Matt Dickenson `mcd31`
STA561/CS571 — Fall 2013 **Homework 7** Due: 11 November, 2013

Homework Notes: I did not work with anyone else on this homework or refer to resources other than the course notes, textbook, and course Piazza page.

Problem 1

A

Problem 2

A We expect values of π_j (with $K = 3$ for this example) close to $(1, 0, 0), (0, 1, 0)$, or $(0, 0, 1)$ with high probability, but assign very low probbaility to $pi_j = (\frac{1}{3}, \frac{1}{3}, \frac{1}{3})$.

B In this case, π_j is uniform.

C When $\alpha = 10$, we assign high probability to $\pi_j = (\frac{1}{k}, \frac{1}{k}, ...)$.

D Figure 1 presents 1,000 samples from three different parameterizations of the Beta distribution: $(0.2, 0.2), (1, 1)$, and $(10, 10)$. These samples support the answers above. For the first panel (Beta$(0.2, 0.2)$), samples of 0 and 1 are highly probable. In the second panel (Beta$(1, 1)$), the samples appear to be uniformly distributed over the unit interval. Samples in the third panel (Beta$(10, 10)$) favor values near the center of the distribution ($\frac{1}{k} = \frac{1}{2}$) rather than at the extremes of 0 or 1.

E I suspect that inference in these models is easier with values of α similar to $[\alpha_1, ..., \alpha_k] = 0.2$. Inference with this setting is easier because each document is assigned to a single topic with high probability, rather than a mixture of topics. That is, assigning $z_{i,j}$ is easier when $[\alpha_1, ..., \alpha_k] < 1$.

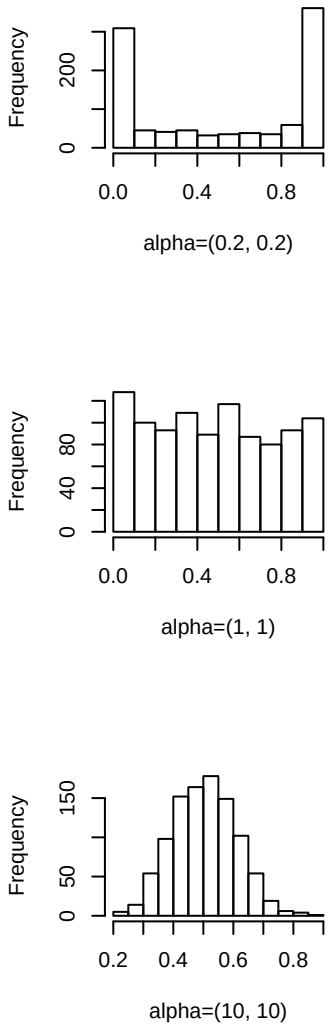

Figure 1: 1,000 Samples from Beta Distributions with Three Different Values of α