CARLETON UNIVERSITY
SCHOOL OF COMPUTER SCIENCE
WINTER 2021

COMP 5005 **Assignment IV** **Due Mar. 19, 2021**

1. For an arbitrary depth of memory per action, $N \geq 3$, write a program to simulate a Tsetlin automaton which is to interact with an environment with penalty probabilities (c_1, c_2).
   (a) Test your program for c_2=0.7 and c_1 taking values increasing from 0.05 to 0.65 in steps of 0.1.
   (b) In each case, use the exact expression for the limiting value of $p_1(\infty)$ (derived in class) and a binary search technique to determine the minimum number of states necessary to obtain 95% accuracy.
   (c) Submit, along with your program, the exact value of $p_1(\infty)$ and the simulated estimated value of $p_1(\infty)$.

2. For **any one environment**, compare the simulation of the Tsetlin automaton interacting with an environment with penalty probabilities $(\frac{c_1}{2}, \frac{c_2}{2})$ with the simulation of the Krylov automaton interacting with an environment with penalty probabilities (c_1, c_2).

3. For any arbitrary parameter, λ_R $(0 < \lambda_R < 1)$, write a program to simulate the L_{RI} automaton which is to interact with an environment with penalty probabilities (c_1, c_2).
   (a) Again, test your program for c_2=0.7 and c_1 taking values increasing from 0.05 to 0.65 in steps of 0.1.
   (b) In each case, use the simulated expression for two initial values of λ_R and a binary search technique to determine the best value of λ_R (i.e., which leads to fastest convergence) necessary to obtain 95% accuracy. Submit, along with your program, **this value** and the mean time for convergence for the environment.

Your assignment should be submitted as a short formal report, with at most a couple of pages for each question. You must also submit a pointer to where we can access your code.