Bayesian Methods: Multi-parameter Models -II

- Home Work discussion

Multinomial Models

- $p(y \mid q) \propto \prod_1^k q_j^{y_j}, \ \sum q_j = 1, \sum y_j = n$
- likelihood involves powers of $q_j's$
- Conjugate prior: same form
  - Dirichlet distribution Dir $(a_1, a_2, \cdots a_k)$ (genralization of beta for two classes)
    - $\propto \prod_j q_j^{a_j - 1}$
- Posterior: Dirichlet Dir$(a + y)$
  - Improper ?, Uniform ?
  - Posterior proper if $a + y > 0$
- Example: 3 or more categories on an item response survey
  - could make posterior inference on any function of q

Multivariate Normal

- Known Covariance matrix Σ
  - Likelihood: quadratic form in mean vector
  - Conjugate Prior involves a quadratic form
  - Posterior updates the mean and covariance(precision) matrix
  - Marginals of subvectors
  - Predictive Distribution
  - Draw samples from Multivariate Distribution
    - Cholesky Decomposition
    - Principal Components
    - Non-informative prior
      - Proper posterior: needs n > d
      - Density does not exist if Cov matrix singular

- Unknown mean and Covariance
  - Conjugate: Normal-Inverted Wishart
  - Try the idea of independent components

Bioassay Problem

- Binomial, Logit