observation data set

Model parameter set

Take the product of individual time steps of the observation sequence

$$\lambda^* = \underset{\lambda}{\operatorname{argmax}} \Pr[O \mid \lambda] = \underset{\lambda}{\operatorname{argmax}} \prod_{t \in [T]} \Pr[O_t \mid \lambda]$$

Note that we can only do this, because we assume that $\forall i,j,\ i \neq j,$ O_i and O_j are independent

the (natural) logarithm is a monotone function

$$= \underset{\lambda}{\operatorname{argmax}} \log \Pr[O \mid \lambda]$$

$$= \underset{\lambda}{\operatorname{argmax}} \log \prod_{t \in [T]} \Pr[O_t \mid \lambda]$$

$$= \underset{\lambda}{\operatorname{argmax}} \underbrace{\sum_{t \in [T]} \log}_{\log(a \cdot b) = \log a + \log b} \Pr[O_t \mid \lambda]$$

$\left(\underset{x}{\operatorname{argmax}} + f(x) = \underset{x}{\operatorname{argmin}} - f(x) \right)$

$$= \underset{\lambda}{\operatorname{argmin}} - \sum_{t \in [T]} \log \Pr[O_t \mid \lambda]$$

$$= \underset{\lambda}{\operatorname{argmin}} + \sum_{t \in [T]} \log C_t$$

BUG FOUND

$$\log \Pr[O \mid \lambda] = - \sum_{t \in [T]} \log C_t$$

because

$$\Pr[O \mid \lambda] = \frac{1}{\prod_{t \in [T]} C_t}$$

as described in the linked tutorial.