T-122.103 EXERCISE 1/2003

In T4 on 19 September 2003 at 12:30–14 o'clock.

1. Study the UCI KDD repository at `http://kdd.ics.uci.edu/`, download a data set, and familiarize yourself with it.

2. Let X be a random variable, and denote by $D^2(X)$ the variance of X, defined by $D^2(X) = E((X - (EX))^2)$. Derive the equation $D^2(X) = E(X^2) - (EX)^2$.

3. Fibonacci numbers are defined by equations $F(1) = F(2) = 1$ and $F(i) = F(i-1) + F(i-2)$ for $i > 2$. Write recursive and iterative algorithms for computing $F(n)$, and express their running times using the O notation.

4. Denote by $\mathcal{P}(U)$ the collection of all subsets of a finite set U. Compute the expected size of a random element of $\mathcal{P}(U)$.

5. Given two random sets from $\mathcal{P}(U)$, what is the expected size of their intersection?

6. An antichain in $\mathcal{P}(U)$ is a subset $\mathcal{C} \subseteq \mathcal{P}(U)$ such that for all $X, Y \in \mathcal{C}$ we have $X \not\subseteq Y$. What is the size of the largest antichain in $\mathcal{P}(U)$?