

Homework 1

TIF150, Information theory for complex systems

A pouch of pawns

You have a pouch containing 4 chess pawns. Your prior knowledge is that the pouch does not contain exactly 2 black and 2 white pieces. All other proportions of colours are equally probable (e.g. 3 black and 1 white is equally probable as 4 black pieces).

- a) What is the Shannon entropy of the system? How much information would you get from looking into the pouch (revealing the colour combination)?
- b) Calculate the information you gain by picking up one piece at a time from the pouch and revealing its colour. You don't have to calculate the tree of all possible combinations of revealed colours; stick to the/a branch that gives the most information in each step (you have to argue for why the revealed colour provides the most information).
- c) Compare the Shannon entropy of the system with the sum of the information gained from the gradual reveal. Should the quantities be equal? Why/why not?