The figure 1 visualizes the generation of the browsing sequence.

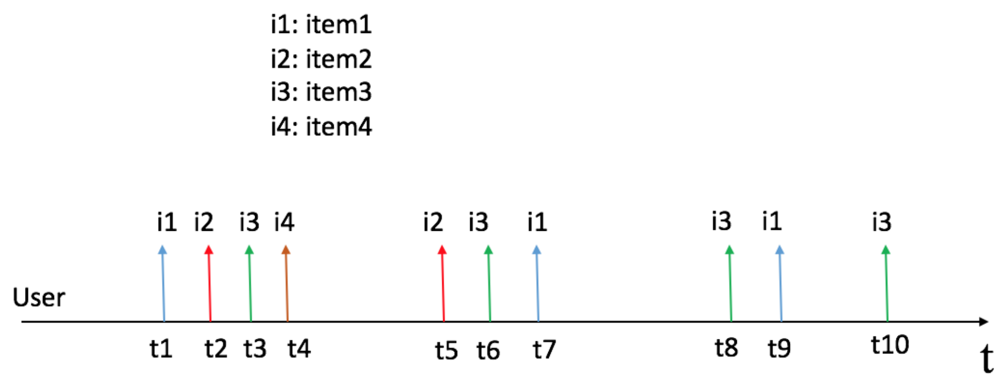

Figure 1: browsing sequence of a purchase of a user

We assume a user's browsing history can be separated into several stages, which indicate different browsing patterns. In different states, the influence of a browsed item on a user can be different. At the early stage of this purchase, since a user browse many items, the influence from an individual item can be rather small. At the final stage of this purchase, the current browsed item is presumably to have a strong influence on the choice of the item to browse next. The stages are represented as S.

$$\lambda_u(t) = \lambda_u(0) + \sum_{t_j<t} S_{t_j} U_{uj} S_t$$

where $\lambda_u(t)$ is the intensity function. $\lambda_u(0)$ is the basic intensity, representing the probability that the user u browse a random item spontaneously. $\sum_{t_j<t}$ is to capture the influence from previous events on the current browsing behavior happening at time t. The S_{t_j} is the stage of one previous event happening at time t_j. The S_t is the stage of the current browsing event. U is the influence matrix, whose rows represent users and columns represent items. The element U_{uj} means the influence of historical browsing event happening at t_j on the user u.

We assume an item can be represented by a K dimensional vector of attributes $(a_1, ..., a_K)$. After selecting the timestamp of the event happening at time t, the generative process of the item is:

$$a_k \sim Gaussian(a_k^{parent(i_t)}, \sigma^2 I)$$

$a_k^{parent(i_t)}$ means the the value of attribute k of the item $parent(i_t)$ which is browsed before the current item i_t.

If there is not parent item, the generation of attributes is:

$$a_k \sim Gaussian(a_k^0, \sigma^2 I)$$

where a_k^0 is the basic mean parameter.