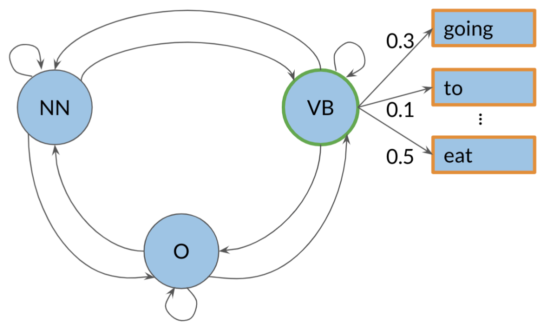
Hidden Markov Models

In the previous video, I showed you an example with a simple markov model. The **transition probabilities** allowed you to identify the transition probability from one POS to another. We will now explore hidden markov models. In hidden markov models you make use of **emission probabilities** that give you the probability to go from one state (POS tag) to a specific word.



$B =$

	going	to	eat	...
NN (noun)	0.5	0.1	0.02	
VB (verb)	0.3	0.1	0.5	
O (other)	0.3	0.5	0.68	

For example, given that you are in a verb state, you can go to other words with certain probabilities. This emission matrix **B,** will be used with your transition matrix **A,** to help you identify the part of speech of a word in a sentence. To populate your matrix **B**, you can just have a labelled dataset and compute the probabilities of going from a POS to each word in your vocabulary. Here is a recap of what you have seen so far:

States — Transition matrix — Emission matrix

$$Q = \{q_1, \dots, q_N\} \quad A = \begin{pmatrix} a_{1,1} & \cdots & a_{1,N} \\ \vdots & \ddots & \vdots \\ a_{N+1,1} & \cdots & a_{N+1,N} \end{pmatrix} \quad B = \begin{pmatrix} b_{11} & \cdots & b_{1V} \\ \vdots & \ddots & \vdots \\ b_{N1} & \cdots & b_{NV} \end{pmatrix}$$

$$\sum_{j=1}^{V} b_{ij} = 1$$

Note that the sum of each row in your **A** and **B** matrix has to be 1. Next, I will show you how you can calculate the probabilities inside these matrices.

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