A General Definition of HMM

$$HMM = (S, V, B, A, \Pi)$$

N states

$$S = \{s_1, \ldots, s_N\}$$

M symbols

$$V = \{v_1, \ldots, v_M\}$$

Initial state probability:

$$\Pi = \{\pi_1, \ldots, \pi_N\} \quad \sum_{i=1}^{N} \pi_i = 1$$

$$\pi_i : \textit{prob of starting at state } s_i$$

State transition probability:

$$A = \{a_{ij}\} \quad 1 \le i, j \le N \quad \sum_{j=1}^{N} a_{ij} = 1$$

$$a_{ij} : \textit{prob of going } s_i \rightarrow s_j$$

Output probability:

$$B = \{b_i(v_k)\} \quad 1 \le i \le N, 1 \le k \le M \quad \sum_{k=1}^{M} b_i(v_k) = 1$$

$$b_i(v_k) : \textit{prob of "generating" } v_k \textit{ at } s_i$$