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CS 1675: Intro to Machine Learning

Professor Milos Hauskrecht

Problem Assignment 8

**Problem 1. Bayesian belief networks**

Assume you want to compute

**Part a.**

**# of additions:**

**# of multiplications:**

**Part b.**

**# of additions:**

**# of multiplications:**

By interleaving the sums and products, the computational cost in terms of number of additions and multiplications both are reduced, especially the multiplication.

**Problem 2. Pneumonia diagnosis**

**Part a.**

**P(Fever | Pneumonia)**

|  |  |  |
| --- | --- | --- |
| **Fe** | **T** | **F** |
| **T** | 0.9 | 0.1 |
| **F** | 0.6 | 0.4 |

**P(Paleness | Pneumonia)**

|  |  |  |
| --- | --- | --- |
| **P** | **T** | **F** |
| **T** | 0.7 | 0.3 |
| **F** | 0.5 | 0.5 |

**P(Cough | Pneumonia)**

|  |  |  |
| --- | --- | --- |
| **C** | **T** | **F** |
| **T** | 0.9 | 0.1 |
| **F** | 0.1 | 0.9 |

**P(HighWBCcount | Pneumonia)**

|  |  |  |
| --- | --- | --- |
| **H** | **T** | **F** |
| **T** | 0.8 | 0.2 |
| **F** | 0.5 | 0.5 |

**Part b.**

**Part c.**

**Part d.**

From the data provided in the file “example.txt”:

* With the parameters 1, 0, 1, 0, the probability the patient has pneumonia is: 0.062021
* With the parameters 1, 0, 1, -1, the probability the patient has pneumonia is: 0.141856
* With the parameters 0, 1, -1, 0, the probability the patient has pneumonia is: 0.002849
* With the parameters 1, -1, -1, 0, the probability the patient has pneumonia is: 0.012097
* With the parameters -1, 0, 1, -1, the probability the patient has pneumonia is: 0.099265