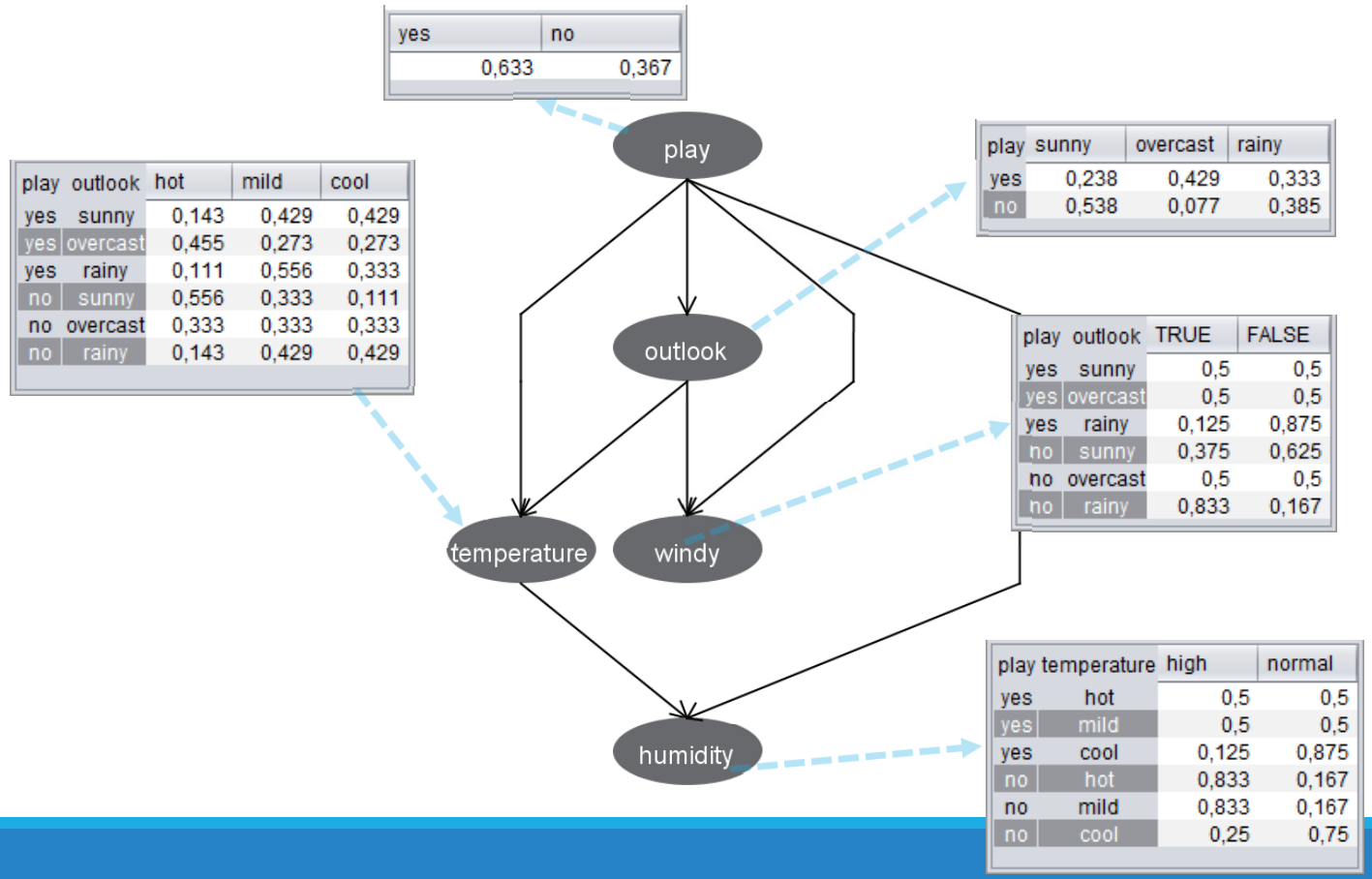
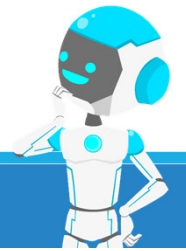
Redes Bayesianas

outlook	temperature	humidity	windy	play
sunny	hot	high	FALSE	no
sunny	hot	high	TRUE	no
overcast	hot	high	FALSE	yes
rainy	mild	high	FALSE	yes
rainy	cool	normal	FALSE	yes
rainy	cool	normal	TRUE	no
overcast	cool	normal	TRUE	yes
sunny	mild	high	FALSE	no
sunny	cool	normal	FALSE	yes
rainy	mild	normal	FALSE	yes
sunny	mild	normal	TRUE	yes
overcast	mild	high	TRUE	yes
overcast	hot	normal	FALSE	yes
rainy	mild	high	TRUE	no

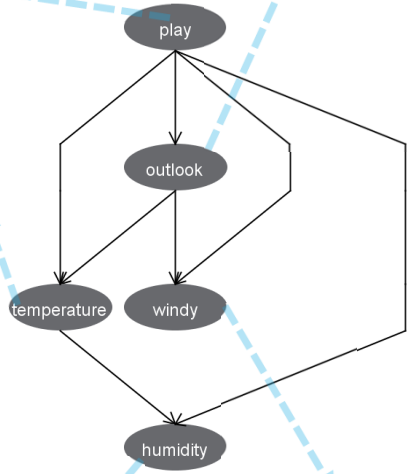




play	sunny	overcast	rainy
yes	0,238	0,429	0,333
no	0,538	0,077	0,385

1: outlook	2: temperature	3: humidity	4: windy
Nominal	Nominal	Nominal	Nominal
sunny	hot	high	FALSE

yes	no
0,633	0,367



play	outlook	hot	mild	cool
yes	sunny	0,143	0,429	0,429
yes	overcast	0,455	0,273	0,273
yes	rainy	0,111	0,556	0,333
no	sunny	0,556	0,333	0,111
no	overcast	0,333	0,333	0,333
no	rainy	0,143	0,429	0,429

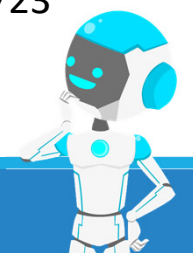
play	temperature	high	normal
yes	hot	0,5	0,5
yes	mild	0,5	0,5
yes	cool	0,125	0,875
no	hot	0,833	0,167
no	mild	0,833	0,167
no	cool	0,25	0,75

play	outlook	TRUE	FALSE
yes	sunny	0,5	0,5
yes	overcast	0,5	0,5
yes	rainy	0,125	0,875
no	sunny	0,375	0,625
no	overcast	0,5	0,5
no	rainy	0,833	0,167

	Class	Outlook P(outlook|Play)	Temperature P(temperature|outlook, play)	Humidity P(Humidity|temperature,Play)	Windy P(Windy|outlook, Play)
P(Yes)	0,633	0,238	0,143	0,5	0,5
P(No)	0,367	0,538	0,556	0,833	0,5

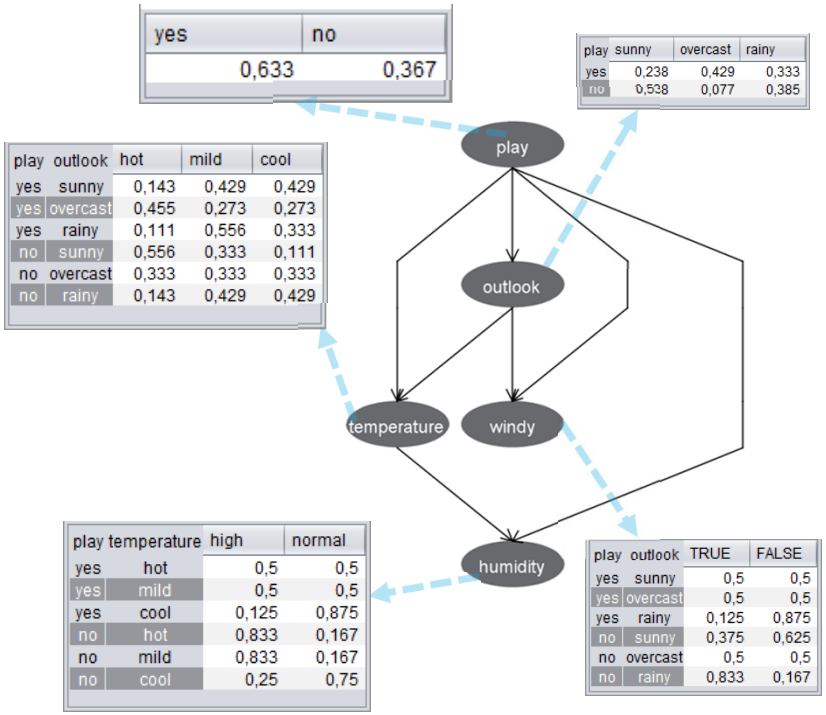
P(yes) = 0,633 * 0,238 * 0,143 * 0,5 * 0,5 = 0,00538588

P(no) = 0,367 * 0,538 * 0,556 * 0,833 * 0,5= 0,045723



Classificador de Rede Bayesiana

Tabelas de distribuição de probabilidade



Calculando uma Previsão

Dados

Outlook	Temperature	Humidity	Windy
sunny	hot	high	FALSE

Probabilidades

	Class	Outlook P(outlook|Play)	Temperature P(temperature|outlook, play)	Humidity P(Humidity|temperature,Play)	Windy P(Windy|outlook,Play)
P(Yes)	**0,633**	**0,238**	**0,143**	**0,5**	**0,5**
P(No)	**0,367**	**0,538**	**0,556**	**0,833**	**0,5**

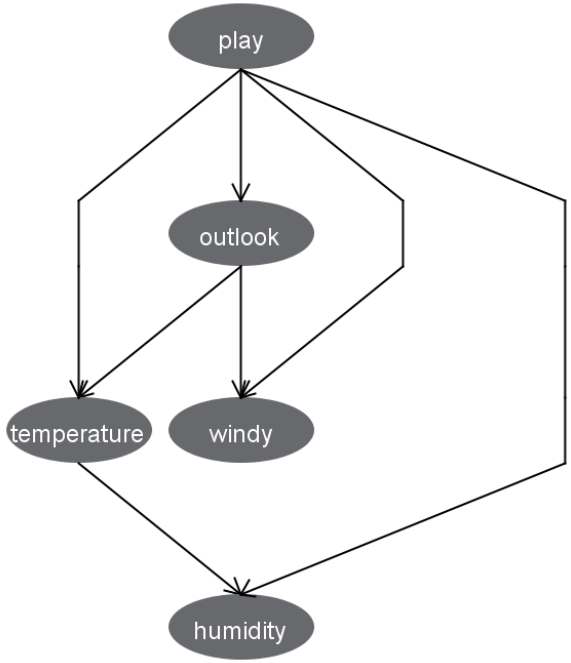
Cálculos

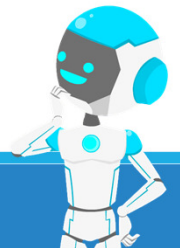
P(yes) = 0,633 * 0,238 * 0,143 * 0,5 * 0,5 = 0,00538588

P(no) = 0,367 * 0,538 * 0,556 * 0,833 * 0,5= 0,045723

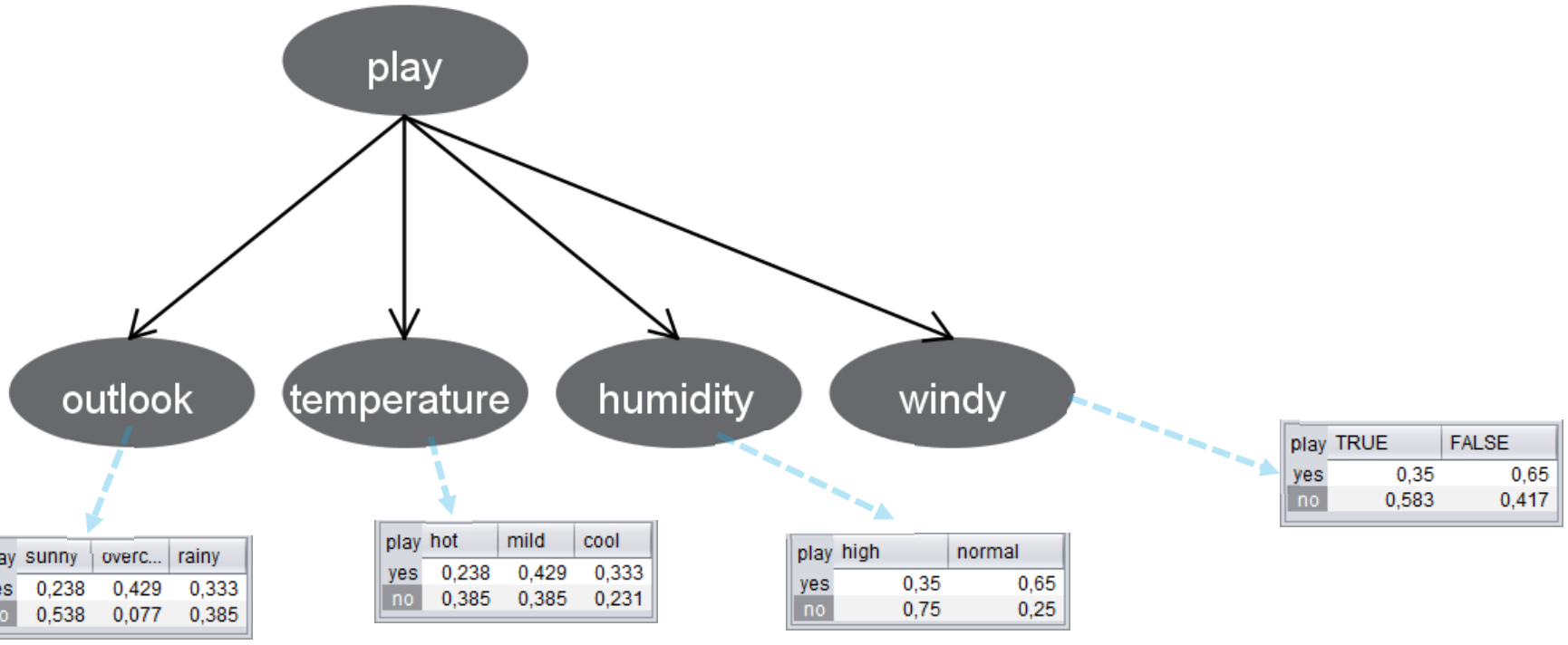
Resultado: no

Dois pais





Redes Bayesianas com 1 pai apenas

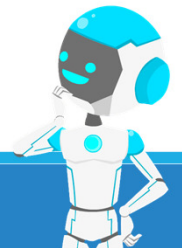


play	sunny	overc...	rainy
yes	0,238	0,429	0,333
no	0,538	0,077	0,385

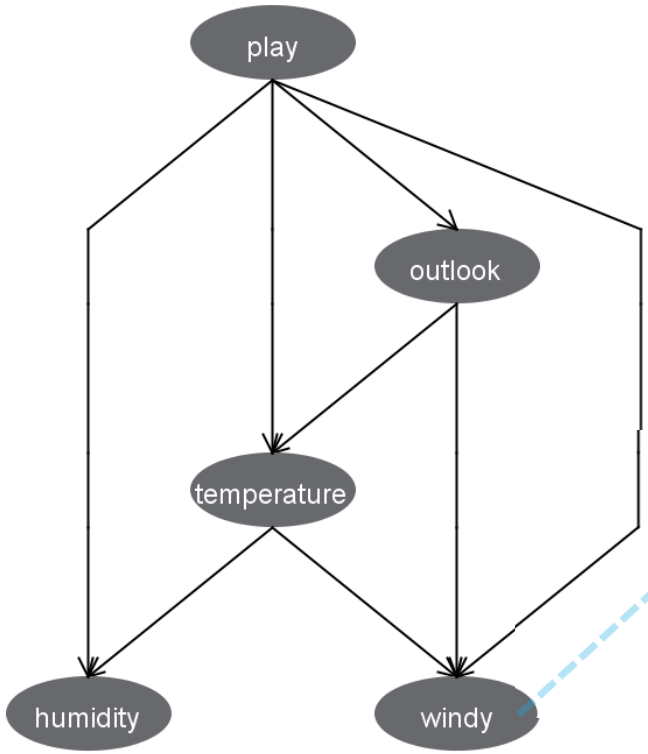
play	hot	mild	cool
yes	0,238	0,429	0,333
no	0,385	0,385	0,231

play	high	normal
yes	0,35	0,65
no	0,75	0,25

play	TRUE	FALSE
yes	0,35	0,65
no	0,583	0,417



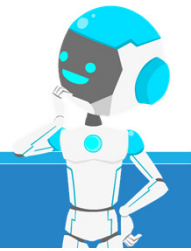
Aumentando o número de pais



play	outlook	temperature	TRUE	FALSE
yes	sunny	hot	0,5	0,5
yes	sunny	mild	0,75	0,25
yes	sunny	cool	0,25	0,75
yes	overcast	hot	0,167	0,833
yes	overcast	mild	0,75	0,25
yes	overcast	cool	0,75	0,25
yes	rainy	hot	0,5	0,5
yes	rainy	mild	0,167	0,833
yes	rainy	cool	0,25	0,75
no	sunny	hot	0,5	0,5
no	sunny	mild	0,25	0,75
no	sunny	cool	0,5	0,5
no	overcast	hot	0,5	0,5
no	overcast	mild	0,5	0,5
no	overcast	cool	0,5	0,5
no	rainy	hot	0,5	0,5
no	rainy	mild	0,75	0,25
no	rainy	cool	0,75	0,25

Dois pais (anterior)

play	outlook	TRUE	FALSE
yes	sunny	0,5	0,5
yes	overcast	0,5	0,5
yes	rainy	0,125	0,875
no	sunny	0,375	0,625
no	overcast	0,5	0,5
no	rainy	0,833	0,167



Todas as possiblidades

3 x 3 x 2 x 2 x 2 = 72

outlook	temperature	humidity	windy	play
sunny	hot	high	FALSE	no
sunny	hot	high	TRUE	no
overcast	hot	high	FALSE	yes
rainy	mild	high	FALSE	yes
rainy	cool	normal	FALSE	yes
rainy	cool	normal	TRUE	no
overcast	cool	normal	TRUE	yes
sunny	mild	high	FALSE	no
sunny	cool	normal	FALSE	yes
rainy	mild	normal	FALSE	yes
sunny	mild	normal	TRUE	yes
overcast	mild	high	TRUE	yes
overcast	hot	normal	FALSE	yes
rainy	mild	high	TRUE	no

Como construir um modelo?

Estrutura de rede - Número de pais	• Algoritmo de busca: hill climber, tabu search etc.
Tabelas de distribuição de probabilidade	• Estimador