Question Paper

Exam Date & Time: 30-Nov-2022 (09:00 AM - 12:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

SEVENTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, NOV 2022
Department of Instrumentation and Control

Multi Sensor Data Fusion [ICE 4057]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions. Section Duration: 180 mins

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1)		Explain different data fusion systems based on sensor configuration with examples.[CO1, PO1, BL2]	(3)
	A)		
	B)	Draw a diagram of a single fusion node and explain its properties.[CO1, PO1, BL2]	(3)
	C)	Given two time series, P= (3.1, 4.6, 2.9, 1.5, 6.6, 7.2) and Q= (1.4, 2.6, 3.3, 4.9, 5.3, 6.2), calculate cumulative matrix D and optimal warping path using dynamic programming.[CO2, PO2, PO3, BL3]	(4)
2)		Compute linear discriminant projection for the following two-dimensional dataset	(5)
	A)	$X_1 = (x_1, x_2) = \{(4,1), (2,4), (2,3), (3,6), (4,4)\}$ $X_2 = (x_1, x_2) = \{(9,10), (6,8), (9,5), (8,7), (10,8)\}$.[CO2, PO2, PO3, BL3]	
	B)	For X= (3, 5, 5, 8, 9, 12, 12, 13, 15, 16, 17, 19, 22, 24, 25, 134), perform Z-score normalization. [CO2, PO2, PO3, BL3]	(3)
	C)	Explain Dasarthy's Input/output Data fusion model. [CO4, PO1, BL2]	(2)
3)	A)	Using k-means algorithm,cluster the following dataset into 2 clusters: A_1=(185,72), A_2=(170,56), A_3=(168,60), A_4=(179,68), A_5=(182,72), A_6=(188,77), A_7=(180,71). [CO3, PO1, PO2, PO3, PO4, BL3]	(4)
	B)	Construct a binary search tree for the given values, Y= (13, 3, 4, 12, 14, 10, 5, 1, 8, 2, 7, 9, 11, 6, 18). [CO3, PO1, PO2, PO3, PO4, BL3]	(2)
	C)	Explain Waterfall model of fusion process with an example.[CO4, PO1, BL2]	(4)
4)		With neat figure, describe different levels of JDL fusion framework. [CO4, PO1, BL2]	(4)
	A)		
	B)	Explain Omnibus model with an example. [CO4, PO1, BL2]	(4)
	C)	Describe Luo-Kay data fusion framework. [CO4, PO1, BL2]	(2)
5)		Estimate the height of an aircraft using Kalman filtering technique for the following data:	(5)

A) True height=50

Initial Estimate=60

Initial error in estimate=225

Error in measurement =25

Measurements= {48.54, 47.11, 55.01, 55.15, 49.89, 40.85, 46.72, 50.05, 51.27, 49.95}. [CO5, PO1, BL3]

B) What is Bayesian filtering? Classify the types of Bayesian filter. [CO5, PO1, BL2] (3)

C) Explain the need of data filtering. [CO5, PO1, BL2] (2)

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