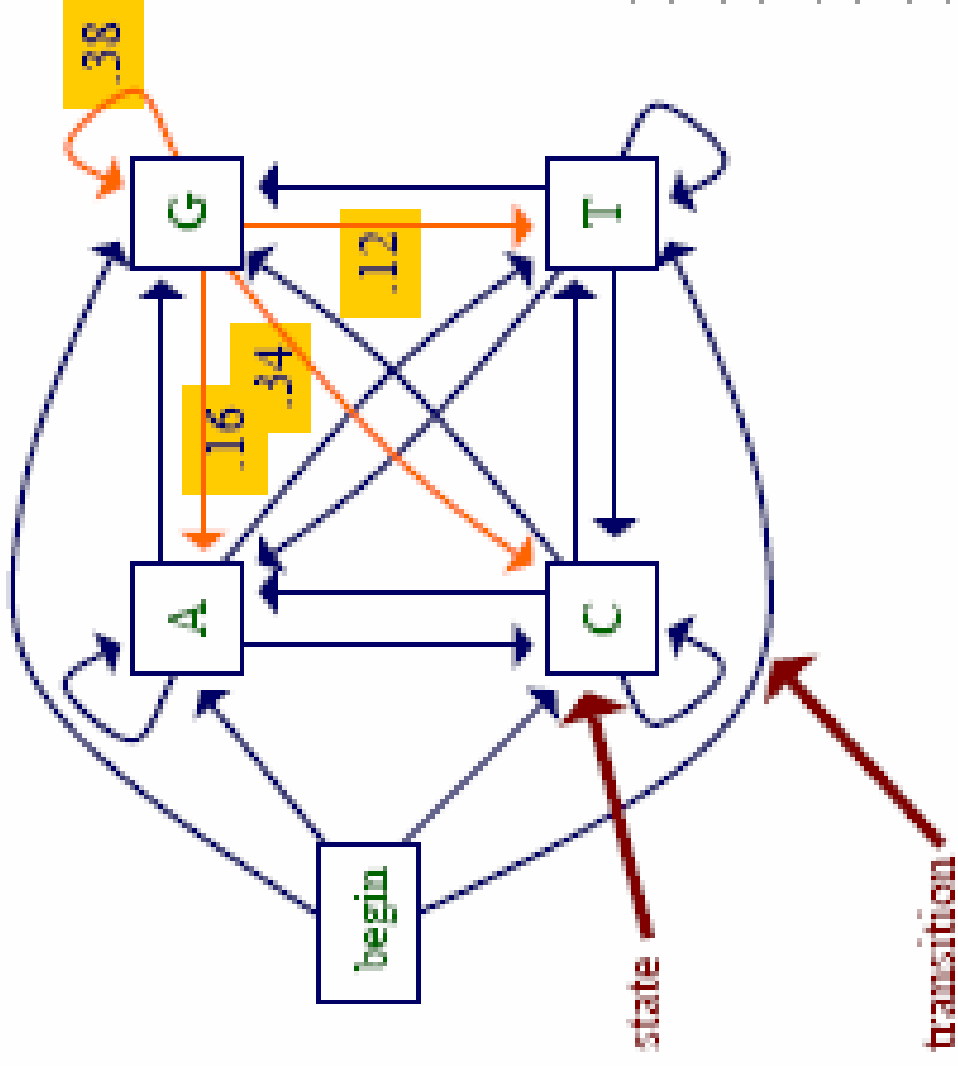# Markov Chain Models

transition probabilities
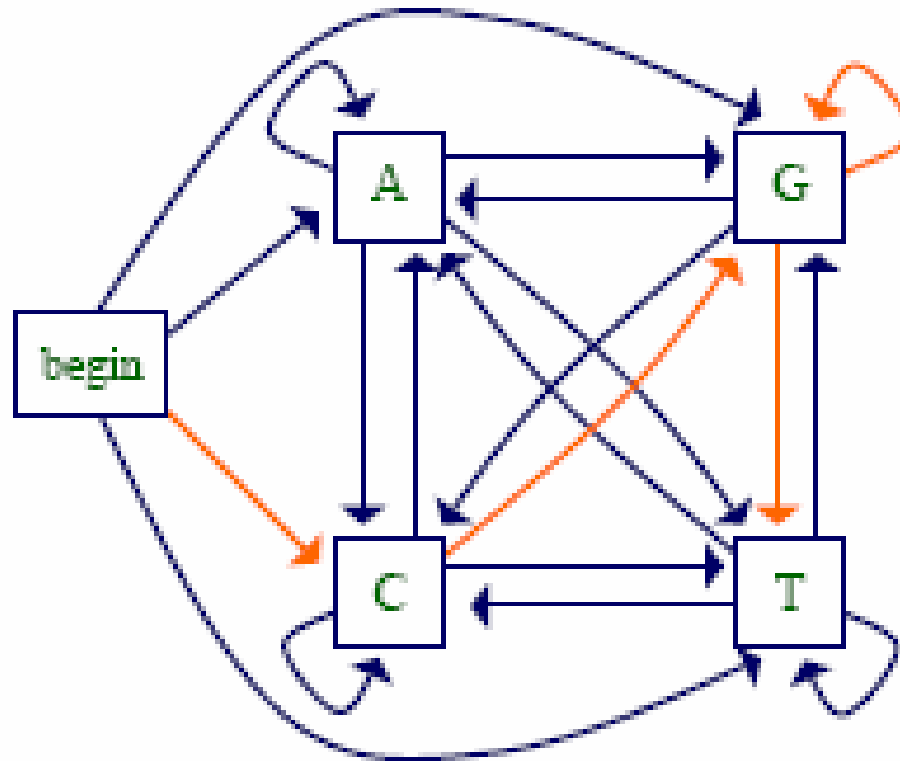
$Pr(x_i = a \mid x_{i-1} = g) = 0.16$

$Pr(x_i = c \mid x_{i-1} = g) = 0.34$

$Pr(x_i = g \mid x_{i-1} = g) = 0.38$

$Pr(x_i = t \mid x_{i-1} = g) = 0.12$

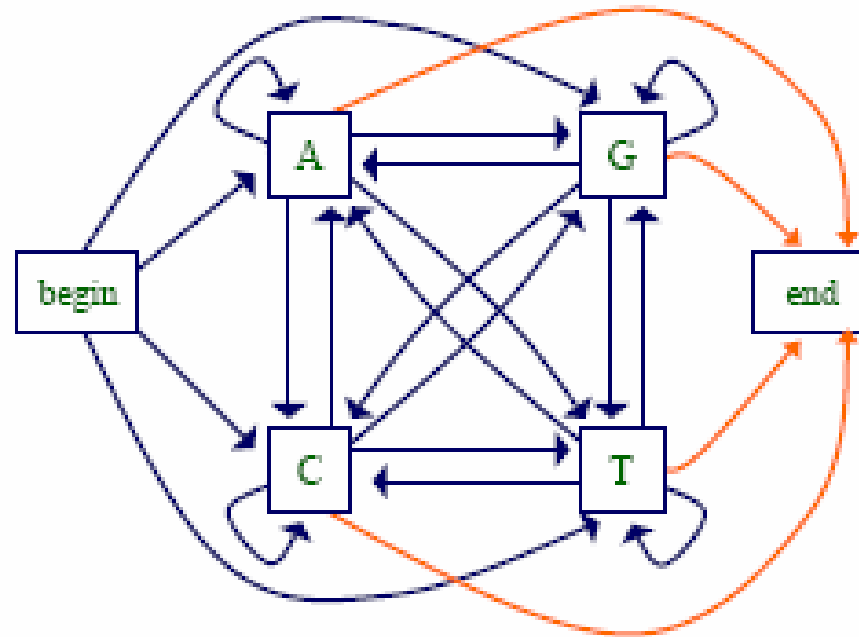# Markov Chain Models

$$\mathrm{Pr}(cggt) = \mathrm{Pr}(c)\mathrm{Pr}(g|c)\mathrm{Pr}(g/g)\mathrm{Pr}(t/g)$$

Markov Chain Models

Can also have an *end* state, allowing the model to represent:

• Sequences of different lengths

• Preferences for sequences ending with particular symbols

Markov Chains for Discrimination

- parameters estimated for CpG and null models

+	A	C	G	T
A	.18	.27	.43	.12
C	.17	.37	.27	.19
G	.16	.34	.38	.12
T	.08	.36	.38	.18

-	A	C	G	T
A	.30	.21	.28	.21
C	.32	.30	.08	.30
G	.25	.24	.30	.21
T	.18	.24	.29	.29

These data are derived from genome sequences