Problems on Probability and Computing

Assignment Two

Deadline: 4 Feb 2020

1. You wish to answer a decision problem (i.e. the answer is Yes or No) by consulting some experts. There are n experts, and the ith expert has probability $p_i > 0.5$ of being correct for your question. You will ask a subset of experts and take their majority vote. For example, if there are three experts with probabilities 0.9 each, then asking all of them and taking the majority vote is better than asking just one of them. If the probabilities are 0.9, 0.6 and 0.6, then asking only the first expert is better than asking all three of them.

   Your goal is to ensure that the error probability is at most ε and thus you want to find an odd number k such that asking the top k experts will ensure this error probability.

   One way to find k is to exactly compute the error probability for each k, but for a computationally efficient (linear-time) solution, describe an algorithm using the Chernoff bound to find such k.