the general science journal

Estimation of a Distribution of Candidates Versus Marks in a Test

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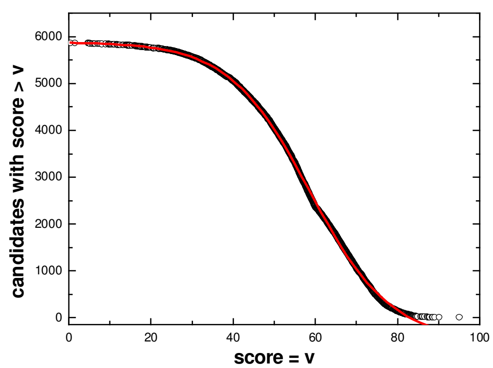
I have taken the results of a test called "ΑΣΕΠ" given in Greece by physicists for being appointed as high school teachers. The scale is from 0 to 100. At first I took the results in a form:N1(v) =N- N_{enlist} (Number of enlistment) (N_{enlist}= order of candidate ex. Number 1245 in the list) versus score achieved. This distribution is perfectly fitted by the sigmoidal curve or else called Boltzmann curve. This is of the form :

$$N1(v) = \frac{N}{\left(1+e^{(v-v_0)/dv}\right)}$$

Fig.1 : Approximation of enlistment number versus score by sigmoidal N1(v)



Where N is the total number of candidates and v is their score while v_0 is the mean value. Now, the distribution N(v) of an assemble is the distribution of candidates who achieved marks between v and v+dv. So, it is that:

$$\int_v^{\infty} N(v')dv' = N1(v) \Rightarrow N(v) = -\frac{d}{dv}N1(v) + C$$

C a constant (C=0 here). For those who know the sigmoidal is also the Fermi-Dirac distribution.

We may actually replace infinity by 100 (maximum) but the curve will not be perfect very near 100 as we will see.

$$N(v) = \frac{N/dv}{\left(1+e^{(v-v_0)/dv}\right)^2} e^{(v-v_0)/dv} + C$$

Finally I would like to add that a useful technique when approximating by a Gaussian is to split the dispersion σ (sigma) to σ=N/K where N is the total number and K is a quality factor to be determined after fitting the function.

Fig.2 Distribution of N(v)/N%- percentage of candidates who achieved marks between v and v+dv