

# ARTIFICIAL INTELLIGENCE & CYBER SECURITY

## BAYESIAN NETWORKS

*Example*

Estefanía Talavera Martínez  
e.talaveramartinez@utwente.nl

## Example: Entering college

Consider two characteristics of a person. Being smart, denoted by binary variable  $S$ , and being an athlete, denoted by binary variable  $A$ .

Let's assume that 40% of the population is smart, and 10% of the population is an athlete.

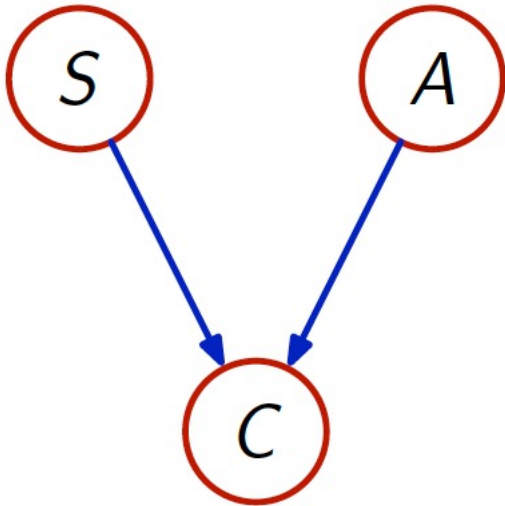
Furthermore, let's denote the fact that someone entered college with the binary variable  $C$ . If you are smart you have higher chances of entering college as well as if you are an athlete. Let's say these probabilities are:

$p(C = c A, S)$	$A = a$	$A = \neg a$
$S = s$	0.91	0.90
$S = \neg s$	0.90	0.04

How would this graphical model look, and what would the factorisation imply?

## Example: Entering college

$$p(C, A, S) = p(C|A, S) p(A) p(S)$$



What is the probability that an athlete is smart?

$$p(s|a) = p(s) = 0.4$$

What is the probability of meeting a smart person in college?

$$p(s|c) = \frac{p(c,s)}{p(c)} \approx .83$$

What is the probability of meeting a smart person in college if that person is an athlete?

$$p(s|a, c) \approx 0.403$$