Introduction to AI assignment 4
Solving Constraint Satisfaction Problems

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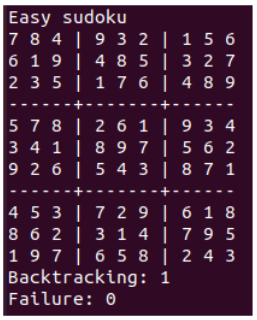
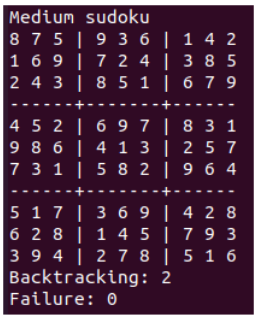
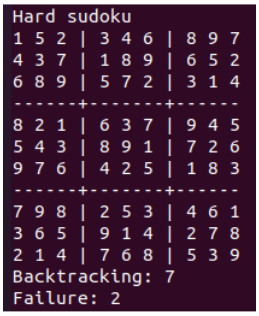
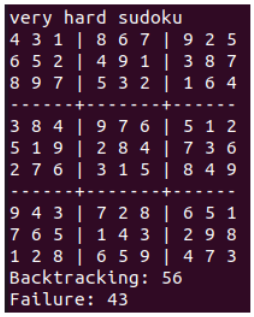
Deliverable a) and b)









Deliverable c)

Board 1 - this board is the easiest to solve and using only AC-3 algorithm is sufficient. Meaning, ensuring that constraints are satisfied across the board is enough for algorithm to arrive at the solution. Hence, the backtracking and failure values.

Board 3 - since the Backtracking algorithm is essentially a depth-first search, with the ability to jump back in case a failure was reached, the hard problem starts to show the amount of the backtracking needed. Our favorite explanation is that when a variable's domain has more than 1 state possible, it is in all of those states simultaneously, just like the Schrödinger's cat experiment. This superposition is collapsed whenever we use the SELECT-UNASSIGNED-VARIABLE function onto one of the states. Then the constraints are propagated across the board, akin to opening the box with the cat inside. In case that propagation does not violate other constraints, the algorithm will have a positive outcome. Otherwise, the contradiction state is arrived, in our case that being the failure state. Backtracking in effect, is rolling back to the moment when the box was open, but this time the algorithm collapses onto the another possibility. This is repeated until the solution is reached, and no constraints are violated.

Board 4 - the heaviest problem, which explains the amount of backtracking steps and failure states. This one requires more steps simply because there is a lot more opportunities to fail, which explains the number of failures and backtrackings.