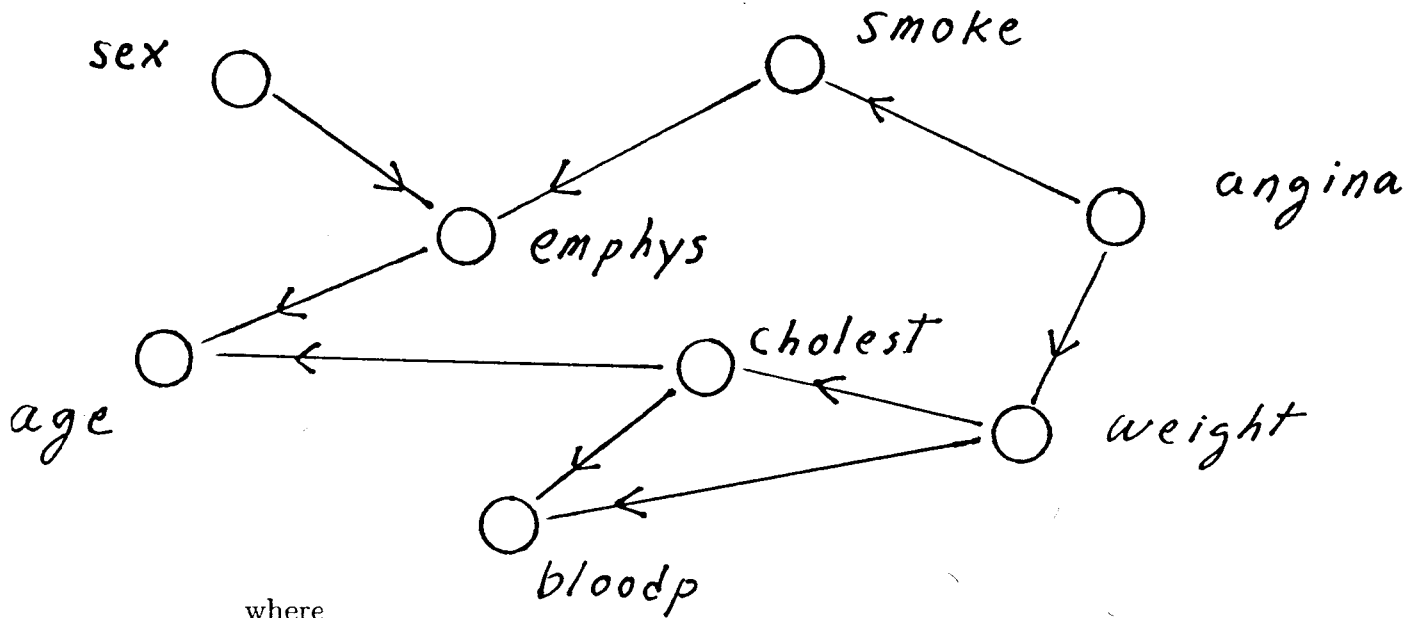


Assignment 9

Expert Medical System

We consider an imaginary (and somewhat sickly) population. The medical status of the individuals in the population are approximately described by eight relevant variables: sex; smoking habit; severity of angina; severity of emphysema; age; weight; blood pressure; and cholesterol level. The probabilistic relationships among these eight variables are summarized in the following directed acyclic graph:



where

- sex $\in \{0, 1\}$ 0=female, 1=male
- smoke $\in \{0, 1, \dots, 60\}$ # cigarettes smoked per day
- angina $\in \{0, 1, 2, 3, 4\}$ 0=no angina, 1=mild angina, ... 4=severe angina
- emphys $\in \{0, 1, 2, 3, 4\}$ 0=no emphysema, 1=mild, ... 4=severe
- age $\in \{20, 21, \dots, 100\}$ age in years
- weight $\in \{0, 1, \dots, 300\}$ weight in pounds
- bloodp $\in \{0, 1, 2, 3, 4\}$ 0=normal blood pressure, 1=mildly elevated, ...
- cholest $\in \{0, 1, 2, 3, 4\}$... 0=low cholesterol, ... 4=highly elevated cholesterol

You will receive eight Matlab functions, one for each variable. These return the conditional probability of the variable given the values of its “parents” in the DAG:

function p=sex(x)

x=0 for female, 1 for male

function p=smoke(x,y)

x=# cigarettes per day;

y=angina severity (y=0 no angina, y=1, mild angina, etc.)

function p=angina(x)

x=angina severity (0=no angina, 1=mild angina, etc.)

function p=emphys(x,y,z)

x=severity of emphysema (0=no emphysema, 1=mild emphysema, etc.);

y=sex (0=female, 1=male);

z=# cigarettes smoked per day

function p=age(x,y,z)

x=age in years;

y=severity of emphysema (0=no emphysema, 1=mild emphysema, etc.);

z=cholesterol level (0=low,...4=highly elevated)

function p=weight(x,y)

x=weight in pounds;

y=angina severity (0=no angina, 1=mild angina, etc.)

function p=bloodp(x,y,z)

x=high blood pressure index (0=normal, 1=mild high blood pressure, etc.);

y=cholesterol level (0=low,...4=highly elevated);

z=weight in pounds

function p=cholest(x,y)

x=cholesterol level (0=low,...4=highly elevated);

y=weight in pounds

ASSIGNMENT: Compute $\text{Prob}(\text{age} > 60 | \text{bloodp} = 4)$. In other words, compute the fraction of individuals with severe high blood pressure ($\text{bloodp} = 4$) who are over 60 years of age ($\text{age} > 60$).