1 Bernoulli

1. $P(v_i \in d|c_j) = s_{ij} = \dfrac{\sum_{d \in c_j} \text{occurences of } v_i}{\sum_{d \in c_j} \text{all words}}$

2. $P(d = (k_1, k_2, \ldots, k_{|V|})|c_j) = \prod_{k_i \neq 0} s_{ij} \prod_{k_i = 0}(1 - s_{ij}); \quad \sum_{k_i \neq 0} \log s_{ij}.$

3. $P(c_j|d) = \dfrac{P(d|c_j)P(c_j)}{P(d)}. \ P(c_j) = \dfrac{ND_{c_j}}{ND}.$

4. $c_j = \text{argmax}\{P(c_k|d); k = 1, 2, \ldots, |V|\}.$
   Вероятность ошибки $P_{error} = 1 - P(c_j|d).$

2 Multinomial

1. $P(v_i \in d|c_j) = r_{ij} = \dfrac{\sum_{d \in c_j} \text{occurences of } v_i}{\sum_{d \in c_j} \text{all words}}$

2. $P(d = (k_1, k_2, \ldots, k_{|V|})|c_j) = N! \prod_{i=1}^{|V|} \dfrac{r_{ij}^{k_i}}{k_i!}; \quad \log N! + \sum k_i \log r_{ij} - \log k_i!; \quad N = \sum k_i$

3. $P(c_j|d) = \dfrac{P(d|c_j)P(c_j)}{P(d)}. \ P(c_j) = \dfrac{ND_{c_j}}{ND}.$

4. $c_j = \text{argmax}\{P(c_k|d); k = 1, 2, \ldots, |V|\}.$
   Вероятность ошибки $P_{error} = 1 - P(c_j|d).$