# EE3731C Tutorial - Pattern Recognition 2
## Department of Electrical and Computer Engineering

1. Given data samples $x_1, x_2, x_3, x_4$ to be $2, 5, 7, 8$. For Parzen's window $\phi(x) = \frac{1}{\sqrt{2\pi}}e^{-\frac{x^2}{2}}$

   (a) What is the estimate of $p_h(x)$ at $x = 4$ for $h = 1, 2$ or $3$?

   (b) What is the estimate of $p_h(x)$ at $x = 6$ for $h = 1, 2$ or $3$?

   (c) Given data points $x = 4$ and $6$ as the validation set, what is the best $h$ (out of the possible values of 1, 2 and 3).

2. Given the same data samples as question 1, what is the 2-NN estimate of $p(x)$ at $x = 3$?

3. Given training data $x_1 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ $x_2 = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ $x_3 = \begin{pmatrix} -1 \\ 0 \end{pmatrix}$ $x_4 = \begin{pmatrix} -1 \\ 1 \end{pmatrix}$ with corresponding class labels $y_1 = 0, y_2 = 0, y_3 = 1, y_4 = 1$.

   (a) What is the 3-NN classification of $x = \begin{pmatrix} 0.5 \\ 1 \end{pmatrix}$, where the distance metric used is the Euclidean distance?

   (b) What is the 3-NN classification of $x = \begin{pmatrix} -0.5 \\ 1 \end{pmatrix}$, where the distance metric used is the Euclidean distance?

   (c) Describe the decision boundary of the classifier, i.e., identify all the points that will be classified as class 1 and all the points that will be classified as class 0.