

Advanced Algorithms  
Spring 2021  
IIIT Hyderabad

Homework 2, Due: January 29, 2021

1. Consider the sum  $X$  of  $n$  i.i.d. random variables each of which takes values  $+1$  or  $-1$  with equal probability. Obtain a Chernoff bound for the probability of the event  $\{X \geq a\}$  for a real number  $a > 0$ . Do not transform the random variables to Bernoulli random variables and use the bounds for the sum of Bernoulli random variables as we did in class. **(5 Points)**
2. Consider the sum  $X$  of  $n$  i.i.d random variables each of which takes values in the set  $\{c, c+1, c+2, \dots, d\}$  with equal probability. Obtain a Chernoff bound for the probability of the event  $\{X \geq E[X](1+\delta)\}$ . You can use the method described in class. **(5 Points)**
3. Consider the sum  $X$  of  $n$  i.i.d random variables each of which takes values in the set  $\{0, 1\}$  with equal probability. Obtain a Chernoff bound for the probability of the event  $\{X \leq E[X](1-\delta)\}$  for  $0 < \delta < 1$ . You can use the method described in class.  
**(5 Points)**