

Written Questions

1) Yes

2) • Probability/Statistics: STAT6000, STAT6600

• Linear Algebra: Linear Algebra in my home university

• Optimization: Numeric Methods in my home university

• Data Mining/Pattern Recognition/Machine Learning: Currently, I am enrolled in Data Mining and Machine Learning.

3)

If Alice draws a red or blue ball ($\frac{7}{12}$), the probability that Bob draws a green ball is $\frac{5}{11}$

If Alice draws a green ball ($\frac{5}{12}$), the probability that Bob draws a green ball is $\frac{4}{11}$

The probability that Bob draws a green ball: $\frac{7}{12} * \frac{5}{11} + \frac{5}{12} * \frac{4}{11} = \frac{5}{12}$

4) a)

$$\frac{1}{2} \|y - Xw\|^2 = \frac{1}{2} (y - Xw)^T (y - Xw)$$

$$\frac{1}{2} (y^T y - 2X^T w^T y - X^T w^T Xw)$$

Now we should take the gradient and minimize it to zero.

- $y^T y$ is independent so the gradient is 0

- $-2X^T w^T y$ is $-2X^T y$

- $X^T w^T Xw$ is $X^T Xw$

$$\text{So: } X^T Xw - 2X^T y = 0 \Rightarrow X^T Xw = 2X^T y$$

$$\text{Then: } w^* = \frac{X^T Xw}{2X^T y}$$

b) If it is full rank the matrix is invertible so the previous solution is valid, otherwise it is not.