

How about a percentile-based rank list

In this method of normalisation of marks, the relative merit of a student is assessed only in comparison with the other students of the

always happens to be 100.

same education system.

When the Tamil Nadu Professional Courses Entrance Examinations (TNPCEE) were eliminated in the year 2006 and admissions to undergraduate professional courses were to be made, thereafter, based only on the marks in the qualifying examinations (+2 and equivalents), a need for 'normalising' the marks obtained by the candidates in the qualifying examinations under different schemes naturally arose. The Tamil Nadu State Board (TNSB) and the Central Board of Secondary Education (CBSE) were the most significant systems that were to be accounted for.

'Normalisation' is a modification, subjecting to a norm or standard. It is thus a kind of standardisation. When there are two or more sets of entities, a method of normalisation is to take one of the sets as 'standard' and normalise the others to that standard. Specifically, the Class XII marks of TNSB students can be viewed as standard and the qualifying marks of students of the other streams, such as CBSE, ISCE, IB and so on, can be normalised to that standard. This is exactly what is done in Tamil Nadu, as recommended by Dr. Anandhakrishnan Committee, effective from the year 2007.

On the other hand, all the sets of marks can also be normalised, without taking any of them as standard.

The need for normalisation can arise in two ways. One is when the students contesting for admission in a single programme, say Engineering (BE/BTech), have cleared their qualifying examinations in different streams which differ from one another in one or more of

the entities: syllabi, teaching/learning methodologies, examination patterns, difficulty levels in questioning and evaluation and the like. The other way is when the candidates have passed a qualifying examination in different years, with possible differences in 'difficulty' of question papers leading to big fluctuations in the number of scorers of maximum mark, the magnitude of maximum mark and the like (With the compounding of

these two, the need for normalisation gets accentuated). For example, among TNSB candidates, the total number of students who scored 200/200 in Physics (P), Chemistry (C), and Biology (B), which form the basis for admission to MBBS, in the years 2014, 2015 and 2016 were 5055, 1560 and 2483 respectively. Corresponding totals of marks in P, C and Mathematics (M) which form the basis for engineering admission, were 8285,

10883 and 5069. These vagaries affect the prospects of admission of students in desired programmes drastically for no fault of theirs, if their raw marks are used for counselling and admission. A suitable normalisation process is therefore required to redeem the student population from the two types of situations described above.

The following are three popular normalisation processes in use in the academic arena.

• The stretching method

This is the currently adopted method in the Tamil Nadu Engineering and Medical admissions. It accounts only for the possible differences in the range of marks of the students in a particular subject in different systems of study. Specifically, the subjects are P, C and M/B, since they only matter for ranking; and the systems of study are TNSB, CBSE, and others, if any. In TNSB, the range in percentage

always happens to be 100 (from 0 to 100 per cent) in all these subjects, and, hence, TNSB marks are taken as the 'standard'. The marks in the other streams only are to be normalised. Consider, for example, the CBSE system in which the maximum mark obtained in a year in the subject C is u per cent and a student who has obtained the (raw) mark of x in that system. Then, his normalised mark y is given by: $y = 100 x/u$. Thus, if the raw mark of a student is 70 and the maximum mark obtained in the subject is 90, the normalised mark of the student is $y = 100 (70/90) = 77.78$ (correct to 2 decimals).

In this process the raw mark x is magnified by the factor $(100/u)$. Thus, for the student who procured the maximum mark (i.e., $x = u$), y becomes 100; for $x = u/2$, $y = 50$; for $x = u/4$, $y = 25$ and so on.

This process can be physically visualised as follows. Consider a rigid metallic or wooden meter scale fixed firmly on your table. The markings from 0 to 100 cm on this can be taken to represent the corresponding percentage marks in the normalised scale. Procure a



PERCENTILES | A fair method that can satisfy most; students at an engineering counselling session at Anna University. FILE PHOTO

Many globally credited examination and admission systems such as SAT, GRE and GMAT use only percentile scores for ranking for admission.

second meter scale which should be elastic and stretchable, to represent the marks to be normalised. Place the 0 mark of this scale on the 0 mark of the rigid scale on the table and hold that end firmly with one hand; with the other hand pull the other end of this elastic tape to make its 90-cm-mark (the maximum mark in the set to be normalised), coincide with the 100-cm mark on the rigid scale. Then each marking on the rigid scale gives the normalised mark corresponding to the raw mark in the stretched tape, against which it stands.

A big advantage of this normalisation process is that it is easy to comprehend. After knowing the maximum mark u , the normalised mark can be computed by the students themselves. Thus there is maximum transparency. It is also easy to implement.

A disadvantage of this method is its high 'instability'. When the magnitude of a computed result is altered drastically by small alterations in a few data values, the method is said to be unstable and the result drawn unreliable. Suppose that in a list of marks to be normalised the highest mark is 70 per cent. This would mean all the marks in the list will be increased by a multiplying factor of $100/70 > 1.42$ which is considerable. Again, if by revaluation or any other process, just one candidate is declared to have obtained 100 per cent, there would be no change in marks due to normalisation!

A second disadvantage is that the method does not take into account the levels of average performances and the manner in which the performances differ from the average performances in the systems being compared.

Normalisation with percentiles

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● Method involving Average Performances and Deviations

A normalising formula which does not suffer from the above two infirmities is: $y = a + b(x - m)/s$. Here, m and s are the mean and the standard deviation of the raw marks, x is a raw mark, y is the corresponding normalised mark and a and b are some suitable constants. The choice $a = 50$, $b = 10$ is usually comfortable. The expression $(x - m)/s$ can be interpreted as the scaled deviation of the raw mark x about the mean mark m , with the corresponding standard deviation s as the scale factor.

It can be observed that when x equals the raw mean mark m , then y takes the value 50, the mean of the normalised range of marks: 0 - 100.

This formula is favoured in academic circles desiring greater rigour. Anna University, for instance, has been using this for several decades for ranking candidates for admission to its ME/MTech programmes. At least one Public Service Commission, guided by this writer, has installed normalisation using this formula in some of its selection examinations.

● Percentile-based normalisation

A method which involves percentile scores turns out to be the most desirable one. Suppose that in a group of individuals, 75 per cent of individuals weigh less than me. Then I am at the 75th percentile, or my percentile score in that group is 75. Further, if my actual weight is 62.5 kg, then 62.5 kg is the 75th percentile weight in that group.

Imagine a conventional rank list of marks corresponding to N students in which the mark r appears in the position q . Then the percentile score p of this mark r is given by: $p = 100(N - q)/N$.

Now, the normalisation process can be explained in



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the following stages. What we refer to in the following as 'raw marks' are the 'ranking marks' computed for 200, for ranking the eligible applicants for admission to either BE/BTech (with 50 for P, 50 for C and 100 for M) or MBBS/BDS (with 50 for P, 50 for C and 100 for B). For the sake of clarity, let us concentrate on TNEA. (Similar procedures can be visualised for other admissions also).

For all the students who have cleared HSC in TNSB this year, procure or prepare the percentile scores based on their raw ranking marks. Pick out only the percentiles of those who are eligible candidates for TNEA this year and make a list of them. Prepare similar lists for CBSE and other streams from which candidates are there for TNEA this year.

Pooling all these lists together you have a list corresponding to all candidates for TNEA this year, who have passed qualifying examinations this year from different streams.

Prepare similar lists corresponding to students who passed their qualifying examinations in each of the previous years but are candidates for TNEA this year. Merge all these lists into one, ranking the entries as per the percentile scores. Percentile scores can be calculated correct to as many decimals as required, so as to minimise ties. The ties that still remain can be resolved

by any of usual tie-breaking criteria, which could be the existing ones also. We are then left with a rank list based on percentiles, which can be used for counselling and admission, satisfying all the participants from most points of view.

The best advantage of this method is that apart from computing percentiles and merging, no other explicit normalisation is required. The relative merit of a student is assessed only in comparison with the other students of the same system of education and belonging to the same year of examination. The magnitude of the maximum mark and the number of students obtaining that maximum are not playing any significant role.

It can be noted that the percentile scores for the 'previous years' will have to be computed only during the first year of implementation of the scheme. From the second year onwards, the previous years' percentiles will be already available.

Many globally credited examination and admission systems such as SAT, GRE and GMAT use only percentile scores for ranking for admission. It is high time that we too switched over to this and do better justice to the academic community.

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