

Homework assignment 1: Some preliminaries

Due date: 2017-10-18

1. Traffic predictions

Cisco has published a prediction of global mobile data traffic. Try to find an up-to-date version and read it. Does it sound plausible?

Solution: <https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.html>

2. Basic stochastics

We will need to deal a lot with stochastic considerations during this class. You should be familiar with the following concepts and be able to work them:

- Random variables, both continuous and discrete
- Distribution functions, probability density/probability mass functions
- Moments of a random variable, expected value, variance, standard deviation
- Covariance and correlation between two random variables
- Stochastic processes, autocorrelation

Knowledge on the level of a typical lecture “Introduction to stochastics” or similar is likely entirely sufficient, but you need to have that knowledge at your fingertips! If not, we can schedule a make-up class as part of the homework discussions.

3. Basic simulation techniques

Use a tool like Python/numpy/matplotlib, Matlab or Octave to do the following:

- (a) Real-valued random samples
 - i. Simulate 1000 samples from a standard Normal random variable
 - ii. Plot a histogram of those samples
 - iii. Overlay a plot of the density function

(b) Complex random samples

- i. Simulate 1000 samples from a complex standard Normal random variable
- ii. Produce a scatterplot
- iii. Also try a two-dimensional histogram

Solution: See SimpleRandomPlots.ipynb