CSCI 4150: Introduction to Artificial Intelligence HW3
Total points: 80.

We only accept electronic submission at Submitty. Please try to ask questions on Piazza. If Piazza is not helpful, please contact the TAs.

Problem 1 (30 pt): If there are multiple winners you should list all of them. Please briefly describe your calculations (or proofs). You will get 0 point without calculations. Consider the following profile P:

$$P = 10@[a \succ b \succ c \succ d] + 7@[d \succ a \succ b \succ c] + 6@[c \succ d \succ a \succ b] + 3@[b \succ c \succ d \succ a]$$

1. Calculate the winner(s) for plurality.
2. Calculate the winner(s) for Borda.
3. Calculate the winner(s) for veto.
4. Calculate the winner(s) for plurality with runoff.
5. Draw the weighted majority graph. You only need to show positive edges and their weights.
6. Calculate the winner(s) for Copeland (assuming $\alpha = 0.5$).

Problem 2 (10 pt) Let the voting rule be STV.

1. Consider the following profile:

   $$27@[a \succ b \succ c] \qquad 42@[c \succ a \succ b] \qquad 24@[b \succ c \succ a]$$

   Who is the winner when four votes switch from $a \succ b \succ c$ to $c \succ a \succ b$? Do you observe anything interesting about the change of winner?

2. For the same profile in 1 before the switch, who is the winner after four voters with $a \succ b \succ c$ don't vote? Do you observe anything interesting about the change of winner?

Problem 3 (10 pt) Prove that for any profile P, let $WMG(P)$ denote the weighted majority graph. Prove that one of the following two cases must hold: (1) weights on all edges of in $WMG(P)$ are even numbers; or (2) weights on all edges of in $WMG(P)$ are odd numbers.

Problem 4 (30 pt). Consider the following game. Compute an NE by iteratively removing dominated strategies. Every time a strategy is removed, you must show which strategy dominates it.

	L	M	R
U	5, 0	1, 3	4, 0
C	2, 4	1, 4	3, 5
D	0, 1	1, 0	5, 0