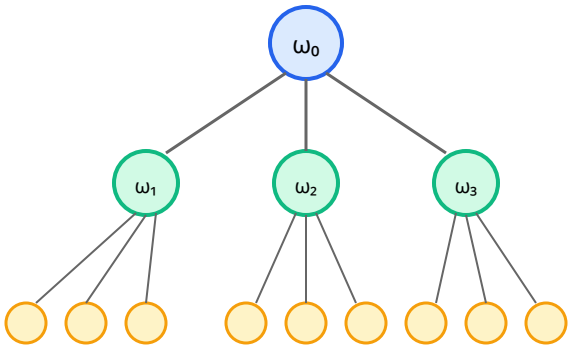
Exponential Tree → Polynomial Network Graph

A. Exponential Tree

3^k states at depth k



Depth k=10: $3^{10} \approx 6 \times 10^4$ states

Depth k=30: $3^{30} \approx 2 \times 10^{14}$ states

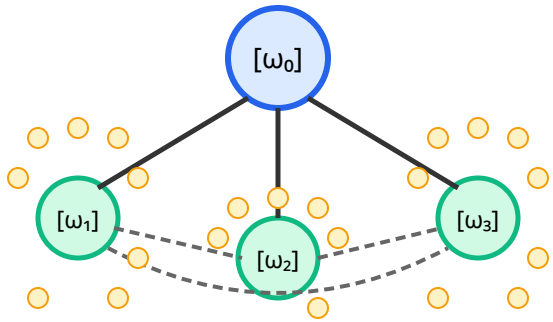
Exponential: O(3^k)

Equivalence Classes

~10^6 to 10^{12} configurations per observable frequency

B. Network Graph

Equivalence class structure



αK^3 polynomial states

K=30: $\alpha \times 30^3 \approx 9 \times 10^3$ states

Polynomial: O(K^3)

10^{10}× Reduction

Exponential → Polynomial complexity