Abstract: Design and Application of Finite Automata Machines Project

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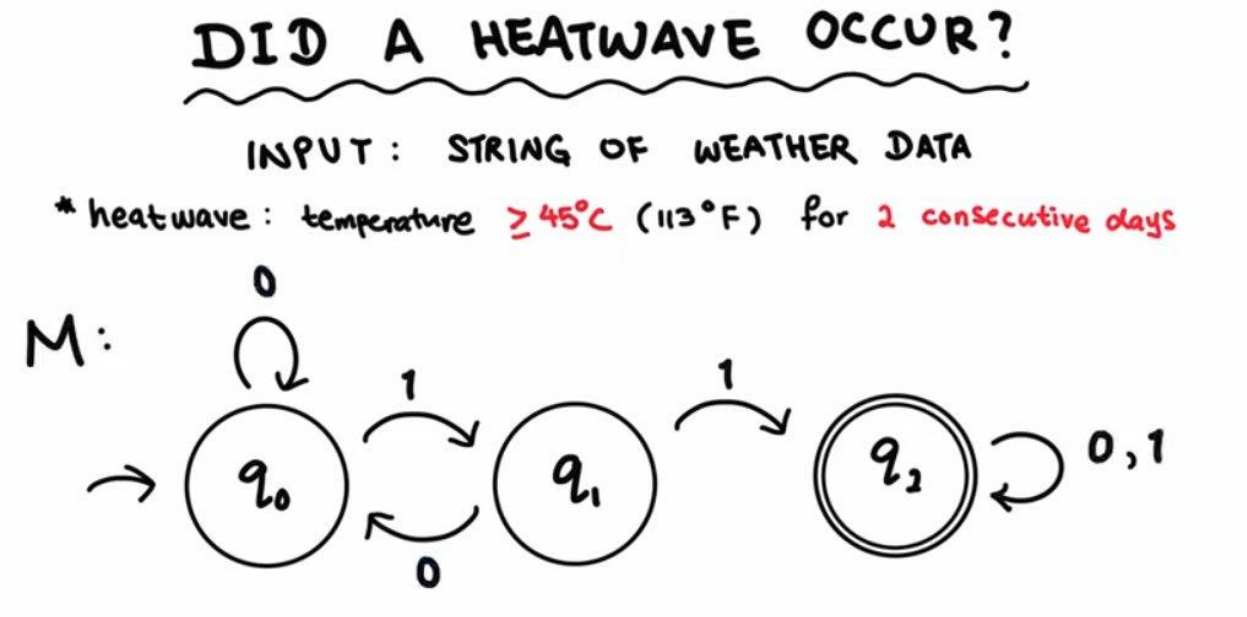
Mentor: Professor Tapas Pandit (Quantum Computing)

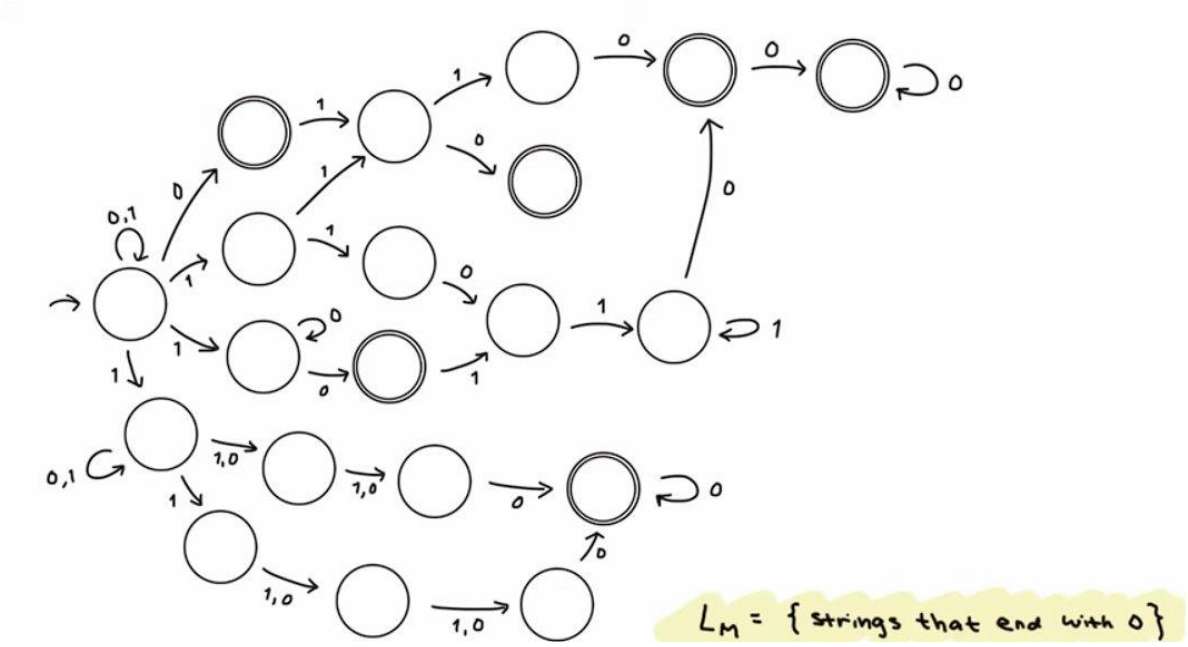
This is a learning Project as I do not have prior expertise or experience in the subject!

Relevant designs

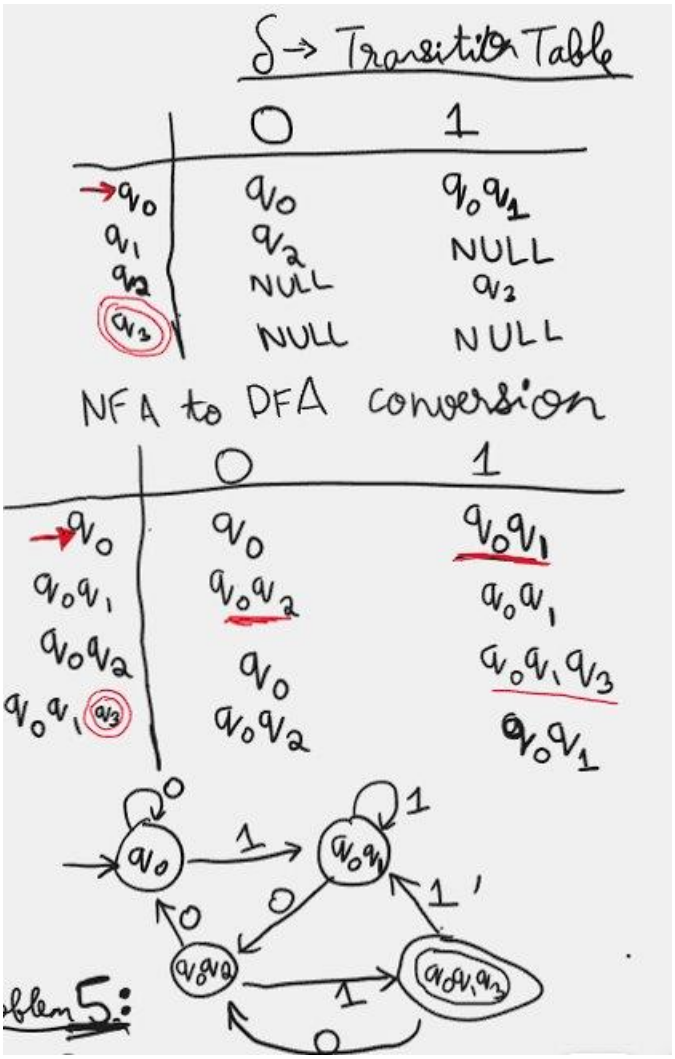


This is just one example out of the infinitely many yes or no questions one could ask. If more variables and more patterns are added then you just increase the input alphabet and then the no. Of accept states respectively.

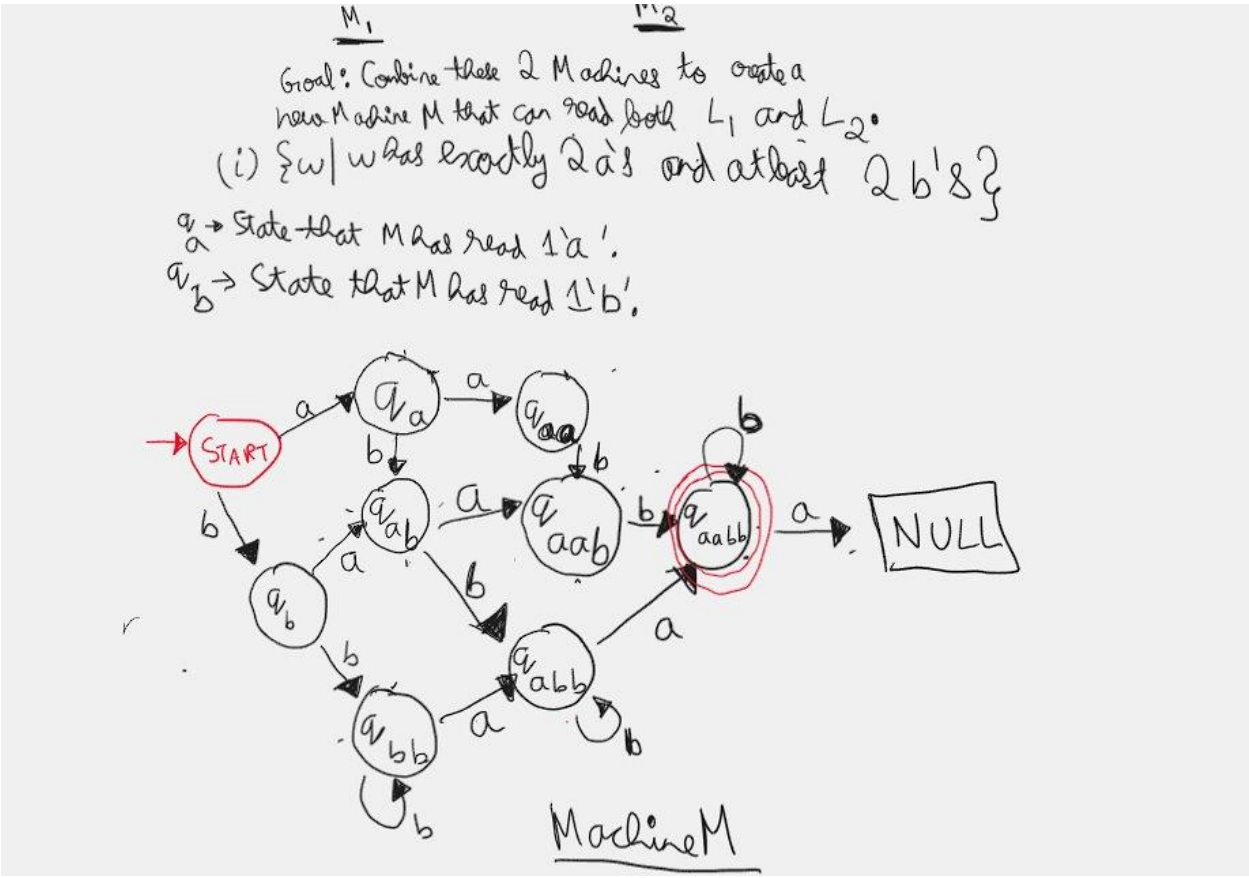
It also assumes like every computer science problem that the rules are unambiguous and logically consistent.



tAccomadates stochasticity into the system that you are working with. If you are very concerned that there is even a non zero probability that the event of your interest may occur this model will best suit you. Also works when you have missing or ambiguous data!



This algorithm is a proof that NFA's can be converted into DFA's. This is helpful because DFA's are easier to program into a computer than NFA's!



Design like art is a creative process that requires human ingenuity

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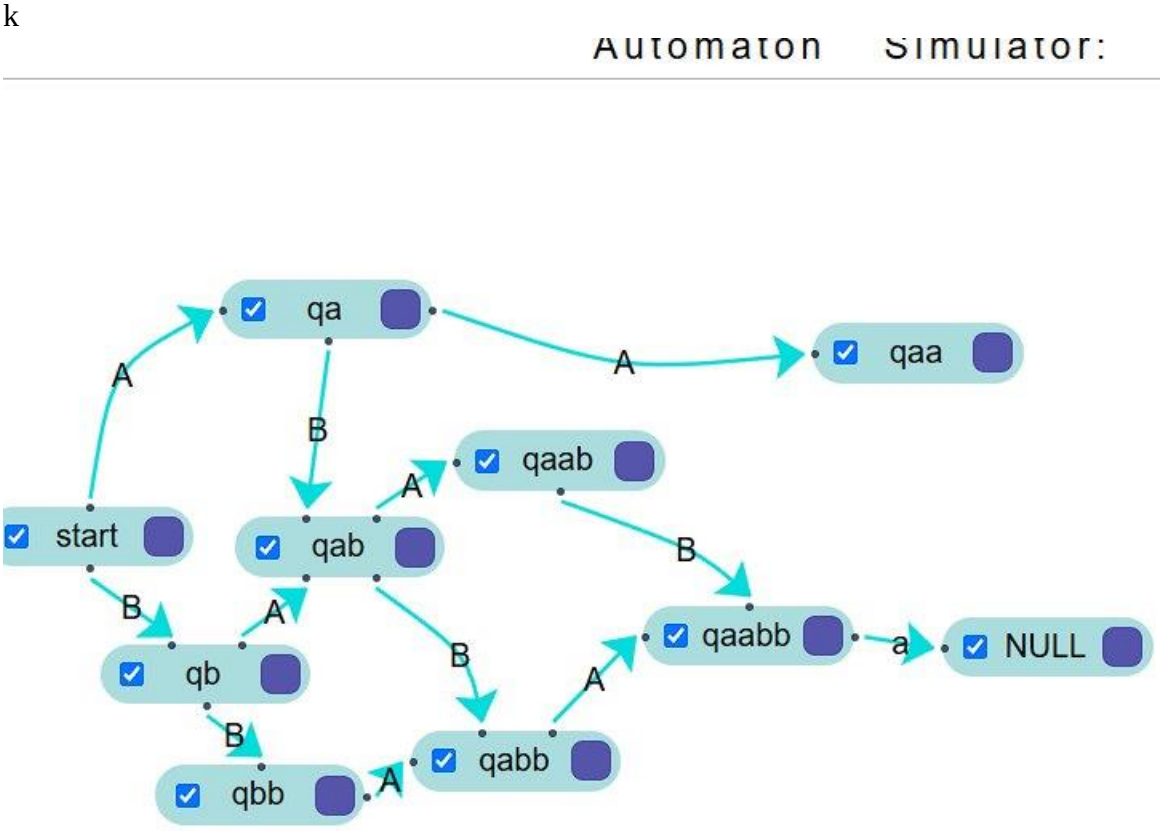
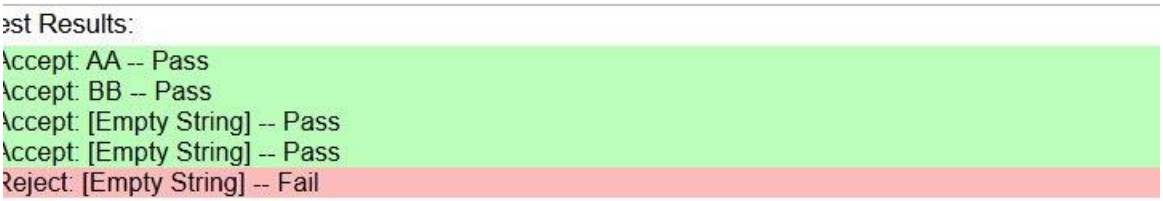




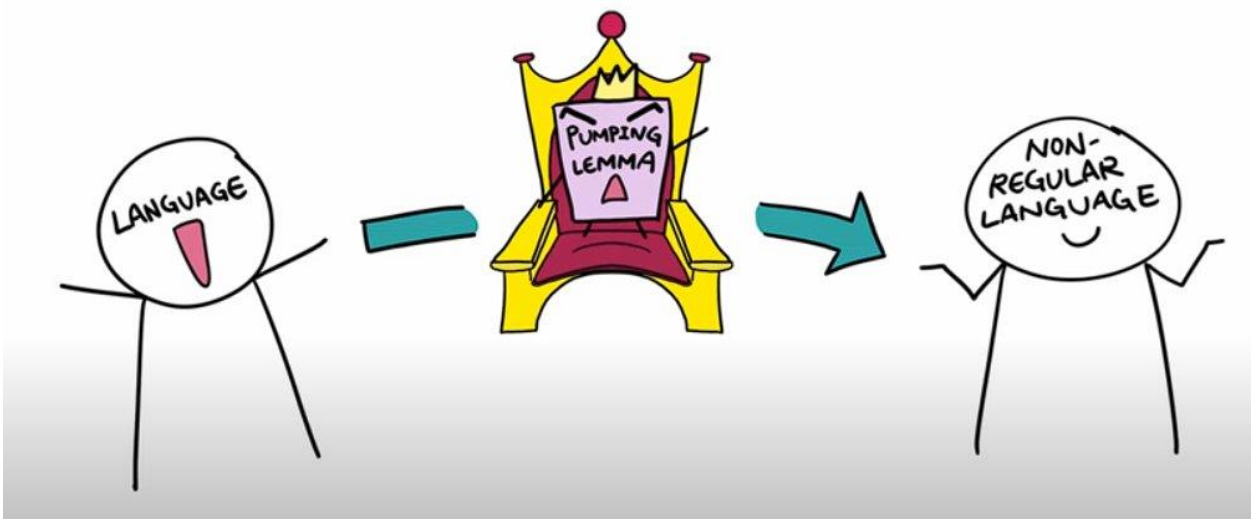
Testing however can be simulated on a computer as I validated with my algorithm!

Code file attached for your reference(Only works on Processing Environment)

Let's imagine one of the patterns (for simplicity because I don't want to make the report too long) that are associated with the event of interest when there are exactly 2 0's in the data and atleast 2 1's in the data. And there are billions of data points.

Relevant Simulation Results

All strings satisfying the pattern are accepted (100000 tests)..You can verify the results of my machine by accessing https://codepen.io/Dhruv-Menon-the-vuer/pen/xbKwgxp?editors=1111 or my Github Repository



Pumping Lemma is a mathematical statement that highlights the theoretical limits of these machines(FA's assume that every string can be broken down such that there is a sub string that can be repeated infinitely many times) More advanced machines like Push Down Automata and Turing Machines may be required to develop a better prediction model.

References:

Michael Sipser. 2006. Introduction to the Theory of Computation (2nd. ed.). International Thomson Publishing