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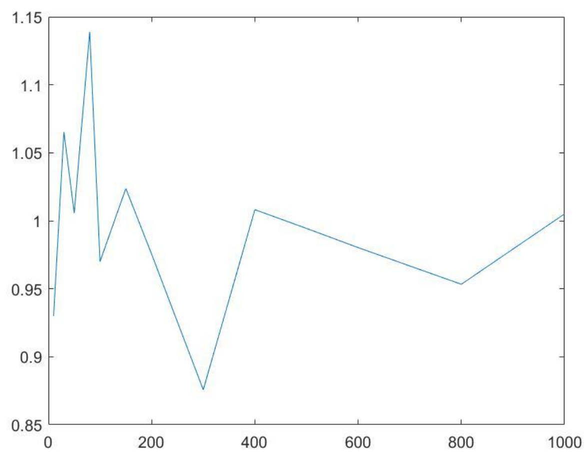
CS541

HW1 Report

1.



For the graph of $\frac{||Ax||}{||x||}$ over the different values k, the ratio generally average around 1, however I notice that the larger k values tend to be closer to 1 with smaller deviations while the smaller k values have more variance and may deviate more.

2. For $Y = y_1 + y_2 + y_3 + \cdots + y_n$, where $P(y_n = +1) \geq 0.6, P(maj(Y) = +1) \geq 0.99$

$P(|x - 0.2n| \geq t) \leq \frac{0.96n}{t^2} = 0.01,\ \frac{0.96n}{t^2} = 0.01,\ \ 0.96n = 0.01t^2,\ \ 96n = t^2$

$Y \geq 0$ for majority, $0.2n - t = 0$, $t = 0.2n,\ \ 96n = (0.2n)^2,\ 96n = 0.04n^2, n = 2400$

$\Pr(y_i = 1) \geq 0.6, \Pr(Z \leq (1-a)(0.6)n) \leq e^{\frac{-a^2(0.6)n}{2}} = 0.01, -a^2(0.3)n = -4.605, a^2 n = 15.35$

$0.5n \leq (1-a)(0.6)n,\quad \frac{5}{6} \leq (1-a),\ a \leq \frac{1}{6}\ ,\ \ n \leq 552.6$

The estimate given by the Chebyshev's is much greater than the one given by Chernoff's bound. This is probably because Chernoff's gives an estimate of n that is the lower bound while Chebyshev's estimate is in between the upper and lower bounds.