DD2434 - Machine Learning, Advanced Course
Assignment 1A

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1 Exponential Family

1.1 Question 1.1

$$\begin{aligned} p(x|\theta) &= h(x)\exp(\eta(\theta)\cdot T(x) - A(\eta)) \\ &= h(x)\exp(\eta(\lambda)\cdot T(x) - A(\eta(\lambda))) \\ &= h(x)\exp(\log\lambda\cdot x - A(\log\lambda)) \\ &= h(x)\exp(\log\lambda\cdot x - \lambda) \\ &= h(x)\exp(\log\lambda\cdot x)\exp(-\lambda) \\ &= e^{-\lambda}\frac{\lambda^x}{x!} \end{aligned} \tag{1}$$

We can see that the distribution correspond to a Poisson distribution of parameter λ.

2 Dependencies in a Directed Graphical Model

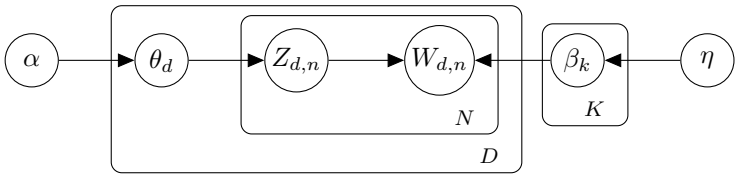

Figure 1: Graphical model of smooth LDA.

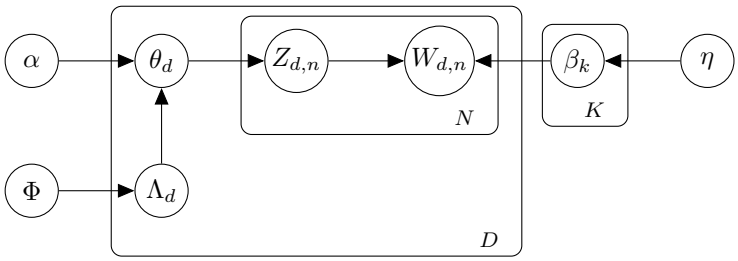

Figure 2: Graphical model of Labeled LDA.