

**Discussion 12**

Fall 2014

**Date:** Wednesday, November 19, 2014

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*Problem 1.* Let  $X$  be equally likely to take any of the values  $\{1, 2, 3\}$ . Given  $X$ , the random variable  $Y$  is  $\mathcal{N}(X, 1)$ .

- (a) Find  $MAP[X|Y]$ ;
- (b) Calculate  $E[X|Y]$ ;
- (c) Calculate  $L[X|Y]$ ;
- (d) Calculate  $E((X - Y)^2)$ .

*Problem 2.* Assume that  $X = Y + 2Y^2 + Z$  where the  $Y$  and  $Z$  are i.i.d.  $U[0, 1]$ . Calculate  $Q[X|Y]$  that is the quadratic least squares estimate of  $X$  given  $Y$ .

*Problem 3.* The random variables  $X, Y, Z$  are jointly Gaussian,

$$(X, Y, Z)^T \sim N((0, 0, 0)^T, \begin{bmatrix} 2 & 2 & 1 \\ 2 & 4 & 2 \\ 1 & 2 & 1 \end{bmatrix})$$

- a) Find  $E[X|Y, Z]$ ;
- b) Find the variance of error.