

CS4510: HW4

Due: Oct 2 before 3pm on Gradescope (there is a link on Canvas)

Separate page for each problem

You should write the solutions on your own,
and include the names of all students you talk to.

1. Single Start. [2 points]

Suppose that P is a PFA that instead of having a start state, has a probability distribution over which state it will start in. Construct a new PFA P' that has a single start state and outputs the same strings with the same probabilities as P .

Clarification: For this problem, you need to output a letter for every transition in the PFA, otherwise the problem becomes trivial. Transitions that output the empty symbol will be considered invalid.

2. Steady State. [2 points]

Consider the PFA with 4 states A_1, A_2, B_1, B_2 . There are transitions (A_i, B_j) and (B_j, A_i) for each pair (i, j) . Show that this PFA does not reach a steady state distribution from some starting distributions/states. Now add the transition (A_i, A_i) with positive probability. Show that it will now reach a steady state from any starting distribution.

3. Applications. [2 points]

Investigate one real-world application of PFAs (Hidden Markov Models) and report back on their history, success and status (1 page limit).