

Topic Models

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Example

Reminder: Sampling Equation

$$\frac{n_{d,k} + \alpha_k}{\sum_i^K n_{d,i} + \alpha_i} \frac{v_{k,w_{d,n}} + \lambda_{w_{d,n}}}{\sum_i v_{k,i} + \lambda_i} \quad (1)$$

- Number of times document d uses topic k
- Number of times topic k uses word type $w_{d,n}$
- Dirichlet parameter for document to topic distribution
- Dirichlet parameter for topic to word distribution
- How much this document likes topic k
- How much this topic likes word $w_{d,n}$

Reminder: Sampling Equation

$$\frac{n_{d,k} + \alpha_k}{\sum_i^K n_{d,i} + \alpha_i} \frac{v_{k,w_{d,n}} + \lambda_{w_{d,n}}}{\sum_i v_{k,i} + \lambda_i} \quad (1)$$

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Reminder: Sampling Equation

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- How much this topic likes word $w_{d,n}$

Documents and Initialization

You are trying to fit a topic model with $V = 5$, $K = 3$, $\alpha = 1$, and $\lambda = 1$. You have these documents and you initialize the topics randomly:

- Document 1: $A_{\text{dog}_1} B_{\text{cat}_2} C_{\text{cat}_3} D_{\text{pig}_1}$
- Document 2: $E_{\text{hamburger}_2} F_{\text{dog}_3} G_{\text{hamburger}_1}$
- Document 3: $H_{\text{iron}_1} I_{\text{iron}_3} J_{\text{pig}_2} K_{\text{iron}_2}$

Topic 1	Topic 2	Topic 3
A_{dog}	B_{cat}	C_{cat}
D_{pig}	$E_{\text{hamburger}}$	F_{dog}
$G_{\text{hamburger}}$	J_{pig}	I_{iron}
H_{iron}	K_{iron}	

Sampling Token A

- Document 1: $A_{\text{dog}_1} B_{\text{cat}_2} C_{\text{cat}_3} D_{\text{pig}_1}$
- Document 2: $E_{\text{hamburger}_2} F_{\text{dog}_3} G_{\text{hamburger}_1}$
- Document 3: $H_{\text{iron}_1} I_{\text{iron}_3} J_{\text{pig}_2} K_{\text{iron}_2}$

Assignments

$\text{Doc}_1 : z_A = 1, z_B = 2, z_C = 3, z_D = 1$

$\text{Doc}_2 : z_E = 2, z_F = 3, z_G = 1$

$\text{Doc}_3 : z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger dog iron pig

Topic 2 :pig hamburger iron cat

Topic 3 :dog iron cat

$$\frac{n_{d,k} + \alpha_k}{\sum_i^K n_{d,i} + \alpha_i} \frac{v_{k,w_{d,n}} + \lambda_{w_{d,n}}}{\sum_i v_{k,i} + \lambda_i} \quad (2)$$

Sampling Token A

Assignments

Doc₁ : $z_A = 1, z_B = 2, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger dog iron
pig

Topic 2 :pig hamburger iron
cat

Topic 3 :dog iron cat

- $p(z_A = 1) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.333 \times 0.125 = 0.042 = 0.042$

Sampling Token A

Assignments

Doc₁ : $z_A = 1, z_B = 2, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger dog iron
pig

Topic 2 :pig hamburger iron
cat

Topic 3 :dog iron cat

- $p(z_A = 1) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.333 \times 0.125 = 0.042 = 0.042$
- $p(z_A = 2) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{4+5.000}\right) = 0.333 \times 0.111 = 0.037 = 0.037$

Sampling Token A

Assignments

Doc₁ : $z_A = 1, z_B = 2, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger dog iron
pig

Topic 2 :pig hamburger iron
cat

Topic 3 :dog iron cat

- $p(z_A = 1) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.333 \times 0.125 = 0.042 = 0.042$
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- $p(z_A = 3) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{3+5.000}\right) = 0.333 \times 0.250 = 0.083 = 0.083$

Sampling Token A

Assignments

Doc₁ : $z_A = 1, z_B = 2, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger dog iron
pig

Topic 2 :pig hamburger iron
cat

Topic 3 :dog iron cat

- $p(z_A = 1) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.333 \times 0.125 = 0.042 = 0.042$
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Sampling Token A

Assignments

Doc₁ : $z_A = 1, z_B = 2, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 : hamburger dog iron pig

Topic 2 : pig hamburger iron cat

Topic 3 : dog iron cat

- $p(z_A = 1) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.333 \times 0.125 = 0.042 = 0.042$
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- $p(z_A = 3) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{3+5.000}\right) = 0.333 \times 0.250 = 0.083 = 0.083$

New assignment for (0, 0): 3

Sampling Token B

- Document 1: $A\text{dog}_1 B\text{cat}_2 C\text{cat}_3 D\text{pig}_1$
- Document 2: $E\text{hamburger}_2 F\text{dog}_3 G\text{hamburger}_1$
- Document 3: $H\text{iron}_1 I\text{iron}_3 J\text{pig}_2 K\text{iron}_2$

Assignments

Doc₁ : $z_A = 3, z_B = 2, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron pig

Topic 2 :pig hamburger iron
cat

Topic 3 :dog dog iron cat

$$\frac{n_{d,k} + \alpha_k}{\sum_i^K n_{d,i} + \alpha_i} \frac{v_{k,w_{d,n}} + \lambda_{w_{d,n}}}{\sum_i v_{k,i} + \lambda_i} \quad (2)$$

Sampling Token B

Assignments

$\text{Doc}_1 : z_A = 3, z_B = 2, z_C = 3, z_D = 1$

$\text{Doc}_2 : z_E = 2, z_F = 3, z_G = 1$

$\text{Doc}_3 : z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron pig

Topic 2 :pig hamburger iron
cat

Topic 3 :dog dog iron cat

- $p(z_B = 1) = \left(\frac{1+1.000}{3+3.000} \right) \times \left(\frac{0+1.000}{3+5.000} \right) = 0.333 \times 0.125 = 0.042 = 0.042$

Sampling Token B

Assignments

$\text{Doc}_1 : z_A = 3, z_B = 2, z_C = 3, z_D = 1$

$\text{Doc}_2 : z_E = 2, z_F = 3, z_G = 1$

$\text{Doc}_3 : z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron pig

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cat

Topic 3 :dog dog iron cat

- $p(z_B = 1) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.333 \times 0.125 = 0.042 = 0.042$
- $p(z_B = 2) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$

Sampling Token B

Assignments

Doc₁ : $z_A = 3, z_B = 2, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

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Topic 2 :pig hamburger iron
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- $p(z_B = 1) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.333 \times 0.125 = 0.042 = 0.042$
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- $p(z_B = 3) = \left(\frac{2+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{4+5.000}\right) = 0.500 \times 0.222 = 0.111 = 0.111$

Sampling Token B

Assignments

Doc₁ : $z_A = 3, z_B = 2, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron pig

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- $p(z_B = 1) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.333 \times 0.125 = 0.042 = 0.042$
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Sampling Token B

Assignments

Doc₁ : $z_A = 3, z_B = 2, z_C = 3, z_D = 1$

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Topics

Topic 1 :hamburger iron pig

Topic 2 :pig hamburger iron
cat

Topic 3 :dog dog iron cat

- $p(z_B = 1) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.333 \times 0.125 = 0.042 = 0.042$
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New assignment for (0, 1): 3

Sampling Token C

- Document 1: $A_{\text{dog}_1} B_{\text{cat}_2} C_{\text{cat}_3} D_{\text{pig}_1}$
- Document 2: $E_{\text{hamburger}_2} F_{\text{dog}_3} G_{\text{hamburger}_1}$
- Document 3: $H_{\text{iron}_1} I_{\text{iron}_3} J_{\text{pig}_2} K_{\text{iron}_2}$

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron pig

Topic 2 :pig hamburger iron

Topic 3 :dog dog iron cat cat

$$\frac{n_{d,k} + \alpha_k}{\sum_i^K n_{d,i} + \alpha_i} \frac{v_{k,w_{d,n}} + \lambda_{w_{d,n}}}{\sum_i v_{k,i} + \lambda_i} \quad (2)$$

Sampling Token C

Assignments

$\text{Doc}_1 : z_A = 3, z_B = 3, z_C = 3, z_D = 1$

$\text{Doc}_2 : z_E = 2, z_F = 3, z_G = 1$

$\text{Doc}_3 : z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron pig

Topic 2 :pig hamburger iron

Topic 3 :dog dog iron cat cat

- $p(z_C = 1) = \left(\frac{1+1.000}{3+3.000} \right) \times \left(\frac{0+1.000}{3+5.000} \right) = 0.333 \times 0.125 = 0.042 = 0.042$

Sampling Token C

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

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Topics

Topic 1 :hamburger iron pig

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Topic 3 :dog dog iron cat cat

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Sampling Token C

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

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Topics

Topic 1 :hamburger iron pig

Topic 2 :pig hamburger iron

Topic 3 :dog dog iron cat cat

- $p(z_C = 1) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.333 \times 0.125 = 0.042 = 0.042$
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Sampling Token C

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron pig

Topic 2 :pig hamburger iron

Topic 3 :dog dog iron cat cat

- $p(z_C = 1) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.333 \times 0.125 = 0.042 = 0.042$
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Sampling Token C

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

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Topics

Topic 1 :hamburger iron pig

Topic 2 :pig hamburger iron

Topic 3 :dog dog iron cat cat

- $p(z_C = 1) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.333 \times 0.125 = 0.042 = 0.042$
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New assignment for (0, 2): 3

Sampling Token D

- Document 1: $A_{\text{dog}_1} B_{\text{cat}_2} C_{\text{cat}_3} D_{\text{pig}_1}$
- Document 2: $E_{\text{hamburger}_2} F_{\text{dog}_3} G_{\text{hamburger}_1}$
- Document 3: $H_{\text{iron}_1} I_{\text{iron}_3} J_{\text{pig}_2} K_{\text{iron}_2}$

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron pig

Topic 2 :pig hamburger iron

Topic 3 :dog dog iron cat cat

$$\frac{n_{d,k} + \alpha_k}{\sum_i^K n_{d,i} + \alpha_i} \frac{v_{k,w_{d,n}} + \lambda_{w_{d,n}}}{\sum_i v_{k,i} + \lambda_i} \quad (2)$$

Sampling Token D

Assignments

$\text{Doc}_1 : z_A = 3, z_B = 3, z_C = 3, z_D = 1$

$\text{Doc}_2 : z_E = 2, z_F = 3, z_G = 1$

$\text{Doc}_3 : z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron pig

Topic 2 :pig hamburger iron

Topic 3 :dog dog iron cat cat

- $p(z_D = 1) = \left(\frac{0+1.000}{3+3.000} \right) \times \left(\frac{0+1.000}{2+5.000} \right) = 0.167 \times 0.143 = 0.024 = 0.024$

Sampling Token D

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron pig

Topic 2 :pig hamburger iron

Topic 3 :dog dog iron cat cat

- $p(z_D = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.167 \times 0.143 = 0.024 = 0.024$
- $p(z_D = 2) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{3+5.000}\right) = 0.167 \times 0.250 = 0.042 = 0.042$

Sampling Token D

Assignments

$\text{Doc}_1 : z_A = 3, z_B = 3, z_C = 3, z_D = 1$

$\text{Doc}_2 : z_E = 2, z_F = 3, z_G = 1$

$\text{Doc}_3 : z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron pig

Topic 2 :pig hamburger iron

Topic 3 :dog dog iron cat cat

- $p(z_D = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.167 \times 0.143 = 0.024 = 0.024$
- $p(z_D = 2) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{3+5.000}\right) = 0.167 \times 0.250 = 0.042 = 0.042$
- $p(z_D = 3) = \left(\frac{3+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{5+5.000}\right) = 0.667 \times 0.100 = 0.067 = 0.067$

Sampling Token D

Assignments

$\text{Doc}_1 : z_A = 3, z_B = 3, z_C = 3, z_D = 1$

$\text{Doc}_2 : z_E = 2, z_F = 3, z_G = 1$

$\text{Doc}_3 : z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron pig

Topic 2 :pig hamburger iron

Topic 3 :dog dog iron cat cat

- $p(z_D = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.167 \times 0.143 = 0.024 = 0.024$
- $p(z_D = 2) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{3+5.000}\right) = 0.167 \times 0.250 = 0.042 = 0.042$
- $p(z_D = 3) = \left(\frac{3+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{5+5.000}\right) = 0.667 \times 0.100 = 0.067 = 0.067$

Sampling Token D

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 1$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron pig

Topic 2 :pig hamburger iron

Topic 3 :dog dog iron cat cat

- $p(z_D = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.167 \times 0.143 = 0.024 = 0.024$
- $p(z_D = 2) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{3+5.000}\right) = 0.167 \times 0.250 = 0.042 = 0.042$
- $p(z_D = 3) = \left(\frac{3+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{5+5.000}\right) = 0.667 \times 0.100 = 0.067 = 0.067$

New assignment for (0, 3): 3

Sampling Token E

- Document 1: $A_{\text{dog}_1} B_{\text{cat}_2} C_{\text{cat}_3} D_{\text{pig}_1}$
- Document 2: $E_{\text{hamburger}_2} F_{\text{dog}_3} G_{\text{hamburger}_1}$
- Document 3: $H_{\text{iron}_1} I_{\text{iron}_3} J_{\text{pig}_2} K_{\text{iron}_2}$

Assignments

$\text{Doc}_1 : z_A = 3, z_B = 3, z_C = 3, z_D = 3$

$\text{Doc}_2 : z_E = 2, z_F = 3, z_G = 1$

$\text{Doc}_3 : z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron

Topic 2 :pig hamburger iron

Topic 3 :pig dog dog iron cat
cat

$$\frac{n_{d,k} + \alpha_k}{\sum_i^K n_{d,i} + \alpha_i} \frac{v_{k,w_{d,n}} + \lambda_{w_{d,n}}}{\sum_i v_{k,i} + \lambda_i} \quad (2)$$

Sampling Token E

Assignments

$\text{Doc}_1 : z_A = 3, z_B = 3, z_C = 3, z_D = 3$

$\text{Doc}_2 : z_E = 2, z_F = 3, z_G = 1$

$\text{Doc}_3 : z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron

Topic 2 :pig hamburger iron

Topic 3 :pig dog dog iron cat
cat

- $p(z_E = 1) = \left(\frac{1+1.000}{2+3.000} \right) \times \left(\frac{1+1.000}{2+5.000} \right) = 0.400 \times 0.286 = 0.114 = 0.114$

Sampling Token E

Assignments

$\text{Doc}_1 : z_A = 3, z_B = 3, z_C = 3, z_D = 3$

$\text{Doc}_2 : z_E = 2, z_F = 3, z_G = 1$

$\text{Doc}_3 : z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron

Topic 2 :pig hamburger iron

Topic 3 :pig dog dog iron cat
cat

- $p(z_E = 1) = \left(\frac{1+1.000}{2+3.000}\right) \times \left(\frac{1+1.000}{2+5.000}\right) = 0.400 \times 0.286 = 0.114 = 0.114$
- $p(z_E = 2) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.200 \times 0.143 = 0.029 = 0.029$

Sampling Token E

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron

Topic 2 :pig hamburger iron

Topic 3 :pig dog dog iron cat
cat

- $p(z_E = 1) = \left(\frac{1+1.000}{2+3.000}\right) \times \left(\frac{1+1.000}{2+5.000}\right) = 0.400 \times 0.286 = 0.114 = 0.114$
- $p(z_E = 2) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.200 \times 0.143 = 0.029 = 0.029$
- $p(z_E = 3) = \left(\frac{1+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{6+5.000}\right) = 0.400 \times 0.091 = 0.036 = 0.036$

Sampling Token E

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron

Topic 2 :pig hamburger iron

Topic 3 :pig dog dog iron cat
cat

- $p(z_E = 1) = \left(\frac{1+1.000}{2+3.000}\right) \times \left(\frac{1+1.000}{2+5.000}\right) = 0.400 \times 0.286 = 0.114 = 0.114$
- $p(z_E = 2) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.200 \times 0.143 = 0.029 = 0.029$
- $p(z_E = 3) = \left(\frac{1+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{6+5.000}\right) = 0.400 \times 0.091 = 0.036 = 0.036$

Sampling Token E

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 2, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger iron

Topic 2 :pig hamburger iron

Topic 3 :pig dog dog iron cat
cat

- $p(z_E = 1) = \left(\frac{1+1.000}{2+3.000}\right) \times \left(\frac{1+1.000}{2+5.000}\right) = 0.400 \times 0.286 = 0.114 = 0.114$
- $p(z_E = 2) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.200 \times 0.143 = 0.029 = 0.029$
- $p(z_E = 3) = \left(\frac{1+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{6+5.000}\right) = 0.400 \times 0.091 = 0.036 = 0.036$

New assignment for (1, 0): 1

Sampling Token F

- Document 1: $A\text{dog}_1 B\text{cat}_2 C\text{cat}_3 D\text{pig}_1$
- Document 2: $E\text{hamburger}_2 F\text{dog}_3 G\text{hamburger}_1$
- Document 3: $H\text{iron}_1 I\text{iron}_3 J\text{pig}_2 K\text{iron}_2$

Assignments

$\text{Doc}_1 : z_A = 3, z_B = 3, z_C = 3, z_D = 3$

$\text{Doc}_2 : z_E = 1, z_F = 3, z_G = 1$

$\text{Doc}_3 : z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger iron

Topic 2 :pig iron

Topic 3 :pig dog dog iron cat
cat

$$\frac{n_{d,k} + \alpha_k}{\sum_i^K n_{d,i} + \alpha_i} \frac{v_{k,w_{d,n}} + \lambda_{w_{d,n}}}{\sum_i v_{k,i} + \lambda_i} \quad (2)$$

Sampling Token F

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger iron

Topic 2 :pig iron

Topic 3 :pig dog dog iron cat
cat

- $p(z_F = 1) = \left(\frac{2+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.600 \times 0.125 = 0.075 = 0.075$

Sampling Token F

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger iron

Topic 2 :pig iron

Topic 3 :pig dog dog iron cat
cat

- $p(z_F = 1) = \left(\frac{2+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.600 \times 0.125 = 0.075 = 0.075$
- $p(z_F = 2) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.200 \times 0.143 = 0.029 = 0.029$

Sampling Token F

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger iron

Topic 2 :pig iron

Topic 3 :pig dog dog iron cat
cat

- $p(z_F = 1) = \left(\frac{2+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.600 \times 0.125 = 0.075 = 0.075$
- $p(z_F = 2) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.200 \times 0.143 = 0.029 = 0.029$
- $p(z_F = 3) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{1+1.000}{5+5.000}\right) = 0.200 \times 0.200 = 0.040 = 0.040$

Sampling Token F

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger iron

Topic 2 :pig iron

Topic 3 :pig dog dog iron cat
cat

- $p(z_F = 1) = \left(\frac{2+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.600 \times 0.125 = 0.075 = 0.075$
- $p(z_F = 2) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.200 \times 0.143 = 0.029 = 0.029$
- $p(z_F = 3) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{1+1.000}{5+5.000}\right) = 0.200 \times 0.200 = 0.040 = 0.040$

Sampling Token F

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 3, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger iron

Topic 2 :pig iron

Topic 3 :pig dog dog iron cat
cat

- $p(z_F = 1) = \left(\frac{2+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.600 \times 0.125 = 0.075 = 0.075$
- $p(z_F = 2) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.200 \times 0.143 = 0.029 = 0.029$
- $p(z_F = 3) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{1+1.000}{5+5.000}\right) = 0.200 \times 0.200 = 0.040 = 0.040$

New assignment for (1, 1): 1

Sampling Token G

- Document 1: $A_{\text{dog}_1} B_{\text{cat}_2} C_{\text{cat}_3} D_{\text{pig}_1}$
- Document 2: $E_{\text{hamburger}_2} F_{\text{dog}_3} G_{\text{hamburger}_1}$
- Document 3: $H_{\text{iron}_1} I_{\text{iron}_3} J_{\text{pig}_2} K_{\text{iron}_2}$

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger
hamburger dog iron

Topic 2 :pig iron

Topic 3 :pig dog iron cat cat

$$\frac{n_{d,k} + \alpha_k}{\sum_i^K n_{d,i} + \alpha_i} \frac{v_{k,w_{d,n}} + \lambda_{w_{d,n}}}{\sum_i v_{k,i} + \lambda_i} \quad (2)$$

Sampling Token G

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog iron

Topic 2 :pig iron

Topic 3 :pig dog iron cat cat

- $p(z_G = 1) = \left(\frac{2+1.000}{2+3.000}\right) \times \left(\frac{1+1.000}{3+5.000}\right) = 0.600 \times 0.250 = 0.150 = 0.150$

Sampling Token G

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog iron

Topic 2 :pig iron

Topic 3 :pig dog iron cat cat

- $p(z_G = 1) = \left(\frac{2+1.000}{2+3.000}\right) \times \left(\frac{1+1.000}{3+5.000}\right) = 0.600 \times 0.250 = 0.150 = 0.150$
- $p(z_G = 2) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.200 \times 0.143 = 0.029 = 0.029$

Sampling Token G

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog iron

Topic 2 :pig iron

Topic 3 :pig dog iron cat cat

- $p(z_G = 1) = \left(\frac{2+1.000}{2+3.000}\right) \times \left(\frac{1+1.000}{3+5.000}\right) = 0.600 \times 0.250 = 0.150 = 0.150$
- $p(z_G = 2) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.200 \times 0.143 = 0.029 = 0.029$
- $p(z_G = 3) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{5+5.000}\right) = 0.200 \times 0.100 = 0.020 = 0.020$

Sampling Token G

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog iron

Topic 2 :pig iron

Topic 3 :pig dog iron cat cat

- $p(z_G = 1) = \left(\frac{2+1.000}{2+3.000}\right) \times \left(\frac{1+1.000}{3+5.000}\right) = 0.600 \times 0.250 = 0.150 = 0.150$
- $p(z_G = 2) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.200 \times 0.143 = 0.029 = 0.029$
- $p(z_G = 3) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{5+5.000}\right) = 0.200 \times 0.100 = 0.020 = 0.020$

Sampling Token G

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog iron

Topic 2 :pig iron

Topic 3 :pig dog iron cat cat

- $p(z_G = 1) = \left(\frac{2+1.000}{2+3.000}\right) \times \left(\frac{1+1.000}{3+5.000}\right) = 0.600 \times 0.250 = 0.150 = 0.150$
- $p(z_G = 2) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{2+5.000}\right) = 0.200 \times 0.143 = 0.029 = 0.029$
- $p(z_G = 3) = \left(\frac{0+1.000}{2+3.000}\right) \times \left(\frac{0+1.000}{5+5.000}\right) = 0.200 \times 0.100 = 0.020 = 0.020$

New assignment for (1, 2): 1

Sampling Token H

- Document 1: $A_{\text{dog}_1} B_{\text{cat}_2} C_{\text{cat}_3} D_{\text{pig}_1}$
- Document 2: $E_{\text{hamburger}_2} F_{\text{dog}_3} G_{\text{hamburger}_1}$
- Document 3: $H_{\text{iron}_1} I_{\text{iron}_3} J_{\text{pig}_2} K_{\text{iron}_2}$

Assignments

$\text{Doc}_1 : z_A = 3, z_B = 3, z_C = 3, z_D = 3$

$\text{Doc}_2 : z_E = 1, z_F = 1, z_G = 1$

$\text{Doc}_3 : z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger
hamburger dog iron

Topic 2 :pig iron

Topic 3 :pig dog iron cat cat

$$\frac{n_{d,k} + \alpha_k}{\sum_i^K n_{d,i} + \alpha_i} \frac{v_{k,w_{d,n}} + \lambda_{w_{d,n}}}{\sum_i v_{k,i} + \lambda_i} \quad (2)$$

Sampling Token H

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog iron

Topic 2 :pig iron

Topic 3 :pig dog iron cat cat

- $p(z_H = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$

Sampling Token H

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog iron

Topic 2 :pig iron

Topic 3 :pig dog iron cat cat

- $p(z_H = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_H = 2) = \left(\frac{2+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{2+5.000}\right) = 0.500 \times 0.286 = 0.143 = 0.143$

Sampling Token H

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog iron

Topic 2 :pig iron

Topic 3 :pig dog iron cat cat

- $p(z_H = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_H = 2) = \left(\frac{2+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{2+5.000}\right) = 0.500 \times 0.286 = 0.143 = 0.143$
- $p(z_H = 3) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{5+5.000}\right) = 0.333 \times 0.200 = 0.067 = 0.067$

Sampling Token H

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog iron

Topic 2 :pig iron

Topic 3 :pig dog iron cat cat

- $p(z_H = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_H = 2) = \left(\frac{2+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{2+5.000}\right) = 0.500 \times 0.286 = 0.143 = 0.143$
- $p(z_H = 3) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{5+5.000}\right) = 0.333 \times 0.200 = 0.067 = 0.067$

Sampling Token H

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 1, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog iron

Topic 2 :pig iron

Topic 3 :pig dog iron cat cat

- $p(z_H = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_H = 2) = \left(\frac{2+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{2+5.000}\right) = 0.500 \times 0.286 = 0.143 = 0.143$
- $p(z_H = 3) = \left(\frac{1+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{5+5.000}\right) = 0.333 \times 0.200 = 0.067 = 0.067$

New assignment for (2, 0): 2

Sampling Token I

- Document 1: $A_{\text{dog}_1} B_{\text{cat}_2} C_{\text{cat}_3} D_{\text{pig}_1}$
- Document 2: $E_{\text{hamburger}_2} F_{\text{dog}_3} G_{\text{hamburger}_1}$
- Document 3: $H_{\text{iron}_1} I_{\text{iron}_3} J_{\text{pig}_2} K_{\text{iron}_2}$

Assignments

$\text{Doc}_1 : z_A = 3, z_B = 3, z_C = 3, z_D = 3$

$\text{Doc}_2 : z_E = 1, z_F = 1, z_G = 1$

$\text{Doc}_3 : z_H = 2, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron

Topic 3 :pig dog iron cat cat

$$\frac{n_{d,k} + \alpha_k}{\sum_i^K n_{d,i} + \alpha_i} \frac{v_{k,w_{d,n}} + \lambda_{w_{d,n}}}{\sum_i v_{k,i} + \lambda_i} \quad (2)$$

Sampling Token I

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 2, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron

Topic 3 :pig dog iron cat cat

- $p(z_I = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$

Sampling Token I

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 2, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron

Topic 3 :pig dog iron cat cat

- $p(z_I = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_I = 2) = \left(\frac{3+1.000}{3+3.000}\right) \times \left(\frac{2+1.000}{3+5.000}\right) = 0.667 \times 0.375 = 0.250 = 0.250$

Sampling Token I

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 2, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron

Topic 3 :pig dog iron cat cat

- $p(z_I = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_I = 2) = \left(\frac{3+1.000}{3+3.000}\right) \times \left(\frac{2+1.000}{3+5.000}\right) = 0.667 \times 0.375 = 0.250 = 0.250$
- $p(z_I = 3) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{4+5.000}\right) = 0.167 \times 0.111 = 0.019 = 0.019$

Sampling Token I

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 2, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron

Topic 3 :pig dog iron cat cat

- $p(z_I = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_I = 2) = \left(\frac{3+1.000}{3+3.000}\right) \times \left(\frac{2+1.000}{3+5.000}\right) = 0.667 \times 0.375 = 0.250 = 0.250$
- $p(z_I = 3) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{4+5.000}\right) = 0.167 \times 0.111 = 0.019 = 0.019$

Sampling Token I

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 2, z_I = 3, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron

Topic 3 :pig dog iron cat cat

- $p(z_I = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_I = 2) = \left(\frac{3+1.000}{3+3.000}\right) \times \left(\frac{2+1.000}{3+5.000}\right) = 0.667 \times 0.375 = 0.250 = 0.250$
- $p(z_I = 3) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{4+5.000}\right) = 0.167 \times 0.111 = 0.019 = 0.019$

New assignment for (2, 1): 2

Sampling Token J

- Document 1: $A\text{dog}_1 B\text{cat}_2 C\text{cat}_3 D\text{pig}_1$
- Document 2: $E\text{hamburger}_2 F\text{dog}_3 G\text{hamburger}_1$
- Document 3: $H\text{iron}_1 I\text{iron}_3 J\text{pig}_2 K\text{iron}_2$

Assignments

$\text{Doc}_1 : z_A = 3, z_B = 3, z_C = 3, z_D = 3$

$\text{Doc}_2 : z_E = 1, z_F = 1, z_G = 1$

$\text{Doc}_3 : z_H = 2, z_I = 2, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron iron

Topic 3 :pig dog cat cat

$$\frac{n_{d,k} + \alpha_k}{\sum_i^K n_{d,i} + \alpha_i} \frac{v_{k,w_{d,n}} + \lambda_{w_{d,n}}}{\sum_i v_{k,i} + \lambda_i} \quad (2)$$

Sampling Token J

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 2, z_I = 2, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron iron

Topic 3 :pig dog cat cat

- $p(z_J = 1) = \left(\frac{0+1.000}{3+3.000} \right) \times \left(\frac{0+1.000}{3+5.000} \right) = 0.167 \times 0.125 = 0.021 = 0.021$

Sampling Token J

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 2, z_I = 2, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron iron

Topic 3 :pig dog cat cat

- $p(z_J = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_J = 2) = \left(\frac{3+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.667 \times 0.125 = 0.083 = 0.083$

Sampling Token J

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 2, z_I = 2, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron iron

Topic 3 :pig dog cat cat

- $p(z_J = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_J = 2) = \left(\frac{3+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.667 \times 0.125 = 0.083 = 0.083$
- $p(z_J = 3) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{4+5.000}\right) = 0.167 \times 0.222 = 0.037 = 0.037$

Sampling Token J

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 2, z_I = 2, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron iron

Topic 3 :pig dog cat cat

- $p(z_J = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_J = 2) = \left(\frac{3+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.667 \times 0.125 = 0.083 = 0.083$
- $p(z_J = 3) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{4+5.000}\right) = 0.167 \times 0.222 = 0.037 = 0.037$

Sampling Token J

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 2, z_I = 2, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron iron

Topic 3 :pig dog cat cat

- $p(z_J = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_J = 2) = \left(\frac{3+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.667 \times 0.125 = 0.083 = 0.083$
- $p(z_J = 3) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{1+1.000}{4+5.000}\right) = 0.167 \times 0.222 = 0.037 = 0.037$

New assignment for (2, 2): 2

Sampling Token K

- Document 1: $A_{\text{dog}_1} B_{\text{cat}_2} C_{\text{cat}_3} D_{\text{pig}_1}$
- Document 2: $E_{\text{hamburger}_2} F_{\text{dog}_3} G_{\text{hamburger}_1}$
- Document 3: $H_{\text{iron}_1} I_{\text{iron}_3} J_{\text{pig}_2} K_{\text{iron}_2}$

Assignments

$\text{Doc}_1 : z_A = 3, z_B = 3, z_C = 3, z_D = 3$

$\text{Doc}_2 : z_E = 1, z_F = 1, z_G = 1$

$\text{Doc}_3 : z_H = 2, z_I = 2, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron iron

Topic 3 :pig dog cat cat

$$\frac{n_{d,k} + \alpha_k}{\sum_i^K n_{d,i} + \alpha_i} \frac{v_{k,w_{d,n}} + \lambda_{w_{d,n}}}{\sum_i v_{k,i} + \lambda_i} \quad (2)$$

Sampling Token K

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 2, z_I = 2, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron iron

Topic 3 :pig dog cat cat

- $p(z_K = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$

Sampling Token K

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 2, z_I = 2, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron iron

Topic 3 :pig dog cat cat

- $p(z_K = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_K = 2) = \left(\frac{3+1.000}{3+3.000}\right) \times \left(\frac{2+1.000}{3+5.000}\right) = 0.667 \times 0.375 = 0.250 = 0.250$

Sampling Token K

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 2, z_I = 2, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron iron

Topic 3 :pig dog cat cat

- $p(z_K = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_K = 2) = \left(\frac{3+1.000}{3+3.000}\right) \times \left(\frac{2+1.000}{3+5.000}\right) = 0.667 \times 0.375 = 0.250 = 0.250$
- $p(z_K = 3) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{4+5.000}\right) = 0.167 \times 0.111 = 0.019 = 0.019$

Sampling Token K

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 2, z_I = 2, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron iron

Topic 3 :pig dog cat cat

- $p(z_K = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_K = 2) = \left(\frac{3+1.000}{3+3.000}\right) \times \left(\frac{2+1.000}{3+5.000}\right) = 0.667 \times 0.375 = 0.250 = 0.250$
- $p(z_K = 3) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{4+5.000}\right) = 0.167 \times 0.111 = 0.019 = 0.019$

Sampling Token K

Assignments

Doc₁ : $z_A = 3, z_B = 3, z_C = 3, z_D = 3$

Doc₂ : $z_E = 1, z_F = 1, z_G = 1$

Doc₃ : $z_H = 2, z_I = 2, z_J = 2, z_K = 2$

Topics

Topic 1 :hamburger

hamburger dog

Topic 2 :pig iron iron iron

Topic 3 :pig dog cat cat

- $p(z_K = 1) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{3+5.000}\right) = 0.167 \times 0.125 = 0.021 = 0.021$
- $p(z_K = 2) = \left(\frac{3+1.000}{3+3.000}\right) \times \left(\frac{2+1.000}{3+5.000}\right) = 0.667 \times 0.375 = 0.250 = 0.250$
- $p(z_K = 3) = \left(\frac{0+1.000}{3+3.000}\right) \times \left(\frac{0+1.000}{4+5.000}\right) = 0.167 \times 0.111 = 0.019 = 0.019$

New assignment for (2, 3): 2