS5330: Assignment for Week 4

Due: Tuesday, 18th Feb 2020.

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Please submit your solutions to the "Assignments/Week 4/Submissions" folder on LumiNUS by 18th February, 6:29 pm. I strongly encourage you to write your solutions using LaTeX.

You may discuss the problems with your classmates, though you should write up your solutions on your own. Please note the names of your collaborators in your submission.

1. Let $f : \{0,1\}^3 \to \{0,1\}$ be defined as: $f(x_1, x_2, x_3) = 1$ iff $x_1 + x_2 + x_3 \geq 2$. Design a Las Vegas algorithm that in expectation only reads $8/3$ input bits. Show that this cannot be improved using Yao's minimax principle.

2. Find the minimax optimal strategies for Row and Col in the zero-sum game with two actions $\{1,2\}$ for each player, where Row pays Col $C(i,j)$ dollars if they choose actions $i$ and $j$ respectively, and $C = \begin{bmatrix} 1/2 & -3/4 \\ -1 & 3/2 \end{bmatrix}$.

3. (Exercise 4.17 of MU) Suppose that we have $n$ jobs to distribute among $m$ processors. For simplicity, we assume that $m$ divides $n$. A job takes 1 step with probability $p$ and $k > 1$ steps with probability $1 - p$. Use Chernoff bounds to determine upper and lower bounds (that hold with high probability) on when all jobs will be completed if we randomly assign exactly $n/m$ jobs to each processor.