Coursework **Fall 2012**
Statistical Pattern Recognition (COMP136) **Roni Khardon**
Department of Computer Science, Tufts University

Assignment 4

This assignment is due by Thursday October 25 in class.

Written Problems

1. Bayesian Inference for Univariate Normal: Consider a sample distributed as in equation 2.152 (page 101) and a joint prior for the mean and variance given by 2.154. Calculate the posterior for μ and λ and show that it is also decomposable as a normal-gamma distribution. In particular explicitly calculate and show the parameters of the posterior when given in this form.

2. Solve problem 2.57 (page 136) in the textbook.

3. Read problem 4.9 page 221 in the textbook and its solution (on text web page). Then solve problem 4.10 using the same representation for the multiclass problem.

4. Solve problem 4.11 (page 222) in the textbook.

5. Calculate one iteration of the Newton-Raphson method for minimizing the function $f(x) = x_1^3 + 5x_1x_2^2 - 7x_1^2x_2$ where $x = (x_1, x_2)^T$. Use $x = (1, 1)^T$ as the initial value.

6. Develop a Gaussian approximation to the beta distribution $beta(\mu|a, b)$ using the Laplace approximation. First develop the formulas in general and then apply them to the case $a = b = 3$.

7. Solve problem 4.18 (page 223) in the textbook.