

Exercise 1.

You are given the joint probability distribution $P(A, B, C, D) = P(A)P(B|A)P(C|A)P(D|B)$ with

$$\begin{array}{rcc}
 P(D|B) & b_1 & b_2 \\
 d_1 & 2/3 & 1/2 \\
 d_2 & 1/3 & 1/2
 \end{array}
 ;
 \begin{array}{rcc}
 P(C|A) & a_1 & a_2 \\
 c_1 & 1 & 2/3 \\
 c_2 & 0 & 1/3
 \end{array}
 ;
 \begin{array}{rcc}
 P(B|A) & a_1 & a_2 \\
 b_1 & 1/2 & 5/6 \\
 b_2 & 1/2 & 1/6
 \end{array}
 ;
 \begin{array}{rcc}
 P(A) & a_1 & a_2 \\
 & 1/4 & 3/4
 \end{array}
 ;$$

Compute $P(A, B)$, $P(B)$, $P(A, C)$, $P(C)$, $P(B|A, C)$ and $P(A, C|B)$.