Selecting Submissions from the Uncertainty Zone

– A Proposal

Introduction

When using submission scores in a selection process, analysis of the scoring variability will likely indicate that some of the submissions selected are statistically indistinguishable from similar-scored submissions that were not selected (as described in [this series of LinkedIn posts]). This document describes an additional selection process for distinguishing among these submissions.

Background

Competition selection processes use scores provided by experts to rank-order submissions. The 'winning' submissions are then selected based on their scores[1]. However, uncertainty analysis of the scoring data may signal that a significant number of the selected submissions are statistically indistinguishable from other high-scoring submissions that were not selected[2].

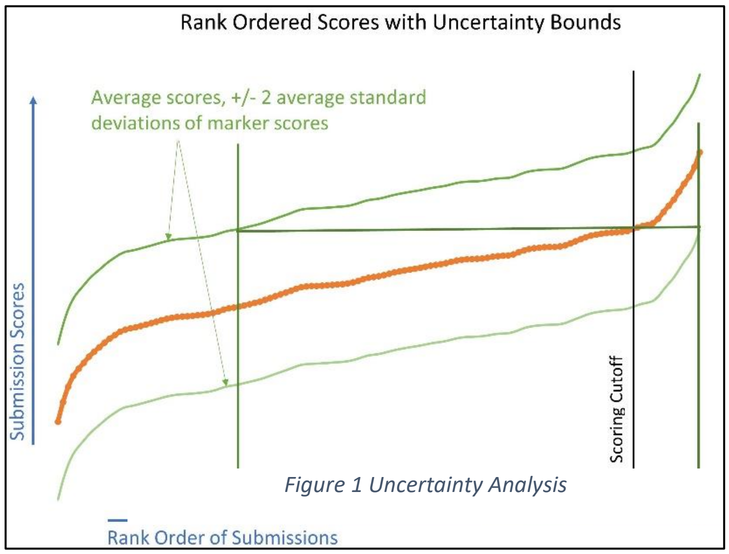

Figure 1 Uncertainty Analysis

In this context a method for selecting equitably among the submissions in the 'uncertainty zone' is required. Additional information can be helpful in this regard[3], but may not be available.

But … there is a piece of information already contained within the markers' scores that is not reflected in the rank-ordered scores used for choosing the 'winners'. This information is hinted at by markers tendency to indicate something to the effect that 'this was my highest ranked project', as a way to signal a particular desire that their top-ranked submission be selected[4]. The number of markers that give a submission their highest score signals the perceived superior quality of that submission. Similarly, if no

[1] For more information about competitive selection processes see this document.

[2] The uncertainty analysis clearly underlines the importance of working to maximize the accuracy of markers in scoring submissions and minimize the scoring variation. This would generally require markers with experience scoring submissions, and expert knowledge of the domain. However, my personal experience is that variability in scoring is an inherent aspect of competitive selection processes.

[3] Some competitions have multiple phases. A subsequent phase could provide additional information to allow 'winners' to be identified. For example, all the submissions in the uncertainty zone could be invited to present their submission to judges, or in the case of possible employees, invited to a training exercise.

[4] Some selection competitions gather the markers together to discuss submissions before final scoring.

marker gives a submission their highest marks it casts some doubt as to the superiority of the submission.

The approach outlined here takes advantage of the information signalled by the markers' highest scores as an indication of the markers' preference among the submissions they scored.

This selection process starts with the usual competitive selection process (submissions, markers, assignments, scores), and then conducts the uncertainty analysis as shown in Figure 1. The markers' highest scores are used to select submissions from among those enclosed by the uncertainty zone.

Description

Using a sample competition data set, here is the additional selection process:

- Markers provide scores on each of the criteria for each assigned submission. It is important that the markers each score a significant number of submissions so as to increase the chances that their sample of marking assignments might include at least one of the better submissions.
- Scores are processed[5] and ranked.
- The scores from each marker are reviewed to identify which submission they scored highest (i.e., which was the 'best' submission in their view).
- The uncertainty analysis is performed, using the number of winners specified to define the cut-off score.

> Markers are allowed (only) one 'best' submission. If their scores have more than one of the assigned submissions tied as their highest scored submission, they are asked to indicate which of these submissions is the 'best'.

To conduct the uncertainty analysis:

1. Rank-order the submission scores.
2. Plot the rank-ordered submission scores.
3. Calculate the confidence bounds on the submission scores. This can be based on the standard deviation of the scoring differences, where a scoring difference is the difference between a submission's average score, and the score that a marker gave the submission[6].
4. Plot the curves that represent the confidence bounds on the submission scores (i.e., +/- 2 standard deviations).
5. Based on how many submissions are to be selected as 'winners', mark the cut-off submission with a vertical line (the 'cut-off line').

[5] The variability of marker scores on submissions can be reduced by normalizing them, before calculating the submission scores (as described here). Normalized scoring reduces the size of the uncertainty zone.
[6] In my experience, it is not unusual for the +/- 2 standard deviation confidence bounds in a selection competition to be one third of the scoring range.

6. Determine where the horizontal line through the cut-off submission intersects the upper and lower confidence bounds. This defines the limits of the uncertainty zone.
7. Identify the submissions enclosed within the uncertainty zone.

> If the number of awards is based on the total funding available, the process of defining the number of awards may change based on which submissions are selected. This may require the approach described here to be repetitively applied.

The uncertainty analysis allows us to:

- Identify which few submissions are clearly top ranked, namely the submission(s) to the right of the uncertainty zone. In Figure 1, only one submission is to the right of the uncertainty zone.
- Identify the additional submissions that nominally are 'winners' (i.e., the submissions to the right of the scoring cut-off). In Figure 1 twelve submissions are to the right of the cut-off but in the uncertainty zone.
- Identify the substantial set of submissions that are to the left of the scoring cut-off, but statistically indistinguishable from those to the right of the scoring cut-off. For the data set in the figure, something like 70 submissions (more than half) are in the uncertainty zone but to the left of the cut-off.

With the uncertainty analysis complete, we now know the set of (82) submissions eligible for selection via the 'best submission' process. We will select from among these submissions those that have the most markers identifying them with their highest score, and also consider how that score compared to the marker's scoring average.

To conduct this additional selection process:

- Identify for each marker the submission that the marker scored the highest. We'll call these the markers' 'best-submissions'.
- Calculate the ratio between each marker's average score and the score they gave their 'best submission' (let's call this the 'best-submission-premium')
- Make a list of 'best submissions' ranked by:
  1. by the number of markers who selected them.

2. By the best-submission premium.

- Filter this list of best-submissions to retain only the submissions in the uncertainty zone.
- Go down this list and make selections to complete the 'winners' cohort.

Submission	Frequency as 'Best Project'	Best-Submission Premium	Winner?
Kabul	3		**Yes**
Tirana	3		**Yes**
Algiers	3		**Yes**
Andorra la Vella	3		**Yes**
Dhaka	2	52.03	**Yes**
Vienna	2	51.78	**Yes**
Bridgetown	2	51.05	**Yes**
Buenos Aires	2	50.99	**Yes**
Canberra	2	49.26	**Yes**
Luanda	2	48.12	**Yes**
Saint John's	2	47.98	**Yes**
Manama	2	46.45	**Yes**
Yerevan	2	46.43	
Baku	2	44.39	

In example above, 12 submissions need to be selected (i.e., there are 12 submissions in the uncertainty zone to the right of the cut-off. Using the (filtered) table in Figure 2, we can see that there are four submissions which three markers signaled as 'best-submissions' and all should be selected (the four green rows).

A further eight submissions need to be selected from among the submissions which two markers have given their highest scores. However, there are more than eight submissions which two markers gave their highest scores. To select from among these, we will look at the markers' best-submission-premiums. Based on their Best-Submission Premiums, all but the submissions 'Yerevan' and 'Baku' would be selected[7].

Conclusion

The approach described above leverages the ability of people to distinguish between alternatives, not withstanding a scoring rubric. In that regard it can be considered as adding an additional piece of information to the selection process and thus helpful for deciding how to choose from the submissions within the uncertainty zone.

[7] In this example, if more than 12 winners were required, the set of submissions with at least one markers' highest-score would also be considered.