EE871 Reg.No. : ..... Marks :

NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA - SURATHKAL, SRINIVASNAGAR-PIN:575 025

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ACADEMIC SESSION January-May 2020

Assignment-2

Course Code	: EE871	Course Title	: **Machine Learning**
Credits	: 3-1-2 : 5	Instructor	: Dr. Jora M. Gonda
Weight	: 3%	Submission Deadline	: 25-01-2020 05:00 PM

1. From Simon Haykin: The Figure 1 overleaf shows a pair of moons facing each other in an asymmetrically arranged manner. The moon labeled Region-A is positioned symmetrically with respect to the y-axis, whereas the moon labeled Region-B is displaced to the right of the y-axis by an amount equal to the radius r and below the x-axis by the distance d. The two moons have identical parameters r and w.
   The vertical distance d separating the two moons is adjustable; it is measured with respect to the x-axis.

   - Increasingly positive values of d signify increased separation between the two moons;
   - increasingly negative values of d signify the two moons coming closer to each other.

   Write a program in Python, given d, r, and w to:

   (a) Generate 1500 samples of data distributed randomly over each of the regions

   (b) Plot the data (A- x, B- o) as shown below, for different values of d.

   (c) Animate the plot, giving control with d.

2. We are familiar with the single-layer, single-neuron perceptron with hard limiter as the activation function. I wish to explore the possibility of using it for classifying non-linearly separable data sets, example – the data corresponding to the notorious, XOR gate. So, let the activation function be replaced by a Hyperbolic Tangent/ bipolar sigmoidal, given by,

$$f(g, \lambda) = \frac{1 - e^{-\lambda g}}{1 + e^{-\lambda g}},$$

   where λ is also a Learning parameter, and $g(\cdot) = \underline{w}^T \underline{x}$. And use a bipolar threshold with threshold β, at the output, $y(\cdot)$. Now, by choosing, different values for w_0, w_1, w_2,and λ,

   (a) Obtain $f(\cdot)$ and plot it (3D) for various values of $\underline{w}$ and λ,

   (b) Draw the contours of $f(\cdot)$ for different values of β, on x_1-x_2 plane, along with $f(\cdot)$.

   (c) Animate the display for variation of w_0, w_1, w_2, λ, and β.

   (d) Obtain a set of values for w_0, w_1, w_2, λ, and β, which can classify the XOR data.

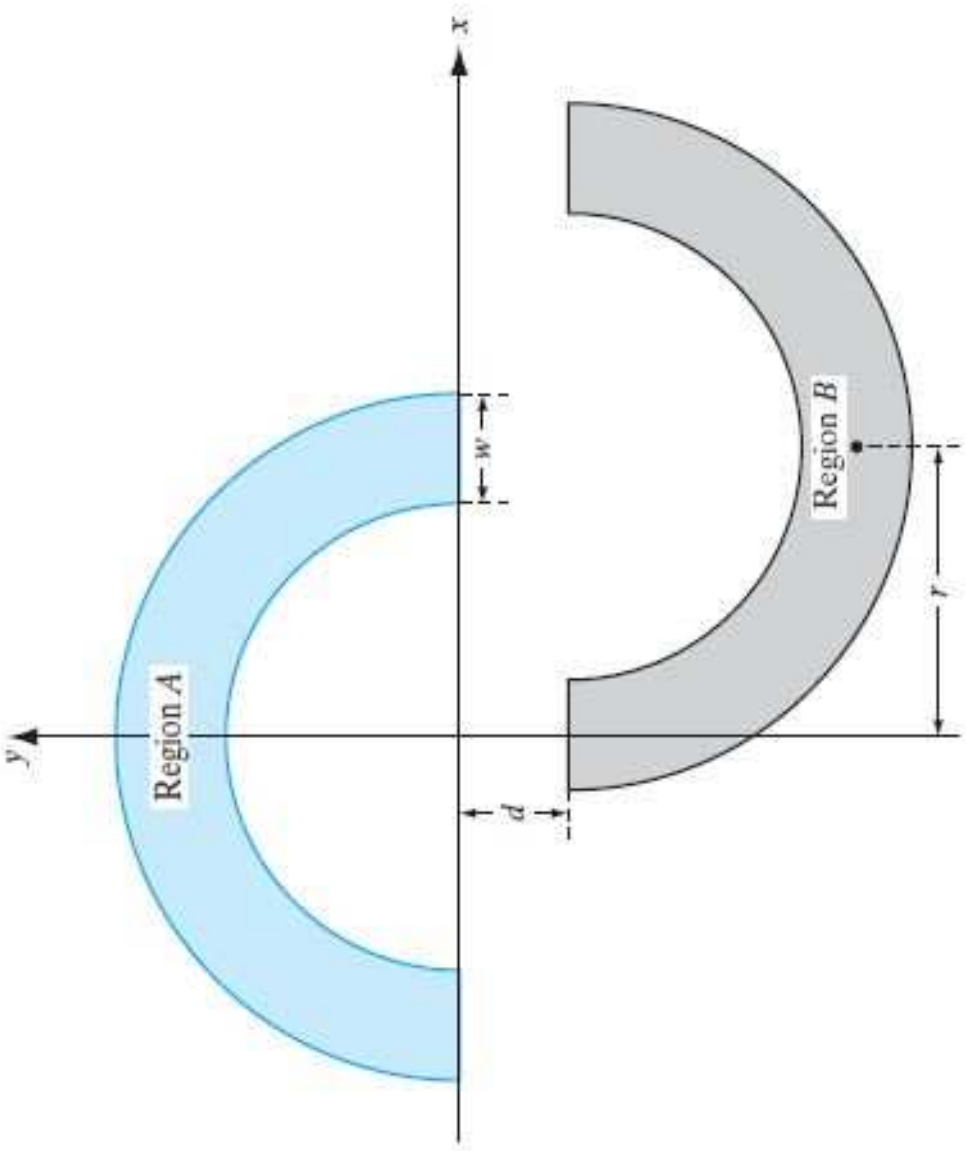

Figure 1: Double half moon