Technical Specs for Harvard NASA Tournament Lab Experimental Competition “Races VS Tournaments“ (SCRIPPS/NIH – BANNER competition)

# The objective of Our Research

Race is a situation in which individuals or groups compete to be first to achieve a particular objective.

Tournament is a situation in which two or more individuals or groups compete each trying to knock off the others, the winner receiving a prize.

The use of races and tournaments is wide spread. Examples of races are: Longitude Prize (1714), Orteig Prize (1919), Ansari X-Prize (2004) and Netflix prize (2009); Examples of tournaments are: research grants (e.g., NIH), Goldcorp Challenge (2002), Super Bowl Ads Challenge (2012), algorithmic contests on TopCoder, Kaggle, etc.

According to economic theory, races & tournaments have similarities and differences.

* They are both “efficient” ways to screen a set of potential solvers according to their abilities: generally the competitor with the highest ability (or equivalently with the lowest costs) will execute the task and earn the prize.
* They compensate winners differently even when they award the same prizes.
  + Think of a winner’s net reward as the difference between the prize awarded and the cost incurred to execute the task.
    - In a tournament, the net reward is endogenous: it depends on how easy is “to knock off” the rivals.
    - In a race, the net reward is (mostly) exogenous: it depends on how easy is to achieve the particular objective.
* Understanding the difference in the net compensation alone gives an idea of the possible advantages or drawbacks from having one or the other setting.
  + If competition is expected to be of low intensity, the race is better suited to reduce the rents paid to the winners (i.e., there is an higher incentive to spend more costs for the same amount of money spent, and therefore produce better solutions).
* This feature is not exclusive of the race, but to all contest imposing a minimum performance condition to award prizes to the winners.
  + So it becomes an empirical question to understand when the race is better than a tournament with a minimum-requirement.
* Other differences less well understood are:
  + Involve different strategic interactions over time.
  + Can determine different levels of entry by low-ability contestants, and therefore different levels of wasted efforts.
  + Require different planning and time management
  + Can induce more or less participation because of different risk preferences.

# Required Technical Specifications for Harvard NASA Tournament Lab Experimental Competition

1. Preliminary competition
2. Pre-registration communication
3. Registration phase
4. Competition rooms
5. Submission phase (leaderboard, forums)
6. Prizes Distribution

# Preliminary Competition for Testing the Problem Statement Specification

* We will invite 4 coders (2 yellows and 2 reds) + the copilot.
* They have 5 days to solve the problem.
* Each coder providing a working solution will receive a prize of $300, and the best solution will get an additional prize of $200.
* Each coder will be given a room to submit code.
  + Testing is done in the same way as in the real competition.
* A forum-based/message update with the distribution of the provisional scores is also provided (not the identities of the other participants).
* The invited coders will not be able to participate to the MM.
* All the requirements for the Banner challenge (see below) should be satisfied also in this preliminary competition.

# Pre-Registration Advertising of the MM

* Send email to all opt-in MM and SRM competitors in the last year. Harvard Researchers will provide the text of the email.
  + First send emails just to reds and yellows.
    - Be sure we reach out to competitors of Antibody MM.
  + After three days, public announcement on Top Coder website for everyone.
  + General email to everyone rated (SRM or MM).

# Registration phase of the MM for Banner

* The duration of the registration phase is of 5 days prior to the competition.
  + No other MM should be in place during the registration period and the submission period.
* Coders cannot submit solutions during the registration period.
  + No problem statement, no test cases are available at this stage.
* We will limit participation to 300 registered participants.
* Registrants have to be rated—they need to have a positive (either algorithm or marathon) rating.
* The competition is a not rated event.
* Because registration involves participation to a research study, Harvard researchers will provide a “Statement page” (see attached document) and registrants will be asked for their consent to be involved in the study (“I agree” button).
  + Top Coder members have to agree to receive communications via email during the competition.
  + Top Coder members have to agree to complete a registration survey, as well as a final survey (see below).
  + People cannot discuss the competition rooms on the Forum or among themselves during the competition.
* The registration process also involves a survey. Top Coder members are required to complete this survey in order to register. Harvard researchers will provide a QUALTRICS link to be embedded in a web page (as for the Top Coder Community Survey).

# Competition Rooms

* At the end of the registration phase, Top Coder will send Harvard Researchers the list of all registered Top Coder members. Within the next 24 hours, Harvard Researchers will return a file with the registered members divided into N rooms (approximately we expect to have 25 groups of 10/12 people).
* Each room will be independent and no communication is allowed among different rooms.
* Each room has its own leaderboard. Leaderboard statistics are not published on the Top Coder website (i.e., only room members can see them).
  + Room details are not public or available to non room members.
* Harvard researchers will also assign each room to one of three kinds of competitions:
  + **The race.** The winners are the first two coders to submit a solution with score greater than S. No prizes will be awarded if no submissions reach a score of at least S.
  + **The tournament.** The winners are the two coders with the highest score at the end of the submission period.
  + **The tournament with a reserve.** Only submissions that score at least S are eligible for prizes. The winners are the two coders with the highest score at the end of the submission period, given that the score is at least S. No prizes will be awarded if no submissions reach a score of at least S.
* The threshold S for the race and the reserve tournament is going to be determined after and on the basis of the results of the preliminary competition.
* Harvard researchers will provide a final description of the rules for each type of competition to be displayed to coders (in the room forums, by email, and in the problem statement) after the end of the preliminary competition.
  + The problem statement for each treatment will also provide details about the competition. So Harvard researchers will provide 3 different problem statements.
* Top Coder will send an email to each registered participant with the rules of the competition for their room. Harvard Researchers will provide the text of the emails.
* There is a forum in each room
  + The first entry of the forum will display the competition rules.
  + Only room members can contribute to the forum.
* Top Coder will collect all timestamps for each individual’s access to:
  + Problem statement,
  + Download of test cases data,
  + Link to Banner (existing algorithm),
  + Leaderboard web page.

# Final Scores & Leaderboard in the Race

* At each submission, Top Coder will compute the final scores in addition to the partial scores.
* The final scores are not to be shown on the leaderboard, which displays the usual things (ranking, submissions, partial score, etc.).
* Every day we will have a status update posted on the form of the rooms with the race condition. This tells competitors whether the threshold has been hit by someone or not.
  + Top Coder should communicate to all competitors the time at which they will run the final score analysis and when they will publish the status update.
* As soon as someone reaches a final score of at least S, Top Coder will send an email to all participants of the room to communicate that the first prize has been awarded, but the second prize is still available. Harvard researchers will provide the exact text of the email.
  + This information will also be posted on the room forum.
* As soon as also the second coder reaches a score of at least S, Top Coder will send a second email to all participants of the room to communicate that the competition is over. Harvard researchers will provide the exact text of the email.
  + This information will also be posted on the room forum.
* People will not be allowed to discuss the competition results outside the room forum (until the 10 days are over).

# Prize Distribution

* An overall prize purse of 25K will be evenly distributed across rooms
  + In each room, the first to qualify for the award will receive 90% of the room prize. The second will receive the remaining 10%.
* In each room with quality thresholds, if no one in the room achieves the objective, no prizes will be distributed in the room.

# Final Survey

* Harvard researchers will provide a QUALTRICS link to be sent to all participants after the submission period ends.

# Data

* Top Coder will provide Harvard researchers with the historical data for each registered competitor:
  + MM and Algorithm ratings before competition
  + Number of past MM and Algorithm competitions
  + Date of first registration on Top Coder platform
  + Total prizes won in MM and Algorithm
  + Demographics (age, school, country, etc.)
  + All the information displayed on the MM profile at the time of registration
    - Best rank
    - Wins
    - Top five
    - Top Ten
    - Avg. rank
    - Avg. num. submissions
    - Competitions
    - Most recent event
* Logs of each person’s activity on the website during the competition (including the 5 days before the start and after the end of the competition)
* Competition outcomes:
  + Timestamps and scores of each submission.
  + All the components to compute the final, as well as the preliminary score per submission.
  + Code of each submission.