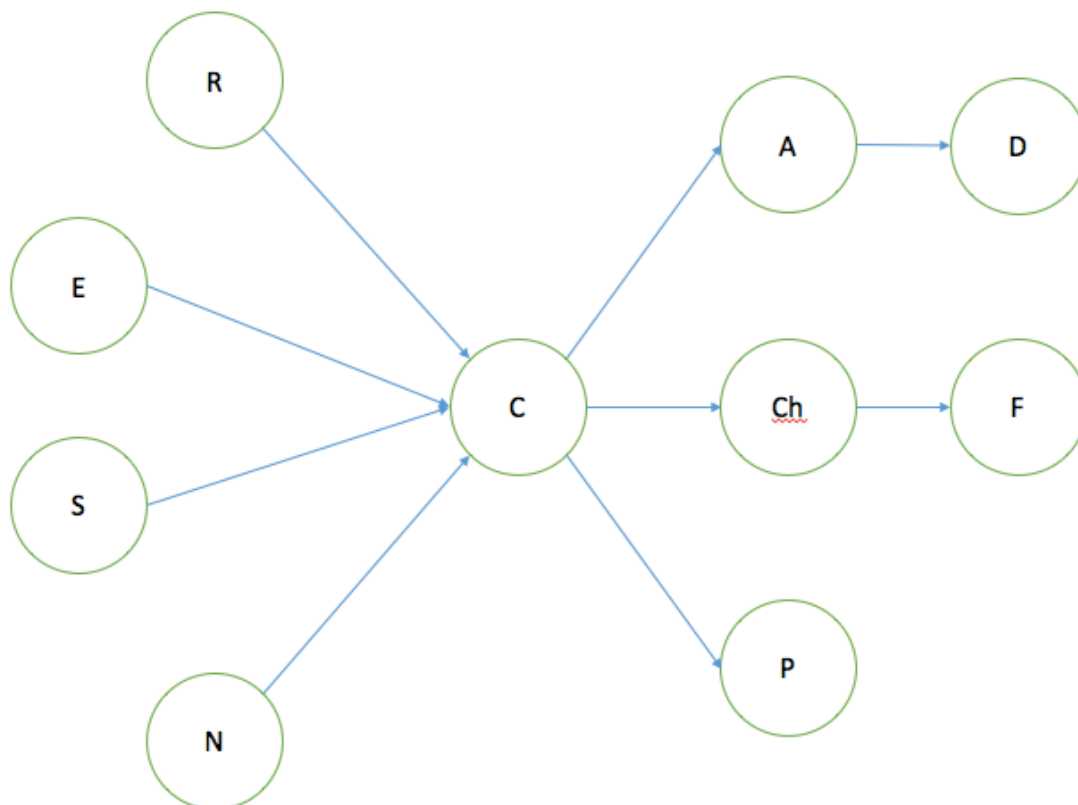


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Artificial Intelligence
Homework #3

Only partially completed.

Question 1: Designing a Bayes Net.



$P(R) = .90$
 $P(E) = .60$
 $P(S) = 0.17$
 $P(N) = 0.70$

$P(C) = .40$
 $P(C \mid R, E, S, N)$

$P(P) =$
 $P(P \mid C) =$

$P(\text{Ch}) =$
 $P(\text{Ch} \mid C)$
 $P(F) =$
 $P(F \mid \text{Ch})$

$P(A) =$
 $P(A \mid C)$
 $P(D) =$
 $P(D \mid A)$

References:

<http://www.cancer.ca/en/cancer-information/cancer-101/cancer-statistics-at-a-glance/?region=on>

Question 2: Inference in a Bayes Net.

(a) $P(\text{rush_hour}, \text{sirens})$

Question 3: Variable Elimination.

Pick an ordering: rush_hour, bad_weather, accident, traffic_jam, sirens

Initialize:

$P(R), P(B), P(A | B), P(T | R, B, A), P(S | A), \delta(R, 1)$

Eliminate R: $m_R(T, B, A) = \sum_r P(r) P(T | r, B, A) \delta(r, 1)$

~~$P(R), P(B), P(A | B), P(T | R, B, A), P(S | A), \delta(R, 1)$~~

$\Rightarrow P(B), P(A | B), P(S | A), m_R(T, B, A)$

Eliminate B: $m_B(A, T) = \sum_b P(b) P(A | b) m_R(T, b, A)$

~~$P(B), P(A | B), P(S | A), m_R(T, B, A)$~~

$\Rightarrow P(S | A) m_B(A, T)$

Eliminate A: $m_A(S, T) = \sum_a P(S | a) m_B(a, T)$

~~$P(S | A) m_B(A, T)$~~

$\Rightarrow m_A(S, T)$

Eliminate T: $m_T(S) = \sum_t m_A(S, t)$

~~$m_A(S, T)$~~

$\Rightarrow m_T(S)$