	Universitas Negeri Surabaya Faculty of Engineering, Undergraduate Study Program in Informatics Engineering	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Machine Learning	5520203143		T=3	P=0	ECTS=4.77	7	July 18, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Aditya Prapanca, S.T., M.Kom.

Learning model: Project Based Learning

Program Learning Outcomes (PLO)

PLO study program that is charged to the course

Program Objectives (PO)

PO - 1	Students are able to explain the concepts of each machine learning method
PO - 2	Students are able to identify, model, analyze and solve problems using machine learning methods.
PO - 3	Students are able to implement machine learning methods using programming languages to solve problems

PLO-PO Matrix

P.O
PO-1
PO-2
PO-3

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PO-1																
PO-2																
PO-3																

Short Course Description: The Machine Learning course trains students to understand basic ideas, intuition, concepts, algorithms and techniques to make computers smarter through the process of learning from data. The material presented includes supervised learning, unsupervised learning, reinforcement learning, and ensemble methods.

References

Main :

1. Peter Flach: Machine learning: The Art and Science of Algorithms that Make Sense of Data. Cambridge University Press 2012
2. Tan, Steinbach, Kumar. Introduction to Data Mining. Addison-Wesley. 2006.
3. Slide perkuliahan: Introduction to Machine Learning, University of Helsinki.
4. Suyanto, Data Mining untuk Klasifikasi dan Klasterisasi Data, INFORMATIKA: Bandung, 2017

Supporters:

Supporting lecturer: Dr. Yuni Yamasari, S.Kom., M.Kom.
Dr. Ricky Eka Putra, S.Kom., M.Kom.

Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (*offline*)	Online (*online*)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	1. Able to explain the concept and motivation of machine learning. 2. Able to determine problems that can be solved with machine learning.	1. Truth and accuracy in explaining machine learning concepts 2. Correct in determining problems that can be solved with machine learning.	**Criteria:** 1. Truth 2. accuracy **Form of Assessment** : Test	lectures, discussions, quizzes			0%
2	Able to identify, model, analyze and solve problems using regression	1. Truth and accuracy in explaining the concept of regression 2. True in regression implementation 3. Regression performance on the prediction problems that have been provided	**Criteria:** 1. Truth 2. accuracy 3. method performance **Form of Assessment** : Practice / Performance	lectures, discussions, programming and written assignments (reports)			5%
3	Able to explain the concept of Naïve Bayes	1. Truth and accuracy in explaining the concept of Naïve Bayes 2. Truth in the implementation of Naïve Bayes 3. Naïve Bayes performance on provided classification problems	**Criteria:** 1. Truth 2. Accuracy 3. method performance **Form of Assessment** : Practice / Performance	lectures, discussions, programming assignments			5%
4	Able to explain concepts, identify, model, analyze and implement Probabilistic Neural Networks to solve classification problems	1. Truth and accuracy in explaining the concept of Artificial Neural Networks 2. Truth in the implementation of Multi-Layer Perceptron and Probabilistic Neural Network 3. Performance of Multi-Layer Perceptron and Probabilistic Neural Network on provided classification problems.	**Criteria:** 1. truth 2. accuracy 3. method performance **Form of Assessment** : Practice / Performance	lectures, discussions, programming assignments			8%

5	Able to explain concepts, identify, model, analyze and implement Probabilistic Neural Networks to solve classification problems	1. Truth and accuracy in explaining the concept of Artificial Neural Networks 2. Truth in the implementation of Multi-Layer Perceptron and Probabilistic Neural Network 3. Performance of Multi-Layer Perceptron and Probabilistic Neural Network on provided classification problems.	**Criteria:** 1. truth 2. accuracy 3. method performance **Form of Assessment** : Practice / Performance	lectures, discussions, programming assignments			7%
6	Able to explain the concept of Support Vector Machine	1. Correctness and accuracy in explaining the concept of Support Vector Machine 2. Correctness in Support Vector Machine implementation 3. Support Vector Machine performance for the classification problems that have been provided	**Criteria:** 1. truth 2. accuracy 3. method performance **Form of Assessment** : Practice / Performance	lectures, discussions, programming assignments			5%
7	Able to explain the concept of Support Vector Machine	1. Correctness and accuracy in explaining the concept of Support Vector Machine 2. Correctness in Support Vector Machine implementation 3. Support Vector Machine performance for the classification problems that have been provided	**Criteria:** 1. truth 2. accuracy 3. method performance **Form of Assessment** : Practice / Performance	lectures, discussions, programming assignments			5%
8	1. Able to explain the concept of hierarchical clustering 2. Able to identify, model, analyze and implement the k-means clustering method to solve clustering problems	1. Correctness and accuracy in explaining the concept of clustering 2. Correctness in implementing K-means (partitional-based clustering) and hierarchical clustering to the clustering problems that have been provided	**Criteria:** 1. truth 2. accuracy **Form of Assessment** : Practice / Performance	lectures, discussions, programming assignments			15%

9	1. Able to explain the concept of hierarchical clustering 2. Able to identify, model, analyze and implement the k-means clustering method to solve clustering problems	1. Correctness and accuracy in explaining the concept of clustering 2. Correctness in implementing K-means (partitional-based clustering) and hierarchical clustering to the clustering problems that have been provided	**Criteria:** 1. truth 2. accuracy **Form of Assessment** : Practice / Performance	lectures, discussions, programming assignments			10%
10	Able to explain the concept of Self-Organizing Maps	1. Truth and accuracy in explaining the concept of SelfOrganizing Maps 2. Correctness in implementing Self-Organizing Maps for clustering problems that have been provided	**Criteria:** 1. truth 2. accuracy **Form of Assessment** : Practice / Performance	lectures, discussions, programming assignments			5%
11	1. Able to explain the concept of Reinforcement learning 2. Able to identify, model, analyze and implement reinforcement learning to solve a problem.	1. Truth and accuracy in explaining the concept of Reinforcement learning 2. Correctness in implementing Reinforcement learning in autonomous robot simulations.	**Criteria:** 1. truth 2. accuracy **Form of Assessment** : Practice / Performance	lectures, discussions, program assignments			10%
12	1. Able to explain the concept of Reinforcement learning 2. Able to identify, model, analyze and implement reinforcement learning to solve a problem.	1. Truth and accuracy in explaining the concept of Reinforcement learning 2. Correctness in implementing Reinforcement learning in autonomous robot simulations.	**Criteria:** 1. truth 2. accuracy **Form of Assessment** : Practice / Performance	lectures, discussions, program assignments			10%
13	1. Able to explain the concept of Ensemble methods 2. Able to identify, model, analyze and implement ensemble methods to solve a problem.	1. Correctness and accuracy in explaining the concept of Ensemble methods 2. Correctness in implementing one of the Ensemble methods for a problem	**Criteria:** 1. truth 2. accuracy **Form of Assessment** : Practice / Performance	lectures, discussions, programming assignments			10%
14	1. Able to explain the concept of Ensemble methods 2. Able to identify, model, analyze and implement ensemble methods to solve a problem.	1. Correctness and accuracy in explaining the concept of Ensemble methods 2. Correctness in implementing one of the Ensemble methods for a problem	**Criteria:** 1. truth 2. accuracy **Form of Assessment** : Practice / Performance	lectures, discussions, programming assignments			10%

15	1.Able to explain the concept of Ensemble methods 2.Able to identify, model, analyze and implement ensemble methods to solve a problem.	1.Correctness and accuracy in explaining the concept of Ensemble methods 2.Correctness in implementing one of the Ensemble methods for a problem	**Criteria:** 1.truth 2.accuracy **Form of Assessment** : Practice / Performance	lectures, discussions, programming assignments			0%
16	Final exams						0%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Practice / Performance	105%
		100%

Notes

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** ability in the process and student learning outcomes are specific and measurable statements that identify the ability or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.