MODULE HANDBOOK
MATHEMATICS OF MACHINE LEARNING

MASTER DEGREE PROGRAM
DEPARTMENT OF MATHEMATICS
FACULTY OF SCIENCE AND DATA ANALYTICS

INSTITUT TEKNOLOGI SEPULUH NOPEMBER

MODULE HANDBOOK
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Module name	**Mathematics of Machine Learning**
Module level	Master
Code	KM185232
Course (if applicable)	Mathematics of Machine Learning
Semester	Spring (Genap)
Person responsible for the module	Prof. Dr. Mohammad Isa Irawan, M.T.
Lecturer	Prof. Dr. Mohammad Isa Irawan, M.T.
Language	Bahasa Indonesia and English
Relation to curriculum	Master degree program, **mandatory**, 2nd semester.
Type of teaching, contact hours	Lectures, <60 students
Workload	1. Lectures : 3 x 50 = 150 minutes per week. 2. Exercises and Assignments : 3 x 60 = 180 minutes (3 hours) per week. 3. Private learning : 3 x 60 = 180 minutes (3 hours) per week.
Credit points	3 credit points (sks)
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.
Mandatory prerequisites	-
Learning outcomes and their corresponding ILOs	Course Learning Outcome (CLO) after completing this module, CLO-1 : The student schemes the types of machine learning and their relationships with other fields. CLO-2 : Students are able to explain the concept of learning CLO-3 : Students are able to apply a mapping from the real value space to another in a linear model. CLO-4 : Students are able to apply the concept of non-linear mapping to overcome the limitations of the linear model. CLO-5 : Students are able to implement SVM CLO-6 : Students are able to explain minimize the sum of

	the empirical risk and regularization functions CLO-7 : Students are able to explain the classifier concept using the perceptron and hebb algorithms CLO-8 : Students are able to understand and implement computations with the backpropagation algorithm CLO-9 : Students are able to implement computations with algorithms based on the Gaussian activation function CLO-10 : Students are able to analyze the matrix concept applied in ELM CLO-11 : Students are able to analyze and implement the computational concept of the Kohonen network, LVQ and k-means for data routing	
Content	Studies on development algorithm which allows the computer to develop behaviors that are based on emprical data, such as from data sensors of the database. The student can utilize sample system (data) to capture the required characteristics of the underlying probability (unknown). Data can be viewed as an example that illustrates the relationship between the variables which includes the design and observed. Diaper main topics of machine learning is how to automatically identify complex patterns and make intelligent decisions based on data. The difficulty occurs because the set of all possible behaviors, of all possible inputs, too big to be covered by a set of sample observation (training data), because the machine must learn generalized behavior of existing instances to produce useful output in new cases.	
Study and examination requirements and forms of examination	• In-class exercises • Assignment 1, 2, 3 • Mid-term examination • Final examination	
Media employed	LCD, whiteboard, websites (myITS Classroom), zoom.	
Reading list	Main : 1. Shwartz SS and SB David, "Understanding Machine Learning: from Theory to Algorithm ", Cambridge University Press, 2014 2. Aaron Hertzmann and David Fleet," Machine Learning and Data Mining ", lecture notes etc. Toronto, 2012 Supporting : -	