Information Theory — Tutorial 1

Iain Murray and Yichuan Zhang

October 1, 2010

MacKay's textbook can be downloaded as a PDF at:
`http://www.inference.phy.cam.ac.uk/mackay/itila/book.html`

1. **Expectations:** MacKay's book Exercises 2.21 and 2.22, p37.

2. **Repetition codes:** MacKay's book Exercise 1.3, p8. Why do you think R2, R4, etc. were omitted from Figure 1.12? If you have time, try to reproduce this figure.

3. **Central Limit Theorem:** MacKay's book Exercise 2.16, p36.

4. **(Bonus Question)** Sample 12 uniform random numbers between zero and one (using your favourite programing language's random number library routine) add them up and subtract 6. Do this many times (10^3 to 10^6 times) and plot a histogram of the numbers you get. Also plot what the Central Limit Theorem predicts. (The lecture slides contained plots for the sums of 3 and 20 uniform random numbers.) Is your Central Limit Prediction the same shape as your histogram? Does your prediction match the overall height of the histogram? **If you don't have time to write code:** try writing down the formula(s) you would use to make the Central Limit Theorem prediction.