

Incentives in Computer Science (COMS 4995-6): Exercise Set #9

Due by Noon on Wednesday, April 8, 2020

Instructions:

- (1) You can work individually or in a pair. If you work in a pair, the two of you should submit a single write-up.
- (2) Submission instructions: We are using Gradescope for the homework submissions. Go to www.gradescope.com to either login or create a new account. Use the course code MKRKK6 to register for COMS 4995-6. Only one person needs to submit the assignment. When submitting, please remember to add your partner's name (if any) in Gradescope.
- (3) Please type your solutions if possible. We encourage you to use the LaTeX template provided on the course home page.
- (4) Write convincingly but not excessively. You should be able to fit all of your solutions into 2–3 pages, if not less.
- (5) Except where otherwise noted, you may refer to the course lecture notes and the specific supplementary readings listed on the course Web page *only*.
- (6) You can discuss the exercises verbally at a high level with other groups. And of course, you are encouraged to contact the course staff (via Piazza or office hours) for additional help.
- (7) If you discuss solution approaches with anyone outside of your group, you must list their names on the front page of your write-up.
- (8) Refer to the course Web site for the late day policy.

Exercise 49

Show that Proposition 3.2 from the lecture notes is tight in the following sense: for every $\epsilon > 0$, there is a choice of b and a weakly monotone planning instance such that the cost ratio is at least $n - 1 - \epsilon$. (Here b denotes the present bias and n the number of vertices/states.)

Exercise 50

Suppose we fix $b = 2$. Prove an upper bound on the worst-case cost ratio of weakly monotone planning instances that is strictly smaller than $n - 1$.