

Madvertise : ML task

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14.05.2013

## My Understanding and Decomposition of the Problem

**Basic Idea :** "Bayesian statistics indicates us how to adapt our belief when acquiring when acquiring new data". I start recalling Baye's first law :

$$p(Clicked|Data) = \frac{p(Data|Clicked)p(Clicked)}{p(Data)},$$

In our context, *Data* means some parameter configuration. The problems are then to select out a parameter subset for which the above formula could be adapted and compute the probabilities accurately.

**Step0 : file correction** The file lines are irregular i.e. there are some empty fields and programs are not going to be able to make the difference between an empty elements/space and a normal space. I figured out that the fields country and campaign were incomplete and just corrected the inputted file putting a None if one of these fields were missing.

**Step1 : identify relevant variables and attribute a probability** That is a tricky problem that would require some experience and a more careful study. Here, I wanted to simplify the problem, although my approach can be easily extended to a broader parameter set.

I have chosen the fields ad, country, bannertype with the following criteria : I pick up fields that I think I understand and that I think should be relevant. I have also looked at the parameters variability and that might have been a reasonable criterion(not too much variability but not too few).

**Step2 : the method and its implementation** The code selects out the elements where a click was recorded. Then I list all the parameters combinations for which a click occurred. From that I build up a list *L* restricted to unique instances of the 3 parameters I considered to be relevant.

The list *L* contain now elements that I identify with *Data* found in Baye's first law. A few comments about my computation of the probabilities :

- $p(Clicked)$  is the probability for an add to get clicked on.
- $p(Data)$  is the probability to find a given parameter configuration present in the list. In python, one can easily identify the number of occurrences of *Data* in the sample and the probability follows.
- $p(Data|Clicked)$  is the probability of finding the particular *Data* or parameter configuration if the add is clicked on. This quantity can also be built up quite easily summing up the clicks found over all the *Data* configurations.

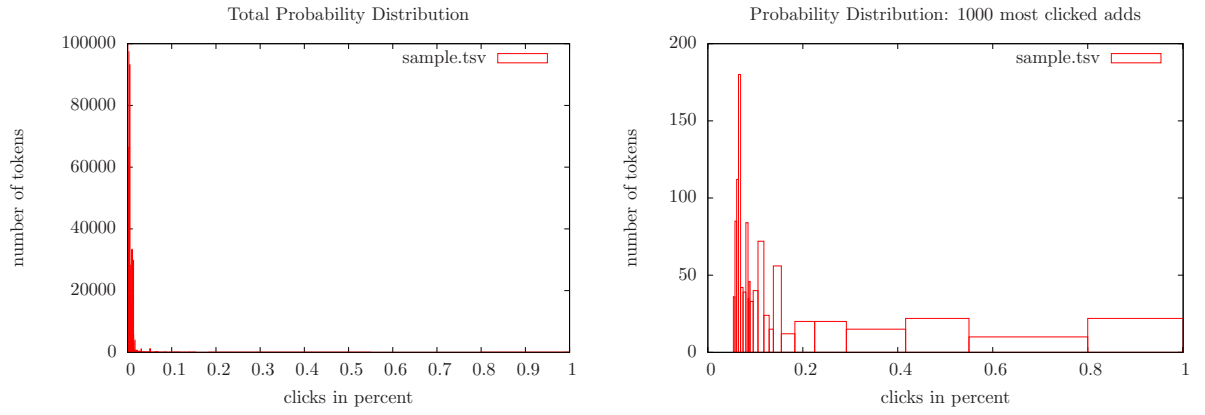


FIG. 1 – Histogram of the probabilities found for the whole set studied on the left. On the right, the same plot but considering the 1000 most clicked items only. The most clicked adds have an astonishing statistics as their counts is quite constant. This is either due to statistical anomalies or very efficient adds. 22 adds have made a perfect score.