Lab Assignment

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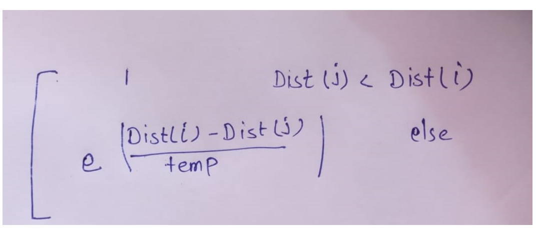
I. Introduction

In AI is different -differnet heuristics or technique to solve a problem faster than classic methods or to find an approximate solution when classic methods cannot. This is achieved by trading optimality, completeness, accuracy, or precision for speed. The heuristic search technique can evaluate the available information and makes a decision on which branch to follow. The heuristic technique is capable to produce a solution that is good enough for the problem.

*1) **Lab Assignment 1**:* For Lab Assigmnet Problem : Solution Link :
https://github.com/201851019-iiitv/CS302_Week1

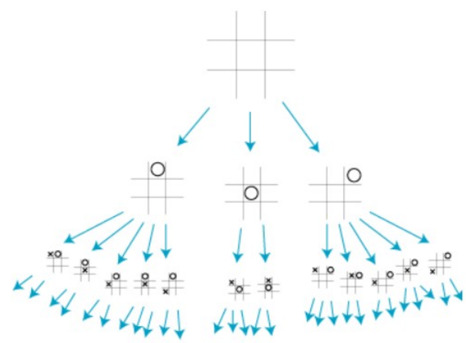
*2) **Lab Assignment 3**:* We have to local search agent to search a local maxima, but Using Simulated Annealing we can find global maxima. Travelling Salesman Problem (TSP),we are able to find a efficient solution using simulated annealing (meta-heuristics) in lesser time. We select 2 cities i & j from permutation of (1 to N) cities. We can go with probabality This is my Github link:



https://github.com/201851019-iiitv/Week3_TSP

*3) **Lab Assignment 4**:* Problem 1:What is the size of the game tree for Noughts and Crosses? Sketch the game tree.

Ans-: For any game, we can define the game tree in which the nodes correspond to game positions, and the children of a node are the positions that can be reached from it in one move. Most of the time we are not able to construct the whole game tree. As we know the game tree of noughts and crosses have 225,000 leaf nodes at the last level of the game tree.
In the game of noughts and crosses has total 9 piles in a game and to fill spaces by each player getting action one action by one player and another action by another player. Therefore there are total number of possibles to fill the spaces by 9! which is 362,880 (if computer goes first) and if computer goes second then the total ways to fill up the spaces is 8! = 40,320.
There is also a have a possibility that the game can complete without filling up the all the 9 spaces in noughts and crosses(Like the game can finish in 5 moves or 6 moves or 7 moves or 8 moves or in 9 moves). Their are 8 states that can give results as win(2 diagonal, 3column and 3 rows).
Game end in 5 moves total number of possibilities are 1440(8*3!*6*5) in there 3 crosses can placed at any sequence and 2 noughts placed in left out spaces. Game finish in 6 moves we get the total possibilities are 5,328. As we do same we can get number of possibilities for game finishing in 7 moves is 47,952, game end in 8 moves is 72,576 at last game complete in 9 moves is 127,872(Wins are 81,792 and Draws 46,080). i.e total number of possible games are 255,168.



The game tree as drawn above has 9! = 362,880 edges. But that includes games that continue after a victory,Removing these gives 255,168 edges.

Problem 2: Ans-: Nim is a two-player game played with several piles of stones. You can use as many piles and as many stones in each pile as you want, but in order to better understand the game, we'll start off with just a few small piles of stones. The two players take turns removing stones from the game. On each turn, the player removing stones can only take stones from one pile, but they can remove as many stones from that pile as they want. If they want, they can even remove the entire pile from the game! The winner is the player who removes the final stone.

Given that there are two players, player-1 and player-2, and initially there are three piles of coins initially having 10, 7, 8 discs in each of them as shown below. We assume that first move is made by A. See the below figure for clear understanding of the whole game play.

In the above image given in pile-1 has 10 discs(8+0+2+0), pile-2 has 7 discs and last pile has 9 discs. To win the game for player-2 we have to leave sum of zero of Nim for player-1 in every turn. AS we observe the sum of the Nim is not zero because in pile 2 there are four extra discs. And the discs in each and every pile are representing sum of power of two. Therefore the sum of the initial configuration of the Nim is not equal to zero(non-zero).
Case-1: Firstly, player-1 goes and choose random discs from any pile. In case that if player-1 choose 1-3 discs from pile-2 then player-2 need to go and pick 4 discs from the remaining pair as[(1,1),(2,2),(8,8)]. If player-1 have any other option then the player-2 need to remove four discs from the pile-2.
Case-2: Secondly, two players(player-1 and player-2) needs to re-check the sum of the Nim piles are balanced or not, and check the balance of the sum is zero.The game will run as long as there are items in any of the piles and in each of their respective turns player-1 would make Nim sum non-zero and player-2 would make it zero again and eventually there will be no elements left and player-2 being the one to pick the last wins the game. Case-3: If player-2 need to win the game then player-1 need to choose the last discs from any pile. From the above method let us assume that last pair left 4 discs each pile 1 and pile 3. After that player-1 turn next.

Problem 3: Ans-: Effectiveness of Alpha-Beta pruning Search
1.Worst-Case-: Branches are ordered so that no pruning takes place. In this case alpha-beta gives no improvement over exhaustive search. 2. Best-Case: – Each player's best move is the left-most alternative (i.e., evaluated first) 3.Alpha/beta best case is O(b(d/2)) rather than O(bd) – This is the same as having a branching factor of sqrt(b), • (sqrt(b))d = b(d/2) (i.e., we have effectively gone from b to square root of b).

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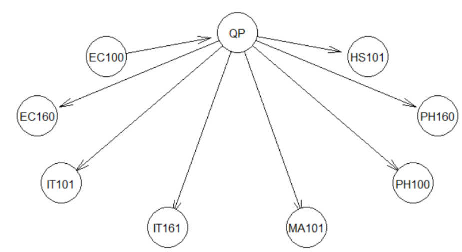
*4) **Lab Assignment 6** :* problem 1 :we have a the graphical models for inference under uncertainty, build Bayesian Network in R, Learn the structure and CPTs from Data, naive Bayes classification with dependency between features.
Bayesian Network :
Bayesian Networks are probabilistic graphical models and they have some neat features which make them very useful for many problems. They are structured in a way which allows you to calculate the conditional probability of an event given the evidence. The graphical representation makes it easy to understand the relationships between the variables and they are used in many AI solutions where decisions need to be automated in a range of contexts such as medical diagnosis, risk modelling and mitigation. Bayesian networks are great where the is a complex system of many causal relationships

1.Consider grades earned in each of the courses as random variables and learn the dependencies between courses.



2.Using the data, learn the CPTs for each course node.
Conditional probability table (CPT) is defined for a set of discrete and mutually dependent random variables to display conditional probabilities of a single variable with respect to the others. this is github link
https://github.com/KAMLESH201851055/Ai-week6

II. Conclusion

We understand the different-different heuristic to solve the NP Problem in lesser time and get a optimal solution. and understand CPTs from Data, naive Bayes classification
Alpha-beta pruning makes a major difference in evaluating large and complex game trees. Even though Noughts and Crosses is a simple game itself, we can still notice how without alpha-beta heuristics the algorithm takes significantly more time to recommend the move in first turn.

Acknowledgment

We would like to thanks Pratik Shah Sir .

References

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https://github.com/201851019-iiitv/Week3_TSP
https://github.com/201851019-iiitv/CS302_Week1