IE477 Fall 2020 Assignment of Projects to Student Groups

In this course, we use an assignment process of projects to groups of students (shortly groups) considering both group's desires and project requirements, as seen by the teaching staff. We implement the algorithm proposed by Gale and Shapley (1962)[1] to obtain a stable solution.

The algorithm requires the following sets of information:

1) Groups ranking the projects – Each group should rank all the projects with respect to the desires of the students in the group. No ties are allowed.
2) Projects ranking groups – Each project should rank all the groups with respect to the available skill set and capability of the group. No ties are allowed.

The first set of information - a matrix of size: (number of groups) X (number of projects) is obtained directly by asking each group to give their ranking of projects.

The second set of information - a matrix of size: (number of projects) X (number of groups) is obtained using all members of the teaching staff ranking groups for each project. To rank each group for a project, a member of the teaching staff (s/he) first determines the extent any skill (for the skills listed in the group information sheet) is required for the project. We then bring together the opinions of all members. Then we check the conformance of this requirement with the information provided by the group. Second, s/he obtains a project-independent score of the group utilizing the information provided by the group. We then bring together these scores. In the last step, we combine these two parts to obtain a score of the group for each project and then rank.

Note that we have a well-defined procedure that utilizes concise information supplied by the group (and of the individual forming the group) and blends it with the expectations and experience of the teaching staff.

Application of the Matching Algorithm

Given all the information (two matrices, as described above) one can apply the matching algorithm, initially proposed by Gale and Shapley (1962)[1], the algorithm that solves the so-called "stable-marriage" problem. Please attached find the slides of the presentation made to describe the matching problem considered.

Note that, some additional constraints can be used to restrict the final assignment. However, the optimality of the stable solution obtained can no longer be guaranteed in theory. In our experience, even if we applied some constraints (such as limit the number of projects from the same location of a company), we always found a stable solution in our relatively small-scaled problem.

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[1] D. Gale and L. S. Shapley, "College Admissions and the Stability of Marriage", *The American Mathematical Monthly,* 69, 1 (1962), pp. 9-15.