Homework 1

TIF150, Information theory for complex systems 2017

Document change log

23 January 2017: Clarified info on probability of colours.

A pouch of pawns

You have a pouch/bag 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?