We view the world as a series of snapshots, or **time slices**, each of which contains a set of random variables, some observable and some not. For example, I want to know whether it’s raining today, but I only access to the outside world occurs each morning when I see the director coming in with, or without, an umbrella.

Applying the variable elimination algorithm to the umbrella DBN is exactly a very complex work, which is appeared in 3 slices: Filtering and prediction, Smoothing, and Finding the most likely sequence.

Variable Elimination

P(R3|U1, U2, U3) = P(R3|R2)·(R2|R1) · P(U3|R3) · P(U2|R2) ·P(U1|R1)

= P(R3|R2) · P(U3|R3) ·(R2|R1) · P(U2|R2) ·P(U1|R1)

= fR3(R3) ·fu3(R3) ·R2(R3) ·fU2(R2) · fU1(R1)

= fR3(R2) · fu3(R3) ·R2(R1, R2) · fU2U1(R1R2)

= fR3(R2) · fu3(R3) ·R2U2U1(R1R2)

= fR3(R2) · fu3(R3) ·R2U2U1(R1)

= fR3(R2) · fR2U1U2U3(R1R3)

=fR3R2U1U2U3(R1R3)

=fR2R3U1U2U3(R1)