Artificial intelligence

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https://youtu.be/hEZjPZ-Ze0A

BAYESIAN BELIEF NETWORKS – EXAMPLE – 1

- You have a new burglar alarm installed at home.

- It is fairly reliable at detecting burglary, but also sometimes responds to minor earthquakes.

- You have two neighbors, John and Merry , who promised to call you at work when they hear the alarm.

- John always calls when he hears the alarm, but sometimes confuses telephone ringing with the alarm and calls too.

- Merry likes loud music and sometimes misses the alarm.

- Given the evidence of who has or has not called, we would like to estimate the probability of a burglary.

BAYESIAN BELIEF NETWORKS – EXAMPLE – 1
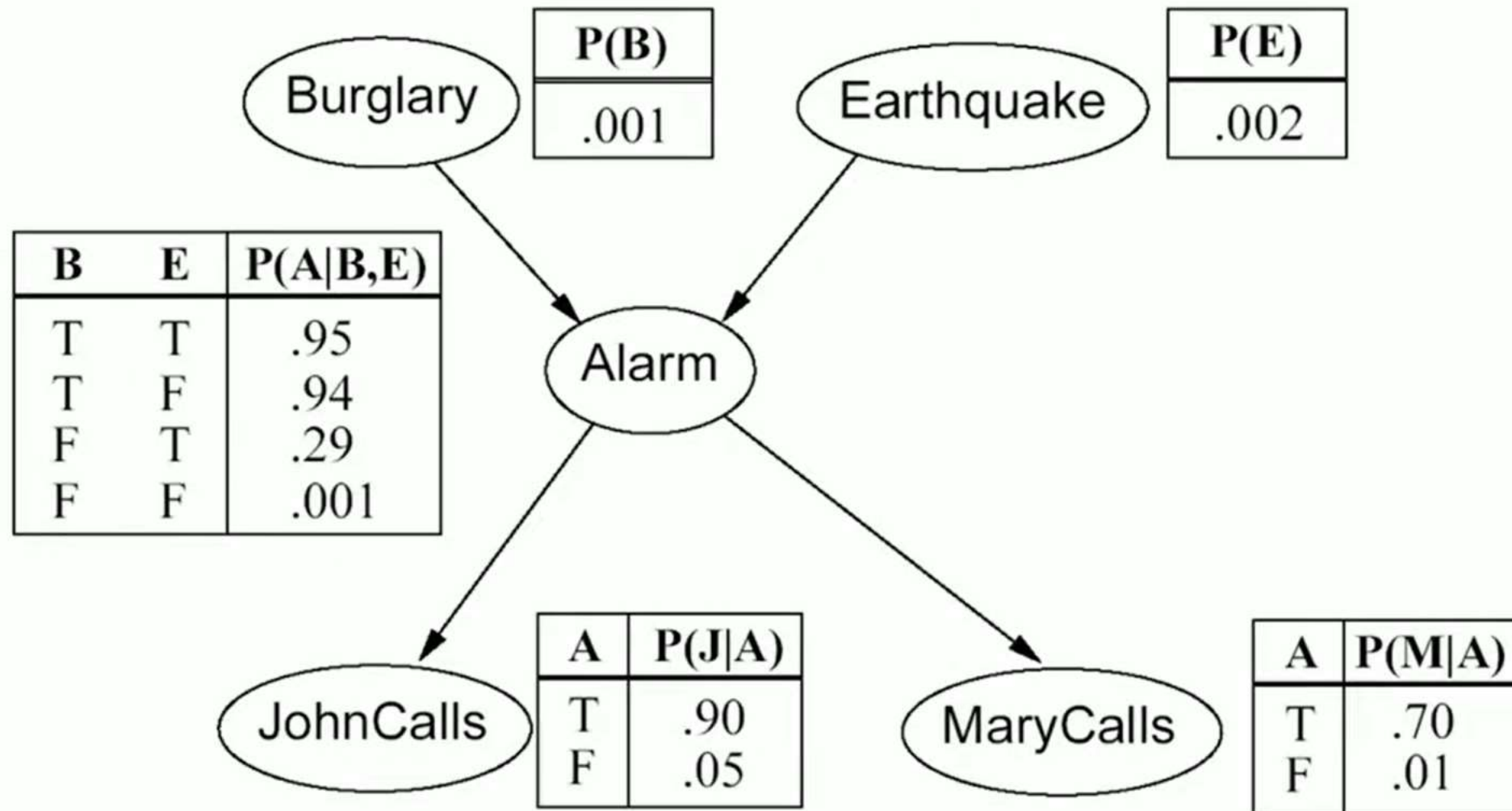
Burglary

P(B)
.001

Earthquake

P(E)
.002

B	E	P(A|B,E)
T	T	.95
T	F	.94
F	T	.29
F	F	.001

Alarm

JohnCalls

A	P(J|A)
T	.90
F	.05

MaryCalls

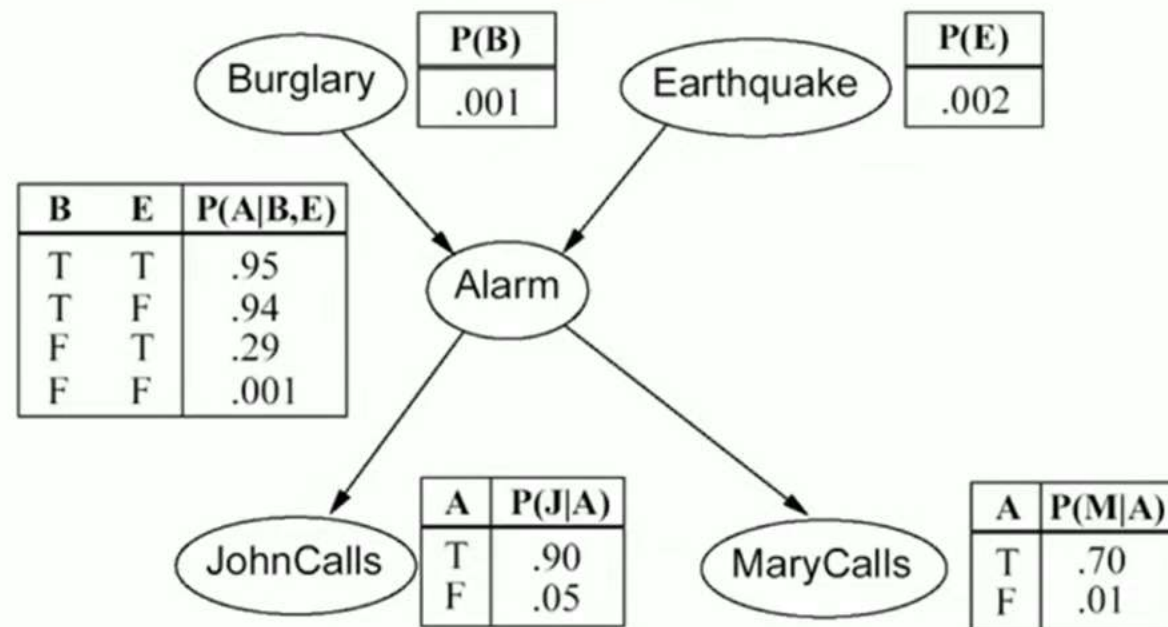| A	P(M|A)
T	.70
F	.01

BAYESIAN BELIEF NETWORKS – EXAMPLE – 1

1. What is the probability that the alarm has sounded but neither a burglary nor an earthquake has occurred, and both John and Merry call?

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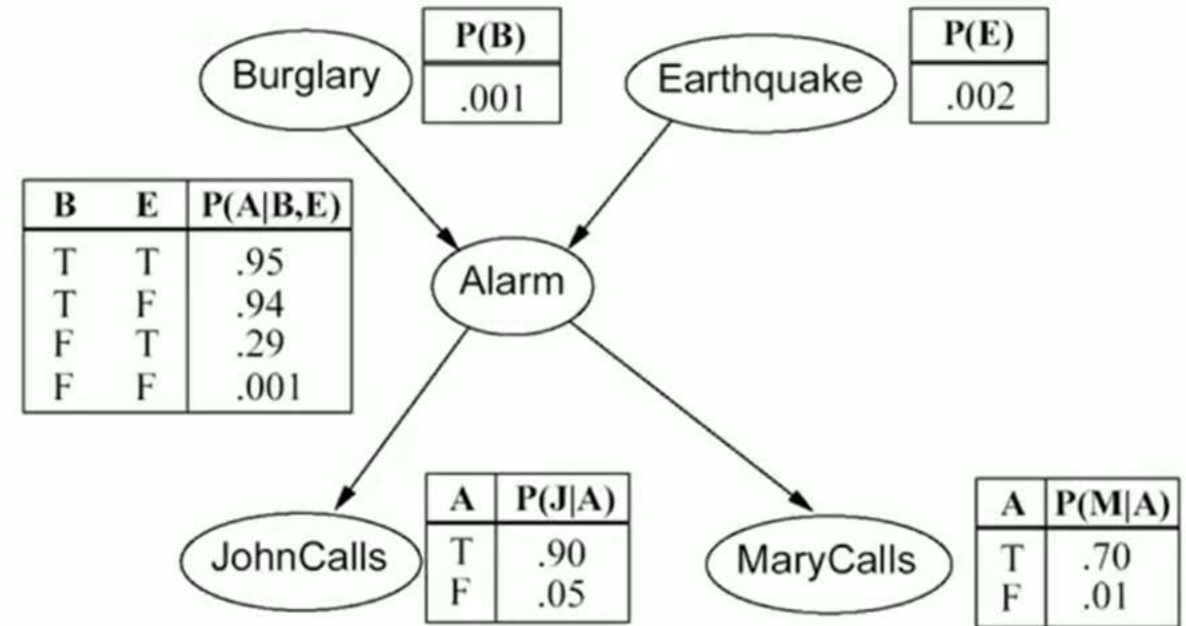
	P(B)
Burglary	.001

	P(E)
Earthquake	.002

B	E	P(A|B,E)
T	T	.95
T	F	.94
F	T	.29
F	F	.001

Alarm

A	P(J|A)
T	.90
F	.05

JohnCalls

A	P(M|A)
T	.70
F	.01

MaryCalls

Solution:

$$P(j \wedge m \wedge a \wedge \neg b \wedge \neg e) = P(j \mid a)\, P(m \mid a)\, P(a \mid \neg b, \neg e)\, P(\neg b)\, P(\neg e)$$

$$= 0.90 \times 0.70 \times 0.001 \times 0.999 \times 0.998$$

$$= 0.00062$$

BAYESIAN BELIEF NETWORKS – EXAMPLE – 1

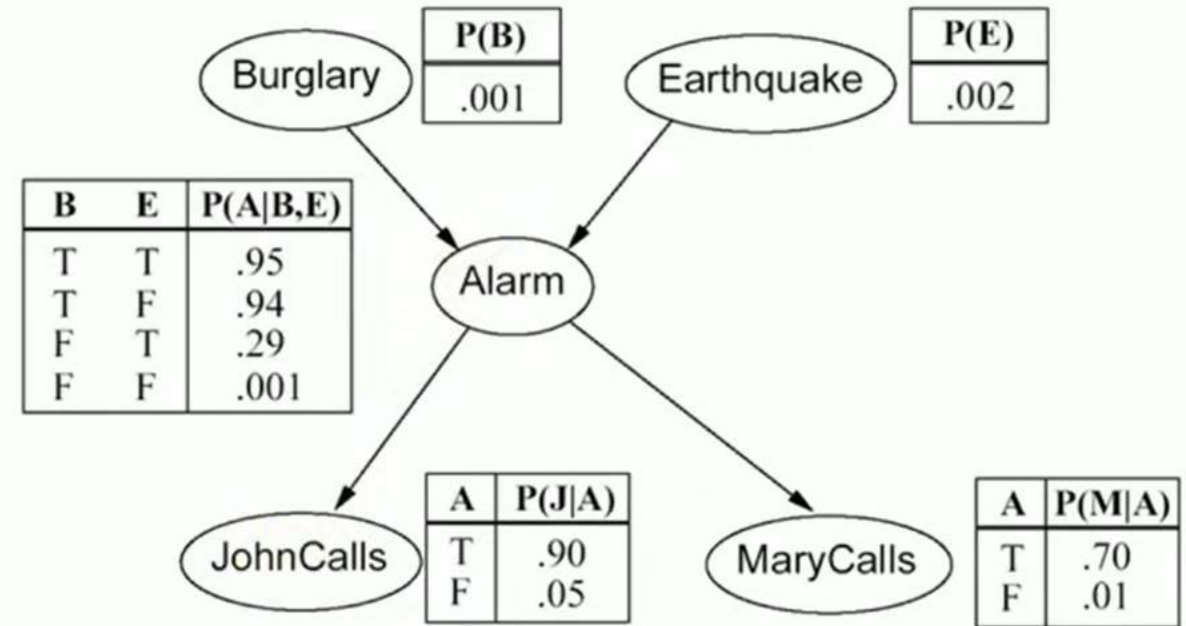2. What is the probability that John call?

P(B)
.001

Burglary

P(E)
.002

Earthquake

B	E	P(A|B,E)
T	T	.95
T	F	.94
F	T	.29
F	F	.001

Alarm

JohnCalls

A	P(J|A)
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MaryCalls

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BAYESIAN BELIEF NETWORKS – EXAMPLE – 1

2. What is the probability that John call?

Solution:

B	E	P(A|B,E)
T	T	.95
T	F	.94
F	T	.29
F	F	.001

Burglary — P(B) .001

Earthquake — P(E) .002

Alarm

A	P(J|A)
T	.90
F	.05

JohnCalls

A	P(M|A)
T	.70
F	.01

MaryCalls

$P(j) = P(j \mid a) P(a) + P(j \mid \neg a) P(\neg a)$

$= P(j|a)\{P(a|b,e)*P(b,e)+P(a|\neg b,e)*P(\neg b,e)+P(a|b,\neg e)*P(b,\neg e)+P(a|\neg b,\neg e)*P(\neg b,\neg e)\}$

$+ P(j|\neg a)\{P(\neg a|b,e)*P(b,e)+P(\neg a|\neg b,e)* P(\neg b,e)+P(\neg a|b,\neg e)* P(b,\neg e)+P(\neg a|\neg b, \neg e)*$

$P(\neg b, \neg e)\}$

$= 0.90 * 0.00252 + 0.05 * 0.9974 = 0.0521$