

TDT4136 Introduction to Artificial Intelligence  
Assignment 5

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The solutions for the boards are shown below. We see that for the easy board the backtrack function is only called once. This means that the AC-3 algorithm is able to solve the board. We don't need any recursion here. For the medium board the backtrack function is called three times. This means that we had to try one of several possible values for two of the variables. Although we had to pick a value for two variables the pick was correct, and we didn't have to backtrack and revert the assignments. For the hard board backtrack was called four times with no failures. Same discussion as for medium board. For the very hard board we see that backtrack is called 43 times and fails 35 times. This is because the AC-3 algorithm is not able to narrow down the domains of the variables as much as in the easier boards. The backtrack algorithm has to try a lot more values for the variables before we end up with a solution.

```

('Going to solve ', 'easy.txt')
7 8 4 | 9 3 2 | 1 5 6
6 1 9 | 4 8 5 | 3 2 7
2 3 5 | 1 7 6 | 4 8 9
-----+-----+-----
5 7 8 | 2 6 1 | 9 3 4
3 4 1 | 8 9 7 | 5 6 2
9 2 6 | 5 4 3 | 8 7 1
-----+-----+-----
4 5 3 | 7 2 9 | 6 1 8
8 6 2 | 3 1 4 | 7 9 5
1 9 7 | 6 5 8 | 2 4 3
('Numb backtrack called: ', 1, ' Numb of failures: ', 0)

('Going to solve ', 'medium.txt')
8 7 5 | 9 3 6 | 1 4 2
1 6 9 | 7 2 4 | 3 8 5
2 4 3 | 8 5 1 | 6 7 9
-----+-----+-----
4 5 2 | 6 9 7 | 8 3 1
9 8 6 | 4 1 3 | 2 5 7
7 3 1 | 5 8 2 | 9 6 4
-----+-----+-----
5 1 7 | 3 6 9 | 4 2 8
6 2 8 | 1 4 5 | 7 9 3
3 9 4 | 2 7 8 | 5 1 6
('Numb backtrack called: ', 3, ' Numb of failures: ', 0)

```

```

('Going to solve ', 'hard.txt')
1 5 2 | 3 4 6 | 8 9 7
4 3 7 | 1 8 9 | 6 5 2
6 8 9 | 5 7 2 | 3 1 4
-----+-----+-----
8 2 1 | 6 3 7 | 9 4 5
5 4 3 | 8 9 1 | 7 2 6
9 7 6 | 4 2 5 | 1 8 3
-----+-----+-----
7 9 8 | 2 5 3 | 4 6 1
3 6 5 | 9 1 4 | 2 7 8
2 1 4 | 7 6 8 | 5 3 9
('Numb backtrack called: ', 4, ' Numb of failures: ', 0)

('Going to solve ', 'veryhard.txt')
4 3 1 | 8 6 7 | 9 2 5
6 5 2 | 4 9 1 | 3 8 7
8 9 7 | 5 3 2 | 1 6 4
-----+-----+-----
3 8 4 | 9 7 6 | 5 1 2
5 1 9 | 2 8 4 | 7 3 6
2 7 6 | 3 1 5 | 8 4 9
-----+-----+-----
9 4 3 | 7 2 8 | 6 5 1
7 6 5 | 1 4 3 | 2 9 8
1 2 8 | 6 5 9 | 4 7 3
('Numb backtrack called: ', 43, ' Numb of failures: ', 35)

```