

~~overfitting~~

~~global optimum~~

~~initialization~~

program code spectra

3rd problem & (3)

likelihood vs free/bound.

what is it good for

problem y is (2)

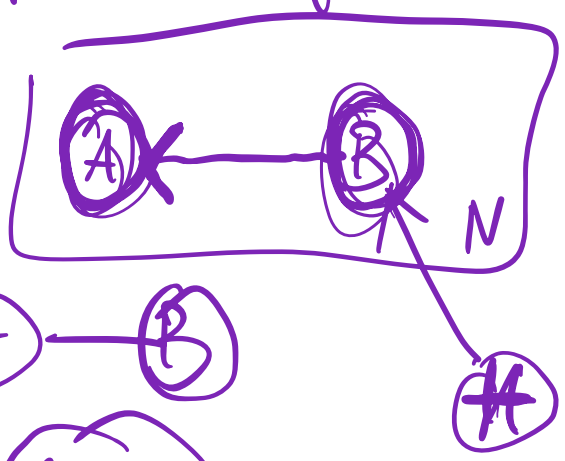
~~data order~~

'standard constraints'
part. obs.

Graphical Models / plate diagrams

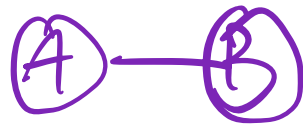
$$\prod_{i=1}^N P(x_i | B)$$

\Rightarrow



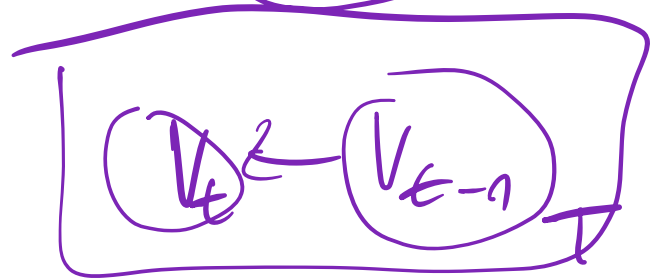
$$P(A | B)$$

\Rightarrow



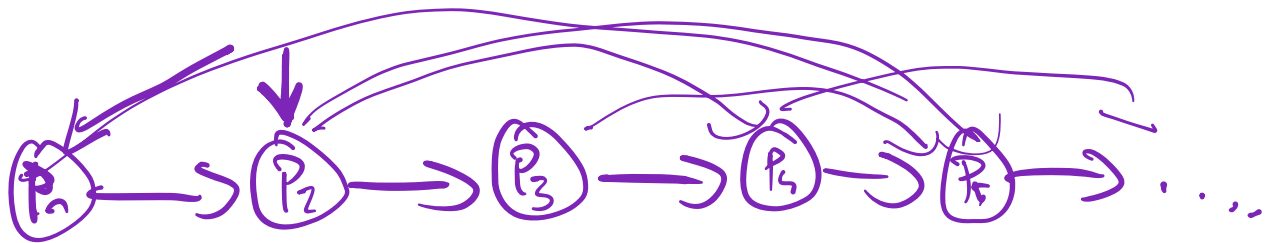
$$P(V_t | V_{t-1})$$

\hookrightarrow



$$L = \prod_{i=1}^N \dots$$

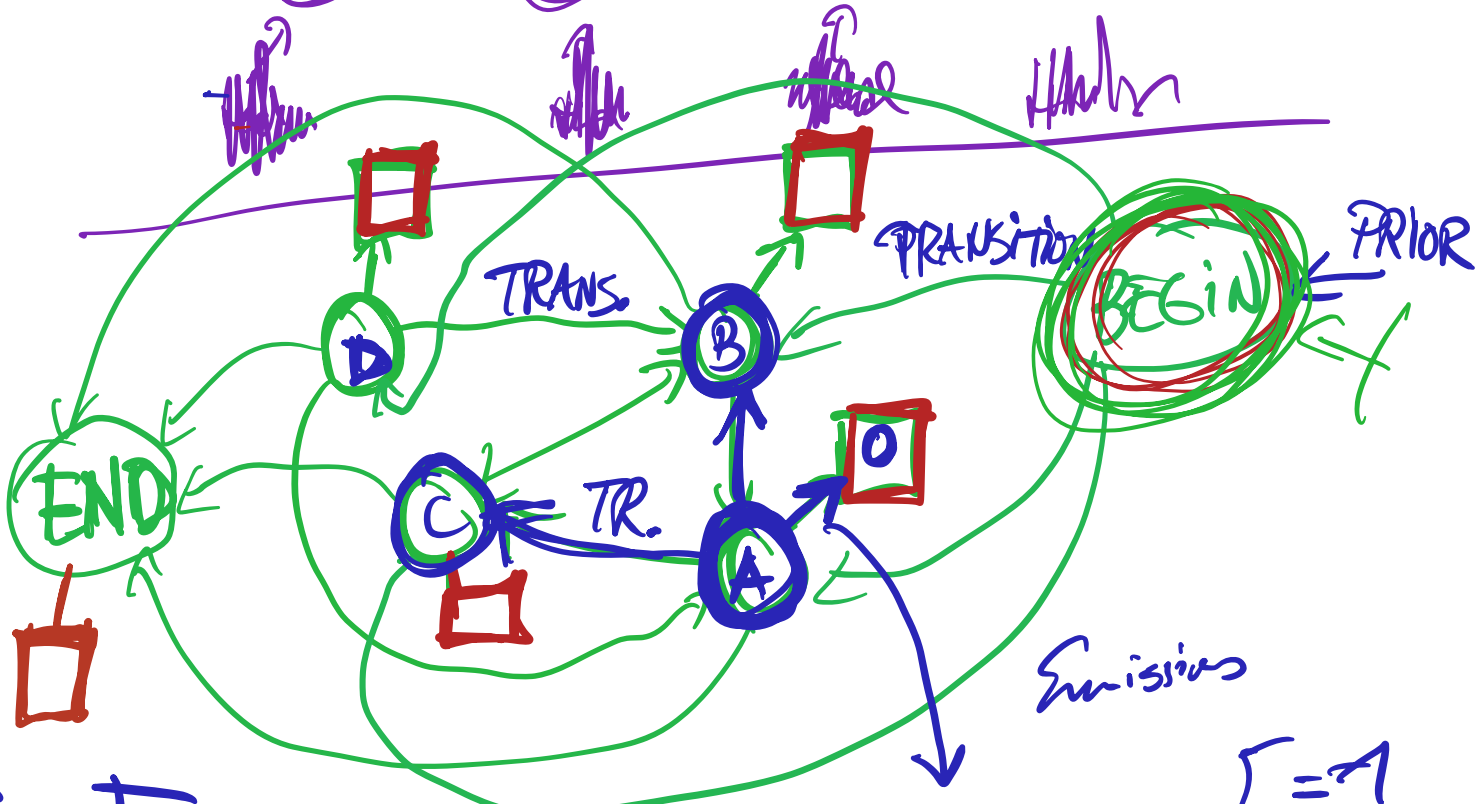
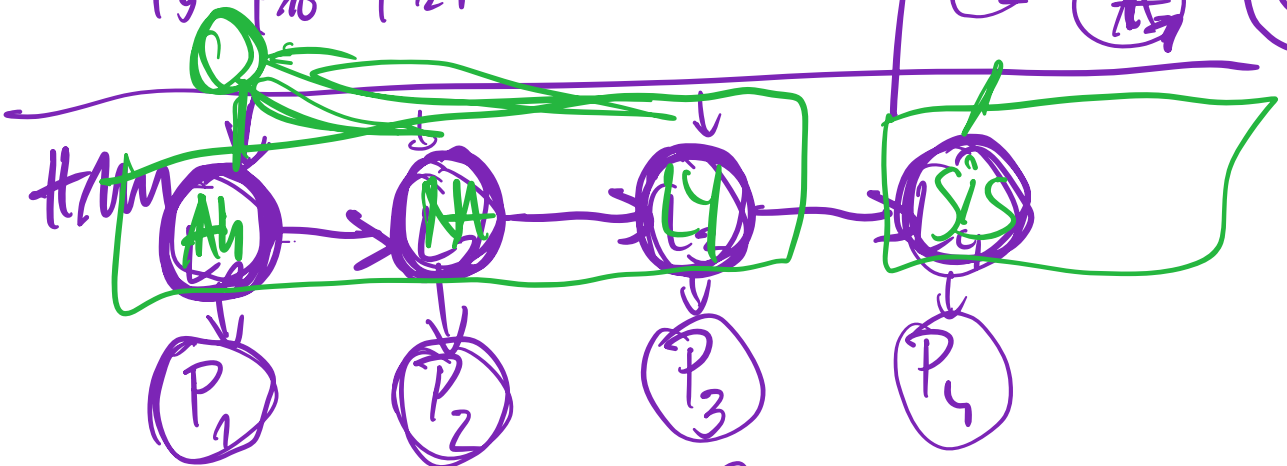
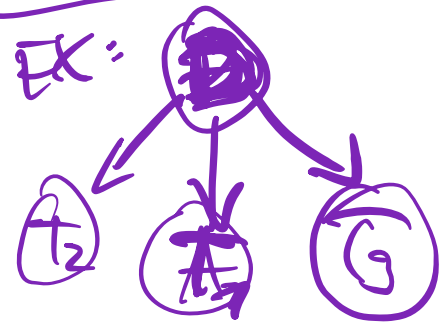
MC



$$p_1 = p_1 \quad p_2 = p_2 \quad p_3 = p_3 \quad \dots$$

$p_1 \quad p_4 \quad p_6 \quad \dots$

$p_5 \quad p_{10} \quad p_{20} \quad \dots$



Transitions

$P(C|A) = \dots$ $\Sigma = 1$

$P(B|A) = \dots$ Multinomial

$P(D|A) = 0$

$P(O_1|A) = \dots$

$P(O_2|A) = \dots$ Multinomial

$P(O_N|A) = \dots$

$$P(O_1|A) = \dots$$

$P(O_1|A) = \dots$
 $P(O_2|A) = \dots$ Multin.

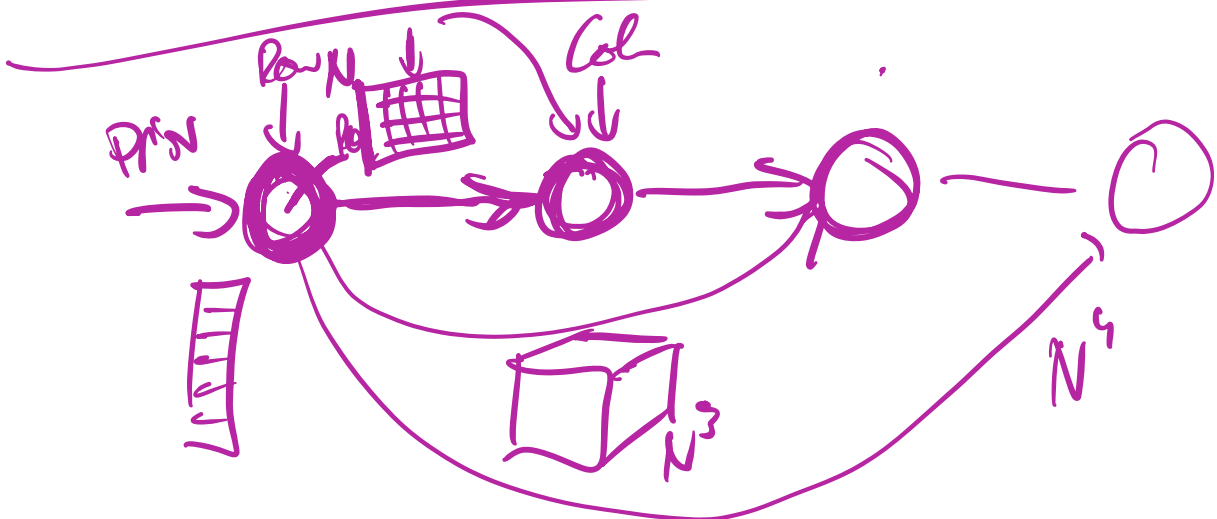
$$P(O_N | A) = \dots$$

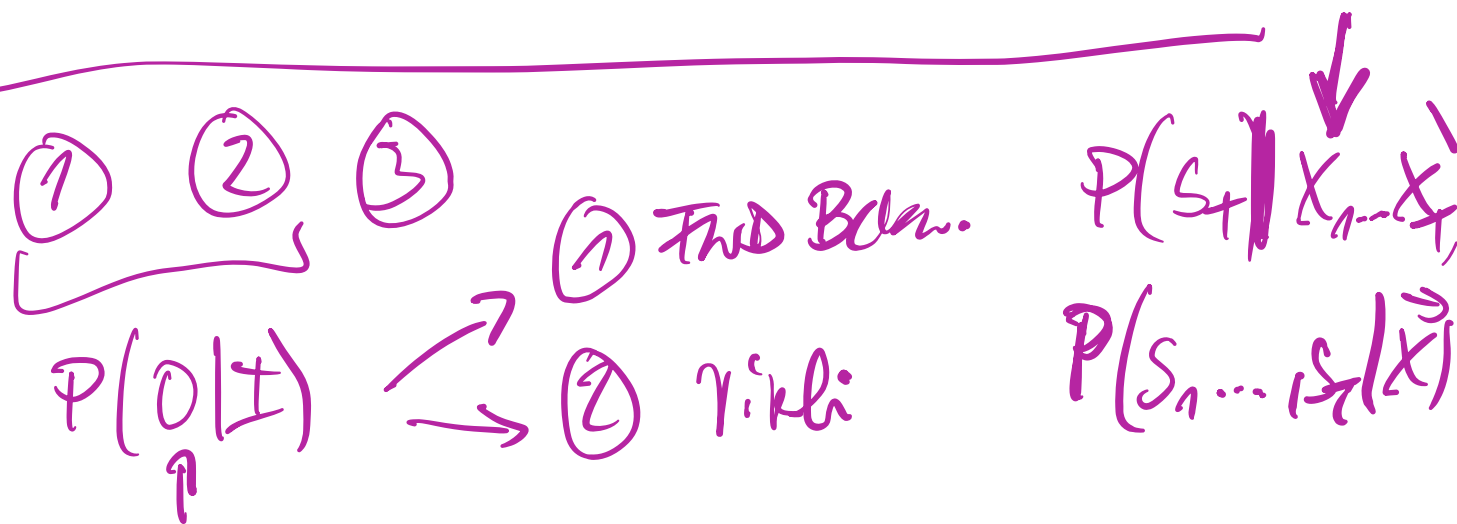
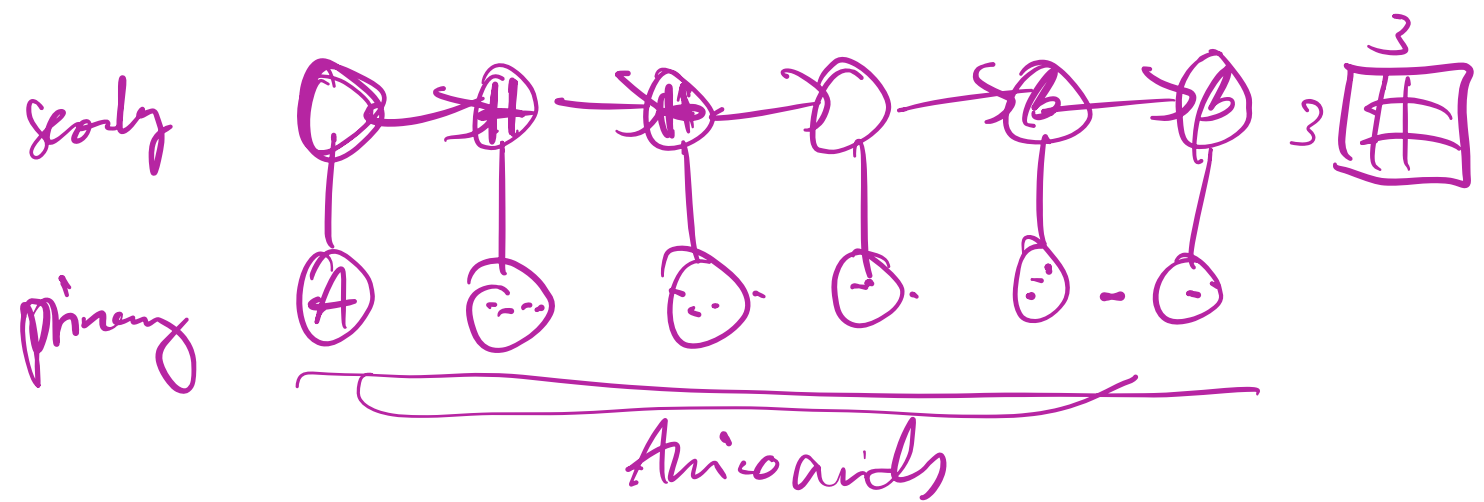
A diagram showing a sequence of states $S_1, S_2, S_3, \dots, S_n$ enclosed in a rounded rectangle. Arrows indicate a flow from S_1 to S_2 , and from S_2 to S_3 . A vertical arrow points down from S_1 , and vertical ellipses are shown below S_2 and S_3 .

$$P(S_0) \quad P(S_2|S_1) \quad P(S_3|S_2) \quad P(S_4|S_3) \dots$$

$$L = \cancel{P(s_1 | \text{BEGIN})} \prod_{t=1}^{T-1} P(s_{t+1} | s_t) \leftarrow$$

$$\cancel{P(\text{BEGIN})} \cdot \underline{P(s_1 | \text{BEGIN})}$$





③ Maximum likelihood

$\mathcal{D} = \{(\vec{I}, \vec{O})\}$

$\rightarrow P(\text{Rasemiter} | S) = 0$

$P(\vec{O} | \vec{I}) = \prod \dots = 0$

Laplace Smoothing
dictionary \mathcal{D}

$P(O_t | S_t) = \frac{\#(O_t S_t) + 1}{N + |D|}$

Baum - Wellen / EM

