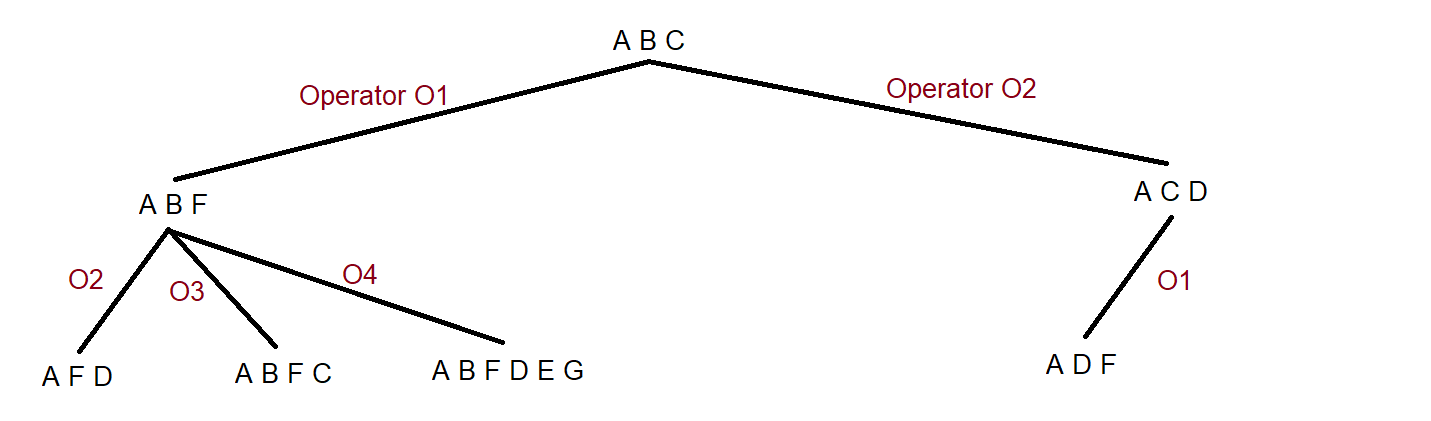
James Hahn

Artificial Intelligence

Dr. Diane Litman

1.

a. 

This search does not find a plan to achieve the goal of [C, D, E]. Intuitively, this cannot happen with a depth limit of two and our project specifications. For example, we need E in our goal state. However, the only way to obtain E is to perform the O4 operator. In order to perform the O4 operator, we must acquire F first. To acquire F, we must execute operator O1. The problem here is that O1 deletes C, which is also required for our goal state. So, in order to obtain C again, we must do operator O3. Only at this point do we have the three required effects for our goal state (C, D, E). This alone required three operations. As a result, with a limited depth of two, our search was unable to find a successful plan.

b.

The approach described above is relatively similar to partial-order regression planning. A sample partial-order regression plan is as follows:

O1

O4

O3

O2

And an example is below:



2.

a. P(toothache) = 0.2

b. P(Cavity) = 0.2

c. P(Toothache | cavity) = 0.6

d. P(Cavity | toothache V catch) = 0.46

3.

P( disease(Z) | positive ) = [ P( positive | disease(Z) ) \* P(disease(Z)) ] / P(positive)

P(positive | disease(Z)) = .94

P(disease(Z)) = .02

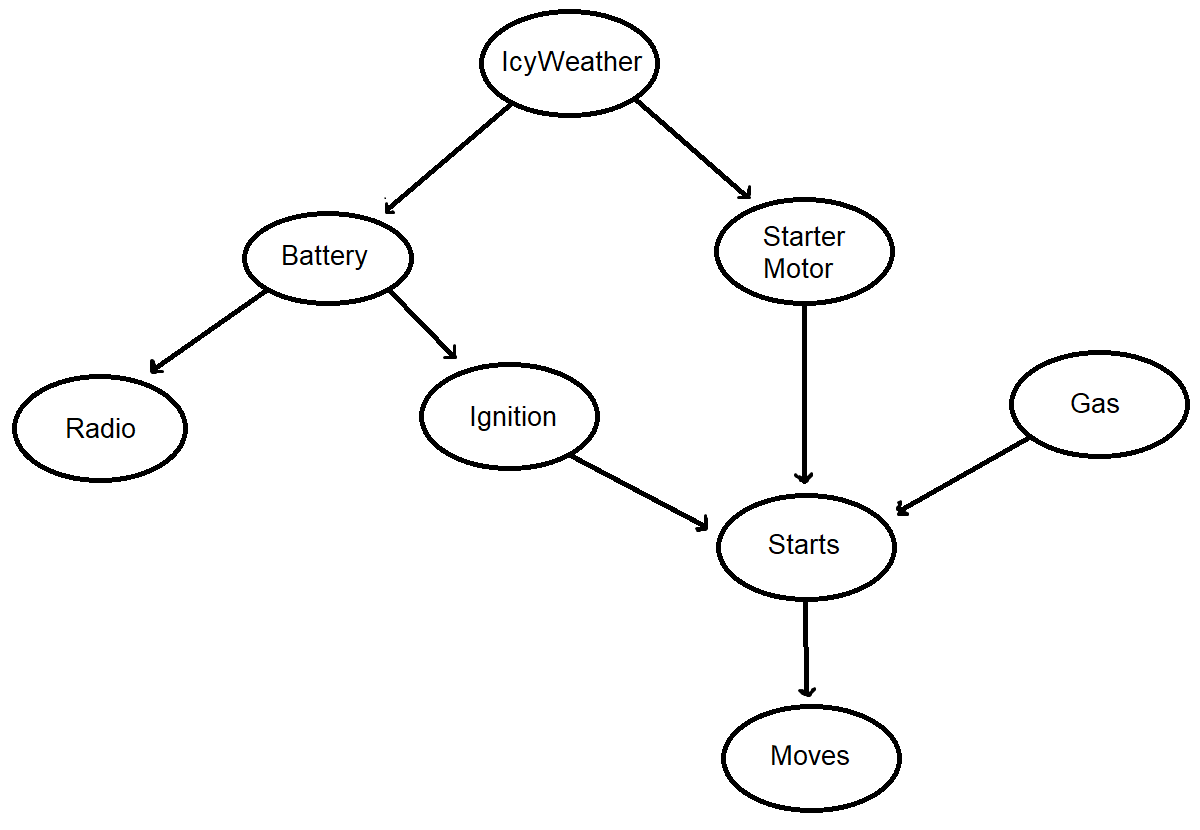
P(positive ^ disease) = P(positive | disease) \* P(disease) = .94 \* .02 = .0188

P(positive ^ ~disease) = P(positive | ~disease) \* P(~disease) = .09 \* .98 = .0882

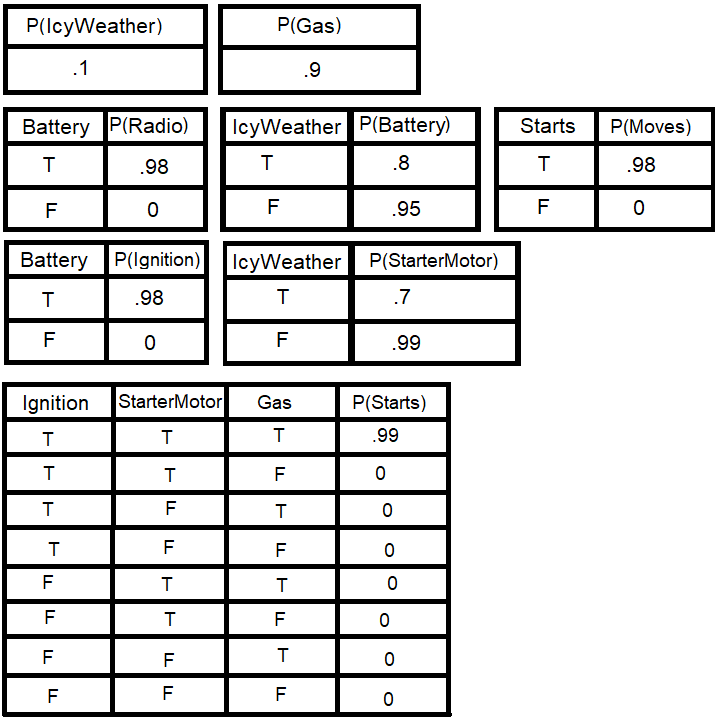
P(positive) = P(positive ^ disease) + P(positive ^ ~disease) = .0188 + .0882 = .107

Therefore, P(disease(Z) | positive) = (.94\*.02) / .107 = .1757

4.

a.

b.



c. Since each variable can be true or false, there are 28 = 256 values.

d. My tables contain 20 independent probability values.

Additional questions:

e. Give the expression for the full joint probability for: Battery=T, Radio=T, Ignition=T, Gas=F, Starts=T, Moves=F. The expression can be found below:

P(Battery ^ Radio ^ Ignition ^ ~Gas ^ Starts ^ ~Moves)

f. Assume we want to compute the probability of the car not moving, that is P(Moves = False). Write down the expression for computing the probability from conditionals:

P(~Moves) = P(~Moves | Starts) = P(~Moves | Battery, Radio, Ignition, Gas, Starts)

5.

Pn = Pneumonia

F = Fever

Pa = Paleness

C = Cough

H = HighWBCcount

P(Pn | F, ~Pa, C, ~H) =

[ P(F, ~Pa, C, ~H | Pn) \* P(Pn) ] / P(F, ~Pa, C, ~H) =

[ P(F, ~Pa, C, ~H | Pn) \* P(Pn) ] / [ P(F, ~Pa, C, ~H) ] =

[ P(F | Pn) \* P(~Pa | Pn) \* P(C | Pn) \* P(~H | Pn) \* P(Pn) ] / [ P(F, ~Pa, C, ~H) ] =

[ P(F | Pn) \* (1 - P(Pa | Pn)) \* P(C | Pn) \* (1 - P(H | Pn)) \* P(Pn) ] / [ P(F, ~Pa, C, ~H) ] =

[ P(F | Pn) \* (1 - P(Pa | Pn)) \* P(C | Pn) \* (1 - P(H | Pn)) \* P(Pn) ] / [ P(F | Pn) \* P(~Pa | Pn) \* P(C | Pn) \* P(~H | Pn) ] =

P(Pn) =