

COMP526 - Assignment 2 - Programming Puzzle: Exam-Cheating Codes

Introduction- This assignment includes a task where we must help our partner answer an exam consisting of 20 yes/no questions. A quick honking twice will mean No, and a single honking will mean Yes. But we have time for 10 yes/no signals. So, we have to find an encoding and decoding function to achieve the highest worst marks.

Grouping in sets of two- The first thing we will do is group two bits together. As a result, there will be ten groups. Since we are grouping by 2, it has 50 percent worst-case accuracy or $\frac{1}{2}$ correct answer. Hence by group 2, it gives the worst-case mark of 10.

Grouping in sets of three- Now we group bits by three; there will be 6 groups and 4 unused groups.

If we just consider just the 6 groups, we get worst-case marks as 12 since it will be $\frac{2}{3}$ correct answers or 66 percent worst answer. But if we use 6 groups and 4 unused groups, we can get the worst marks scenario as 14.

Moreover, if we make 5 sets containing 3 bits each and map the remaining 5 bits as it is, we get the worst case mark of 15. The representation of the same is illustrated in figure 1. Using the majority of decisions encoded in the cheating code, the decoding process reconstructs the original exam answers. The majority of decisions are duplicated at both even and odd indices, while the remaining five bits remain unchanged.

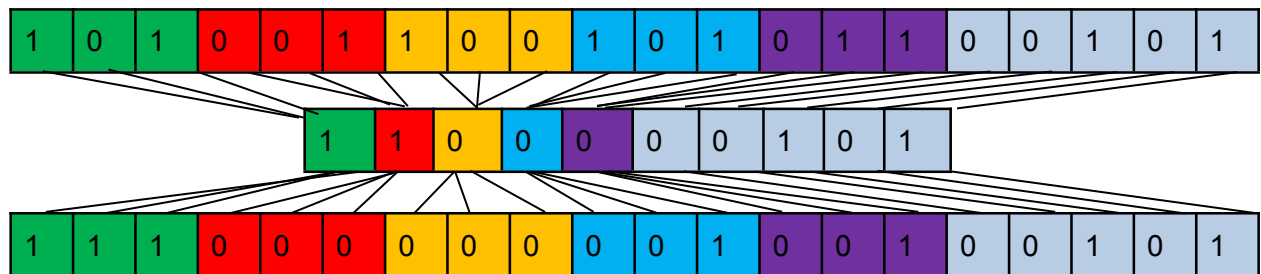


Figure 1

Grouping in sets of five-Next, we group the answers as sets of five we get 4 sets containing 5 bits each. It will give us $\frac{3}{5}$ correct answer or 60 percent accuracy. Which produces worst-case marks of 12. But if we make set of two fives, one three and map the remaining bits as it is we get worst case marks as 15. Therefore, we can conclude that a higher number of sets doesn't usually mean the maximum worst-case mark.

Conclusion - The maximum worst-case mark is 15 when 3 bits are allocated into 5 sets, with the remaining 5 being mapped as is. The code regarding this is in the file "examCheatingCode.py". The other solution that were tried is in the file "otherSolutions.py".