

Homework 1

TIF150, Information theory for complex systems 2018

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?

Hand in your solutions no later than Friday 26 January at 13:15. Late submissions will normally not be graded. You may hand in on paper in class, or by emailing a PDF named `yourcid.pdf`, e.g. `rasmuse.pdf`, to Rasmus: [rasmus.einarsson\[at\]chalmers.se](mailto:rasmus.einarsson@chalmers.se). Hand-written solutions are fine, but please take care to make them legible.