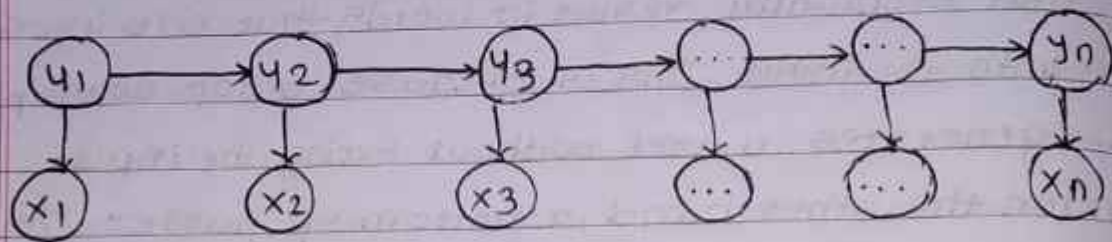## Hidden Markov Model (HMM):-

i] The word 'Hidden' symbolizes the fact that only the symbols released by the system are observable, while the user cannot view the underlying random walk between states. Many in this field recognize HMM as a finite state machine.

ii] HMM's are a form of generative model, that defines a joint probability distribution $p(x, y)$ where x and y are random variables respectively ranging over the observation sequences and their corresponding label sequences.

iii] In order to define a joint distribution of this nature, generative models must enumerate all possible observation sequences - a task which, for most domains, is intracable unless observation elements are represented as isolated units, independent from the other elements in an observation sequence.

iv] More precisely, the observation element at any given instant in time may only directly depend on state, or label, at that time.

v] This is an appropriate assumption for a few simple data sets, however most real-world observation sequences are best represented in terms of multiple interacting features and long-range dependence between observation elements.

Advantages of HMM:-

1] HMM has a strong statistical foundation with efficient learning algorithms where learning can take place directly from raw sequence data.

2] It allows consistent treatment of insertion and deletion penalties in the form of locally learnable method and can handle inputs of variable length.

3] They are the most flexible generalization of sequence profiles. It can also perform a wide variety of operations including multiple alignment, data mining and classification, structural analysis, pattern discovery.

4] It is also easy to combine into libraries.

Disadvantages of HMM:-

1] HMM is only dependent on every state and its corresponding observed object.

2] The sequence labeling, in addition to having a relationship with individual words, also relates to such aspects as the observed sequence length, word context and others.

3] The target function and the predicted target function do not match. HMM acquires the joint distribution $P(u,x)$ of state and the observed sequence, while in estimation issue, we need a conditional probability $P(y|x)$.