Generative models comparison

	Naïve Bayes	HMM	PCFG
G/D	Generative	Generative	Generative
Estimates	P(C, W) – C = category	P(T, W) – T= tag sequence	P(T, W) T = Tree structure
L/G	N/A	Locally normalized $P(t_i \rightarrow t_j)$	Locally normalized $P(X \rightarrow Y_0 \cdots Y_n)$
Decomposition	P(C=c,W) = $P(C = c)\prod_i P(w_i \mid C = c)$	P(T,W) = $\prod_i P(t_{i-1} \rightarrow t_i)P(t_i : w_i)$	P(T,W) = $\prod_{t \in Subtrees(T)} P(t)$
Forward / Inside recurrence	N/A	$a_i(t^j) = P(W_{1..i}, t_i = t^j)$	$P_{inside}(X,i,j) = P(W_{i..j} \mid X)$ $= P(X \rightarrow^* w_i \cdots w_{i+j})$
Viterbi recurrence	N/A	$\pi_i(t^j) = P(W_{1..i}, T_{1\ldots i} = T^*_{1\ldots i})$	$P_{viterbi}(X,i,j) = P(W_{i..j}, T^*_{i..j} \mid X)$

Worked Viterbi Example

Start index

	0	1	2	3	4
	will	it	include	a	meal
1					
2					
3					
4					
5					

2

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Det → that | this | a | the
  N → book | flight | meal | mo
 NP → i | me | you | it
  V → book | include | prefer |
Aux → do | does | will | is
  P → from | to | on | for
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Rule	-log P
S → NP VP	2
S → V NP	5
S → Aux SInv	4
SInv → NP VP	2
NP → Det N	2
NP → NP PP	2
VP → V NP	1
PP → P NP	1